



Enterographa assamica, a new species from North-East India

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ABSTRACT: A new species *Enterographa assamica*, in the family Roccellaceae *sensu lato* is described from Assam, India. It is characterized by whitish grey thallus, rounded to elongate ascomata with yellowish-white thalline margin and presence of lichexanthone and confluent acid in the thallus. A key to all the known species of *Enterographa* in India is also provided.

KEY WORDS: Arthoniales; Assam; India; *Enterographa assamica*; Lichenized Ascomycota; Roccellaceae *s. l.*; Taxonomy.

INTRODUCTION

The genus *Enterographa* Fée (Roccellaceae *s. l.*) was monographed by Sparrius (2004) with the genus *Sclerophyton*. It is characterized by the immersed ascomata, *Opegrapha*-type asci, thin branched, anastomosed paraphysoids, non-carbonized hypothecium and excipulum hyaline, fusiform-acicular ascospores. Recently, Seavey & Seavey (2014) provided a revised world key to the species of *Enterographa*. So far, seven species, viz. *Enterographa bengalensis* Jagadeesh, G.P. Sinha & Kr.P. Singh, *E. divergens* (Müll. Arg.) Redinger, *E. mesomela* Sparrius, Saipunkaew & Wolseley, *E. micrographa* (Nyl.) Redinger, *E. multiseptata* R. Sant., *E. nicobarica* Jagadeesh and *E. pallidella* (Nyl.) Redinger are known from India (Jagadeesh Ram, 2016; Jagadeesh Ram *et al.*, 2007, 2008; Sparrius, 2004; Singh & Sinha, 2010). During the course of lichenological studies in Assam, an interesting *Enterographa* was found which has resulted in the discovery of a new species. The same has been described in detail to facilitate its identification.

MATERIALS AND METHODS

Sections of thalli and ascomata were mounted in water, 10% KOH (K), Lugol's solution (I) and lactophenol cotton-blue (LPCB). All measurements were made on material mounted in water. Secondary metabolites were identified by thin-layer chromatography following Orange *et al.* (2001). The specimens are deposited in the Botanical Survey of India, Central Regional Centre, Allahabad (BSA). Taxonomic comparison with closely allied species is provided in Table 1.

TAXONOMIC TREATMENT

A key to *Enterographa* species in India

1a. Thallus foliicolous; ascomata 0.05–0.10 × 0.2–0.8 mm; ascospores 22–36 µm long, 7–10-septate *E. multiseptata*

1b. Thallus corticolous 2
 2a. Thallus C+ pink to red, gyrophoric acid present; ascomata 0.10–0.15 × 0.3–1 mm; ascospores 22–33 µm long, 6–12-septate *E. pallidella*
 2b. Thallus C– 3
 3a. Thallus P+ yellow, psoromic acid present 4
 3b. Thallus P– 5
 4a. Ascomata lirelliform to dendroid; ascospores 15–25 µm long, 3–5 septate *E. micrographa*
 4b. Ascomata punctiform; ascospores 46–57 µm long, 12–15 septate *E. bengalensis*
 5a. Ascomata in pseudostromata *E. nicobarica*
 5b. Ascomata not in pseudostromata 6
 6a. Ascospores < 30 µm long, 6–8-septate, ascomata red brown to black *E. divergens*
 6b. Ascospores > 30 µm long, 9–12-septate; ascomata black 7
 7a. Thallus UV+ bright yellow, lichexanthone present *E. assamica*
 7b. Thallus UV–, lichexanthone absent *E. mesomela*

Enterographa assamica Pooja Gupta, S. Joseph & G.P. Sinha *sp. nov.* **Fig. 1A–C**

Type: INDIA. Assam: Sonai, Binnakandy Tea Garden, on shade tree, 17 January 2005, V.N. Singh 1856 (Holotype-BSA). **Mycobank No.:** 829101

Diagnosis: Thallus corticolous, epiperidermal; ascomata rounded to elongate; 0.25–0.55 mm diam., if rounded; 0.5–1(–1.2) × 0.2–0.5 mm, if lirelliform; asci clavate, 8-spored, 60–80 × 15–19 µm; ascospores hyaline, acicular, transversely 7–11-septate, slightly curved at the end, (39–)48–55(–60) × 2–3 µm; confluent acid and lichexanthone present.

Thallus crustose, corticolous, epiperidermal, 4–8 cm diam., 40–55 µm thick; surface whitish-grey, countinuous, smooth, epruinose; medulla white, with 10–25 µm diam. calcium oxalate crystals; photobiont *Trentepohlia*; prothallus thin, slightly brown to black. Ascomata immersed to erumpent, rounded to elongate, rarely lirelliform, irregular; 0.25–0.55 mm diam. if rounded, 0.5–1(–1.2) mm long and 0.2–0.5 mm wide if lirelliform; disc open, black, epruinose, plane to convex; thalline margin indistinct or thin, 0.02–0.05 mm thick; excipulum thin, reddish-brown, K+ olivaceous, I+ red, 20–35 µm thick; epithecium pale-brownish, 20–22 µm

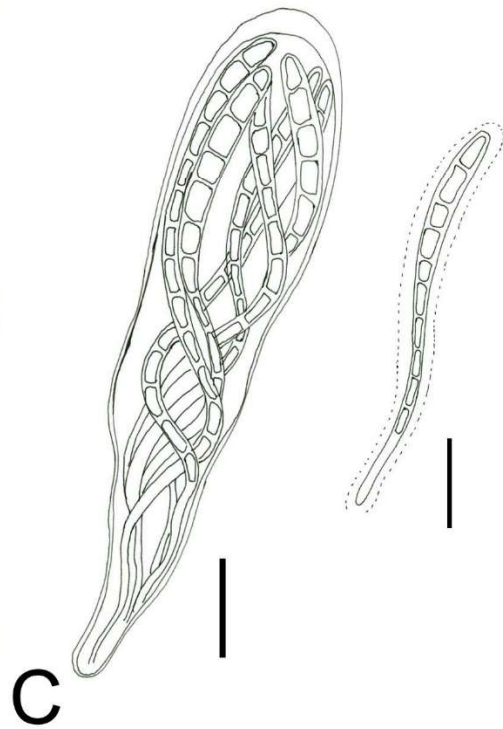
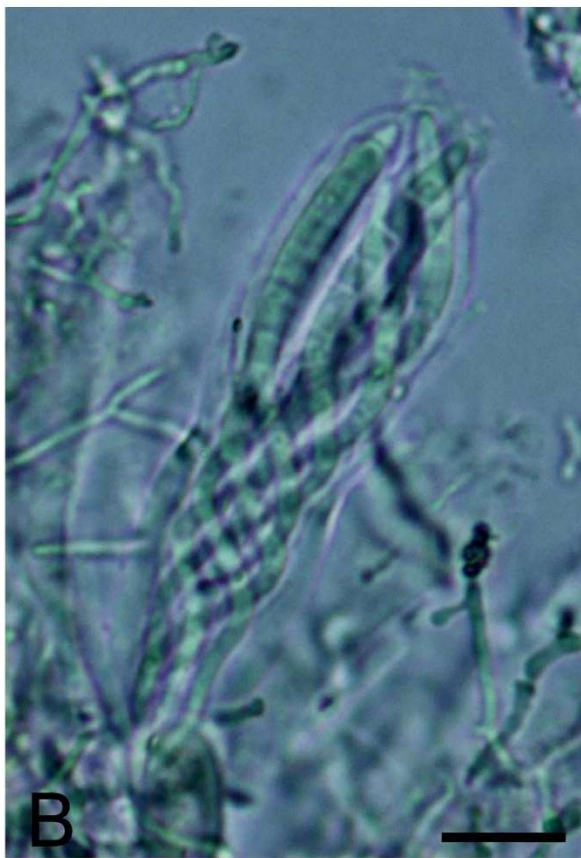


Fig. 1. *Enterographa assamica*. A. Thallus with ascomata; B & C. Asci with ascospores. Scale: A. 1mm; B & C. 10 μ m.

**Table 1.** Comparison of *Enterographa assamica* with closely allied species.

| Characters | <i>E. assamica</i> | <i>E. caudata</i> | <i>E. divergens</i> | <i>E. kalbii</i> | <i>E. mesomela</i> |
|-----------------|--|-------------------------------------|-------------------------------|------------------------|----------------------------|
| Thallus stroma | Pseudoascomata not present | Pseudoascomata not present | Pseudoascomata not present | Pseudostromata present | Pseudoascomata not present |
| UV | UV + bright yellow | UV+ yellow | UV- | UV+ yellow | UV- |
| Ascomata size | 0.5-1(1.2)×0.2-0.5mm | 0.09-0.23×0.08-0.17mm | 0.10-0.5×0.2-0.5mm | 0.06-0.09×0.08-0.5mm | 0.2-0.3×0.3-0.8mm |
| shape | rounded to elongate (rarely lirelliform) irregular | rounded to angular | lirelliform, shortly branched | dendroid-lirelliform | Rounded to ellipsoid |
| colour | black | black | chocolate brown | dark brown-black | black |
| Ascospores size | 48-55 × 2.5-3 µm | 37-67 × 3-4 µm | 20-30 × 2-3.5 µm | 25-35 × 3.5-5 µm | 32-40 × 4-5 µm |
| septation | 7-11 septate | 10-15 septate | 5-7 septate | 5-7 septate | 9-12 septate |
| Chemistry | Confluent acid and lichexanthone | Schizopeltic acid and lichexanthone | no substance | no substance | Confluent acid |

thick, with crystals, K–; hymenium hyaline, clear, 80–113 µm high, I+ red, KI+ blue; paraphysoids branched and anastomosed, 1–1.5 µm thick; hypothecium hyaline to pale brown, K–, I+ red, KI+ blue; asci clavate, 8-spored, 60–80 × 15–19 µm; ascospores hyaline, fusiform-acicular, transversely 7–11-septate, slightly curved at the ends, (39–)48–55(–60) × 2–3 µm; perispore distinct 1.5–3 µm thick. Pycnidia rare, visible as blackish spots; conidia hyaline, baciliform, straight to slightly curved, 4.5–6.5(–7) × 0.8–1.2 µm.

Chemistry: Thallus K–, C–, KC–, P–, UV+ bright yellow; lichexanthone and confluent acid (major) detected in TLC.

Etymology: The specific epithet refers to the Indian state, Assam, where it was discovered.

Remarks: *Enterographa assamica* is characterized by the rounded to elongate, irregular ascomata, 7–11-septate ascospores and the presence of lichexanthone and confluent acid as lichen substances. The new species is morphologically very close to *E. mesomela* (Sparrius *et al.*, 2006) but the latter species having UV– thallus, I+ blue epithecium and hymenium, and absence of lichexanthone. In the protologue of *E. mesomela*, Sparrius *et al.* (2006) mentioned thallus is UV+ white and ascospores of 7–9-septate. We examined the holotype image of the *E. mesomela* (available in Jstor Global Plants) and found an annotation label by Damien Ertz where it mentioned ascospores are 9–12-septate and no crystals of norstictic acid seen in K in hypothecium. Personal communication with Gothamie Weerakoon, Senior curator, Lichens & Slime Moulds, BM, the thallus of the *E. mesomela* holotype is confirmed as UV–. The new species closely resembles *E. caudata* F. Seavey & J. Seavey, which also has similar morphology and lichexanthone in thallus, but differs by the smaller (0.09–0.23 × 0.08–0.17 mm), more adnate apothecia, larger ascospores with more septation, acicular tails and schizopeltic acid in the thallus (Seavey & Seavey, 2014). It differs from the other allied species *E. divergens* (Müll. Arg.) Redinger and *E. kalbii* Sparrius by the smaller ascospores with less septa and lack of chemical substances (Sparrius, 2004).

Habitat & Ecology: It is found growing on the bark of

shade trees in open localities in the tea gardens of Assam.

Additional specimens examined: INDIA, Assam, Sibsagar district, Rajabari Tea Garden, on shade tree, 07 June 2004, V.N. Singh 1389 (BSA); North Cachar hills district, Pailapool, Dewan Tea Garden, on shade tree, 17 January 2005, V.N. Singh 1903 (BSA).

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