

## A new species of *Diorygma* (*Graphidaceae*) from India

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**Abstract:** *Diorygma isidiatum* Swarnal., *sp. nov.*, characterized by ecorticate and isidiate thallus; ascomata with anastomosing paraphyses, asci without ascospores and by the presence of salazinic acid, is described from India.

**Key words:** Assam, isidiate, Kameng River, salazinic acid, taxonomy.

### Introduction

The lichen genus, *Diorygma* Eschw. belonging to the family *Graphidaceae*, has *c. 77* species globally (Lücking *et al.* 2017, Jia and Lücking 2017, Sipman 2018, Lima *et al.* 2019, Kalb 2020, Aptroot & Feuerstein 2020). It is characterized by ecorticate thallus; lirellate ascomata; usually uncarbonized, poorly developed excipulum; hyaline, non interspersed hymenium; anastomosing paraphyses and hyaline and, transversely septate to muriform ascospores (Kalb *et al.* 2004). The present collection made from an islet in the Kameng river near Bhalukpong (Assam), is located in the foothills of the Himalaya.

The material has been primarily identified as species of the genus *Diorygma* based on its ecorticate thallus; lirellate ascomata; hyaline, non interspersed hymenium, poorly developed uncarbonized excipulum; anastomosing paraphyses and thick, brown to blackish epihymenium. But the new material exhibits isidia which is uncommon in *Diorygma* and also in other genera of the Graphidoid *Graphidaceae*. *D. australasicum*, *D. antillarum* and *D. isidiolichexanthonicum* are the other three hitherto known isidiate species in the genus *Diorygma*. Of which, *Diorygma australasicum* and the new material exhibit asci without ascospores but differ in chemistry. Whereas, *D. antillarum* and *D. isidiolichexanthonicum* differ from the new material in lack of ascomata and in chemistry.

It has been observed that in all hitherto known isidiate species of *Diorygma* either they lack ascospores or lack ascomata, the reason could be the significance of sexual propagules (ascospores) might have been reduced due to presence of isidia.

### Material and Methods

The study was carried out at Lichenology Laboratory, Botanical Survey of India, Central Regional Centre, Allahabad. Olympus SZ51 and Nikon SMZ 1500 microscopes were used in morphological study. Thin hand-cut sections of thalli and ascomata were mounted in water, 10% KOH and Lugol's solutions and examined under Magnüs MLX- Tr and Leica DM2500 light microscopes for anatomical study. Thin Layer Chromatography (TLC) in solvent system 'A' was used to study its chemistry (White and James 1985). Spot tests were performed with the usual chemical reagents, K, C and P.

**New species**

*Diorygma isidiatum* Swarnal., *sp. nov.*

Fig. 1A–C

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The new species is similar to *Diorygma australasicum* in possession of isidia and ascomata with immature asci but differs from it in the presence of only salazinic acid in its thallus; the latter possess protocetraric, salazinic, norstictic acids and atranorin.

Type: INDIA. Assam: Sonitpur district, Bhalukpong, on an islet in the Kameng river, alt. 146 m, N 26°59'50.9", E 92°41'25.4", 28 Feb. 2009, K.P. Singh & G. Swarnalatha 4604 (holotype: BSA!; isotype: CAL!).

Thallus crustose, corticolous; surface pale-grey to grey, uneven, continuous to finely cracked; prothallus indistinct. Thallus in section epiphloeodal, ecorticate, (–57) 96–225 µm thick above the bark, 35–74 µm thick photobiont layer. Photobiont *Trentepohlia*. Isidia numerous, spread all over the thallus, crowded at central region, globose initially, turn elongate and cylindrical, simple to coralloidly branched later, 0.3–1.2 mm long and 0.1–0.5 mm broad.

Ascomata lirellate, prominent, concolorous with thallus, numerous, simple to sparsely branched, straight to curved or flexuous, 0.8–6 mm long and 0.2–0.6 mm broad, acute to obtuse at the ends; disc concealed to slightly open, with yellowish-white pruina; excipulum complete, uncarbonised, hyaline and poorly developed at lateral, brown at base, complete thalline margin; labia entire, convergent; epihymenium golden brown to blackish brown, 19–30 µm thick; hymenium hyaline, non interspersed, 100–145 µm high, I+ blue-violet at lateral and the apical parts, dull violet at central; subhymenium hyaline, 13–21 µm high; paraphyses sparsely branched at central and anastomosing at peripheral regions, c. 1.5 µm thick; tips brown, reticulately branched and tightly interwoven. Asci without ascospores.

Chemistry: Thallus K+ dark red, C–, P+ yellow; UV–; salazinic acid (major) detected by TLC.

Etymology: The specific epithet refers to the presence of isidia.

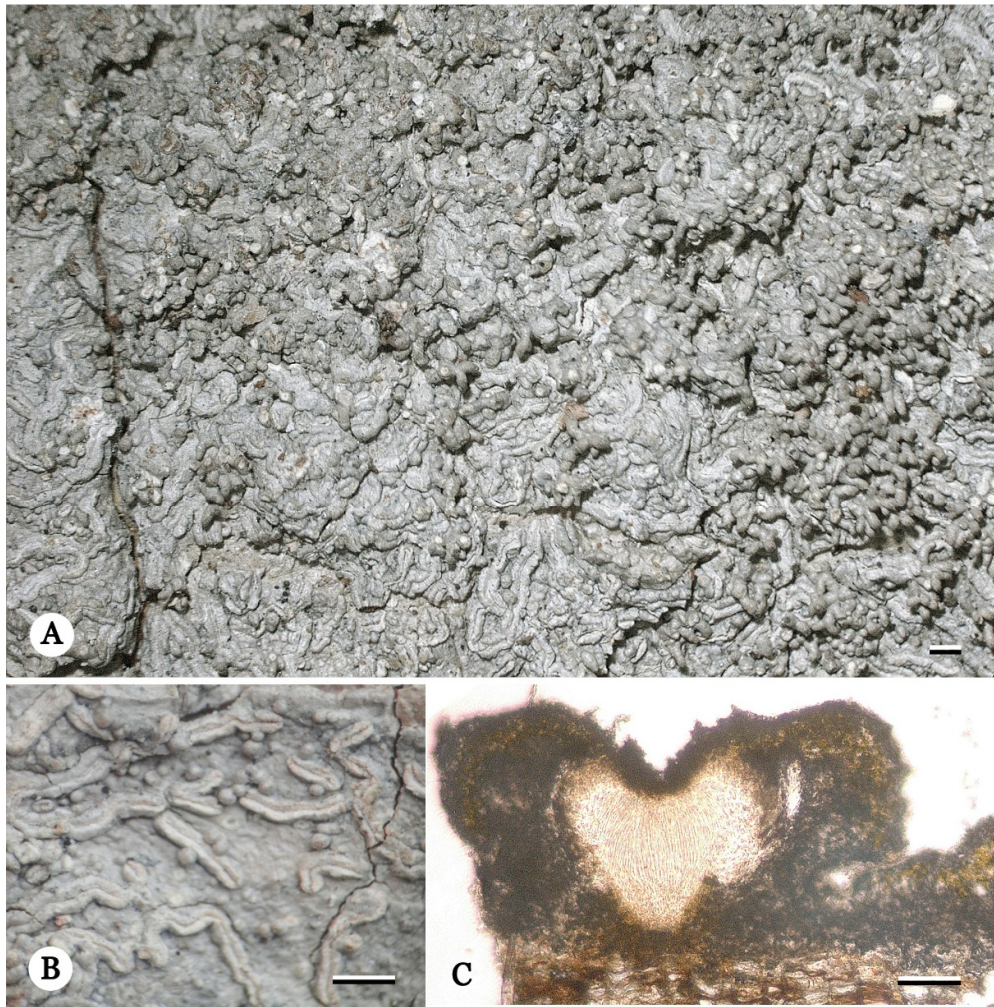
Remarks: *Diorygma isidiatum* is characterized by its pale-grey to grey, ecorticate thallus; concolours, globose to elongate and cylindrical, simple to coralloidly branched isidia; lirellate ascomata; asci without ascospores.

*D. australasicum* (Elix) Lücking, Elix & A.W. Archer, *D. antillarum* (Vain.) Nelsen, Lücking & Rivas Plata, and *D. isidiolichexanthonicum* Aptroot are the other three hitherto known isidiate species in the genus *Diorygma*. The new species differs from *D. australasicum*, another isidiate species with immature asci, by presence of only salazinic acid in its thallus; the latter possess protocetraric, salazinic, norstictic acids and atranorin (Archer and Elix 2009).

*Diorygma isidiatum* differs from *D. antillarum* and *D. isidiolichexanthonicum* by the presence of ascomata with immature asci whereas both the latter species lack ascomata. In addition, *D. antillarum* has protocetraric, salazinic, norstictic acids (Nelsen *et al.* 2012) and *D. isidiolichexanthonicum* has lichexanthone (Aptroot and Feuerstein 2020).

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**Figure 1.** *Diorygma isidiatum* (holotype). A–B. Thallus with ascomata and isidia; C. Cross section of ascomata. Scales = 1 mm in A & B; 100  $\mu$ m in C.

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