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RESEARCH ARTICLE

New Species and New Records of Thelotremoid Graphidaceae (Lichenized Ascomycota) from Arunachal Pradesh (India)

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ABSTRACT: *Rhabdodiscus indicus,* a new species is described from Arunachal Pradesh, India. It is characterized by the isidiate thallus, white prurinose, reticulate columellate apothecia, hyaline small 4-locular ascospores and presence of cinchonarum unknown substance. In addition, two species *viz. Ocellularia neopertusariiformis* Hale and *Ocellularia subgranulosa* (Homchantara & Coppins) Lumbsch & Papong dealt briefly are reported for the first time from India.

KEY WORDS: Eastern Himalaya, India, isidia, new records, new species, taxonomy.

INTRODUCTION

The state of Arunachal Pradesh, in the North-Eastern region of India is a part of Himalayan biodiversity hotspot (Mittermeier *et al*., 2005) and possesses luxuriant and rich diversity of lichens. It is an important area for lichenological research and some interesting findings (Tewari and Upreti, 2007; Urvashi *et al*., 2010, Singh and Swarnlatha, 2011a, 2011b, 2011c) pertaining to Graphidaceous lichens have already been published. During the course of further studies on lichen collections from Arunachal Pradesh, Eastern Himalaya, India, an interesting new species *Rhabdodiscus indicus* is described and two species viz. *Ocellularia neopertusariiformis* Hale and *Ocellularia subgranulosa* (Homchantara & Coppins) Lumbsch & Papong discovered as new records for India are briefly dealt.

MATERIAL AND METHODS

Specimens collected from Arunachal Pradesh and deposited in ASSAM were investigated. Morphological observations were made using stereomicroscope (Nikon SMZ 1500). Thin hand-cut sections, of thalli and ascomata were mounted in water, 10% KOH and Lugol's iodine solution. All anatomical measurements were made in water mounts and examined under a compound microscope (Digi 2, Nikon Eclipse 50i). Lichen substances were identified by thin layer chromatography (TLC) in solvent A (180 Toluene: 60 dioxane: 8 acetic acid) following White & James (1985).

TAXONOMIC TREATMENT

Rhabdodiscus indicus Pushpi Singh & Kr. P. Singh ***sp. nov.*** Figs. 1 & 2

MycoBank No. MB 805112.

Thallus corticolous, crustose, pale yellowish, rugulose, isidiate; isidia cylindrical, 0.7–0.8 mm long. Apothecia solitary to paired, rounded to irregular, 0.7–1.5 mm diam., concolorous with thallus; disc covered by thick white pruina. Proper exciple cupular, brown at base, brown to dark brown or carbonized laterally. Columella pale brown to dark brown. Ascospores 8/ascus, colorless, oblong to ellipsoidal, transversely 4-loculate, 10–13 × 5–6 µm. TLC Cinchonarum unknown present.

Type: INDIA: Arunachal Pradesh, Upper Subansiri district, Taliha, BMC area, Subansiri river bed, on bark, alt. *ca.* 2000 m, April 2000, *K.P. Singh 10512* (holotype: ASSAM).

Thallus corticolous, crustose, pale yellowish, rugulose to slightly warty, with a glossy isidiate surface, *ca.* 8 cm across, up to 0.18 mm thick; isidia cylindrical, simple, rarely branched, 0.7–0.8 mm long and *ca.* 0.07 mm diam.; prothallus indistinct; cortical layer 3–8 um thick; photobiont layer 20–25 µm thick; photobiont trentepohlioid; medulla 100–150 µm thick, filled with large calcium oxalate crystals, partly endophloeodal.

Apothecia dispersed, numerous, solitary to paired, rounded to irregular, 0.7–1.5 mm diam., sometime irregularly elongated and up to 2 mm long; margin

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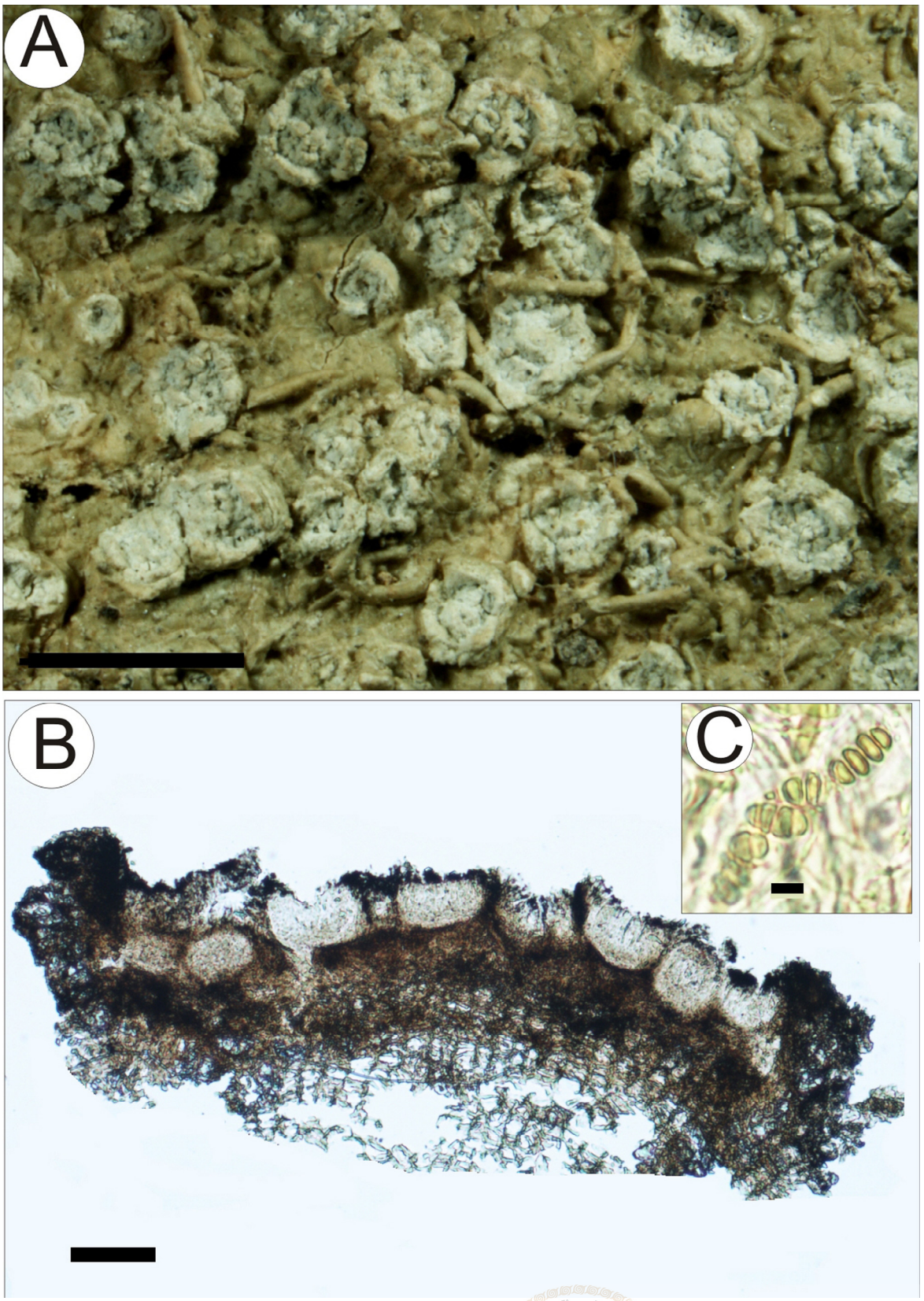


Fig. 1. *Rabdodiscus indicus* sp. nov. A: Thallus showing apothecia and isidia. B: Vertical section of apothecium. C: Ascospores. Scale bars: A = 2 mm; B = 200 µm; C = 5 µm.

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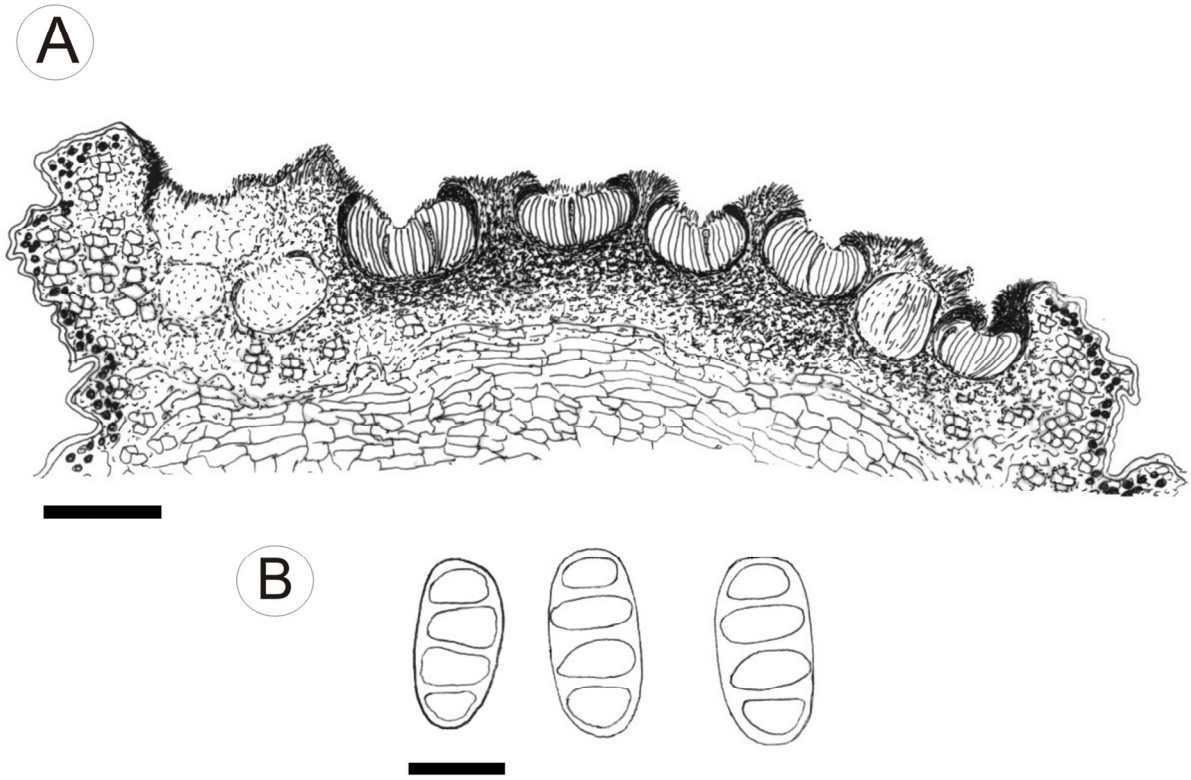


Fig. 2. *Rabdodiscus indicus* sp. nov. A: Cross section of apothecium. B: Ascospores. Scale bars: A = 200 µm. B = 5 µm.

concolorous with thallus, entire, fissured or jagged; pore moderately wide; disc exposed, filled with brown strands of columella, covered by thick white pruina. Proper exciple cupular, brown at base, 45–80 µm deep, laterally brown to dark brown or carbonized, 60–90 µm wide. Columella reticulate, with strands of ± equal width, pale brown to dark brown, 25–38 µm wide, 76–88 µm high, slightly raised above the surface of the hymenium. Subhymenium *ca.* 14 µm high. Hymenium 70–80 µm high, clear, I-; paraphyses simple, straight, strongly conglutinated, with a slightly thickened apices, *ca.* 1.5 µm thick. Epihymenium unpigmented, 5–8 µm high. Asci 8-spored, narrowly clavate to cylindrical, 53–60 × 9–10 µm. Ascospores colorless, oblong to ellipsoidal, transversely 4-loculate, 10–13 × 5–6 µm with subacute to rounded ends, I+ purplish-blue.

Chemistry: Thallus and apothecia K-, C-, KC-, P+ reddish-orange; UV-; TLC: Cinchonarum unknown present (major).

Etymology: The species epithet refers to the name of the country from where the new species is described.

Remarks: *Rhabdodiscus* (Vainio, 1921), a re-established genus in the Graphidaceae through molecular studies (Rivas Plata and Lumbsch, 2011; Rivas Plata *et al.*, 2012) is characterized by the *Ocellularia*-type of apothecia with a broad stump-shaped to complex columella, carbonized proper exciple and hyaline to brown, transversely septate to submuriform ascospores.

The present new species clearly belongs to *Rhabdodiscus* and is characterized by its isidiate thallus, rounded to irregular apothecia with white pruinose disc, reticulate columella, brown to dark brown exciple, small, hyaline, 4-loculate ascospores with subacute to rounded ends and presence of cinchonarum unknown compound. In isidiate nature, the new species closely resembles *Rhabdodiscus isidiifer* (Hale) Rivas Plata, Lücking & Lumbsch and *Rhabdodiscus tanzanicus* (A. Frisch) Pushpi Singh comb. nov., Mycobank No. MB 805145 (Basionym: *Stegobolus tanzanicus* A.Frisch, Biblioth. Lichenol. 92: 495.2006.). But both the latter species possess psoromic acid as major substance and the ascospores of *R. isidiifer* are hyaline and 6–8 locular whereas *R. tanzanicus* has brown, ornamented 4–6 locular ascospores.

Ocellularia neopertusariiformis Hale, Bull. Brit. Mus. (Nat. Hist.), Bot. 8: 315. 1981. Type: Srilanka, Sabaragamuwa Province, Ratnapura District, Sinharaja Forest Reserve, Weddagal (holotype-US, *n.v.*) Figs. 3A & B

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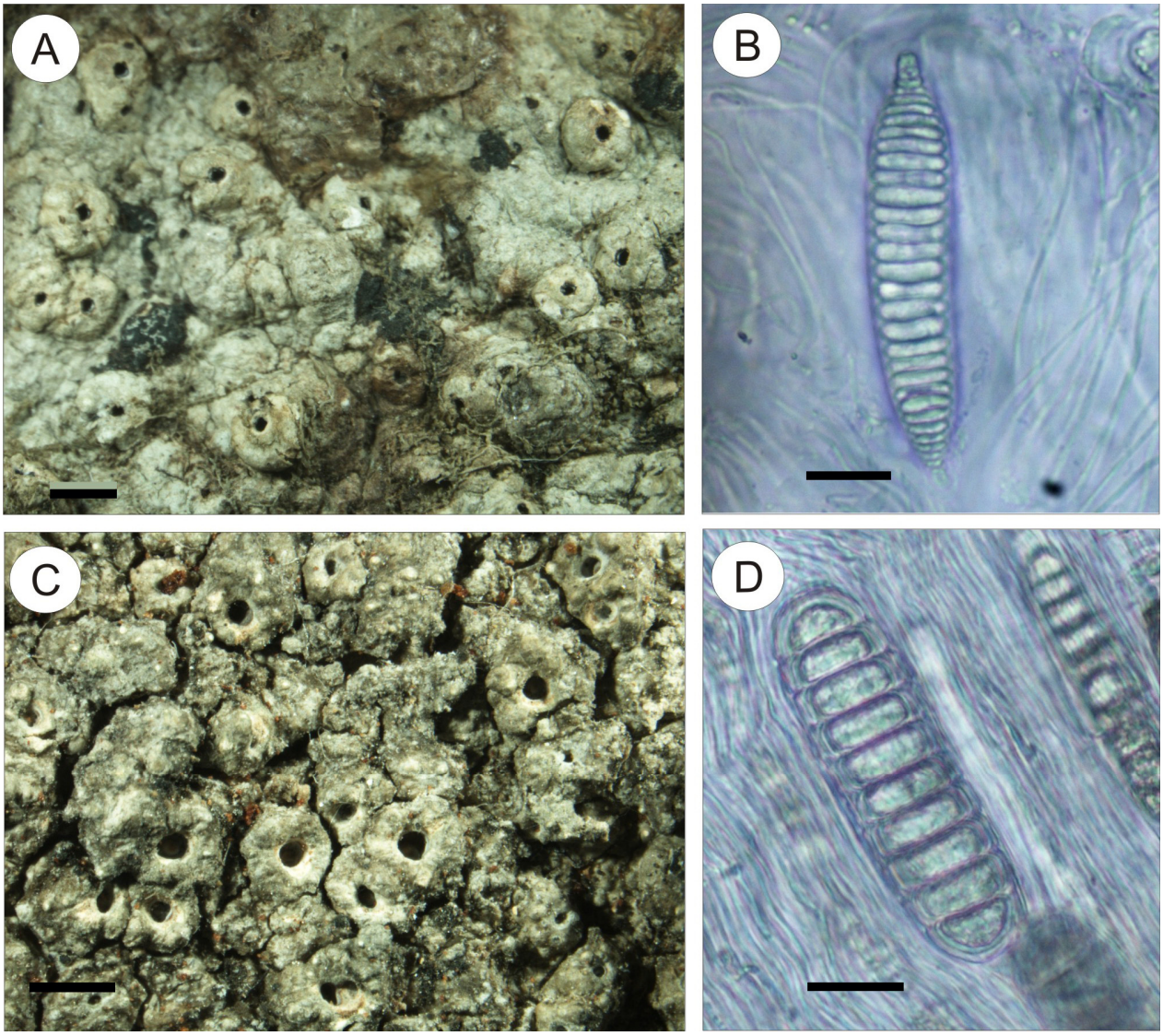


Fig. 3. Habit and ascospores of newly reported lichens. A & B: *Ocellularia neopertusariiformis*. C & D: *Ocellularia subgranulosa*. Scale bars: A & C = 1 m. B & D = 20 µm.

This species is characterized by its corticolous, greenish grey, dull to glossy, smooth thallus; solitary, sessile, constricted, perithecioid, ecolumellate ascomata; 6–8 spored asci; hyaline, transversely septate, oblong-fusiform, amyloid, (25–) 30–38 locular, 80–200 × 10–20 µm ascospores with acute or slightly appendiculate ends and presence of hypoprotocetratic acid. Morphologically and anatomically this species resembles *O. pertusariiformis* (Leighton) Zahlbr. a rare species from Sri Lanka which has 11–12 loculed ascospores and lacks hypoprotocetratic acid. It grows between 250 and 300 m altitude in shady exposed places in tropical forests. The species is distributed in Australia and Sri Lanka.

Specimen examined: **INDIA**: Arunachal Pradesh, West Kameng district, Tipi-Bhalokpong road side forest, *G.P. Sinha & T.A.M. Jagadeesh Ram 10607* (ASSAM).

Ocellularia subgranulosa (Homchantara & Coppins) Lumbsch & Papong, Lichenologist 42 (2): 133. 2010. Type: Northern Thailand, Chiang Mai Province, Doi Inthanon National Park (holotype-BM, *n.v.*) Figs. 3C & D

This species is characterized by the crustose, corticolous, pale olive brown to greyish-brown, rough dull, cracked, fissured-areolate, verrucose to strongly warty thallus; perithecioid to apothecoid, ecolumellate or weakly columellate ascomata; 2-spored asci; hyaline, amyloid, 10–12 transversely septate, 100–130 × 20–25 µm ascospores and presence of norisonotatic and norsubnotatic acids. In chemical characters this species

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closely resembles *O. chonestoma* (Leighton) Zahlbr. which has smaller ascospores (18–30 × 5–6 μm). It somewhat also resembles *O. nylanderiana* Hale, which possess larger ascospores (90–180 × 10–20 μm) with 18 locules. It grows at lower elevations in shady exposed places in tropical areas. The species is known so far, from Thailand.

Specimen examined: **INDIA**: Arunachal Pradesh, Papumpare district, Sankei view, *K.P. Singh 9617* (ASSAM).

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印度阿魯納恰爾邦發現的文字衣科（子囊菌門）新種與新紀錄種

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摘要：*Rhabdodiscus indicus*是印度發現的文字衣科新種，其特徵為裂芽狀的菌體、表面白色粉霜狀、網狀且具囊軸的子囊盤，透明且具有四腔室的子囊孢子。另外，本文也一併報導兩個印度皮點衣屬新紀錄種新雞皮點衣與*Ocellularia subgranulosa*。

關鍵詞：東喜馬拉雅、印度、裂芽、新紀錄、新種、分類學。

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