

Heterotergum dargazii sp. nov. (Acari: Eriophyidae) from Northeast Iran

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Abstract. During field surveys of eriophyoid mites in Northeast of Iran (Razavi Khorasan province) in 2023, one new species belonging to the tribe Anthocoptini (Acari: Eriophyoidea: Eriophyidae: Phyllocoptinae) was discovered, described and illustrated herein. It is *Heterotergum dargazii* sp. nov. associated with *Teucrium polium* L. (Lamiaceae). No visible symptom was observed in host plant. Up to now, no species of the genus *Heterotergum* have been reported on Lamiaceae plants worldwide. The new species was compared with all *Heterotergum* species that was morphologically more similar to *Heterotergum munduleae* Meyer, 1992 and *Heterotergum sariensis* Ranjbar-Varandi, Haddad Irani-Nejad et Lotfollahi, 2022.

Keywords: Anthocoptini, Dargaz, *Heterotergum*, *Teucrium*, Vagrant.

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Introduction

Teucrium L. is a widespread genus of shrubs, subshrubs, and perennial herbs (rarely annuals or biennials) in the Lamiaceae family, including about 434 recognized taxa, with an unusual distribution: 93% of its species distribute in the Northern Hemisphere and only 7% in the Southern Hemisphere (Australia, New Zealand, the Cape Region, and Argentina) (Navarro, 2020). This genus contains 19 species in Iran, of which four are endemic to the country (Bagheri Moghadam & Kharazian, 2020). *Teucrium polium* L. is a perennial herbaceous plant with a woody base, a round pubescent stem 10–12 cm tall that is fully branched in the upper part, leaves 2 cm long and up to 4 mm wide with intact and folded margins in the lower part, and small verticillasters of flowers ranging in color from pink to yellow (Negri, 1979). This wild-growing flowering plant is widely distributed across almost all Mediterranean countries, including Southwestern Asia, Europe, and North Africa, where it typically inhabits dry, stony hills and deserts (Kovacevic *et al.*, 2001). *Teucrium* species are found throughout various parts of Iran. For instance, *T. polium* and *T. orientale* L., are widely distributed in steppe, arid, and semiarid regions (Eshratifar *et al.*, 2011). Traditionally, *T. polium* has been used for various pathological conditions, including gastrointestinal disorders, inflammation, diabetes, and rheumatism. In traditional Iranian medicine, the tea of *T. polium* is used for treating many diseases such as abdominal pain, indigestion, common cold and type 2 diabetes (Bahramikia & Yazdanparast, 2012).

Up to now, approximately 101 eriophyoid mite species (Acari: Eriophyoidea) have been reported on Lamiaceae plants around the world (Amrine & de Lillo unpublished databases). Out of these species, five of them reported on *Teucrium* species around the world: *Aculus teucii* (Nalepa, 1892), *Aculus chamaedrys* (Szépligeti, 1895), *Anthocoptes octocinctus* Nalepa, 1894 and *Aculops thymi* (Nalepa, 1889) on *T. chamaedrys* L., and *Aceria pocrii* Honarmand, Sadeghi–Namaghi *et de* Lillo, 2020 on *T. polium* L. (Nalepa, 1892; Canestrini, 1892; Nalepa, 1894; Szépligeti, 1895; Honarmand *et al.*, 2020). So far, no species of the genus *Heterotergum* have been reported on Lamiaceae plants worldwide. In order to expand our understanding of the eriophyoid fauna in Iran, a study was conducted during the growing seasons in 2023 to survey eriophyoid mites in Razavi Khorasan provinces, Iran.

Materials and methods

The plant samples were collected from Razavi Khorasan Provinces of Iran (Northeast) during the 2023 growing season. Eriophyoid mites specimens were extracted from plant materials using a modified washing method (Lotfollahi & Masoudi-Rad 2024) and preserved in 70% ethanol (Walter & Krantz 2009). Mites were cleared and slide-mounted following the protocol of Lotfollahi and Masoudi-Rad (2024). Morphological measurements were obtained in accordance with Amrine and Manson (1996), as modified by de Lillo *et al.* (2010), using an Olympus BX53 phase-contrast microscope (Japan). All measurements are given in micrometers; measurements are rounded off to the nearest integer and regard the length of the morphological traits unless otherwise specified. In the female description, the holotype measurements are followed by range values for the studied population (i.e. holotype and paratypes) set between parentheses; only the range values are given for the nymphs. The mean values of the paratypes are reported in a few cases when measurements of the holotype could not be taken, due to the slide mounting position of the specimens; these are marked by an asterisk (*). The line drawings were made by the first author using a camera lucida, following de Lillo *et al.* (2010), and edited with Adobe Photoshop® CC 2017 software. Abbreviation labeling in the schematic drawings of Figure 1 followed the guidelines of Amrine *et al.* (2003). Host plants were identified by Mohammad Reza Joharchi, botanist at the Plant Science Research Institute, Ferdowsi University of Mashhad, Iran; names are in accordance with "Plants of the World Online" (2025). All paratypes and holotype of the new species are deposited at the Acarology Laboratory, Department of Plant Protection, Faculty of Agriculture, Azarbaijan Shahid Madani University (Iran) except one paratype which is deposited in the Acarological Collection, Jalal Afshar Zoological Museum (JAZM), Faculty of Agriculture, University of Tehran, Karaj, Iran.

Results

Family Eriophyidae Nalepa

Subfamily Phyllocoptinae Nalepa

Tribe Anthocoptini Amrine et Stasny

Genus *Heterotergum* Keifer

Heterotergum dargazii sp. nov.

<http://zoobank.org/urn:lsid:zoobank.org:act:E8937B91-C826-4F88-8E51-90FDB21E4E28>

Description

Female (Figs. 1, 2; measured specimens n= 8). **Body** vermiform, 180 (155–185, including gnathosoma), 50 (44–50) wide, 50* (48–50) thick. **Gnathosoma** projecting obliquely downwards, cheliceral stylets 16 (16–20), palp 20 (19–24), palp coxal setae *ep* 2 (2–3), dorsal palp genual setae *d* 5 (4–6), unbranched, subapical palp tarsal setae *v* 1* (no variation). Suboral plate anteriorly rounded with few granules. **Prodorsal shield** subtriangular 30 (30–35), including frontal lobe, 37 (34–37) wide; with a rounded frontal lobe, 6 (5–7), over gnathosomal base. Prodorsal shield pattern composed by median line on anterior 3/4 of the shield, complete admedian line that connected together on shield's posterior 3/4, and incomplete submedian line on anterior half of the shield; anterior parts of median and admedian lines and lateral sides of prodorsal shield ornamented with granules. Some granules and dashes present on lateral sides between shield and coxal region. Tubercles of scapular setae *sc* on rear shield margin, 25 (23–25) apart, scapular setae *sc* 25 (25–28), directed backward divergently. **Legs** with all usual segments and setae. Leg I 26 (25–29), trochanter 2 (2–3), femur 9 (7–10), genu 4 (4–5), tibia 4 (4–5), tarsus 6 (5–6), tarsal solenidion ω 9 (9–10), slightly curved down, distally rounded, empodium 5 (4–5), simple, 4-rayed; basiventral femoral setae *bv* 11 (9–11), antaxial genual setae *l''* 22 (19–24), paraxial tibial setae *l'* 5 (4–6), paraxial fastigial tarsal setae *ft'* 16 (16–18), antaxial fastigial tarsal setae *ft''* 24 (24–27), paraxial unguinal tarsal setae *u'* 3 (2–3). Leg II 23 (22–25), trochanter 2 (2–3), femur 8 (7–9), genu 3 (3–4), tibia 3 (3–4), tarsus 6 (5–6), tarsal solenidion ω 11 (10–11), slightly curved down, distally rounded, empodium 5 (4–5), simple, 4-rayed; femoral setae *bv* 10 (9–10), genual setae *l''* 8 (7–11), tarsal setae *ft'* 4 (3–4), setae *ft''* 26 (24–26), setae *u'* 3 (2–3). Coxae ornamented with some dashes; anterolateral setae on coxisternum I (*lb*) 11 (9–11), tubercles *lb* 8 (7–9) apart, proximal setae

on coxisternum I (*Ia*) 27 (26–29), tubercles *Ia* 5 (5–6) apart, proximal setae on coxisternum II (*2a*) 41 (39–45), tubercles *2a* 16 (16–18) apart, prosternal apodeme 6 (4–6). Opisthosoma dorsally with 31 (27–31) dorsal semiannuli; first 1 (1–2) dorsal semiannuli relatively narrow with rounded microtubercles across back followed by broad and smooth semiannuli, and 54 (54–56) ventral semiannuli, with elliptical microtubercles; 4 (3–5) semiannuli with fine microtubercles between coxae and genital coverflap; last 8 (8–11) ventral semiannuli with elongated microtubercles and last 3 (2–3) dorsal semiannuli with spines. Setae *c2* 16 (16–18), on ventral semiannulus 8 (8–10); setae *d* 41 (38–42), on ventral semiannulus 19 (18–22); setae *e* 12 (10–13), on ventral semiannulus 32 (32–36); setae *f* 19 (16–20), on ventral semiannulus 46 (46–51), 6 (5–6) annuli after setae *f*. Setae *h2* 52 (48–54), setae *h1* 3 (2–3). **External genitalia** 14 (12–14), 20 (19–22) wide, coverflap with one rank of 10 (9–11) longitudinal striae, proximal setae on coxisternum III (*3a*) 15 (14–15), 11 (9–12) apart; with 2 (no range) transversal rows of lines at the genital coverflap base. **Internal genitalia**: spermathecae ovoid, oriented posterolaterad; spermathecal tubes relatively short; transverse genital apodeme trapezoidal, distally folded.

Nymph (Fig. 1-NAD; measured specimen n= 2). Body vermiform, 160–165 (including gnathosoma), 40–42 wide. Palp genual setae *d* 3. Prodorsal shield 28–29, including frontal lobe, 29–30 wide, acuminate frontal lobe 3–4. Shield pattern composed short median line, incomplete admedian and submedian lines that one transverse line across the lines on shield 1/3. Tubercles of scapular setae *sc* on rear shield margin, 19–20 apart, setae *sc* 25–26, empodium 3. Coxae similar to those of female; setae *1b* 6–7, tubercles *1b* 7 apart, setae *1a* 17–18, tubercles *1a* 4–5 apart, setae *2a* 34–35, tubercles *2a* 14–15 apart. Opisthosoma with 44–45 narrow dorsal semiannuli; 49–50 ventral semiannuli; 8–9 semiannuli between coxae and genital region. Setae *c2* 11–12 on ventral semiannulus 9, setae *d* 28–30 on ventral semiannulus 18; setae *e* 8–9 on ventral semiannulus 29–30; setae *f* 15 on ventral semiannulus 44, 4–5 annuli after setae *f*. Setae *h2* 39–40; setae *h1* 2; setae *3a* 9–10, 7 apart.

Male. Unkown

Type host plant. *Teucrium polium* L. (Lamiaceae) (Fig. 4-A)

Relation to the host plant. Vagrant; no apparent symptom was observed.

Type locality. Ali Bolagh Shrine, Nokhondan District, Dargaz County, Razavi Khorasan Province, Northeast Iran, (37°31'60.0"N 58°35'50.5"E), 1573 m above sea level, coll. A. Honarmand, 10 July 2023 (Fig. 4-B).

Type material. Holotype: single female on a microscope slide (TP-IRK-AH-DZ-AD(a)-1); paratypes: seven females and two nymphs mounted on separate microscope slides (TP-IRK-AH-DZ-AD(a)-2–10).

Other material. Mites extracted from the same sample as the type specimens were preserved in a tube (TP-IRK-AH-DZ-AD(a)).

Etymology. The specific designation is derived from the type locality city name.

Differential diagnosis

Up to now, no species of the genus *Heterotergum* have been reported on Lamiaceae plants worldwide. The new species is morphologically similar to the *Heterotergum munduleae* Meyer, 1992, which has been reported on *Mundulea sericea* (Willd.) A.Chev. (Fabaceae) from South Africa. The median line on the posterior half of the shield in *H. munduleae*, while is present on the anterior of the shield in the new species. Admedian lines are connected transversally at the posterior of the shield in the new species, while they are not in *H. munduleae*. In addition to differences in the prodorsal shield pattern, the new species is distinguishable by the length of the scapular setae *sc* (25–28 in the new species versus 9–13 in *H. munduleae*) and *3a* (14–15 in the new species versus 18–19 in *H. munduleae*), and in the empodial rays number (4 in the new species versus 5 in *H. munduleae*).

The new species is also close to *Heterotergum sariensis* Ranjbar-Varandi, Haddad Irani-Nejad *et* Lotfollahi, 2022, which has been reported on *Quercus castaneifolia* C. A. Mey., 1831 (Fagaceae) from northern Iran. The median line on the posterior half of the shield in *H. sariensis*, while is present on the anterior of the shield in the new species.

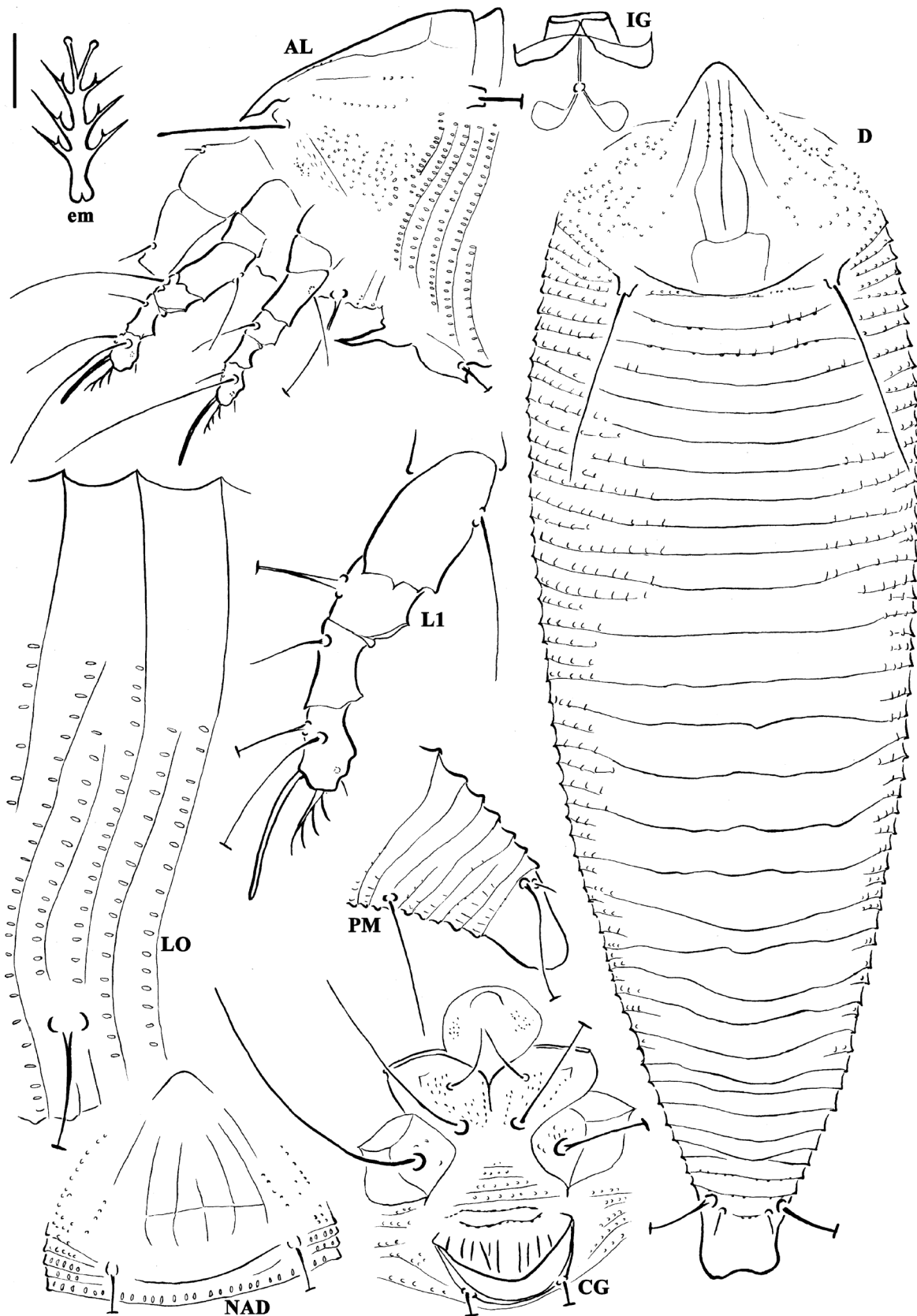


Fig. 1. Schematic drawings of *Heterotergum dargazii* sp. nov.: **D**. Female dorsal view; **AL**. Lateral view of female anterior body region; **CG**. Female coxigenital region; **em**. Female empodium; **IG**. Internal female genitalia; **GM**. Male genital region; **LO**. Lateral view of female annuli; **L1**. Female leg I; **PM**. Lateral view of posterior opisthosoma of female. **Scale bar**: 10 μ m for D, AL, CG, IG, NAD, PM; 5 μ m for LO, L1; 2.5 μ m for em.

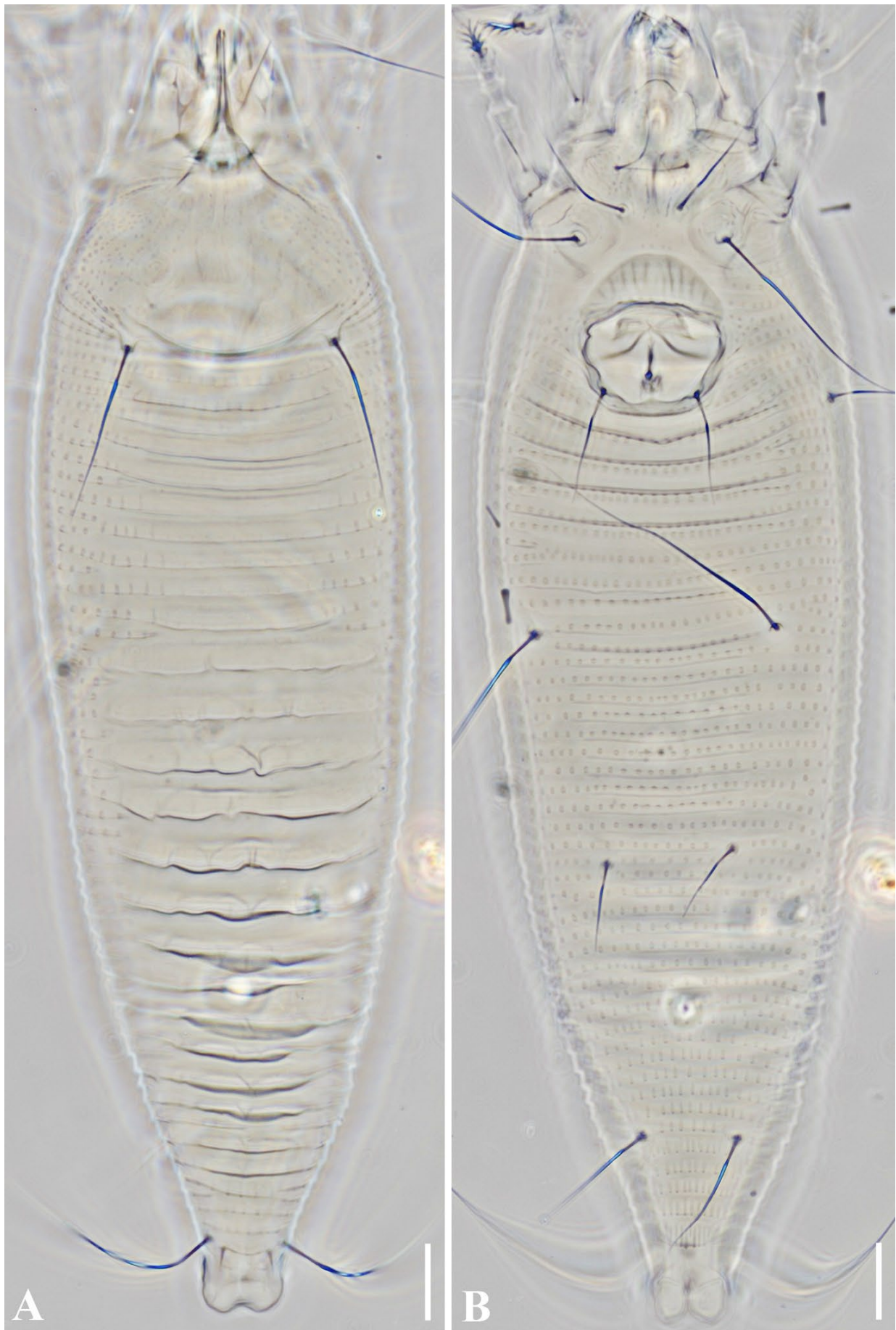


Fig. 2. Phase contrast light microscopy images of *Heterotergum dargazii* sp. nov.: **A.** Female Dorsal view; **B.** Female ventral view; **Scale bar:** 10 μ m.

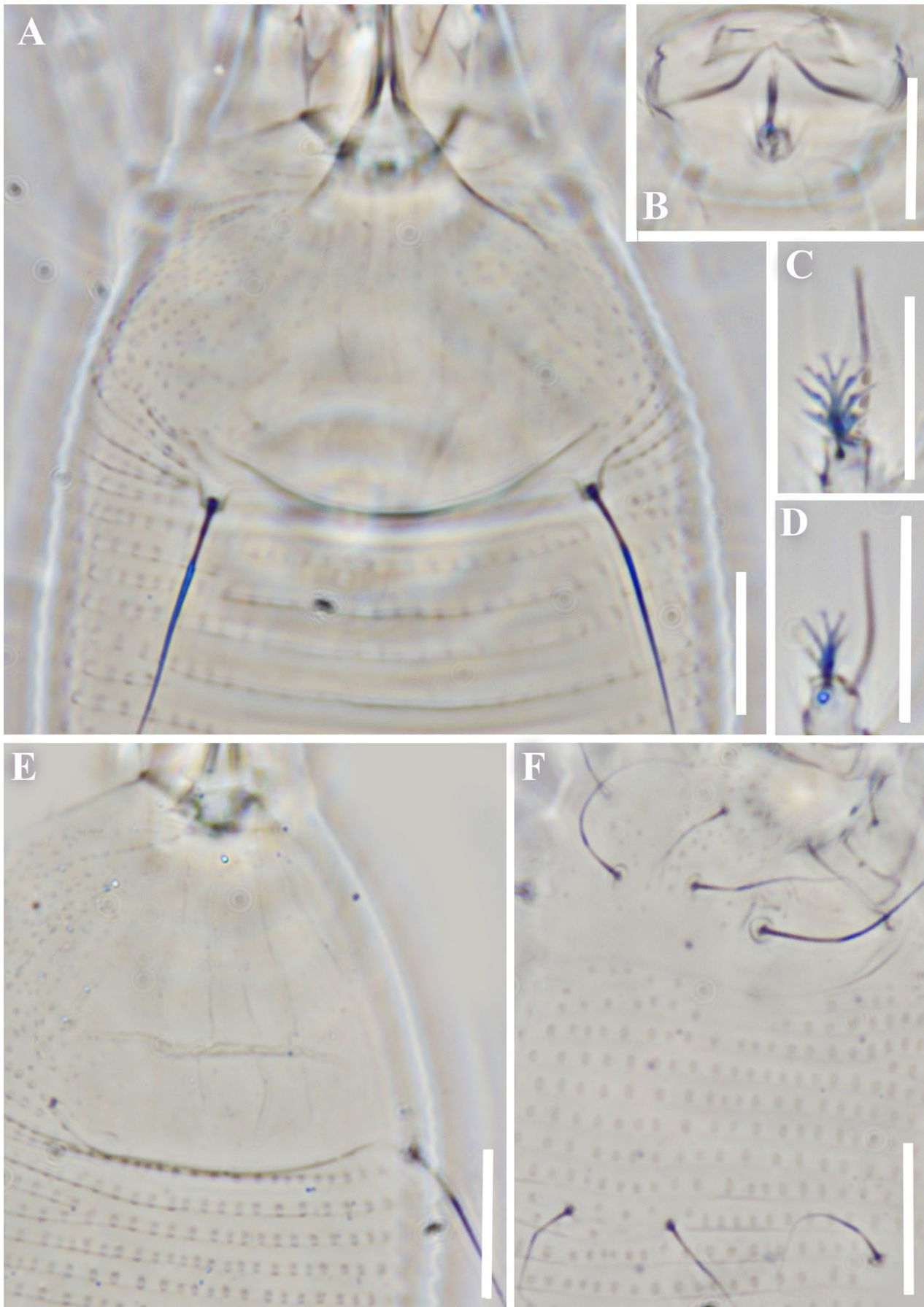


Fig. 3. Phase contrast light microscopy images of *Heterotergum dargazii* sp. nov.: **A.** Female prodorsal shield; **B.** Female internal genitalia; **C.** Female empodium; **D.** Nymph empodium; **E.** Nymph prodorsal shield; **F.** Nymph coxigenital region; **Scale bar:** 10 μ m.

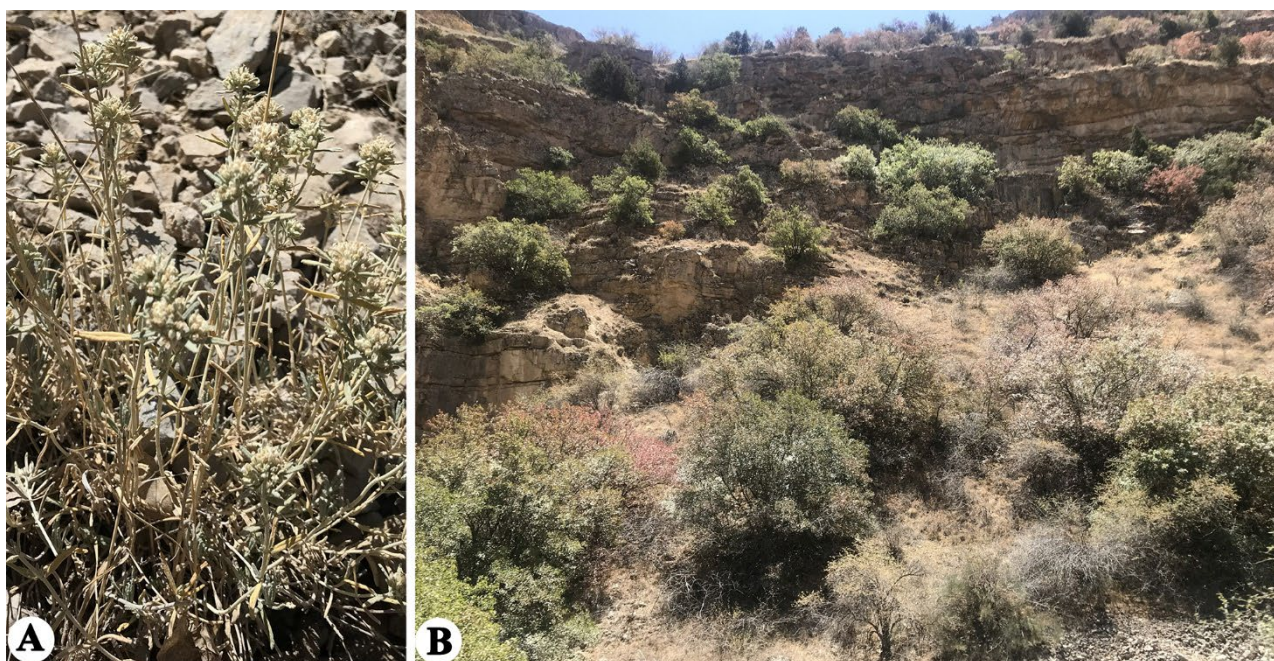


Fig. 4. A) *Teucrium polium* L. (Lamiaceae) as type host of *Heterotergum dargazii* sp. nov., B) Type locality of *H. dargazii* sp. nov. in Ali Bolagh shrine, Nokhondan District, Dargaz County, Razavi Khorasan Province, Northeast Iran.

While *H. sariensis* possesses a closed cell in center of the shield that median line disappeared inside this cell, this character is absent in the new species. Alongside the observed differences in the prodorsal shield patterns, the new species is distinguishable by the length of the scapular setae *sc* (25–28 in the new species versus 22–23 in *H. sariensis*) and *3a* (14–15 in the new species versus 25–37 in *H. sariensis*), and in the empodial rays number (4 in the new species versus 7 in *H. sariensis*).



Author's Contributions

AH: methodology; investigation; draft preparation; and visualization; PL: Conceptualization; methodology; formal analysis; final review and edit; visualization; supervision; and project administration.

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Data Availability Statement

All paratypes and holotype of the new species are deposited at the Acarology Laboratory, Department of Plant Protection, Faculty of Agriculture, Azarbaijan Shahid Madani University (Iran) except one paratype which is deposited in the Acarological Collection, Jalal Afshar Zoological Museum (JAZM), Faculty of Agriculture, University of Tehran, Karaj, Iran.

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Ethics Approval and Consent to Participate

This article does not contain any studies with human participants performed by the author.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Generative AI statement

The authors declare that no Gen AI was used in the creation of this manuscript.

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Research Article

گونه جدید (*Heterotergum dargazii* sp. nov. (Acari: Eriophyidae) از شمال شرق ایرانآرش هنرمند¹ و پریسا لطف الهی¹

۱- گروه گیاهپزشکی، دانشکده کشاورزی، دانشگاه شهید مدنی آذربایجان، تبریز، ایران

چکیده: در طی بررسی های میدانی کنه های اریوفیوئید در شمال شرق ایران (استان خراسان رضوی) در سال ۲۰۲۳ یک گونه جدیدی برای دنیا از قبیله Anthocoptini (Acari: Eriophyoidea: Eriophyidae: Phyllocoptinae) کشف، توصیف و ترسیم شد. این گونه *Heterotergum dargazii* sp. nov. می باشد که از روی میزبان گیاهی *Teucrium polium* L. از خانواده Lamiaceae جمع آوری گردید. هیچ علامت قابل مشاهده ای در میزبان گیاهی مشاهده نگردید. تاکنون هیچ گونه ای از جنس *Heterotergum* روی گیاهان خانواده نعنائیان در سراسر جهان گزارش نشده است. گونه جدید با تمام گونه های *Heterotergum* مقایسه شد که از نظر ریخت شناسی بیشتر شبیه *Heterotergum sariensis* Ranjbar-Varandi, Haddad و *Heterotergum munduleae* Meyer, 1992, بود. Irani-Nejad et Lotfollahi, 2022

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