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Previous volumes (2010-2017): 250 € / year (4 issues)
Acarologia, CBGP, CS 30016, 34988 MONTFERRIER-sur-LEZ Cedex, France
ISSN 0044-586X (print), ISSN 2107-7207 (electronic)

The digitalization of Acarologia papers prior to 2000 was supported by Agropolis Fondation under the reference ID 1500-024 through the « Investissements d’avenir » programme (Labex Agro: ANR-10-LABX-0001-01)

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CHEYLOSTIGMAEUS HASSANPOURI N. SP., A NEW SPECIES OF THE GENUS CHEYLOSTIGMAEUS WILLMANN, 1951 (ACARI: TROMBIDIFORMES: STIGMAEIDAE) FROM NORTHWEST IRAN

Mohammad BAGHERI1, Reza NAVAEI-BONAB4, Edward A. UECKERMANN2,3, Hamed GHRORANI1,5

(Received 16 May 2011; accepted 23 August 2011; published online 23 September 2011)

1 Department of Plant Protection, Faculty of Agriculture, University of Maragheh, Maragheh, Iran. mbagheri200222002@yahoo.com; mbagheri2012@gmail.com; reza_kami2005@yahoo.com; hg.ghorbani@gmail.com
2 ARC-PPRI, Private Bagx134, Queenswood, Pretoria 0121, South Africa UeckermannE@arc.agric.za
3 School of Environmental Sciences and Development, North-West University, Potchefstroom Campus 2520, South Africa
4 Young Researchers Club, Islamic Azad University, Marand Branch, Marand, Iran
5 Young Researchers Club, Islamic Azad University, Maragheh Branch, Maragheh, Iran

ABSTRACT — A new species of the genus Cheylostigmaeus (Acari: Stigmaeidae) is described and illustrated based on females and males collected from soil under apple trees in Marand, East Azerbaijan Province, Iran.

KEYWORDS — Acari; Prostigmata; Stigmaeidae; Cheylostigmaeus; Iran

INTRODUCTION

Members of the family Stigmaeidae are ecologically diverse, acting as predators of spider mites, scale insects, especially their eggs in leaf litter and on trees, and as herbivores on moss (Akyol and Koç 2010). This family is one of the most important predatory mite family after Phytoseiidae (Santos and Laing 1985, Croft 1994, Khanjani et al. 2010). To date 26 species of the genus Cheylostigmaeus have been described worldwide (Fan and Zhang 2004, Koç 2005, Khanjani et al. 2010, Dünel and Dogan 2011), among them two species namely C. iranensis Khanjani and Ueckermann 2002 and C. ferdowisi Khanjani et al. 2010 have been described from Iran. In this paper we described the third species, collected from soil in apple orchards from East Azerbaijan province.

MATERIALS AND METHODS

Mites were extracted from the soil using a Berlese funnel; specimens were cleared in Nesbit’s fluid, mounted in Hoyer’s medium (Walter and Krantz 2009) and were examined under 1000x magnification of Olympus Bx40 phase contrast microscope. The length of the idiosoma was measured from the base of chelicerae to the posterior margin of suranal shield, the width of the idiosoma at the broadest part of the idiosoma and setae were measured from their insertions to their tips; distances between setae were measured between their insertions. The terminology and abbreviations are based on Kethley
FIGURE 1: Cheylostigmaeus hassanpouri n. sp. (Male) – Dorsal view of body.
FIGURE 2: Cheylostigmaeus hassanpouri n. sp. (Male) – Ventral view of body.
(1990). All measurements are given in micrometers (μm). The first measurement is that of the holotype male or allotype female followed by the variation in measurements of the paratype specimens in parentheses including the holotype and allotype.

**STIGMAEIDAE OUDEMANS, 1931**

_Cheylostigmaeus_ Willmann, 1951
_Cheylostigmaeus hassanpouri_ n. sp. Bagheri
(Figures 1–11)

Diagnosis — Dorsal setae are thick and barbed sparsely in male and female; palp femur without apophyses; ratios of setae _sci_: _sc1 = 1.9_, _ve: sci_ = 2.6 in female; endopodal shield divided and smooth in both sex; femura I–IV and genua II–IV of male and female each with one sheathed seta; subcapitulum of male with one pair of bicuspitate lamellae; aedeagus without bulb, reversed comma-shape sclerotized appendages present on both sides of shaft distally.

Holotype male (n = 4) — Idiosoma oval, idiosoma length 292 (285 – 300); idiosoma width 214 (210 – 217); length of leg I 330 (325 – 331); leg II 280 (275 – 285); leg III 230 (265 – 270); leg IV 271 (267 – 274).

Dorsum — (Figure 1): Dorsum covered with three weakly sclerotized and smooth shields; no obvious dimples or micro-punctations observed; prodorsal shield truncated anteriorly, triangular and bearing four pairs of setae (_vi, ve, sci and sce_) and a pair of eyes; setae _ve_ are the longest and setae _sci_ the shortest; opisthosomal shield with six pairs of setae (_c1, d1, d2, e1, e2 and f1_) and suranal shield with two pairs of setae (_h1 and h2_); _h2_ two-times longer than _h1_; most of dorsal setae fairly rigid, sparsely barbed and hyaline sheaths cover their tips; humeral shield bearing setae _c2_ situated ventro-laterally. Length of setae: _vi_ 28 (26 – 30); _ve_ 67 (65 – 73); _sci_ 19 (18 – 21); _sce_ 49 (46 – 51); _c1_ 34 (33 – 35); _c2_ 52 (50 – 55); _d1_ 34 (34 – 35); _d2_ 40 (39 – 41); _e1_ 33 (32 – 35); _e2_ 42 (40 – 45); _f1_ 65 (62 – 68); _h1_ 23 (22 – 25); _h2_ 41 (40 – 45); distances between dorsal setae: _vi-vi_ 32 (30 – 35); _ve-ve_ 72 (70 – 75); _vi-ve_ 41 (39 – 43); _ve-sce_ 22 (20 – 24); _sce-sce_ 126 (125 – 130); _c1-d1_ 55 (53 – 57); _c1-d2_ 53 (50 – 55); _d1-d1_ 93 (93 – 95); _d1-d2_ 39 (37 – 42); _d1-e1_ 50 (47 – 52); _d1-e2_ 31 (30 – 33); _d2-e2_ 52 (50 – 54); _e1-e1_ 69 (67 – 71); _e1-e2_ 35 (33 – 38); _e1-f1_ 25 (23 – 27); _f1-f1_ 63 (60 – 65); _h1-h1_ 31 (30 – 33); _h1-h2_ 11 (10 – 12); _h2-h2_ 60 (57 – 63).

Venter — (Figure 2): Coxae I–II and III–IV surrounded by smooth and divided endopodal shields; length of setae _1a_ 23 (21 – 25), _3a_ 22 (20 – 25), and _4a_ 20 (20 – 22); anogenital shield with three pairs of subequal aggenital setae (_ag1-ag3_) and three pairs of pseudanal (_ps1-ps3_) setae on tubercles; measurements of setae: _ag1_ 16 (15 – 17); _ag2_ 16 (15 – 18); _ag3_ 20 (19 – 22); _ps1_ 11 (11 – 12); _ps2_ 12 (12 – 13); _ps3_ 15 (14 – 15).

Gnathosoma — Chelicerae finely punctated, fixed digit 80 and moveable digit 60; palpi (Figure 5) five-segmented; palp femur with five tactile setae plus one solenidiom (ω) and one trifid eupathidium distally; palp femur with two setae plus one claw and one spine-like accessory claw; palpgenu with two dorsal and palp femur with three setae; palp trochanter without setae. Subcapitulum (Figure 3) finely punctated and with two pairs of subcapitular setae (_m_ and _n_), _m_ 19 (18 – 21), _n_ 20 (18 – 24) and two pairs of adoral setae (_or1_ and _or2_), _or1_ 17

![Figure 3: Cheylostigmaeus hassanpouri n. sp. (Male) – Subcapitulum.](image-url)
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or 2 19 (17 – 20); subcapitulum bears a pair of strongly developed wing-like lamellae and one pair of acute teeth in front of lamellae, each lamellae thick and bicuspidate in front.

F I G U R E 4: Cheylostigmaeus hassanpouri n. sp. (Male) – Aedeagus.

Aedeagus — (Figure 4) Calyx of the aedeagus funnel-shaped, shaft straight and pointed distally, no obvious bulb; reversed comma-shaped sclerotized appendages present on both sides of shaft distally.

F I G U R E 5: Cheylostigmaeus hassanpouri n. sp. (Male) – Palp.

Legs — (Figures 6): Counts of setae (excluding solenidia; solenidia in parentheses) on legs I-IV: coxae 2-2-2-2; trochanter 1-1-2-1; femora 6-5-3-2; genua 4-3+κ-1-1; tibiae 5+(1φ+1ϕρ)-5+(1φρ)-5+(1φρ)-5+(1φρ); tarsi 13+(2ω)-9+(2ω)-7+(2ω)-7+(2ω); dorsal setae are rigid and sparsely barbed; femora I-IV and genua II-IV each with one distinct sheathed seta; lengths of solenidia: Lω1 29 (28 – 30), Lω2 42 (40 – 44); IIω1 20 (20 – 21); IIIω2 50 (48 – 52); IIIω1 9 (8 – 10); IIIω2 41 (40 – 44); IVω1 6 (5 – 8); IVω2 37 (35 – 40); Iφ 11 (10 – 12); ϕρ 21 (20 – 22); IIφ 19 (19 – 21); IIIφ 21 (20 – 23); IVφ 19 (18 – 20).

Female (n = 5) — Idiosoma oval, idiosoma length: 350 (340 – 365); idiosoma width 280 (270 – 292); length of leg I 360 (350 – 370); leg II 300 (294 – 305); leg III 265 (260 – 270); leg IV 320 (312 – 325).

Dorsum — (Figure 7): Dorsum covered with two shields, the shields weakly sclerotized; no obvious dimples or micro-punctations; suranal shield is displaced to ventral position; prodorsal shield with four pairs (vi, ve, sci and sce) of setae and a pair of eyes, setae ve are the longest and setae sci the shortest; opisthosomal shield with six pairs of setae (c1, d1, d2, e1, e2 and f1); suranal shield with two pairs of setae (h1 and h2); dorsal setae fairly

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rigid, sparsely barbed and hyaline sheaths cover their tips; humeral shields bearing setae c2 situated ventro-laterally. Length of setae: \( vi \) 50 (48 – 50); \( ve \) 90 (85 – 90); \( sci \) 35 (33 – 36); \( sce \) 65 (62 – 67); \( c1 \) 50 (50 – 51); \( c2 \) 70 (70 – 75); \( d1 \) 50 (49 – 50); \( d2 \) 60 (54 – 60); \( e1 \) 55 (55 – 60); \( e2 \) 60 (57 – 63); \( f1 \) 80 (72 – 81); \( h1 \) 55 (50 – 55); \( h2 \) 50 (48 – 50); distances between dorsal setae: \( vi \) – \( vi \) 40 (37 – 41); \( ve \) – \( ve \) 95 (92 – 98); \( vi \) – \( ve \) 65 (64-66); \( ve \) – \( sce \) 35 (33 – 35); \( sci \) – \( sci \) 150 (145 – 152); \( sci \) – \( sce \) 30 (27 – 32); \( sce \) – \( sce \) 180 (176 – 182); \( c1 \) – \( c1 \) 120 (118 – 125); \( c1 \) – \( d1 \) 76 (75 – 77); \( c1 \) – \( d2 \) 60 (59 – 63); \( d1 \) – \( d1 \) 115 (111 – 116); \( d1 \) – \( d2 \) 65 (62 – 67); \( d1 \) – \( e1 \) 80 (79 – 82); \( d1 \) – \( e2 \) 55 (53 – 55); \( d2 \) – \( e2 \) 80 (77 – 81); \( e1 \) – \( e1 \) 95 (92 – 96); \( e1 \) – \( e2 \) 55 (55 – 57); \( e1 \) – \( f1 \) 60 (60 – 63); \( f1 \) – \( f1 \) 75 (74 – 77); \( h1 \) – \( h1 \) 30 (30 – 34); \( h1 \) – \( h2 \) 20 (19 – 22); \( h2 \) – \( h2 \) 50 (49 – 53); setal ratios: \( vi \) – \( vi \) 1.25; \( c1 \) – \( c1 \) 0.42; \( d1 \) – \( d1 \) 0.43; \( e1 \) – \( e1 \) 0.58; \( f1 \) – \( f1 \) 1.06; \( h1 \) – \( h1 \) 1.83; \( h2 \) – \( h2 \) 1; \( c1 \) – \( c1 \) : \( d1 \) – \( d1 \) : \( e1 \) – \( e1 \) : \( f1 \) – \( f1 \) 1.60: 1.53: 1.27: 1.00.

Venter — (Figure 8): Ventral cuticle striated; coxae I-II and III-IV surrounded by smooth and divided endopodal shields; length of setae \( 1a \) 30 (28 – 30), \( 3a \) 30 (28 – 31), and \( 4a \) 32 (30 – 32); anogenital shield with three pairs of subequal aggenital setae (\( ag1-ag3 \)) and three pairs of pseudanal (\( ps1-ps3 \)) setae; measurements of setae: \( ag1 \) 15 (15 – 21); \( ag2 \) 20 (18 – 21); \( ag3 \) 20 (19 – 22); \( ps1 \) 20 (19 – 20); \( ps2 \) 20 (19 – 21); \( ps3 \) 22 (19 – 22).

Gnathosoma — Chelicerae finely punctated, fixed digit 80 and moveable digit 60; palpi (Figure 9) five-segmented; palpatarsus with five tactile setae plus one solenidion (\( \omega \)) and one trifid eupathidium distally; palptibia with two setae plus one claw and one spine-like accessory claw; palpgenu with two setae and palpfemur with three setae; palptronchanter without setae. Subcapitulum (Figure 10) finely punctated and with two pairs of subcapitular setae (\( m \) and \( n \)), \( m \) 35 (33 – 36), \( n \) 25 (25 – 27) and two pairs of adoral setae (\( or1 \) and \( or2 \)), \( or1 \) 17 (15 – 17), \( or2 \) 20 (19 – 21).

Legs — (Figures 11): Counts of setae (excluding solenidia; solenidia in parentheses) on legs I-IV: coxae 2-2-2-2; trochanters 1-1-2-1; femora 6-5-5-3-2; genua 4-3+\( \kappa \)-1-1; tibiae 5(1\( \varphi \)+1\( \varphi \))-5(1\( \varphi \)+1\( \varphi \))-5(1\( \varphi \)+1\( \varphi \)); tarsi 13(1+\( \omega \))-9(1+\( \omega \))-7(1+\( \omega \))-7(1+\( \omega \)); dorsal setae are rigid and sparsely barbed;
FIGURE 7: Cheylostigmaeus hassanpouri n. sp. (Female) – Dorsal view of body.
FIGURE 8: Cheylostigmaeus hassanpouri n. sp. (Female) – Ventral view of body.
femora I-IV and genua II-IV each with one distinct sheathed seta; lengths of solenidia: $L_ω$ 27 (25 – 27), $I_ω$ 19 (18 – 20); III $ω$ 10 (10 – 11); IV $ω$ 4 (4 – 5); I $ϕ$ 12 (12 – 13); I $ϕp$ 25 (23 – 25); II $ϕp$ 20 (18 – 20); III $ϕp$ 17 (16 – 17); IV $ϕp$ 20(18 – 21).

**Figure 9:** *Cheylostigmaeus hassanpouri* n. sp. (Female) – Palp.

Etymology — This species is named in honor of Dr. Mehdi Hassanpour, University of Mohaghegh Ardabili who is the friend of the first author.

Material examined — Holotype male, allotype female, paratype males (3) and paratype females (n = 4) were collected from soil in apple orchards, 20 August 2009, Marand, East Azerbaijan province, Iran, by Reza Navaei-Bonab. The holotype and one paratype female are deposited in the Arachnida Collection of Plant Protection Research Institute, Pretoria, South Africa and the rest of the paratypes are deposited in the Acarological Collection, Department of Plant Protection, Faculty of Agriculture, University of Maragheh, Maragheh, Iran.

**Figure 10:** *Cheylostigmaeus hassanpouri* n. sp. (Female) – Subcapitulum.

Remarks — The new species is unique in having the following characters:

1. setae $sci$ are the smallest dorsal setae and 1/3 length of $ve$, the longest setae,
2. shape of the male aedeagus.

The new species closely resembles *Cheylostigmaeus luxtoni* Wood (Wood, 1968) by having one pair of bicuspidate lamellae on subcapitulum and absence of bulb on aedeagus but differs from the latter by:

1. the length of setae $sci$ 18 – 21 in new species vs 34 – 49 in *C. luxtoni*,
2. the distance $vi$–$vi$ in the new species (30 – 35) is about the half (59 – 69) than in *C. luxtoni*;
3. shape of copulatory appendages of aedeagus in the two species distinctively differ.

*Cheylostigmaeus hassanpouri* n. sp. is also close to *C. pannonicus* Willmann (Summers and Ehara, 1965) by the following characters: femur of palpus without apophyse and having one pair of bicuspidate lamellae on subcapitulum. But it differs from this latter species by:
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FIGURE 11: Cheylostigmaeus hassanpouri n. sp. (Female): A – Leg I, femur-tarsus; B – Leg II, femur-tarsus; C – Leg III, femur-tarsus; D – Leg IV, femur-tarsus.

1. aedeagus of C. pannonicus has a capacious bulb which is absent in the new species, addi-
   tionnaly the copulatory appendages have different shapes in the two species,

2. ratio ve : sci = 2.6 in female of the new species vs 1.3 in those of C. pannonicus.

The new species also resembles to Cheylostigmaeus urhani Dönel, G. and Dogan as in both species the setae sci are the smallest prodorsal setae and there is a bicuspidate lamellae on subcapitullum.

However these species could be differentiated by the following characters:

1. in all specimens of the new species apophy-
   ses on the palp femur are absent whereas C. urhani has apophyses on the palp femur,

2. ratio of sce : sci = 1.9 [ sce 65 (62 – 67), sci 35 (33 – 36)] in female of the new species vs 1.4 [sce 110 (105 – 125), sci 77 (65 – 97)] in C. urhani,

3. there is not obvious bulb on aedeagus of the new species vs capacious bulb in C. urhani,

4. endopodal shield of the new species is smooth vs reticulated in C. urhani.

ACKNOWLEDGEMENTS

This project was supported by the research division of the University of Maragheh, Maragheh, Iran, which is greatly appreciated. The authors also wish to thank the reviewers of this paper for their inputs. Thanks also to Dr. Salih Dogan, Atatürk University, Kazım Karabekir Education Faculty, Department of Biology Education, Erzurum, Turkey for some litera-

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