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### A NOTE ON LICHENS FROM KASHMIR, INDIA

LICHEN collections from the Kashmir valley in the vicinities of Srinagar (alt. ca. 5,500 ft.), Gulmarg to Khilanmarg (7,000–9,000 ft.), Pahalgam (8,000 ft.) and Sonamarg (9,000–11,000 ft.) made by the excursion party from the Department of Botany, Lucknow University in 1968, have been examined. The collections at each of the above localities are not exhaustive, but apparently the common and conspicuous lichens have been collected. As exemplified by the numerous common species the lichens from Kashmir exhibit a close relation to the European lichen flora.

Out of the total of 43 species determined, the nine taxa detailed below in the beginning are reported for the first time from the Indian sub-continent as seen on comparison to the Catalogue by Awasthi (1965). This indicates the richness in the lichen flora of Kashmir as well as the possibilities of more interesting finds if exhaustive collections are undertaken.

1. *Verrucaria æthiobola* Wahl. ex Achi—Sonamarg; on submerged stones in the streamlet below the foot of the glacier. Thallus crustaceous, effuse, thin, dark to olivaceous black; perithecia hemispherical, partially immersed, upto 0.3 mm. in diam.; perithecial wall black, 38  $\mu$  thick; hymenium hyaline, I + red; spores colourless, simple, ellipsoid, 15–28  $\times$  11  $\mu$ . The species is distributed in high mountains of Europe and Eastern Asia.

2. *Calicium abietinum* Pers.—Gulmarg; on bark of conifer tree. Thallus thin, ashy granulose to evanescent; stipe thin, erect, black; disc black, pruinose; spores brown-black, 2-celled, ellipsoid, 11–12  $\times$  3.5–4  $\mu$ . The species is widely distributed in the temperate regions of the world.

3. *Catillaria atropurpurea* (Schaer.) Th.Fr.—Gulmarg; on dead wood. Thallus evanescent; apothecia eventually flat to convex; spores

colourless, 2-celled, 9–12  $\times$  5–6  $\mu$ . The species is well distributed in temperate regions of the world and always occurs on dead wood.

4. *Stereocaulon condensatum* Hoffm.—Pahalgam; on sandy soil along river bank. Primary thallus squamulose, persistent; squamules crowded with brown-black cephalodia containing *Stigonema* alga; pseudopodetia short (upto 10 mm.), sterile. The species is distributed in temperate Europe, America and Java.

5. *Peltigera prætextata* (Floerker) Zopf—Gulmarg to Khilanmarg; on old wooden logs. Thallus characteristically marginally squamulose-isidiate; underside white-veined, sterile. The species is distributed in temperate regions of the world.

6. *Pertusaria globulifera* (Turn.) Mass. var. *discoidea* (Pers.) Almb.—Gulmarg to Khilanmarg; on bark of coniferous trees. Thallus suborbicular, crustaceous, cracked-wrinkled, greenish-grey; soredia dense, discoid, large, white. Thallus K-, Cl-, Pd-. The taxon is distributed in the temperate parts of the world.

7. *Parmelia glabra* Nyl.—Gulmarg to Khilanmarg, Pahalgam and on way to Sonamarg (7,000 ft.); on bark of coniferous trees. Thallus brown, non-isidiate and non-sorediate; underside black with rhizinæ; medulla white, K-, Cl + red, KCl + red; apothecia upto 5 mm. in diam.; spores colourless, simple, ellipsoid, 12–14  $\times$  5–7  $\mu$ . The species is distributed in temperate regions of Europe, America and Africa.

8. *Parmelia glabratula* (Lamy) Nyl.—Gulmarg and Pahalgam; on bark of conifer trees. Thallus dark brown, densely isidiate; underside black with branched rhizinæ; medulla white, K-, Cl + red, KCl + red, Pd-; scarcely fertile; apothecia upto 5 mm. in diam.; spores colourless, simple, oval to ellipsoid, 7–11  $\times$  5–7  $\mu$ . The species is distributed in cooler northern regions of the world.

9. *Parmelia ulophyllodes* (Vain.) Sav.—Khilanmarg and on way to Sonamarg; on bark of conifer trees. Thallus glaucous grey to pale grey, marginally intermittently sorediate; underside grey to brownish with short rhizinæ; medulla white, K-, Cl + red, KCl + red. The species is known from western Siberia.

The additional 34 taxa comprising the collections are:

*Dermatocarpon moulinii* (Mont) Zahl., *D. minutum* (L.) Mann, *D. velleum* Zschacke, *Lecidea* sp., *Rhizocarpon tinci* (Tornab.) Rune., *Collema polycarpon* Hoffm., *Leptogium saturinum* (Dicks.) Nyl., *Peltigera canina* (L.) Willd.,



*P. dolichorhiza* Nyl., *P. horizontalis* (Huds.) Baumg., *P. polydactyla* (Neck.) Hoffm., *P. rufescens* (Weis.) Humb., *Lecanora carpinea* (L.) Ach., *L. chlarotera* Nyl., *L. mnuralis* (Schreb.) Rabenh., *Ochrolechia pallescens* (L.) Mass., *Parmelia borrieri* (Sm.) Turn., *P. caperata* (L.) Ach., *P. flaventior* Stirt. (syn. *Parmelia himalayensis* Nyl.), *P. furfuracea* (L.) Ach., *P. scortea* (Ach.) Ach., *P. subargentifera* Nyl. (syn. *Parmelia verruculifera* Nyl.), *P. sulcata* Tayl., *Hypogymnia physodes* (L.) Nyl., *Cetraria cetrarioides* (Del. ex Duby) Culb. et Culb. (syn. *Parmelia cetrarioides* Del. ex Duby), *Evernia divaricata* (L.) Ach., *Ramalina sinensis* Jatta, *Xanthoria candelaria* (Ach.) Arn., *X. substellaris* var. *subsoresdiosa* Räs., *Buellia montana* H. Magn., *Physcia aipolia* (Ehrh.) Hampe, *Physconia grisea* (Lam.) Poelt (syn. *Physcia grisea* Lam. Zahl.), *Physconia pulverulenta* (Schreb.) Poelt (syn. *Physcia pulverulenta* Schreb. Hampe), *Physconia pulverulenta* var. *argyphæa* (Ach.) Awasthi comb. nov. (syn. *Parmelia pulverulenta* v. *argyphæa* Ach. *Lichengr. Univ.*, p. 474. 1810; and *Physcia pulverulenta* v. *argyphæa* (Ach. Nyl.), and *Anaptychia kaspica* Gyel.

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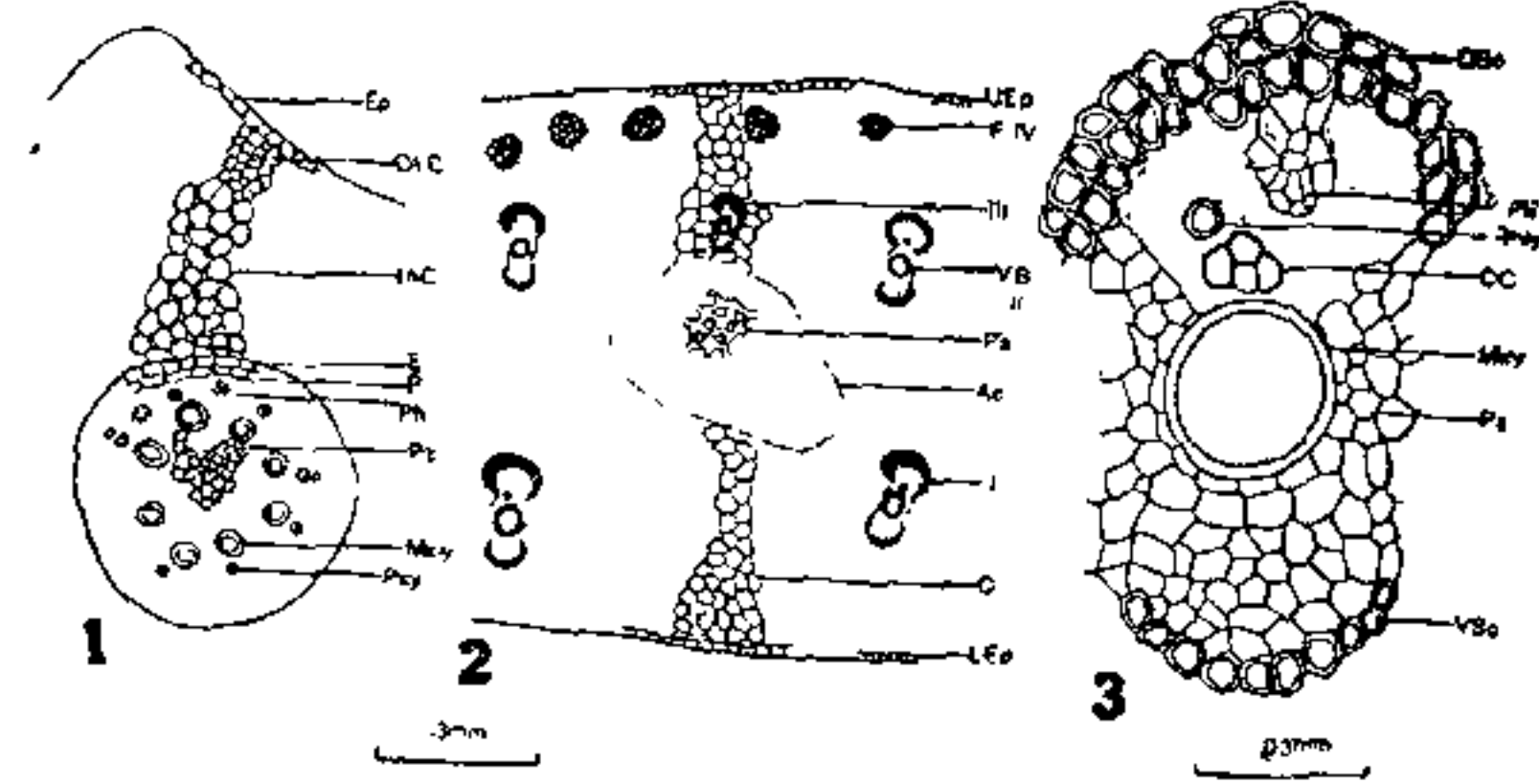
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### SILICIFIED PSEUDOSTEM OF CANNA L. FROM EARLY EOCENE OF DECCAN INTERTRAPPEAN BEDS, M.P., INDIA

THE genus *Canna* L. has been known so far in fossil state only by leaf impressions.<sup>1,2,6</sup> The pseudostem and roots described here are the first petrified fossil record of *Canna*. The material comes from the Deccan Intertrappean beds of Mohgaon Kalan (22° 1' N., 97° 11' E.) in district Chhindwara (M.P.), India. The specimen, before sectioning, was 5.4 cm. in length. On sectioning the pseudostem, we came across many roots at its basal end.

Root (Fig. 1).—The roots are 0.7 to 1.5 mm. in diameter, root hairs absent. Cortex is divisible into outer cortex with compactly arranged hexagonal cells and inner cortex

with loosely arranged round cells and intercellular spaces. Both the endodermis and pericycle are one cell thick, the former has casparin thickenings. Xylem strands 8 to 10, radially arranged, protoxylem exarch, metaxylem elements 50–66  $\mu$  and protoxylem 17  $\mu$  in diameter. Phloem patches indistinct, alternate with xylem. Pith thick-walled and composed of hexagonal cells.



FIGS. 1-3. Fig. 1. T.S. part of fossil petrified root. Fig. 2. A part of leaf-sheath showing fibrous and vascular bundles, and air canal. Fig. 3. A vascular bundle of leaf-sheath showing the tissues. *Ac*, Air canal; *CC*, Commissural connective; *DSc*, Dorsal sclerenchyma; *E*, Endodermis; *Ep*, Epiblema; *F*, Fibrous bundle; *G*, Ground tissue; *InC*, Inner cortex; *LeP*, Lower epidermis; *Mxy*, Metaxylem; *OtC*, Outer cortex; *P*, Perycycle; *Pa*, Parenchyma cells; *Ph*, Phloem; *Pt*, Pith; *Pxy*, Protoxylem; *Uep*, Upper epidermis; *VSc*, Ventral sclerenchyma.

*Pseudostem*.—Transsections of the pseudostem reveal 4 to 6 concentric leaf-sheaths which are wider in the middle but gradually become narrower towards the margins. Each leaf-sheath has vascular bundles in four arcs (I, II, III and IV), a single series of large air canals (Fig. 2) and all these arranged in definite sequence. There are also present fibrous bundles which lie close to the abaxial side of the leaf-sheath (Fig. 2). Air canals have narrow parenchymatous cells which enclose large intercellular spaces (Fig. 2). The epidermal cells are slightly cuticularised.

The vascular bundles are elliptical or dumb-bell-shaped and are characterised by a single large metaxylem vessel surrounded by xylem parenchyma; furthermore, they possess dorsal and ventral sclerenchymatous sheaths. Few thick-walled cells between metaxylem and phloem probably represent commissural connectives (Fig. 3). Protoxylem within the bundle is situated towards the periphery. Phloem is well preserved (Fig. 3).

The structure of the petrified pseudostem and roots described above have been compared with similar structures found in the various families of the order Scitamineæ.<sup>3-5,7</sup> It has been observed that very close resemblance