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A HYPOGEOUS CORTINARIUS FROM KASHMIR

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ABSTRACT. *Cortinarius kashmiriensis* sp. nov. (Cortinariaceae) is described and compared with all known hypogeous and subhypogeous species in the same genus. A key to these species is provided.

During the National Workshop on Larger Fungi held in Kashmir in autumn 1978 a foray was held at the Gulmarg forest. Although the majority of the larger fungi found were characteristically either European or cosmopolitan, one collection caused great interest. The collection superficially resembled a species of *Cortinarius* yet the stipe was hardly elongated and the cortina had thickened to become parchment-like. Thus the basidiomes not only resembled those of a squat *Cortinarius* but also those of members of the gasteromycetoid genus *Thaxterogaster*. However, whereas members of the latter genus fail to give spore-prints, the Kashmir specimens, once the veil had been cut away, shed groups of spores over a twelve-hour period in much the same way as a normal agaricoid basidiome; indeed, basidiospores could be located in lines on the upper side of the cortina when it had been excised. The collection therefore agrees not only in many macromorphological respects with the five species of hypogeous cortinarii described from North America by Thiers & Smith (*Mycologia* 61:526–536, 1969), but also in the subalpine to alpine habitat which characterised these taxa. It is undoubtedly a new species.

Cortinarius (Phlegmacium) kashmiriensis Watling, **sp. nov.** Plate 3, Fig. 1A.

Pileus 43–48 mm latus, siccus, bombycinus, albus demum ferrugineo-maculatus, convexus demum planus, ad marginem cortina crassa alba pertinace junctus. Lamellae ferrugineae, latae, tenuissimae. Stipes 18–23 mm longus, ad apices 14 mm deorsum 15 mm latus, albidus ferruginascens. Basidiosporae 10–11·5(–12) × 7·5–9 μm, tuberculato-rugosae.

Typus: India, Gulmarg Forest, near Srinagar, Kashmir, 28 ix 1978, *Watling* 13069 (holo. E).

Pileus 43–48 mm broad, convex, expanding, with undulate outline apparently dry although covered in a white silky membrane and appearing superficially 'mouldy', whitish ivory, chalk- or snow-white throughout but soon becoming stained ochraceous tawny on handling, or even tawny red-brown towards the margin although remaining white at disc; margin incurved and attached to a tough thickened silvery white cortina which stretches from the pileus to stipe and is persistent even in the fully expanded basidiome. *Gills* normally developed, rather brittle, appearing decurrent because of poor expansion of pileus and elongation of stipe, and almost entirely covered by tough veil, rusty orange or bright reddish tawny. *Stipe* 18–23 × 14–15 mm, short, with a prominent bulb (20 mm broad) with a

PLATE 3. *Cortinarius kashmiriensis*, type gathering. × approx 1.

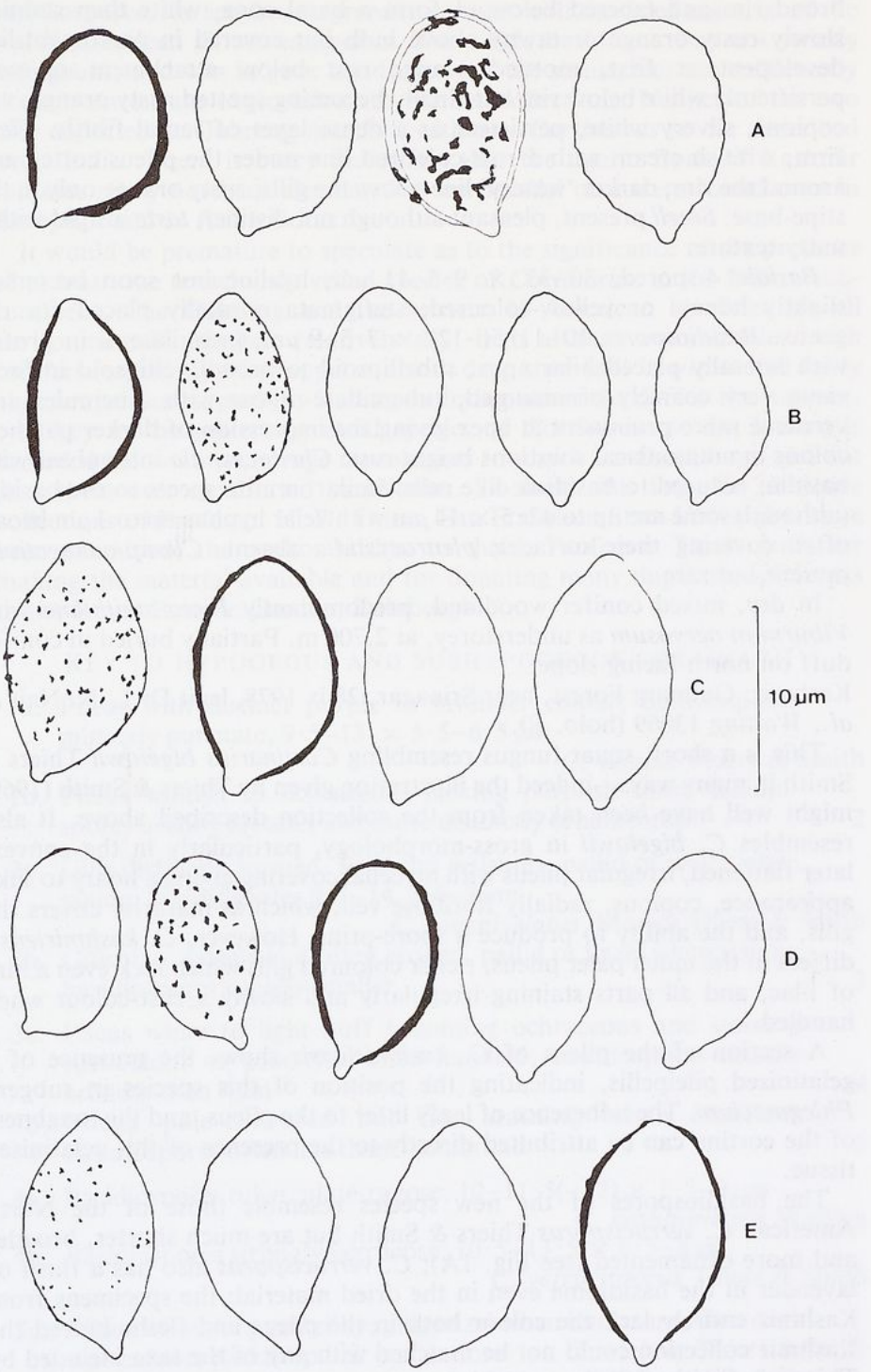

FIG. 1. Basidiospores. A, *Cortinarius kashmiriensis*, type; B, *C. bigelowii, Thiers* 32433; C, *C. verrucisporus, Thiers* 34568; D, *C. magnivelatus, Thiers* 12653; E, *C. velatus, Thiers* 35050—all Thiers' specimens from California.

broad rim and tapered below to form a basal cone, white then staining slowly rusty orange or tawny above bulb but covered in parchment-like developent at first, mottled orange rust below attachment of veil, persistently white below rim but finally becoming spotted rusty orange; veil copious, silvery white, persistent as a dense layer of radial fibrils. *Flesh* firm, whitish cream with a rust-coloured line under the pileus cortex and around the rim, darker 'watery' line above the gills, rusty orange only in the stipe-base. *Smell* present, pleasant although not distinct; *taste* insipid with a nutty texture.

Basidia 4-spored, 30–33 × 9·5–11 μm, hyaline but soon becoming slightly honey- or yellow-coloured; sterigmata normally placed for the genus. *Basidiospores* 10–11·5(–12) × 7·5–9 μm, inequilateral in profile with laterally placed hilar apex, subellipsoid to broadly ellipsoid in face-view, very coarsely ornamented, tuberculate-rugose with tubercules and verrucae more prominent at apex giving the impression of darker patches, colour in ammoniacal solutions bright rust. *Cheilocystidia* intermixed with basidia, reduced to basidiole-like cells similar in all respects to the basidia (although some are up to 42·5 × 14 μm with velar hyphae up to 3 μm broad often covering their surface); *pleurocystidia* absent. *Clamp-connections* present but rare.

In dry, mixed conifer woodland, predominantly *Picea smithiana* with *Viburnum nervosum* as understorey, at 2,700 m. Partially buried in conifer duff on north-facing slope.

Kashmir: Gulmarg Forest, near Srinagar, 28 ix 1978, legit Dr L. N. Nair *et al.*, *Watling* 13069 (holo. E).

This is a short, squat fungus resembling *Cortinarius bigelowii* Thiers & Smith in many ways—indeed the illustration given by Thiers & Smith (1969) might well have been taken from the collection described above. It also resembles *C. bigelowii* in gross-morphology, particularly in the convex, later flattened, irregular pileus with mycelial covering giving a hoary to silky appearance, copious, radially fibrillose veil, which at maturity covers the gills, and the ability to produce a spore-print. However, *C. kashmiriensis* differs in the much paler pileus, richer coloured gills which lack even a hint of lilac, and all parts staining irregularly and slowly a rust-colour when handled.

A section of the pileus of *C. kashmiriensis* shows the presence of a gelatinised pileipellis, indicating the position of this species in subgen. *Phlegmacium*. The adherence of leafy litter to the pileus, and the toughness of the cortina can be attributed directly to the presence of this gelatinised tissue.

The basidiospores of the new species resemble those of the North American *C. verrucisporus* Thiers & Smith but are much shorter, broader and more ornamented (see Fig. 1A); *C. verrucisporus* also has a flush of lavender in the basidiome even in the dried material; the specimens from Kashmir entirely lack the colour both in the pileus and flesh. Indeed the Kashmir collection could not be matched with any of the taxa included by Thiers & Smith (1969) nor with subsequent collections of them in the herbarium at San Francisco State University.

A second gasteromycetoid *Cortinarius* was also found at Gulmarg (*Watling* 12979, E). Although larger and with differently shaped

basidiospores, the specimen agreed in colours with the dried material of the North American *C. verrucisporus*. The single basidiome was not strictly hypogeous, and was in poor condition, but the similarities are sufficiently close to encourage exploration for further collections. Neither of the two taxa collected at Gulmarg matched with any *Cortinarius* so far described from India. There is every indication that the agaric flora of Kashmir contains many northern elements but no parallel taxa were found even in European and N Asian floras.

It would be premature to speculate as to the significance of the presence of at least one tenaciously veiled species of *Cortinarius* in the Indian subcontinent. The Gulmarg and the western N American localities are all environmentally similar: relatively dry, high altitude communities, with conifers (especially *Picea* spp.) and with deep snowfalls in winter and fairly high temperatures, possibly leading to drying out of the duff in the summer.

A key to the gasteromycetoid species of *Cortinarius* so far known is provided below to encourage mycologists to search for these fungi and not pass them over as aborted basidiomes. To make this key, the extensive collections of Professor H. D. Thiers, San Francisco State University, have been examined; the author wishes to thank Professor Thiers both for making the material available and for donating many duplicate specimens to the Royal Botanic Garden, Edinburgh.

KEY TO HYPOGEOUS AND SUBHYPOGEOUS CORTINARII

1a. Pileus with distinct purple to lavender colour; basidiospores minutely punctate, 9·5–13 × 5·5–6·5 μm . . . . . *C. velatus* Thiers & Smith

1b. Pileus whitish to ochraceous lacking purplish tints; basidiospores usually broader and more distinctly ornamented . . 2

2a. Gills distinctly formed, firm and resistant, pallid or white when young; basidiospores 9·5–14 × 6–8 μm . . . . . *C. magnivelatus* (Morse) Thiers & Smith

2b. Gills thin, fragile and often eroded, pallid or hazel when young; basidiospores usually smaller 3

3a. Pileus white to light buff becoming ochraceous and staining rust-colour or yellowish when handled; basidiospores usually broader than 7 μm 4

3b Pileus pale-coloured but not staining when handled; basidiospores often less than 7 μm broad 5

4a. Basidiospores tuberculate-rugose, 10–11·5(–12) × 7·5–9 μm . *C. kashmiriensis* Watling

4b. Basidiospores strongly verrucose, 10·5–13·5 × 6·5–8 μm . *C. verrucisporus* Thiers & Smith

5a. Pileus white, dry and silky; gills hazel when immature, then dark rust-colour; basidiospores verruculose . *C. wiebeae* Thiers & Smith

5b. Pileus pale alutaceous, often with a thin mycelial coating; gills avellaneous becoming pallid brownish with lilaceous flush and finally dull cinnamon-colour; basidiospores verruculose . . *C. bigelowii* Thiers & Smith

Although black and white photographs of Thiers and Smith's taxa appear in their original publication, no line drawing of basidiospores were supplied. The opportunity is therefore taken to supply basidiograms (Fig. 1).