



## Two new species of eriophyid mites (Acari: Eriophyidae) from India

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### Abstract

Two new species of eriophyid mites (Acari: Prostigmata) viz. *Cosetacus sharadi* n. sp., collected from leaf erineum on *Cordia dichotoma* (Boraginaceae), and *Acalitus delhiensis* n. sp., collected from leaf erineum on *Salvadora persica* (Salvadoraceae), are described from India. *Cosetacus sharadi* has divided feather claw, each branch comprising of 4–5 rays, shield with median line present from rear to mid, admedian lines parallel to median line till mid, then bulging out meeting at the anterior end, submedian lines present from anterior to mid, epigynium ribbed in 2 ranks, accessory seta absent, antapical seta present. *Acalitus delhiensis* has 7 rayed simple feather claw, shield with median line present in rear to mid, admedian and submedian lines branched, epigynium coarsely granulated, accessory seta and antapical seta absent.

**Key words:** Taxonomy, *Cosetacus*, *Cordia dichotoma*, *Acalitus*, *Salvadora persica*, India

### Introduction

*Cordia dichotoma* (Forster F.) (Boraginaceae) is a small to moderate-sized deciduous tree, found in tropical and subtropical regions. A new mite species, namely *Cosetacus sharadi* has been described from the leaf erineum of this plant. The erineum mostly on the under surface is whitish when still fresh/immature, gradually becoming brownish as it matures. *Salvadora persica* (Linneaus) (Salvadoraceae) is a medium to large, evergreen shrub. The plant is more popular for its medicinal properties and is used extensively in dental care products while its leaves are used as camel fodder. *Acalitus delhiensis* n. sp., was collected from the yellowish erineum occurring on both surface of leaves of the plant.

The genus *Cosetacus* was erected by Keifer in 1966 and to this genus he assigned *Aceria camelliae* (Keifer, 1945) as its type species. A total of three species are known so far, namely *C. camelliae* (Keifer, 1945, ex: *Camellia japonica*, California), *C. citrifolis* (Das & Chakrabarti, 1985, ex: *Morinda citrifolia*, India) and *C. eupatoria* (Chakrabarti & Pandit, 1997 ex: *Eupatorium odoratum*, India). The genus *Acalitus* was erected by Keifer in 1965, and literature reveals that of the 95 known species, 7 species namely, *A. gossypii* (Misra 1920, ex: *Gossypium* sp.), *A. ruelliae* (ChannaBasavanna 1966, ex: *Ruellia patula*), *A. meliosoma* (Mohansundaram 1981, ex: *Meliosoma simplicifolia*), *A. reticulatae* (Mohansundaram 1981, ex: *Leptadenia reticulata*), *A. schefflerae* (Mohansundaram 1981, ex: *Schefflera* sp.), *A. hibisci* (Mondal & Chakrabarti 1982, ex: *Hibiscus vitifolius*) and *A. epiphytivagrans* (Mohansundaram 1983, ex: unidentified epiphytic parasite) are known from India.

The classification and terminology is after Amrine *et al.*, 2003. All measurements are in micrometer ( $\mu\text{m}$ ) and are mean values followed by standard deviation and the range in parentheses. Length of the body is the distance from the tip of the rostrum to the posterior end. Length of leg is the distance from the base of trochanter to the tip of tarsus, excluding the tarsal appendages (solenidion and empodium). The ventral opisthosomal annuli count starts from the first complete ring visible posteriorly for *A. delhiensis* n. sp. and the first annulus bordering the genitalia posteriorly for *C. sharadi* n. sp.

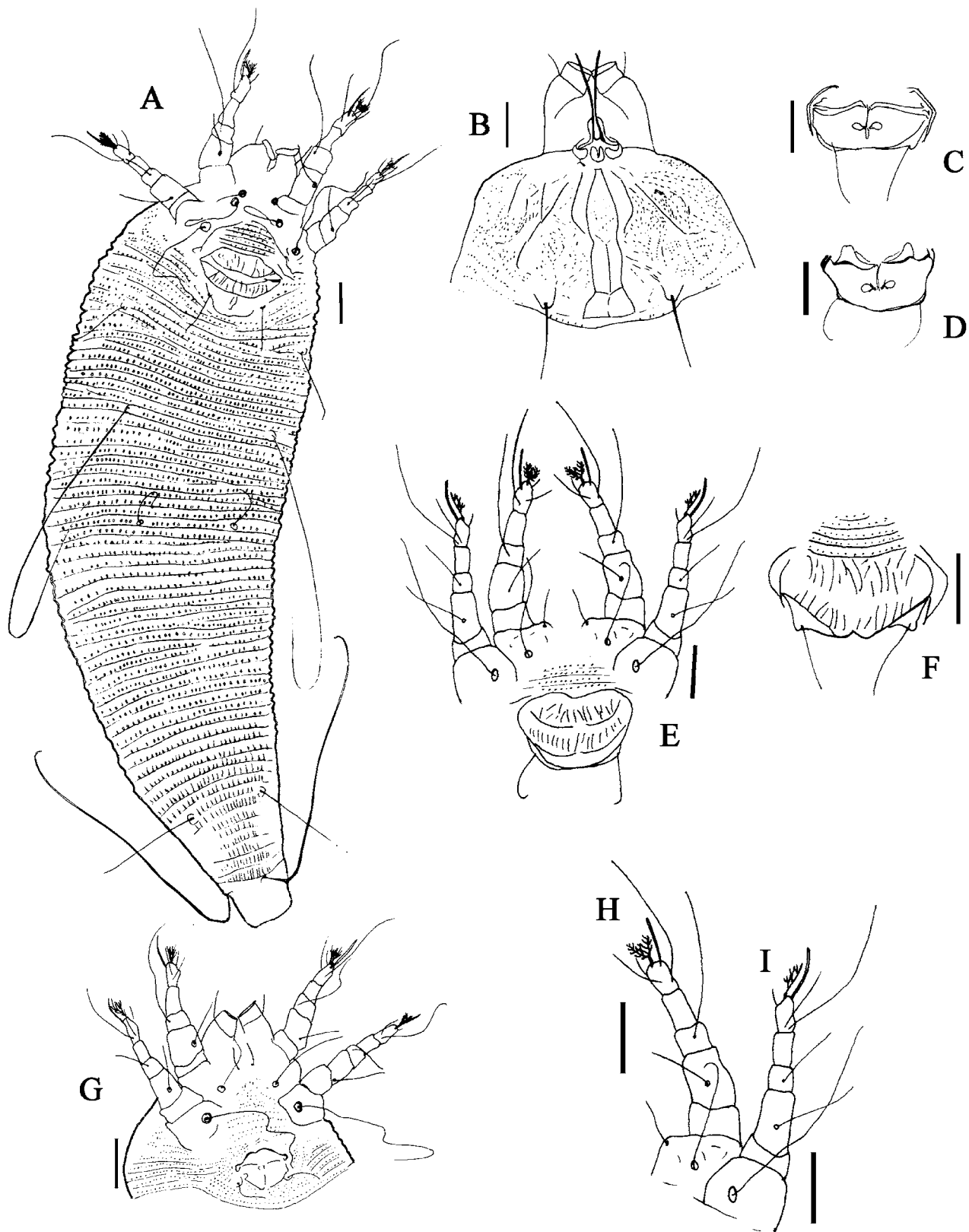
***Cosetacus sharadi* n. sp.**

(Fig. 1 A–I)

**Diagnosis.** This species is distinguished by the following combination of characters: antapical seta present; feather claw divided, each with 4–5 rays; coxa I and II mostly smooth; coxisternal area with microtuberculate annuli. Female genital cover flap ribbed with 12–14 ridges in 2 ranks. Seta *c*2 hardly reaching the base of the longest seta *d*, seta *f* more than twice the length of the shortest seta *e*, setae *h*1 absent and caudal setae *h*2 slightly shorter than seta *d*. Prodorsal shield area coarsely granulated and with small lines. Median line discernable on rear half, connected to admedian lines by cross lines at just beyond half and also ahead of rear margin. Admedian lines complete, curving back from near front of anterior lobe. First submedians curving out from anterior side of admedian lines and recurving back to admedians just before half. Second submedian lines irregular, running out to the shield margins. Body colour pale yellow.

**FEMALE** (n=10) – Body worm like, 198±37.8 (155–260) long, 61.5±7.4 (55–75) wide. **Gnathosoma** projecting downwards; antapical setae 6.9±0.7 (6–8); chelicerae 21.3±2.8 (18–25); rostrum 20.1±3.6 (15–25). **Prodorsal shield** tapering anteriorly, however, slightly rounded at tip with numerous small granules/dots and short lines; 31.5±3.5 (26–36) long, 52.1±7.19 (42–63) wide; median line discernable on rear half, very faintly represented in the anterior shield with broken lines, median line connected to admedian lines by cross lines at two points, just a little ahead of rear margin and at about half of median. Admedian lines complete, curving out and back from near front of anterior lobe to half of shield and then running almost parallel to median. First submedian lines represented in anterior shield only, seen curving out and recurving back to admedians just before half. Second submedian lines irregular, running out to the shield margins. Dorsal tubercles near rear shield margin 26.2±2.2 (20–28) apart, directing scapular seta (*sc*) divergently backwards; *sc* 22.3±2 (18–24), spanning 9±1 (8–11) annuli. **Legs** lacking tibial setae. Leg I 33.6±4.2 (28–40); femur 8.1±0.7 (7–9), femoral seta (*bv*) 10.7±0.9 (10–12); femur without ventral lines; genu 3.7±0.8 (3–5), genual seta (*l*′) 23±2.2 (19–25); tibia 5.5±0.5 (5–6), tibial seta (*l*′) absent; tarsus 6.5±1 (5–8), solenidion 8.2±1.5 (5–11), slightly curved, rod-like, empodium 4.7±0.6 (4–6), feather claw divided, 4–5 rayed, dorsal seta (*ft*′) 13±2.3 (10–17), lateral seta (*ft*′′) 19.6±1.8 (17–22), unguinal seta (*u*′) 3.5±0.5 (3–4). Leg II 25±3.3 (21–29); femur 6.1±0.9 (5–8); *bv* 12±1.8 (10–14); femur without ventral lines; genu 3.5±0.5 (3–4), *l*′′ 5.9±0.7 (5–7); tibia 4.9±0.3 (4–5), *l*′ absent; tarsus 6.2±0.4 (6–7), solenidion 9.5±0.5 (9–10), slightly curved, not knobbed, empodium 4.5±0.7 (4–6), feather claw divided, 4–5 rayed, *ft*′ 5.7±1.1 (4–7), *ft*′′ 20.7±1.8 (19–23), *u*′ 3.6±0.5 (3–4). Coxae I approximate centrally and not contiguous, mealy granulated; coxal seta I (*Ib*) 6.9±0.7 (5–8), 12.6±1.8 (10–14) apart; coxal seta II (*Ia*) 23.2±3.8 (20–30), 14.8±2 (12–17) apart; coxal seta III (*Ia*) 37.3±2.7 (36–42), 24.2±4.2 (17–30) apart. Coxisternal area without coarse granules but with annulus. **Genitalia** 24±5.2 (18–24) wide, 16.2±2.2 (13–19) long; epigynium ribbed with 12–14 ribs each in two ranks, lower rank with more regular ribs; genital seta (*3a*) 11±2.2 (9–15). **Opisthosoma** annuli continuous dorsoventrally. Lateral seta (*c*2) 13.6±1.7 (11–15), on annulus 7.7±0.4 (7–8) from the first complete ventral ring. Ventral seta I (*d*) 63.5±9.7 (51–75), 38.8±2.9 (36–44) apart, on annulus 17.5±1.1 (16–18); ventral seta II (*e*) 10.8±1.3 (9–13), 24.3±2 (21–27) apart, on annulus 28.4±1.5 (27–30); ventral seta III (*f*) 25±2.8 (21–28), 21.6±3.3 (17–25) apart, on annulus 55.3±3.1 (52–58). Dorsal annuli undulate with oval microtubercles but not so distinctly visible, those on posterior 12–15 annuli more elongate and triangular, total dorsal annuli 54.2±2.8 (50–57); ventral annuli with small and slightly oval microtubercles, becoming more narrow, elongate and triangular around 10–13 annuli before setae *f* and thereon they appear as closely spaced thin lines till the last annuli, total ventral annuli 62.3±3.3 (59–66). Caudal seta (*h*2) 56.8±7.1 (47–63); accessory seta (*h*1) absent.

**MALE** (n=10) – Similar to female, 167±8.6 (155–175), 54.2±3 (49–55) wide. **Gnathosoma** projecting downwards; antapical setae 5.4±0.5 (5–6); chelicerae 20.5±1.9 (17–22); rostrum 16.5±2.5 (12–19). **Prodorsal shield** 28±1.8 (26–30) long, 46±2.2 (45–50) wide; Dorsal tubercles near rear shield margin 25.2±2.2 (22–28) apart, directing scapular seta (*sc*) divergently backwards; *sc* 19.2±0.7 (18–20), spanning 8±0 (8) annuli. **Legs** lacking tibial setae. Leg I 29.5±4.2 (25–30); femur 7±0 (7), femoral seta (*bv*) 10.5±0.5 (10–11); genu 3.5±0.5 (3–5), genual seta (*l*′) 19.0±1.3 (9–21); tibia 5.2±0.4 (5–6), tibial seta (*l*′) absent; tarsus 6±0.6 (5–7),



**FIGURE 1.** *Cosetacus sharadi* n.sp. **A** Ventral view of female; **B** dorsal shield design; **C** & **D** internal genitalia female; **E** & **F** female genital coverflap; **G** genitalia of male; **H** leg I; **I** leg II. Scale= 10 $\mu$

solenidion  $7.2 \pm 0.7$  (6–8), slightly curved, not knobbed, empodium  $4 \pm 0$  (4), feather claw divided, 4–5 rayed, dorsal seta (*ft'*)  $11 \pm 1.7$  (8–13), lateral seta (*ft''*)  $17.7 \pm 1.8$  (16–21), unguinal seta (*u'*)  $3.2 \pm 0.4$  (3–4). Leg II

24.5±1.9 (22–27); femur 6.5±1.5 (5–9); *bv* 10±0.6 (9–11); genu 3.2±0.4 (3–4), *l*'' 6.5±0.5 (6–7); tibia 4.2±0.4 (4–5), *l*' absent; tarsus 5.7±0.4 (5–6), solenidion 9±0.6 (9–10), slightly curved, not knobbed, empodium 4.2±0.7 (3–5), feather claw divided, 4–5 rayed, *ft*' 6.5±0.5 (6–7), *ft*'' 18±1.4 (16–20), *u*' 3±0 (3). Coxae I fused; coxal seta I (*Ib*) 9±0 (9), 10±0 (10) apart; coxal seta II (*Ia*) 17±2.1 (17–20), 12.5±1 (11–14) apart; coxal seta III (*2a*) 35.5±2.7 (32–40), 21.4±0.8 (20–22) apart. **Genitalia** 15±1.1 (14–17) wide, 13.7±1.2 (13–16) long; genital seta (*3a*) 10±1.1 (9–12). **Opisthosoma** lateral seta (*c2*) 14±1.4 (12–16), on annulus 8±0.6 (7–9) from the first complete ventral ring. Ventral seta I (*d*) 51.7±7.5(40–60), 33.7±0.4 (33–34) apart, on annulus 16.7±0.8 (16–18); ventral seta II (*e*) 10.5±0.8 (10–12), 19.7±0.4 (19–20) apart, on annulus 27±1.1 (25–28); ventral seta III (*f*) 23.2±2.2 (20–26), 17.5±0.8 (16–18) apart, on annulus 51.5±1.9 (48–53). Total dorsal annuli 48.2±1 (47–50), microtuberculate; total ventral annuli 58.2±2.3 (54–60), microtuberculate. Caudal seta (*h2*) 46.2±2.7 (43–50); accessory seta absent.

**Type material.** Holotype female, 30 female and 10 male paratypes, from *Cordia dichotoma* (Boraginaceae), IARI, New Delhi, coll. Pratibha Menon, 07 March 2008, on ten microscopic preparations deposited in NPC. Also 4 paratypes on three slides will be deposited in the Insect and Mite National Collection, National Museum of Natural History (NMNH), Smithsonian Institution, U.S.D.A. and Systematic Entomology Laboratory (SEL), Beltsville, Maryland.

**Relation to host.** Mites of this species cause whitish erineum on the under surface of leaf, gradually becoming brownish as it matures, and observed hidden in the hair like outgrowths.

**Etymology.** The specific designation *sharadi* is derived from and is in honour of Mr. Sharad Pawar, Minister of Agriculture and President of Indian Council of Agricultural Research, which funds the Network Project on Insect Biosystematics.

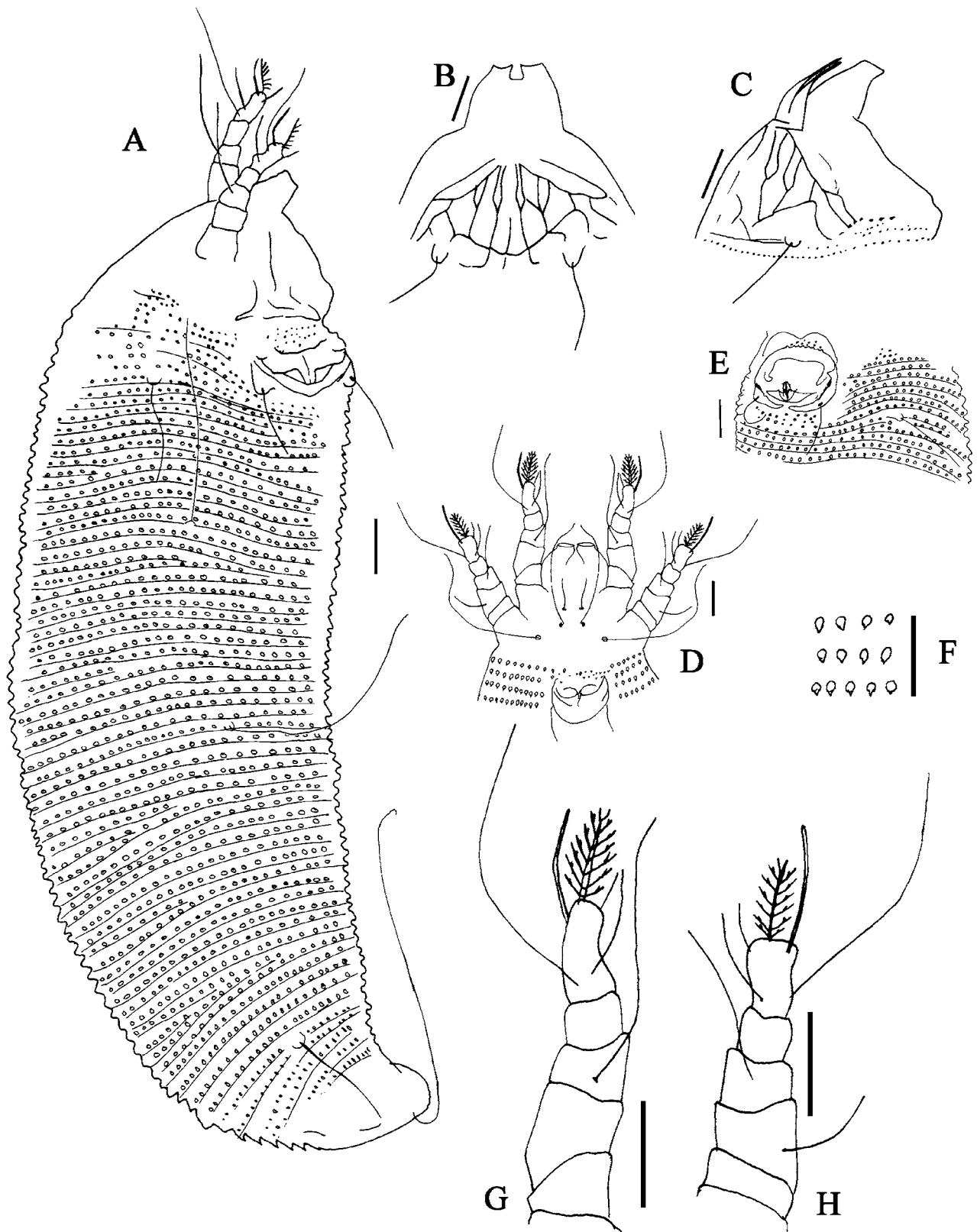
**Remarks.** This species differs from all species known so far viz., *C. camelliae*, *C. citrifolis* and *C. eupatori* in having divided feather claw and its specific shield design.

### *Acalitus delhiensis* n. sp.

(Fig. 2 A–H)

**Diagnosis.** This species is distinguished by the following combination of characters: 7 rayed feather claw; presence of coarse granules on female genital cover flap, coxae I and II not granulated; coxisternal area clear. Female genital cover flap not deeply ribbed, however the flap is granulated. Seta *c2* almost reaching the base of seta *d*, which is slightly longer than seta *e*, seta *e* more than half the length of seta *f* which is shortest, setae *h1* absent and caudal setae very long, nearly thrice seta *e*. Dorsal shield with median line present in rear half, fading anteriorly. Admedian lines complete, bifurcating at anterior end to half of the shield. First submedian lines bifurcating or in some case trifurcating at anterior end of the shield. Second submedian lines small. Median, admedian and submedian lines joined by an invariable transverse line posteriorly. All branches of admedian and submedian lines terminate anteriorly on a transverse line that curves upward. Body colour brown.

**FEMALE** (n=10) – Body worm like, 258±33.8 (200–310) long, 60.7±3.8 (53–65) wide. **Gnathosoma** projecting downwards; antapical setae absent; chelicerae 18.5±1.3 (17–20); rostrum 12.7±1.2 (10–15). **Prodorsal shield** wide, slightly rounded at anterior end, 31.2±2.1 (28.35) long, 50±6 (43–66) wide; shield design with median line prominent in rear end. Admedian lines bifurcates at anterior end to half of the shield, complete. First submedian lines branched twice or thrice from anterior shield, the branches may be connected with branches of admedian lines. Second submedian lines small. Median, admedian and submedian lines joined by an invariable transverse line a little above rear end of the shield. All branches of admedian and submedian lines terminate anteriorly on a transverse line that curves upward. Dorsal tubercles near rear shield margin 22.2±5.7 (14–34) apart, directing scapular seta (*sc*) divergently backwards; *sc* 22.9±1.7 (20–25), spanning 7.4±1.3 (6–11) annuli. **Legs** lacking tibial setae. Leg I 29±3.6 (25–36); femur 7.9±1.3 (5–10), femoral seta (*bv*) absent; femur without ventral lines; genu 4.9±0.5 (4–6), genual seta (*l*''') 20.4±2.1 (18–25);



**FIGURE 2.** *Acalitus delhiensis* n.sp. **A** Lateral view of female; **B** dorsal shield design; **C** lateral shield design of female paratype; **D** female coxigenital area; **E** female genitalia; **F** microtubercles; **G** leg I; **H** leg II. Scale= 10 $\mu$

tibia  $5.1 \pm 0.87$  (4–6), tibial seta ( $l'$ ) absent; tarsus  $7.0 \pm 0.9$  (6–9), solenidion  $9.6 \pm 0.8$  (8–11), slightly curved, tapered, empodium  $8.0 \pm 1.3$  (6–10), 7 rayed, dorsal seta ( $ft'$ )  $10.2 \pm 2.8$  (8–15), lateral seta ( $ft''$ )  $23.1 \pm 4.2$

(18–31), unguinal seta (*u'*) 4.7±0.9 (3–6). Leg II 26.2±4.7 (20–34); femur 7.6±2.0 (5–10); *bv* 13.1±2.5 (9–18); femur without ventral lines; genu 4.7±0.8 (3–6), *l''* 14.4±1.7 (11–17); tibia 4.5±0.7 (3–5), *l'* absent; tarsus 7.2±0.9 (5–8), solenidion 10.2±1 (8–11), slightly curved, not knobbed, empodium 6.8±0.9 (5–8), 7 rayed, *ft'* 8.6±1.6 (7–12), *ft''* 22.1±2.5 (18–25), *u'* 4±0.9 (3–5). Coxae I fused; coxal seta I (*Ib*) 16.8±2.5 (14–23), 11±0.4 (10–12) apart; coxal seta II (*Ia*) 33.2±7.7 (20–45), 14±1 (13–16) apart; coxal seta III (*2a*) 49.7±6.5 (40–58), 28.1±1.9 (24–31) apart. Coxisternal area with a few coarse granules. **Genitalia** 20.1±3.2 (15–25) wide, 18±3.2 (13–23) long; epigynium with coarse granules; genital seta (*3a*) 13.1±1.6 (11–16). **Opisthosomal** annuli continuous dorsoventrally. Lateral seta (*c2*) 19.6±1.1 (18–22), on annulus 8.6±0.6 (8–10) from the first ventral annulus. Ventral seta I (*d*) 57±10.8 (40–75), 37±1.9 (33–40) apart, on annulus 20.4±1.3 (18–22); ventral seta II (*e*) 44.3±9.8 (30–55), 25.7±5.1 (21–35) apart, on annulus 34.7±2 (31–38); ventral seta III (*f*) 23.6±2.5 (20–28), 21.5±3.1 (18–28) apart, on annulus 59.2±2.9 (54–64). Total dorsal annuli 72.7±2 (68–76), microtuberculate, microtubercles slightly oval, with posterior base pointed, thorn-like, caudal 8–12 annuli with smaller, microtubercles, reducing in size towards rear annuli; total ventral annuli 63.4±3.1 (58–68), microtuberculate, oval, with its posterior margin also thorn-like, slightly triangular and pointed, caudal 5–6 annuli with thinner, elongate microtubercles. Caudal seta (*h2*) 121.8±28.1 (72–160); accessory seta (*h1*) absent.

**MALE.** Unknown.

**Type material.** Holotype female, 20 female paratypes, from *Salvadora persica* (Salvadoraceae), IARI, New Delhi, coll. Sushila Joshi, 13 November 2007, on thirteen microscopic preparations deposited in NPC. Also 2 paratypes on two slides will be deposited in the Insect and Mite National Collection, NMNH, Smithsonian Institution located at the U.S.D.A. and SEL, Beltsville, Maryland.

**Relation to host.** The mite causes yellowish erineum on both the surface of the leaves.

**Etymology.** The specific designation *delhiensis* is derived from the name of the area of collection, New Delhi.

**Remarks.** This species resembles *Acalitus epiphytivagrans* (Mohanasundaram, 1983) described from an unknown epiphytic parasitic plant from Tamil Nadu, India, in having 7 rayed feather claw and similar dorsal shield design, but differs in not having antapical setae, absence of accessory seta, microtubercles oval, reducing in size caudally and genital cover flap design which has coarse granules and absence of prominent crescentic scorings. *A. epiphytivagrans* has antapical seta, accessory seta, microtubercles oval to elongate along the posterior margin of each ring and genital cover flap shows 3–4 pairs of crescentic scorings. Further, this new species causes yellowish erineum on both surface of leaves, whereas, *A. epiphytivagrans* has been reported as vagrant on leaf surface, causing slight crinkling of leaves.

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