

THE LICHEN GENUS *ANTHRACOTHECIUM* FROM MANIPUR, INDIA

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ABSTRACT

The paper deals with seven taxa of *Anthracothecium* from Manipur state. They are—*A. globiferum* var. *globiferum*, *A. globiferum* var. *microsporum*, *A. goniostomum*, *A. macrosporum*, *A. manipurense*, *A. pseudocyphellatum* and *A. pseudohimalayense*. *Anthracothecium globiferum* var. *microsporum* is a new taxon.

INTRODUCTION

Manipur lies in the north-eastern part of the Indian Republic. The state enjoys humid tropical climate. MÜLL. ARG. (1892) described 101 lichen species from Manipur, that were collected by G. WATT in 1881-82, out of which two *Anthracothecium* species reported were *A. manipurense* Mull. Arg. and *A. variolosum* (Pers.) Mull. Arg. SINGH (1981) listed the same two species referring the work of Mull. Arg. NAGARKAR AND PATWARDHAN (1981) reported *A. goniostomum* Mull. Arg. and *A. variolosum*, of which the former is new record for the area. The report of *A. variolosum* is based on the study of their own collection preserved at AMH (No. 77.1530) and on Watt's specimen No. 6956 (BM).

I had an opportunity of examining Watt's specimen. I found it comprising two pieces of bark (substratum), completely covered with lichen patches, which actually consist of three different taxa (Pl. 1, Figs 5 & 6), i.e., *Anthracothecium pseudohimalayense* A. Singh, *Pyrenula* sp. and *Anthracothecium pseudocyphellatum* A. Singh (numbered a, b, c, respectively).

NAGARKAR AND PATWARDHAN (loc. cit.) reported the asci of *Anthracothecium variolosum* to be 4-8-spored. On the contrary, NYLANDER (1858, p. 41), MALME (1929, p. 37), and VAINIO [1890, p. 197; 1915, p. 187, as *Bottaria* (*Anthracothecium*) *ariolosa* (Pers.) Vainio] mention the asci of this species as 1-spored. The identity of the specimen No. 77. 1530 (AMH) by NAGARKAR AND PATWARDHAN as *A. variolosum*, therefore, seems doubtful.

On the basis of the specimens of *Anthracothecium* borrowed from BM and CAL and examined by me, and on the observations of NAGARKAR AND PATWARDHAN (loc. cit.), we find that seven taxa of this group, as mentioned in the abstract occur in Manipur. *A. globiferum* var. *microsporum* is a new taxon.

Details of type collections have been given only in the case of taxa that have originally been collected and described from India.

Key to the species from Manipur

- 1a. Asci 2-4-spored
 - 2a. Thallus with pseudocyphellae —5. *A. pseudocyphellatum*
 - 2b. Thallus without pseudocyphellae
 - 3a. Excipuloid tissue not spreading laterally —1. *A. globiferum*
 - Spores more than 115 μ m long var. *globiferum*

- var. *microsporum*
- Spores less than 110 μm long
- 3b. Excipuloid tissue spreading laterally
- 4a. Ascocarps with columella —3. *A. macrosporum*
- 4b. Ascocarps without columella —4. *A. manipurens*
- 1b. Asci 4-8-spored
- 5 a. Ascocarps 0.6-0.8 mm in diameter, solitary to crowded, situated in thalline verrucae with plane to concave top, asci 8-spored —2. *A. goniostomum*
- 5b. Ascocarps 1.0-2.0 mm in diameter solitary, occasionally paired, situated in thalline verrucae with convex top, asci 4-8-spored —6. *A. psuedohimalayense*
1. ***A. globiferum*** (Eschw.) Müll. Arg., *Flora*, 67: 666. 1884. *Verrucaria globifera* Eschw. apud Mart., *Flora Brasil I*: 131. 1843.

var. ***globiferum***

Pl. 1, Fig. 1.

Thallus corticolous, hypophloedal, ochre, smooth, K-, C-, KC-, P-, without a visible hypothallus; corticiform layer 25-96 μm thick, phycobiont layer 18-50 μm thick, medulla indistinct.

Ascocarps 1.5-2.0 mm in diameter, 700-1200 μm high, hemispherical, completely embedded in the thalline warts, or upper part covered with corticiform layer and dull black, sometimes naked around ostiole and black, nitidous, ostioles umbilicate; excipuloid tissue black and carbonaceous, slightly spreading laterally, 100-330 μm thick at top and sides, 30-90 μm thick at bottom; nucleus I+ wine red, with numerous oil globules; paraphysoid threads simple or sparingly branched and anastomosing near base, asci (1-)2-spored, clavate, 250-360 \times 50-100 μm ; spores brown, oblong-ellipsoid, multi-celled muriform, cells arranged in numerous transverse tiers, with 17-20 primary septa, 192-196 \times 50-65 μm .

Remarks—*Anthracothecium globiferum* resembles *Anthracothecium epapillatum* (Nyl.) Müll. Arg. and *A. paraguayense* Malme in ascocarp shape and size, as well as spore shape, size and septation, but the three species differ in thallus colour. How far the thallus colour can prove to be a good taxonomic character in separating species in this genus is yet to be ascertained.

Specimen examined—Manipur; Avankhul, 930 m, K. P. Singh 550998A (CAL), on bark of *Citrus*.

var. ***microsporum*** A. Singh var. nov.

Similis var. *globiferum* sed spora minora.

Pl. 1 Fig. 2.

Holotype—Manipur; Avankhul, 930 m, K. P. Singh 550998B (CAL) on bark of *Citrus*; Pl., 1, Fig. 2.

Thallus yellow-brown to brown. Ascocarps 1.0-1.25 mm in diameter; asci 2-4-spored; spores brown, oblong-ellipsoid, multi-celled muriform, cells arranged in numerous transverse tiers, with 9-12 primary septa, 72-105 \times 22-34 μm .

Remarks—*Anthracothecium globiferum* var. *microsporum* agrees with var. *globiferum*

in all morphological details except in its much smaller spores. The spores in var. *globiferum*, based on the study of a number of specimens measure $120-220 \times 40-90 \mu\text{m}$. Known from the type collection only.

2. **A. goniostomum** Mull. Arg., *Flora*, 66 : 246. 1883.

Not seen. Reported by NAGARKAR AND PATWARDHAN (1981). (Though the description of the species by NAGARKAR AND PATWARDHAN, *loc. cit.*, is sketchy, their observations, however, appear to tally with those of MULL. ARG., 1883).

3. **A. macrosporum** (Hepp) Müll. Arg., *Linnaea*, 63 : 44. 1880.-*Verrucaria macrospora* Hepp apud Zolling, *System. Verzeichn. Indisch. Archip. Gesamm. Pflanzen.* p. 9. 1854.

Pl. 1, Fig. 3

Thallus corticolous, hypophloedal, grey or yellow ochre, rough, K-, C-, KC-, P-, with no visible hypothallus; corticiform layer $65-72 \mu\text{m}$, phycobiont layer $35-60 \mu\text{m}$ thick, medulla indistinct.

Ascocarps solitary, 2.0 mm in diameter, $850-1300 \mu\text{m}$ high, convex, partly to completely covered with thallus, naked part black, ostioles umbilicate; excipuloid tissue black and carbonaceous, broadly spreading laterally and with a prominent central columella, $100-300 \mu\text{m}$ thick at top, ca. $4500 \mu\text{m}$ thick at sides, $40-75 \mu\text{m}$ thick at bottom; nucleus I+ wine red; paraphysoid threads simple or sparingly branched and anastomosing near base; asci 2-spored, cylindrical, $270, 350 \times 45-60 \mu\text{m}$; spores brown, oblong-ellipsoid, multi-celled muriform, with numerous transverse tiers of cells and 9-13 primary septa, $150-210 \times 38-42 \mu\text{m}$.

Remarks—*Anthracotheceium macrosporum* [Syn. *A. columellaum* (Vainio) Zahlbr.], originally reported from the Philippines seem to be widely distributed in the Tropics. Its occurrence in Sri Lanka and Andaman Islands (my own observations) and its report from south-western India (PATWARDHAN AND MAKHIJA, 1980), and now from Manipur give a clear indication of its common occurrence in \pm whole of the Indian subcontinent. This species is easily identified by its large, 2.0-5.0 mm diameter ascocarps with a prominent central columella developed from the bottom of the excipuloid tissue, and 2-4-spored asci.

Specimen examined—Manipur; Karang, Kabrulakha area, 1220-1530 m, K. P. Singh 55078 (CAL).

4. **A. manipurens** Müll. Arg., *J. Linn. Soc. Bot.*, 29 : 231. 1882. Pl. 1, Fig. 4.

Type collection—Manipur; no precise locality, Watt s. n. (Holotype : BM).

Thallus corticolous, hypophloedal, yellow-brown to brown, smooth, K-, C-, KC-, P-, hypothallus indistinct or like a black border line; corticiform layer $50-90 \mu\text{m}$ thick, phycobiont layer $20-45 \mu\text{m}$ thick, medulla indistinct.

Ascocarps solitary or up to 4 grouped together, 1.0-1.75 mm in diameter, $700-1100 \mu\text{m}$ high, immersed, later emergent, rather flat to slightly convex, conico-depressed to conico-hemispherical, completely to partly covered with corticiform layer or completely naked, covered part dull black, naked part black and nitidous, ostioles umbilicate; excipuloid tissue black and carbonaceous, laterally spreading, (100-)200-400 μm thick at top, $250-600 \mu\text{m}$ thick at sides, (50-)110-150 μm thick at bottom; nucleus I+ wine red; paraphysoid threads simple or sparingly branched and anasto-

mosing near base; asci 2-4-spored, cylindrical to clavate, $280-400 \times 60-90 \mu\text{m}$; spores brown, oblong-ellipsoid, multi-celled muriform, cells arranged in many transverse tiers, with (7-)12-20 primary septa, middle septum often more prominent and spores sometime slightly constricted here, $108-200 \times 50-90 \mu\text{m}$.

Remarks—MÜLL. ARG. (1892) traced the affinity of *Anthracothecium manipurensense* with some taxa of this genus in the following words, "Juxta Brasiliense *A. aurantium*, Müll. Arg. Revis. Lich Eschw. n. 7, locandum est, a quo non diversum videtur nisi thallo minus aurantiaco-fulvo, apotheciis paullo altius convexis et sporis majoribus. Apothecia distincte minora et convexiora sunt quamsin *A. lhwaitesii*, *A. borbonico* et *A. macrosporo* Müll. Arg."

Anthracothecium manipurensense, however, shows great resemblance to *Anthracothecium globiferum* (Eschw.) Müll. Arg. var. *globiferum* in many morphological details, except two following differences. The excipuloid tissue in *A. manipurensense* is distinctly spreading laterally, but in *A. globiferum* it has \pm the same thickness all round or is slightly thickened at top and sides. In the case of spore, the middle primary septum (out of 7-20) is often more prominent than others and the spore-wall is sometimes constricted here in *A. manipurensense*, while in *A. globiferum* all the primary septa, numbering 17-20 are equally developed and spore-wall shows no constriction.

Specimens examined—Manipur; Karang-Kabrulakha area, alt. 1220-1530 m, K. P. Singh 55040 (CAL); Pl. 1, Fig. 4. and the Type.

5. ***A. pseudocyphellatum*** A. Singh, *Feddes Repertorium*, 93 : 68. 1982. Pl. 1, Figs 5 & 6 c.

Type collection—India; West Bengal, Darjeeling, Atkinson s. n. Ex. Hb. Leighton (Holotype: BM).

Thallus corticolous, epiphloedal, yellow-brown, smooth, nitidous, pseudocyphellate, K-, G-, KG-, P-, with a black border line; corticiform layer $65-85 \mu\text{m}$ thick, phycobiont layer $25-33 \mu\text{m}$ thick, medulla in the form of hyphae compactly filling the scattered intercellular spaces of the substratum below the phycobiont layer.

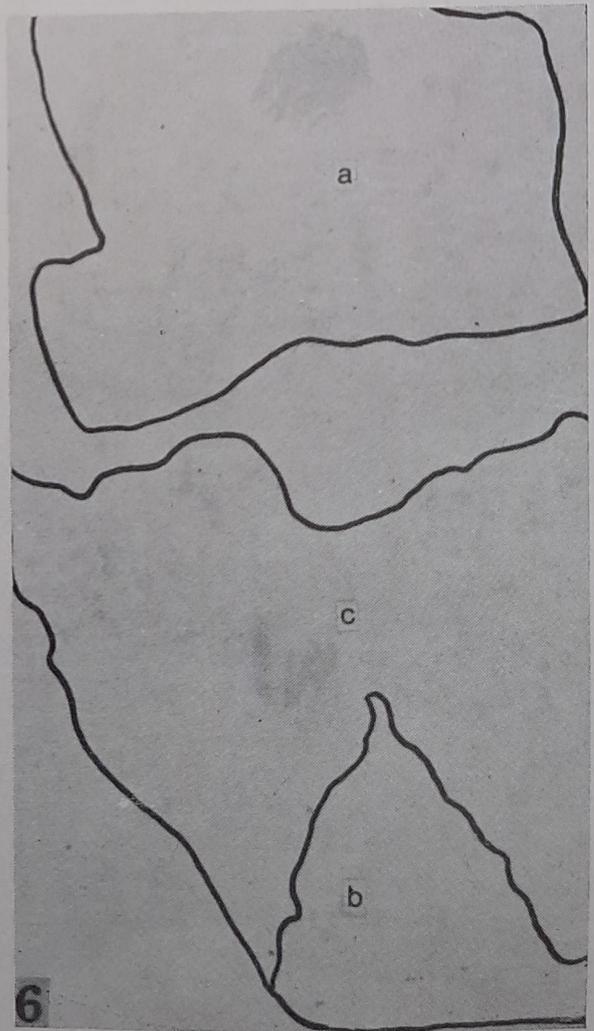
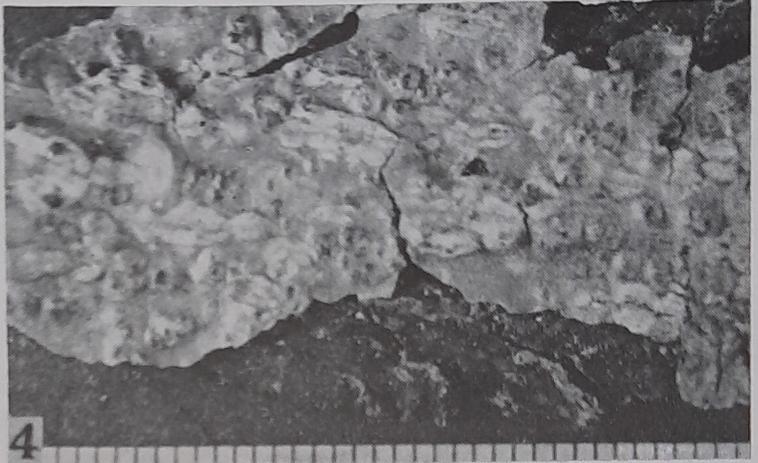
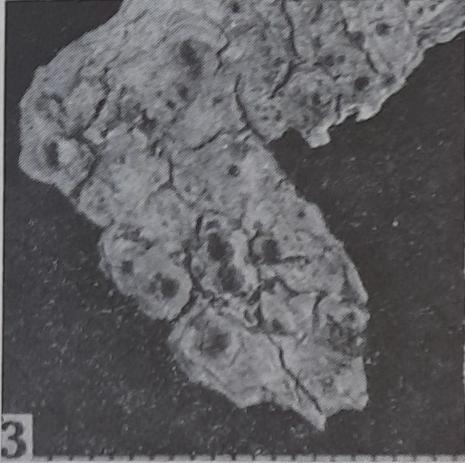
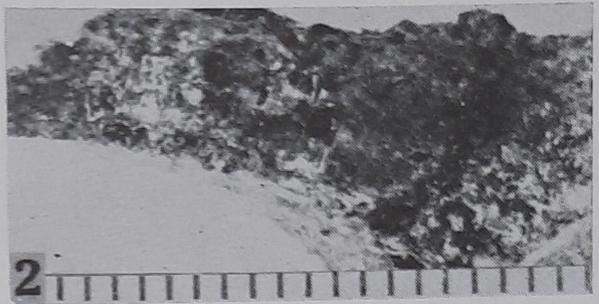
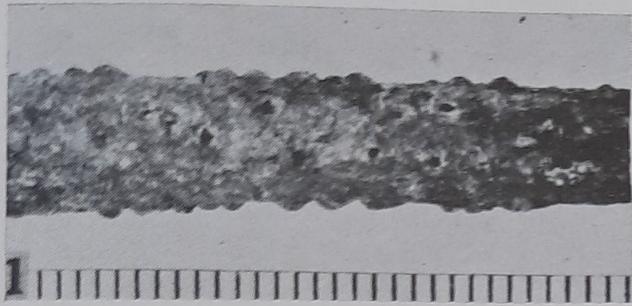
Ascocarps up to 1.5 mm in diameter, ca. $1100 \mu\text{m}$ high, immersed to emergent and convex, partly or completely covered with corticiform layer, covered part dull black, naked part black, ostioles indistinct; excipuloid tissue black and carbonaceous, with heavy deposition of colourless crystals, not spreading laterally, $100-150 \mu\text{m}$ thick at top and sides, ca. $50 \mu\text{m}$ thick at bottom; nucleus I+ wine red; paraphysoid threads simple or sparingly branched and anastomosing near base; asci 2-4-spored, clavate, $270-300 \times 65 \mu\text{m}$; spores brown, oblong-ellipsoid, multi-celled muriform, cells arranged in many transverse tiers, with 9-13 primary septa, $110-192 \times 35-50 \mu\text{m}$.

Remarks—*A. pseudocyphellatum* is easily distinguished from all other species of the genus by the presence of pseudocyphellae in its thallus.

Specimen examined—Manipur (no precise locality), Watt 6958 c (BM-Ex Hb. G. Watt); Pl. 1, Figs 5 & 6c.

6. ***A. pseudohimalayense*** A. Singh, *Feddes Repertorium*, 93 : 68. 1982. Pl. 1, Figs. 5 & 6 a.

Type collection—India; West Bengal, Darjeeling district, Kalimpong division, on way to Munsong from Kalimpong, alt. ca. 1675 m, March 10, 1967, Awasthi & Agarwal 67:266 (Holotype: LWU).



Thallus corticolous, hypophloedal, yellow-brown, smooth, K-, C-, KG-, P-, hypothallus indistinct; corticiform layer 30-90 μm thick, phycobiont layer 12-20 μm thick, medulla indistinct.

Ascocarps solitary or up to 4 crowded together, up to 1.25 mm in diameter, ca 900 μm high convex, \pm completely embedded in thalline verrucae, a small area around ostiole black, ostioles indistinct to faintly umbilicate; excipuloid tissue black and carbonaceous, with heavy deposition of colourless crystals, not spreading laterally, 40-75 μm thick at top and sides, 35-40 μm thick at bottom; nucleus I+ wine red; paraphysoid threads simple or sparingly branched and anastomosing near base; asci 4-8-spored, 280-300 \times 50 μm ; spores uniseriate in ascus, brown, multi-celled muriform, oblong-ellipsoid, cells arranged in (6-) 8-14 transverse tiers, with 7-11 primary septa, 70-85 \times 23-30 μm .

Remarks—*A. pseudohimalayense* closely resembles *Anthracothecium himalayense* (Räsänen) Awas. in outward appearance but the asci in the latter are invariably 2-4 spored.

Specimen examined—Manipur (no precise locality), Watt 6958a (BM-Ex Hb. G. Watt); Pl. 1, Figs 5 & 6a (Duplicate in CAL).

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EXPLANATION OF PLATE 1

Figs. 1-6. *Anthracothecium* spp. from Manipur. 1. *A. globiferum* var. *globiferum* 2. *A. globiferum* var. *microsporum* (Holotype). 3. *A. macrosporum*. 4. *A. manipurensis*. 5. Watt's specimen no. 6958 (Hb. G. Watt—BM). 6. Diagrammatic representation of fig. 5. a.—*A. pseudohimalayense*. b—*Pyrenula* sp. c—*A. pseudocyphellatum*. (Scale—each division—1.0 mm).