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# Additions to the lichen flora of Sikkim, India

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## ABSTRACT

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Twenty lichen taxa are reported as additions to the lichen flora of Sikkim. One of these, *Lecanora horiza* (Ach.) Röhl, has been recollected after 1905. Their characteristic features and distribution are briefly discussed.

**Key-words:** Additions, lichens, taxonomy, Sikkim, India.

## INTRODUCTION

Sikkim is well known for its rich plant wealth and has been extensively botanized since 1848 by J. D. Hooker, and unlike elsewhere, lichens were also collected and studied from the area since then (Nylander 1860, 1863, Chopra 1934, Awasthi 1965, 1988, 1991, 2007, Asahina 1966, Sinha 1999, Upreti et al. 2004, Sinha & Singh 2005). Based on these reports and further explorations, Sinha and Jagadeesh Ram (2011) listed 506 species of lichens in Sikkim, followed by reports of 13 additional species (Joseph & Sinha 2012a, b). In continuation of the same, twenty additional species have been found, that are being enumerated in the present paper.

## MATERIAL AND METHODS

The study is based on the collection of more than 250 lichen specimens collected from different parts of Sikkim. Specimens were examined using stereomicroscope (Olympus SZ61) and Zeiss compound microscope (Nikon Eclipse 50*i*). Squash preparations were studied in water or KOH solution (K) and the amyloid reactions were tested with Lugol's reagents, without (I) or with pre-treatment of KOH (K/I) and the chemical constituents were identified by thin-layer chromatography (Orange et al. 2001). Specimens were identified with the help of authenticated specimens and literature (Harris 1975, Awasthi & Mathur 1987, Pant & Awasthi 1989, Awasthi 1991, Staiger 2002, Kalb et al. 2004, Nash et al. 2004, Nayaka 2005, Frisch & Kalb 2006, Galloway 2007, Joshi 2008, Lücking et al. 2009).

## ENUMERATION OF TAXA

### 1. *Arthonia tumidula* (Ach.) Ach.

Plate 1, figure A

**Specimen examined:** East Sikkim, near Setipool, Lat. 27°02'16.2"N, Long. 92°36'22.4"E, 898–913 m, 20.04.2010, G. Swarnalatha 5639 (BSA).

**Description:** The cosmopolitan species is characterized by greyish–green, corticolous thallus; rounded–irregular, sunken, erumpent, reddish–white, 0.5–1 mm diam. apothecia; colourless, oval, 12–20 × 4–6 µm ascospores with one larger cell.

**Distribution in India:** It is known so far from Arunachal Pradesh, Assam, Goa, Karnataka, Tamil

Nadu and West Bengal plains.

**2. *Arthopyrenia analepta*** (Ach.) A. Massal.

Plate 1, figure B

**Specimen examined:** East Sikkim, 15 km to Dikchu from Singtam, Lat. 27°02'16.2"N, Long. 92°36'22.4"E, 681 m, 21.04.2010, G. Swarnalatha 5744 (BSA).

**Description:** The cosmopolitan species is characterized by yellowish–green, corticolous thallus; simple, sunken, black, 0.2–0.4 mm diam. perithecia; colourless, oval–ellipsoidal, transversely 1–septate, 10–15 × 3–5 µm ascospores with one larger cell.

**Distribution in India:** The species is known so far from Arunachal Pradesh, Karnataka, Kerala and Tamil Nadu.

**3. *Bacidia convexula*** (Müll. Arg.) Zahlbr.

Plate 1, figure C

**Specimen examined:** East Sikkim, Dikchu, Lat. 27°02'16.2"N, Long. 92°36'22.4"E, 725 m, 21.11.2006, G. P. Sinha 3648B (BSA).

**Description:** The endemic species is characterized by whitish–grey, corticolous thallus; rounded, sessile, plane to convex, reddish–brown, biatorine, 0.5–1.5 mm diam. apothecia; colourless, acicular, transversely 5–7 septate, 22–38 × 1–1.5 µm ascospores.

**Distribution in India:** It is known so far from Assam, Madhya Pradesh, Manipur and Uttar Pradesh.

**4. *Bacidia incongruens*** (Stirt.) Zahlbr.

Plate 1, figure D

**Specimen examined:** East Sikkim, Majitar, Rangpo, 355 m, 27.11.2006, G. P. Sinha 3835 (BSA).

**Description:** The endemic species is characterized by the greenish, corticolous thallus; rounded, adnate–sessile, plane–convex, biatorine, 0.2–0.9 mm diam. apothecia; colourless, fusiform, transversely 1–3 (–5) septate, 19–23 × 2–3 µm ascospores.

**Distribution in India:** The species is known so far from Karnataka, Tamil Nadu and West Bengal plains.

**5. *Bacidia laurocerasi*** (Delise ex Duby) Zahlbr.

Plate 1, figure E

**Specimens examined:** East Sikkim, 3 km to Mulcha on the way to Dikchu, Lat. 27°02'16.2"N, Long. 92°36'22.4"E, 908–920 m, 21.04.2010, G. Swarnalatha 5724; South Sikkim, Tendong Biodiversity Park, 2009 m, 26.11.2006, G. P. Sinha 3813C (BSA).

**Description:** The cosmopolitan species is characterized by yellowish–grey, corticolous thallus; rounded, sessile, yellowish–grey, biatorine, 0.2–1 mm diam. apothecia; colourless, fusiform–acicular, transversely 5–15 septate, 40–55 × 2–3 µm ascospores.

**Distribution in India:** It is known so far from Manipur, Tamil Nadu and Uttarakhand.

**6. *Bacidia phaeolomoides*** (Müll. Arg.) Zahlbr.

Plate 1, figure F

**Specimen examined:** East Sikkim, Dikchu, Lat. 27°02'16.2"N, Long. 88°30'96.7"E, 725 m, 21.11.2006, G. P. Sinha 3650 (BSA).

**Description:** The palaeotropical species is characterized by greenish–brown, corticolous thallus; rounded, sessile, convex–plane, 0.5–1.5 µm diam. apothecia; colourless, acicular, transversely 9–21 septate, 40–58 × 2–5 µm ascospores.

**Distribution in India:** The species is known so far from Tamil Nadu, Uttarakhand and West Bengal hills.

**7. *Caloplaca flavorubescens*** (Huds.) J. R. Laundon

Plate 1, figure G

**Specimen examined:** South Sikkim, Temi–Damthang, Lat. 27°13'67.2"N, Long. 88°24'94.1"E, 1853 m, 26.11.2006, G. P. Sinha 3784 (BSA).

**Description:** The cosmopolitan species is characterized by yellowish–brown, corticolous thallus; black prothallus; rounded, adnate to sessile, yellowish–orange, lecanorine, K+ purple red, 0.3–1.5 mm diam. apothecia; colourless, ellipsoidal, polaribilocular, 8–12 × 5–7 µm ascospores, with 0.5–1 µm thick isthmus.

**Distribution in India:** It is known so far from Himachal Pradesh, Karnataka, Manipur, Nagaland and Uttarakhand.

**8. *Caloplaca squamosa*** (de Lesd.) Zahlbr.

Plate 1, figure H

**Specimen examined:** West Sikkim, Yuksum, Katoch Lake, Lat. 27°22'15.2"N, Long. 88°13'28.3"E, 1741 m, 23.03.2012, G. P. Sinha & Siljo Joseph 7239 (BSA).

**Description:** The species is characterized by yellowish–orange, saxicolous, UV+ yellow thallus; rounded, adnate, brown, plane to concave, 0.2–0.4 mm diam. apothecia with yellow margin; colourless, ellipsoid, polaribilocular, 11–16 × 6–7 µm ascospores.

**Distribution in India:** The species is known so far only from Uttarakhand.

**9. *Candelariella vitellina*** (Ehrh.) Müll. Arg.

Plate 1, figure I

**Specimen examined:** North Sikkim, Lashar (Nymateng), 19.07.1996, G. P. Sinha 1181 (BSA).

**Description:** The cosmopolitan species is characterized by yellowish–brown, saxicolous thallus; rounded, sessile, plane–slightly concave, 0.3–0.8 mm diam. apothecia; colourless, simple, broadly ellipsoidal, 8–12 × 5–6 µm ascospores.

**Distribution in India:** It is known so far from Jammu & Kashmir and Uttarakhand.

**10. *Chapsa leprocarpa*** (Nyl.) A. Frisch

Plate 1, figure J

**Specimen examined:** East Sikkim, Gangtok, near Tibetology, Lat. 27°02'16.2"N, Long. 92°36'22.4"E, 1524 m, 17.04.2010, G. Swarnalatha 5569C (BSA).

**Description:** The pantropical species is characterized by white pruinose, corticolous thallus; rounded–irregular, immersed–erumpent, 1–3 mm diam. apothecia; white pruinose disc with lobed margin; pale–brown, oblong–ellipsoidal, muriform, 64–98 × 24–30 µm ascospores.

**Distribution in India:** The species is known so far from Andaman & Nicobar Islands and Karnataka.

**11. *Diorygma heiroglyphicum*** (Pers.) Staiger & Kalb

Plate 1, figure K

**Specimens examined:** South Sikkim, Temi–Damthang road, Lat. 27°13'67.2"N, Long. 88°24'94.1"E, 853 m, 26.11.2006, G. P. Sinha 3788, 3810 (BSA).

**Description:** The pantropical species is characterized by greenish–white, corticolous thallus containing stictic acid; lirelliform, 2–3.5 × 0.3–0.5 mm apothecia with white convergent labia; colourless, ellipsoid–oblong, muriform, I+ deep blue, 89–130 × 35–53 µm ascospores.

**Distribution in India:** It is known so far from Andaman & Nicobar Islands, Assam, Kerala and Maharashtra.

**12. *Fissurina dumastii*** Fée

Plate 1, figure L

**Specimen examined:** East Sikkim, Gangtok–Dikchu–Singtam road, Tumin, Lat. 27°19'50.3"N, Long. 88°30'65.6"E, 1489 m, 21.11.2006, G. P. Sinha 3631 (BSA).

**Description:** The palaeotropical species is characterized by yellowish–brown, corticolous thallus; lirelliform, 0.5–1.5 × 0.02–0.07 mm apothecia, with slightly open disc; uncarbonized exciple, fissured labia; colourless, broadly ellipsoid, transversely 3–septate, 12–16 × 6–8 µm ascospores.

**Distribution in India:** The species is known so far from Andaman & Nicobar Islands, Assam, Karnataka and Kerala.

**13. *Glyphis scyphulifera*** (Ach.) Staiger

Plate 1, figure M

**Specimen examined:** East Sikkim, Ranipool, Souremi village area, 1890 m, 20.11.2006, G. P. Sinha 3617 (BSA).

**Description:** The pantropical species is characterized by blackish–grey, corticolous thallus; rounded disciform, brown, 0.7–1.2 mm diam. apothecia; completely carbonized exciple; colourless, ellipsoidal, muriform, 33–36 × 9–12 µm ascospores.

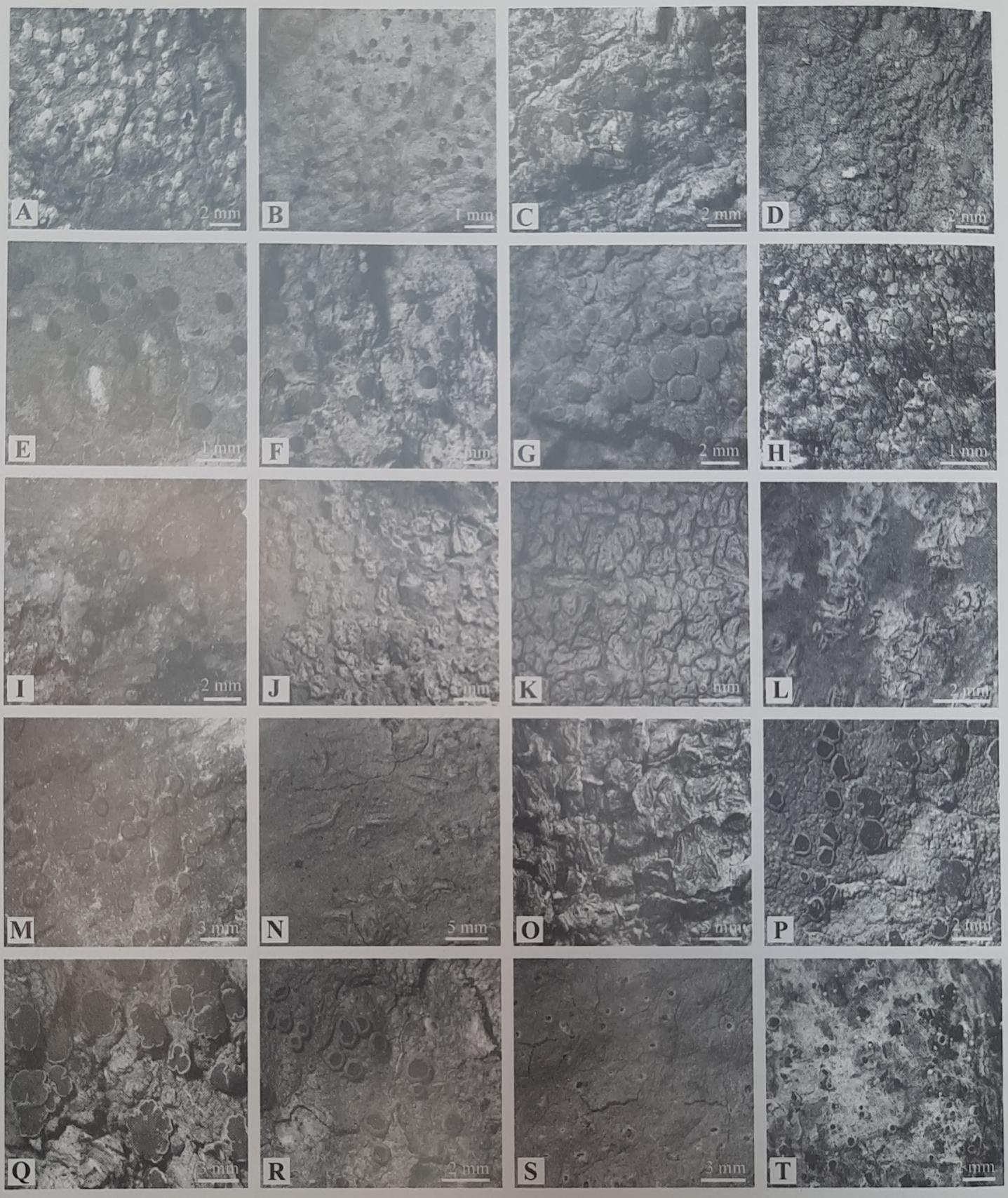
**Distribution in India:** It is known so far from Assam and West Bengal plains.

**14. *Graphis glaucescens*** Fée

Plate 1, figure N

**Specimen examined:** South Sikkim, Tendong Biodiversity park, 2009 m, 26.11.2006, G. P. Sinha 3813B (BSA).

**Description:** The pantropical species is




## Plate 1

A–T. Habit. A. *Arthonia tumidula*. B. *Arthopyrenia analepta*. C. *Bacidia convexula*. D. *Bacidia incongruens*. E. *Bacidia laurocerasi*. F. *Bacidia phaeolomoides*. G. *Caloplaca flavorubescens*. H. *Caloplaca squamosa*. I. *Canderariella vitellina*. J. *Chapsa leprocarpa*. K. *Diorygma heiroglyphicum*. L. *Fissurina dumastii*. M. *Glyphis scyphulifera*. N. *Graphis glaucescens*. O. *Graphis pertricosa*. P. *Lecanora gangaleoides*. Q. *Lecanora horiza*. R. *Letrouitia domingensis*. S. *Myriotrema clandestinum*. T. *Tylophoron nidulans*.

characterized by greyish–white, corticolous thallus; lirelliform, erumpent apothecia; apically carbonized exciple; dichotomously branched labia, colourless, fusiform, transversely 7–11 septate, 40–56 × 6–8 µm ascospores.

**Distribution in India:** The species is known so far from Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Kerala, Tamil Nadu, Uttarakhand and West Bengal plains.

**15. *Graphis pertricosa*** (Kremp.) A. W. Acher

Plate 1, figure O

**Specimens examined:** East Sikkim, Chongey, Lat. 27°20.656'N, Long. 88°38.812'E, 1784 m, 23.11.2006, G. P. Sinha 3666A (BSA); South Sikkim, Temi–Damthang, Lat. 27°13.802'N, Long. 88°24.914'E, 1853 m, 26.11.2006, G. P. Sinha 3790B (BSA); West–Sikkim, Sombaria Forest R.H. campus, on *Pinus* bark, 1700 m, 20.11.1997, G. P. Sinha 1278 (BSHC).

**Description:** The palaeotropical species is characterized by greenish–grey, corticolous thallus, K+ yellow forming red crystals, containing norstictic acid; lirelliform, simple, erumpent, black, 1–2 mm long apothecia; laterally carbonized exciple; colourless, fusiform, submuriform, 17–22 × 6–7 µm ascospores.

**Distribution in India:** It is known so far from Andaman & Nicobar Islands, Karnataka, Manipur and Tamil Nadu.

**16. *Lecanora gangaleoides*** Nyl.

Plate 1, figure P

**Specimens examined:** East Sikkim, near Setipool, Lat. 27°02'16.2"N, Long. 92°36'22.4"E, 898–913 m, 20.04.2010, G. Swarnalatha 5662A; East Sikkim, near Rhenok, Lat. 27°02'16.2"N, Long. 92°36'22.4"E, 912 m, G. Swarnalatha 5804 (BSA); North Sikkim, near Yakche, Lachung–Yumthang road, 20.03.2012, G. P. Sinha & Siljo Joseph 7174.

**Description:** The pantropical species is characterized by yellowish–brown, corticolous thallus containing gangaleoidin; rounded, adnate–sessile, black, plane to convex, whitish–grey, 0.5–1.5 mm diam. apothecia; colourless, simple, ellipsoid, 9–14 × 5–7 µm ascospores.

**Distribution in India:** The species is known so far only from Manipur.

**17. *Lecanora horiza*** (Ach.) Röhl.

Plate 1, figure Q

**Specimen examined:** East Sikkim, Pakyong, on the way to Rhenok, Lat. 27°02'16.2"N, Long. 92°36'22.4"E, 1009 m, G. Swarnalatha 5775 (BSA).

**Description:** The pantropical species is characterized by whitish–grey, corticolous thallus containing atranorin; rounded–irregular, sessile, red brown, plane to convex, 1–2.5 mm diam. apothecia; colourless, simple, ellipsoid, 12–14 × 6–7 µm ascospores.

**Distribution in India:** It is known so far only from West Bengal hills. The species is recollected from India after 1905 (Jatta 1905, fide Awasthi 1965).

**18. *Letrouitia domingensis*** (Pers.) Hafellner & Bellem.

Plate 1, figure R

**Specimen examined:** East Sikkim, near Setipool, Lat. 27°02'16.2"N, Long. 92°36'22.4"E, 898–913 m, 20.04.2010, G. Swarnalatha 5662B (BSA).

**Description:** The pantropical species is characterized by greenish–grey, corticolous thallus; rounded, sessile, reddish–brown, 0.3–1.4 mm diam., K+ pinkish–purple apothecia with yellowish prominent margin; colourless, broadly–ellipsoid, transversely 5–7 septate, 22–45 × 8–12 µm ascospores with lens shaped locules.

**Distribution in India:** The species is known so far from Andhra Pradesh, Arunachal Pradesh, Jharkhand, Karnataka, Madhya Pradesh, Orissa, Tamil Nadu and West Bengal.

**19. *Myriotrema clandestinum*** (Fée) Hale

Plate 1, figure S

**Specimen examined:** East Sikkim, near Setipool, Lat. 27°02'16.2"N, Long. 92°36'22.4"E, 898–913 m, 20.04.2010, G. Swarnalatha 5649 (BSA).

**Description:** The cosmopolitan species is characterized by pale–greenish, corticolous thallus, containing psoromic acid; rounded, immersed, white rimmed, 0.2–0.6 mm diam. apothecia open by a pore;

colourless, fusiform, transversely 3–7 sepatate, I+ blue, 23–27 × 6–8 µm ascospores.

**Distribution in India:** It is known so far from Andaman & Nicobar Islands, Arunachal Pradesh, Karnataka, Kerala, Maharashtra and Meghalaya.

**20. *Tylophoron nidulans*** Stirt.

Plate 1, figure T

**Specimens examined:** East Sikkim, Gangtok, near Tibetology, Lat. 27°02'16.2"N, Long. 92°36'22.4"E, 1524 m, 17.04.2010, G. Swarnalatha 5554; near Rhenok, Lat. 27°02'16.2"N, Long. 92°36'22.4"E, 912 m, G. Swarnalatha 5799 (BSA).

**Description:** The endemic species is characterized by its yellow pruinose, corticolous thallus; rounded, sessile, 0.3–1 mm diam., mazaediate apothecia; brown, ellipsoid, 1–septate ascospores; K–, C–, KC– and P– apothecial disc and thalline margin.

**Distribution in India:** The species is known so far from Assam and Kerala.

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