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Two new species of phytoseid mites *Euseius* (Acari: Phytoseiidae) from Kerala, India

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Abstract: Two new species of phytoseiid mites, *Euseius pariyarensis* sp. nov. and *E. curcasae* sp. nov., collected from the medicinal plants *Saraca indica* L. and *Jatropha curcas* L. respectively, are described from the Kerala State of India. The morphological features of the two species are described with appropriate illustrations.

Keywords: *Euseius curcasae, Euseius pariyarensis,* Mesostigmata, Phytoseiidae.

Abbreviations: Z- Posterior mediolateral setae; S-Posterior lateral setae; JV-Ventrocentral setae; ZV-Mediolateral ventral setae

Phytoseiid mites have received considerable attention in pest management programs with respect to their potential for biological control of various phytophagous mites and agricultural and horticultural pests in greenhouses, on strawberries, and on deciduous fruits (McMurtry 1982; Helle & Sabelis 1985). The genus *Euseius* was first described by Wainstein (1962) under the subfamily Amblyseiinae based on the possession of an oval body, short, simple setae with Z_5 being the longest and well separated from Z_4, setae S_2 and S_4 present on ventrianal shield, setae JV_1 on its anterior margin and usually aligned with setae JV_2 and ZV_2.

The first version of the world phytoseiid catalogue was published by Moraes et al. (1986), which included about 1,500 species under 79 genera. The first version of an electronic database of Phytoseiidae prepared by Demite et al. (2014) included 2,436 valid species under 91 genera, of which the genus *Euseius* contains 219 valid species. Gupta & Karmakar (2015) prepared an updated checklist of Indian phytoseiid mites, which included 211 species. The present paper deals with the description of two new species under the genus *Euseius*, inhabiting the medicinal plants growing in northern Kerala, India.

Methods

The specimens included in the study were collected from mite-infested leaves of two species of medicinal plants namely, *Saraca indica* L. and *Jatropha curcas* L. The collected leaves were examined under a stereo zoom microscope (Magnus - MSZ-TR Trinocular Microscope). The mites wandering on the leaf surface were picked up with a camel hair brush and directly mounted on microscopic slides in Hoyer's medium (Haderson 2001). Systematic position of the species was identified following Gupta (2003) and Chant & McMurtry (2007) and by seeking expert opinion. The setal nomenclature

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followed Rowel et al. (1978) and Chant & Yoshida-Shaul (1989, 1991). All measurements are given in microns.

All the type specimens are kept in the P.G. & Research Department of Zoology, Malabar Christian College, Calicut and will be deposited in the National Zoological Collections of Zoological Survey of India, Kolkata, India.

Results

Euseius pariyarensis sp. nov.

(Fig. 1)

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Material examined: Holotype: No. D 75/1, female, 18.xii.2015, India, Kerala, Botanical Garden, Ayurveda College Pariyaram, Kannur District, 12.07^{0}N, 75.29^{0}E, xiiex: *Saraca indica* L., coll. P.P. Santhosh.

Paratype: No. D 75/2, 75/3, 75/4, three slides with three females, collection details same as holotype.

Female: Dorsum: Dorsal shield 320µm (300–325 µm) long, 202µm (200–208 µm) wide with 17 pairs of setae. Measurements of setae: j_1 37µm (35–42 µm), j_3 20µm (18–22 µm), j_4, j_5 & j_6 8µm (6–9 µm) each, J_2 9µm (8–10 µm), z_2 & z_4 – 6µm (5–7 µm) each. z_5 4µm (3–5 µm), Z_1 12µm (10–15 µm), Z_4 15µm (13–16 µm), Z_5 50µm (48–52 µm), s_4 8µm (6–9 µm), S_2 8µm (6–9 µm), S_4 9µm (8–10 µm), S_5 9µm (8–10 µm), r_3 8µm (6–9 µm), R_1 15µm (12–17 µm). Peritreme terminates anteriorly between legs I & II (Z_2 & Z_4).

Venter: Sternal shield 73µm (70–75 µm) long and 68µm wide with ST_1 22µm, ST_2 & ST_3 20µm long, ST_4 on metasternal shield 12µm long. Genital shield 50µm long and 65µm wide with ST_5 20µm long. Ventrianal shield slightly pentagonal in shape, 88µm long and 53µm wide. ZV_1 12µm, ZV_2 & ZV_3 14µm each, JV_1 15µm, JV_2 8µm, JV_4 12µm, JV_5 30µm long. A thick fold present between genital and ventrianal shields.

Chelicera: 24.5µm long, three teeth on fixed digit and none on movable digit.

Metapodal plate: Primary 13µm long, 4µm wide, accessory 5µm long.

Spermatheca: With tubular cervix 20µm long and with bifid atrium.

Macroseta on leg IV: Genu 37µm (34–39 µm) with pointed tips, tibia30µm (28–32 µm) with broadened tips, basitarsus 48µm (45–52 µm) with broadened tips.

Leg chaetotaxy:

$$\text{genu II } 2\frac{2}{0}\frac{2}{0}1 \qquad \text{tibia II } 1\frac{1}{1}\frac{2}{1}1$$

$$\text{genu III } 1\frac{2}{0}\frac{2}{1}1 \qquad \text{tibia III } 1\frac{1}{1}\frac{2}{1}1$$

Male: Unknown

Habitat: *Saraca indica* L.

Remarks: This new species closely resembles *E. ovalis* (Evans 1953) in dorsal chaetotaxy but differs in the structure of spermatheca and by the possession of the following features:

1. In the new species, the length of seta j_1 is 37µm (35–40 µm) whereas in *E. ovalis,* it is 31µm long.
2. The ventri-anal shield of the new species is slightly pentagonal, measuring 88µm (86–100 µm) in length and 53µm (51–55 µm) in width whereas it is oval and 84–90 µm long and 72–78 µm wide in *E. ovalis*.
3. The chelicera of the new species is with three teeth on the fixed digit and none on the movable digit whereas in *E. ovalis*, the fixed digit has two teeth and the movable digit has a small tooth.
4. In the new species, the spermatheca has a long tubular cervix (20µm) with funnel-shaped atrium whereas in *E. ovalis*, the cervix is funnel-shaped.
5. The new species possesses a thick fold between the genital and ventri-anal shields, which is absent in *E. ovalis.*

The new species also resembles *E. sacchari* (Ghai & Menon 1967) in the structure of chelicerae and spermatheca but differs by the possession of the following features:

1. The dorsal shield is smaller in size (320µm long & 202µm wide) in the new species when compared to that of *E. sacchari* (350µm long & 230µm wide).
2. The number of teeth on the fixed digit is three in the new species instead of two in *E. sacchari.*
3. The ventri-anal shield is 88µm long and 53µm wide in the new species, whereas in *E. sacchari*, it is 90–100 µm long and 70–80 µm wide.
4. In the new species, the macrosetae on leg IV basitarsus have broadened tip, whereas in *E. sacchari*, the tip of all macrosetae are pointed.
5. In the new species, the peritreme terminates between z_2 and z_4, whereas in *E. sacchari*, peritreme terminates anteriorly between j_3 and z_2.

Etymology: The nomenclature of this new species is based on the place from where the specimens were collected.

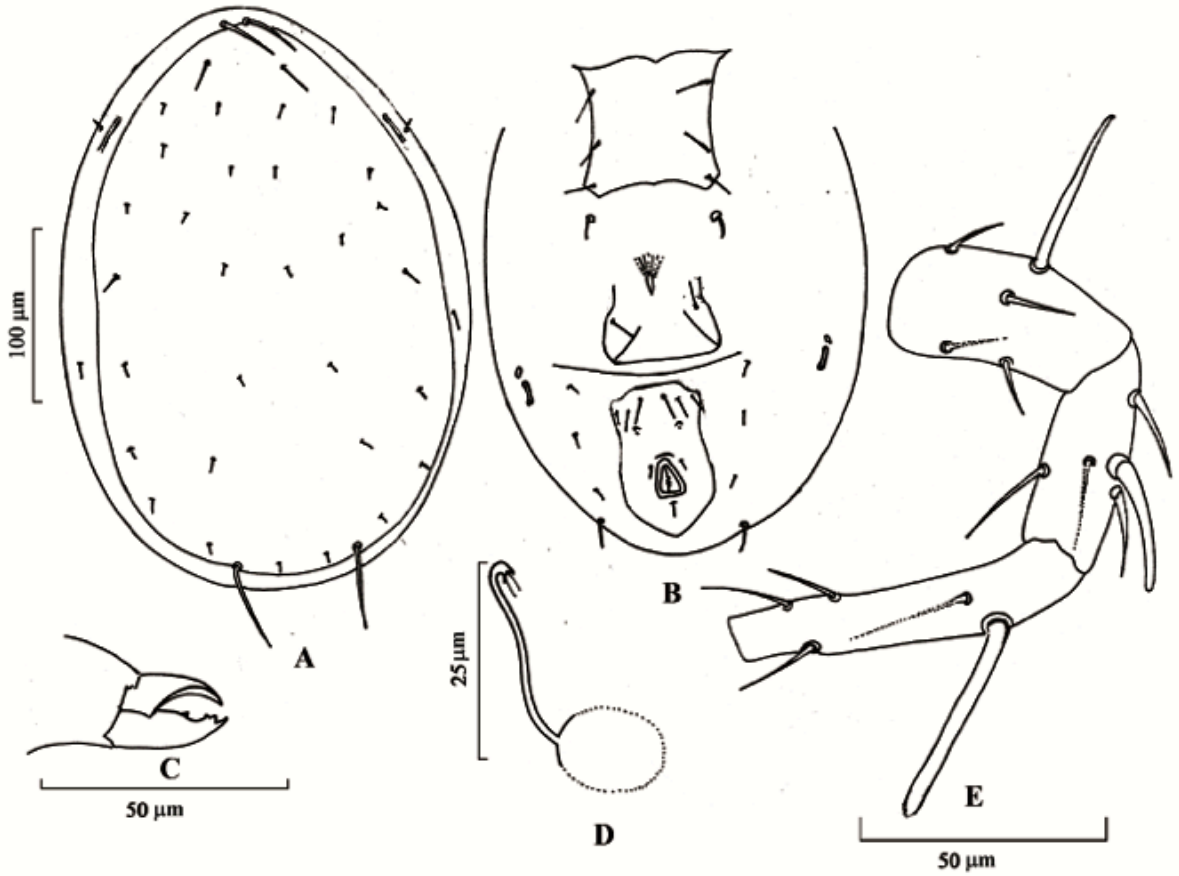

Figure 1. ***Euseius pariyarensis*** **sp. nov. (female). A - dorsal view, B - ventral view, C - chelicerae, D - spermatheca, E - leg IV**

Euseius curcasae sp. nov.
(Fig. 2)

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Material examined: Holotype: No. C 15/1, female, 15.v.2014, India, Kerala, University of Calicut, Malappuram District, 11.13^{0}N, 75.89^{0}E, ex: *Jatropha curcas* L., coll. P.P. Santhosh.

Paratype - Nos. C 15/2, 15/3, two females from the same habitat as holotype. Nos. C 15/4, 15/5, 20.vi.2015, two females, Chelembra, Malappuram District, 11.16^{0}N, 75.87^{0}E, ex: *Bauhinia acuminata* (L.), coll. P.P. Santhosh.

Female: Dorsum: Dorsal shield slightly reticulated along the lateral margin, 368µm (365–380 µm) long, 270µm (260–278 µm) wide with 17 pairs of simple setae. Measurements of setae: j_1 30µm (29–31 µm), j_4 9 µm (8–10 µm), j_5 & j_6 8µm (7–9 µm) each, J_2 11µm (10–12 µm), J_5 8µm (7–9 µm), j_3 13µm (12–14 µm), z_2 11µm (10–12 µm), z_4 11µm (10–12 µm), s_4 12µm (11–13 µm), Z_1 15µm (14–16 µm), S_2 11µm (10–12 µm), S_4 15µm (14–16 µm), S_5 11µm (10–12 µm), Z_5 44µm (43–45 µm) smooth, z_5 8µm (7–9 µm), Z_4 15µm (14–16 µm), r_3 11µm (10–12 µm), R_1 8µm (7–9 µm).

Venter: Sternal shield 75µm (73–78 µm) long and 73µm (70–75 µm) wide with three pairs of sternal setae, ST_1 & ST_2 measure 22µm each, ST_3 measures 18µm (16–20 µm). ST_4 lies on the metasternal plate, measuring 20µm (19–21 µm). Genital shield 75µm long, 93µm (90–95 µm) wide with ST_5 20µm (18–22 µm) long. Ventrianal shield vase-shaped, slightly concave laterally, 124µm (120–126 µm) long and 65µm (63–67 µm) wide with three pairs of preanal setae and four pairs of setae around. Setae ZV_1 & ZV_2 15µm (14–16 µm) each, ZV_3 12µm (11–13 µm), JV_1 & JV_2 15µm (14–16 µm) each, JV_4 12µm (11–13 µm), JV_5 25µm (23–26 µm) long. Two pairs of metapodal plates present, primary 17µm long and 5µm wide and accessory one 10µm long.

Spermatheca: Long tubular cervix (33µm) bent anteriorly with nodular atrium.

Peritreme: Terminates anteriorly between j_1 and j_3.

Chelicera: Fixed digit 22µm long with two apical teeth and movable digit with no tooth. Macrosetae on leg IV: genu 37µm (34–38 µm), tibia 35µm (36–37 µm), basitarsus 49µm (47–45 µm).

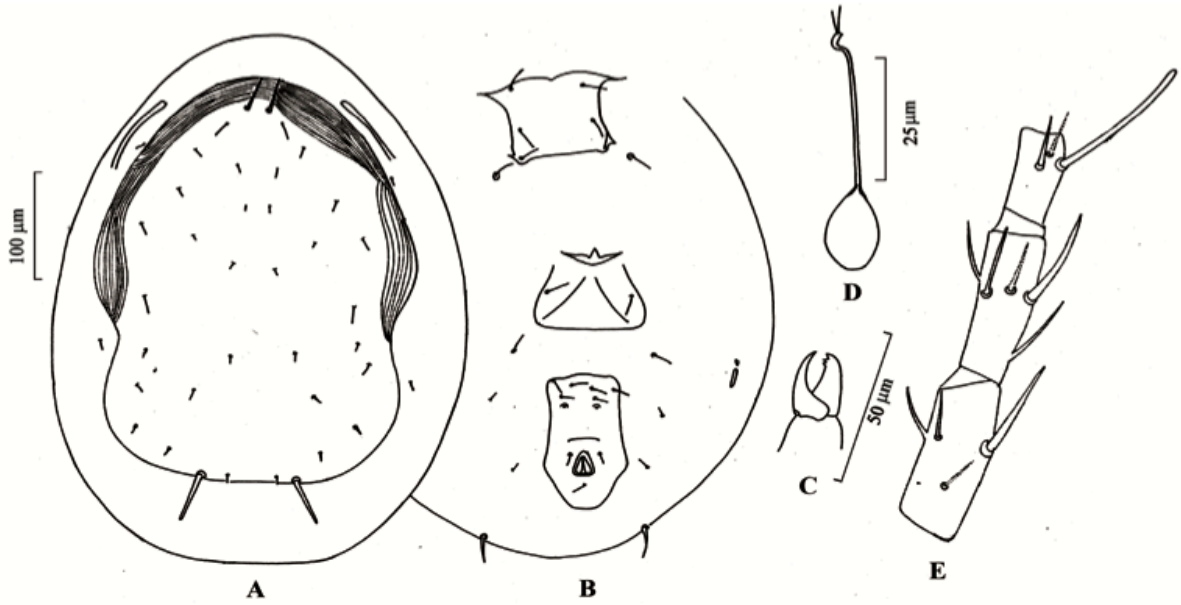

Figure 2. ***Euseius curcasae*** **sp. nov. (female). A - dorsal view, B - ventral view, C - chelicerae, D - spermatheca, E - leg IV**

Leg chaetotaxy:

genu II $2\frac{2}{0}\frac{2}{0}1$ tibia II $1\frac{1}{1}\frac{2}{1}1$

genu III $1\frac{2}{0}\frac{2}{1}1$ tibia III $1\frac{1}{1}\frac{2}{1}1$

Male: Unknown

Habitat: *Jatropha curcas* L., *Bauhinia acuminata* L.

Remarks: The specimen studied resembles *E. alstoniae* described by Gupta (1975) in dorsal chaetotaxy, structure of spermatheca, and length of macrosetae but differs in the following characters:

1. Dorsal shield longer and wider (368µm, 270µm) than that of *E. alstoniae* (325µm, 204µm).
2. Dorsal shield slightly reticulated on lateral margin of the anterior half, whereas it is smooth anteriorly and rugose posteriorly in *E. alstoniae*.
3. In the new species, seta S_2 shorter than Z_1, while in *E. alstoniae*, S_2 noticeably longer than Z_1.
4. In the new species, j_1 30µm (29–31 µm) and j_3 13µm (12–14 µm) long, whereas in *E. alstoniae*, j_1 almost equal (25–28 µm) in length and j_3 double the length than that of the new species (28–34 µm).
5. Seta JV_5 25µm long in the new species, whereas in *E. alstoniae*, JV_5 is 44µm.
6. The number of teeth on the fixed digit of chelicerae is three in the new species, whereas it is two in *E. alstoniae*.
7. In the new species, the shape of the ventrianal shield is pentagonal and measures 124µm long and 65µm wide, whereas in *E. alstoniae*, lateral margin of ventrianal shield slightly concave and differs in size (90–100 µm long, 70–80 µm wide).
8. Peritreme terminates anteriorly between j_1 and j_3 in the new species, whereas in *E. alstoniae*, it terminates between j_3 and z_2

This new species resembles *E. bambusae* described by Ghai & Menon (1967) also in the dorsal chaetotaxy but differs in the following characters:

1. Dorsal shield slightly reticulated along the lateral margin in the new species, whereas in *E. bambusae*, the entire dorsal shield is gently reticulate.
2. In the new species, seta JV_5 22µm long, whereas in *E. bambusae* it is 38µm long.
3. Macrosetae on leg IV genu 37µm (35–39 µm), tibia 35µm (33–37 µm), and tarsus 49µm (47–50 µm) long in the new species, whereas in *E. bambusae*, genu 52–56 µm, tibia 44—45 µm, and basitarsus 68–72 µm long.
4. In the new species, peritreme terminates between j_1 and j_3, whereas in *E. bambusae*, peritreme terminates anteriorly between j_3 and z_2.
5. Fixed digit of chelicerae with three apical teeth and movable digit with no tooth in the new species, whereas in *E. bambusae*, 3–4 apical teeth and one tooth on movable digit.

Etymology: The nomenclature of this new species is

based on one of the host plants, *Jatropha curcas* L., from which the specimens were collected.

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