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CLADOBOTRYUM PENICILLATUM SP. NOV.

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Cladobotryum penicillatum sp. nov. was isolated from *Alnus* twigs in New Forest, Hampshire, U. K., in 1971, and from *Sebacina effusa* in the Houtribbos Forest, O.-Flevoland Polder, Netherlands, in 1980. The species has conidia intermediate in dimension between *C. varium* and *C. mycophilum*, and it differs from both species by having rather slow-growing colonies and long conidiophores with apical penicillate branching. Conidiogenesis is basipetal and retrogressive.

Species of *Cladobotryum* Nees ex Steud. have been described and revised in recent years by Gams & Hoozemans (*1970*), Matsushima (*1975*), de Hoog (*1978*), and Gray & Morgan Jones (*1980*). An apparently undescribed species has been isolated twice.

Cladobotryum penicillatum W. Gams, *sp. nov.*—Figs. 1, 2

Coloniae fere lente crescentes, post 10–14 dies ad 3 cm diam., rubrae et ochraceae, actinomycetum modo olentes. Conidiophora erecta, ad 350–450 µm alta, ad basim 10–12 µm crassa, hyalina, levia, sursum in 2–3 gradibus penicillate ramosa. Phialides 2–4 in verticillis, aculeatae, 15–25 µm longae, e 3–5 µm ad 1.5–3.0 µm angustatae, sed gradatim longitudine diminutae et apice latiore terminatae. Conidia in capitulis irregularibus siccis vel catenis imbricatis cohaerentia, cylindrico-ellipsoidea, constanter bicellularia, basi recte vel oblique apiculata et truncata, hyalina, levia, 15–20 × 6.0–8.0(–9.0) µm. Chlamydosporae catenis brevibus vel longis connexae, laterales vel intercalares, hyalinae, cellulis globosis, prolatis vel oblatis, 8–18 µm diam., parietibus 1.0–1.5 µm crassis, levibus. Teleomorphosis ignota. Typus vivus et exsiccatus CBS 407.80, lectus ad *Sebacinam effusam* (Bref.) Pat., in ligno frondoso dejecto in silva Houtribbos dicta, O.-Flevoland Polder in Neerlandia, 26 Jun. 1980, a *W. Gams*.

Colonies on 2% MEA or OA rather slow growing, reaching *c.* 3 cm diam. in 10–14 days at 20–22 °C, without further radial extension, partly deep red, partly ochreous to amber, with intensely coloured reverse; aerial mycelium velvety to floccose, ochreous, interspersed with areas of whitish conidial heads. Odour not strong, somewhat reminiscent of actinomycetes. Conidiophores erect, to 350–450 µm tall, 10–12 µm wide near the base, with about 6 septa in the unbranched stipe, hyaline, smooth-walled, penicillately branched in 2–3 stages in the upper part. Conidiogenous cells arranged in whorls of 2–4 on the metulae, awl-shaped, 15–25 µm long, tapering from 3–5 µm near the base to 1.5–3.0 µm at the tip, but shortening progressively with the opening widening to 3–4 µm and with internal wall thickening in older stages. Conidia cohering in irregular dry heads or imbricate chains, cylindrical-ellipsoidal, consistently 2-celled, with apiculate and truncate base, the apiculation straight or oblique, hyaline, smooth-walled, 15–20 × 6.0–8.0(–9.0) µm. Chlamydospores abundant after 14 days, forming short or long, lateral or intercalary chains, hyaline, with globose, elongate or oblate cells, 8–18 µm diam., wall 1.0–1.5 µm thick, smooth. Teleomorph unknown.

MATERIAL EXAMINED.—CBS 697.71, isolated from decaying twig of *Alnus glutinosa* underneath the bark, New Forest, near Lyndhorst, Hampshire, U. K., *W. Gams*, 17 Sept. 1971. — CBS 407.80, holotype, isolated from *Sebacina effusa* (Bref.) Pat. on decaying deciduous wood, Houtribbos, O.-Flevoland Polder, Netherlands, *W. Gams*, 26 June 1980.

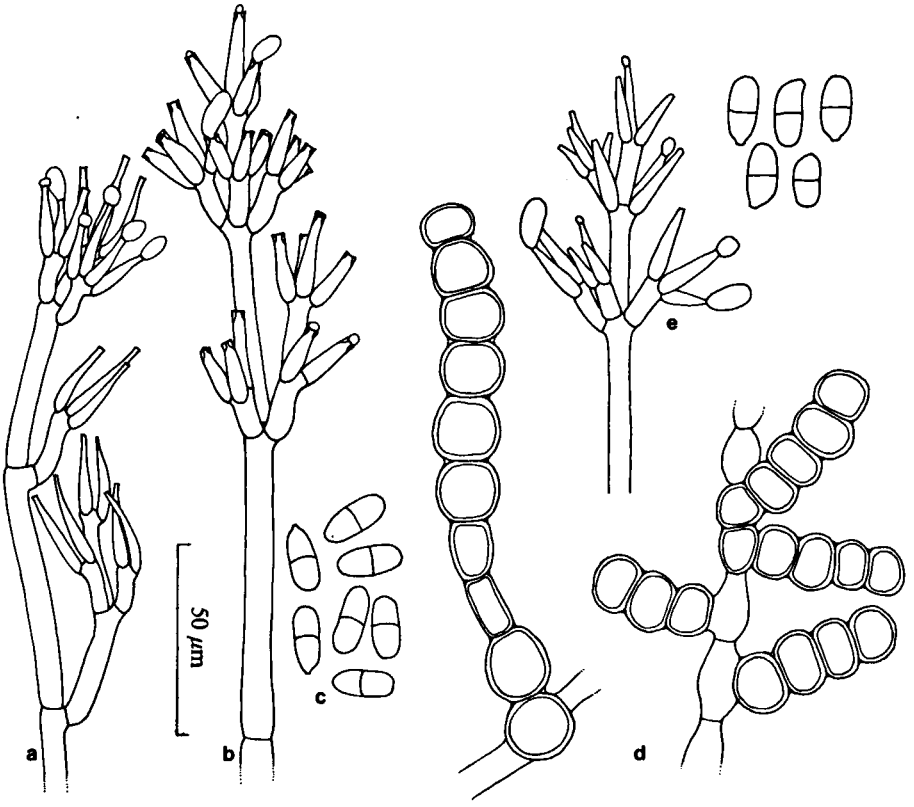

Fig. 1. *Cladobotryum penicillatum*. CBS 407.80, from 14-day-old freshly isolated culture on 2% MEA. — a. Young conidiophore. — b. Old conidiophore. — c. Conidia. — d. Chlamydospores. — e. Conidiophore and conidia from natural substrate.

Species of *Cladobotryum* tend to degenerate in culture after repeated transfer. The isolate CBS 697.71, maintained for nine years on agar media, has now lost its pigmentation and forms white colonies with slender, diffusely verticillate, not penicillate conidiophores. The conidia are somewhat narrower than in the fresh isolate (Fig. 2c). This isolate was supplied to Dr. G. T. Cole for a study of conidiogenesis; he did not consider this fungus to be distinct from *C. varium* Nees ex Duby and incorporated a drawing by the present author (fig. 5.5B, wrongly labelled *C. verticillatum*) in the book 'Patterns of development in conidial fungi' (Cole & Samson, *1979*). The same isolate was then studied by de Hoog (*1978*), who did not regard it as significantly different from *C. mycophilum* (Oudem.) W. Gams & Hoozemans (pers. comm.). Whilst the study of Gams & Hoozemans (*1970*) was mainly based on fresh isolates, de Hoog (*1978*) reexamined isolates preserved in the culture collection for several years and tried to overcome degeneration by growing them on a mushroom agar (made from shredded fruit-bodies of *Lactarius*, *Russula*, and *Boletus* species). He thus encountered some difficulties in distinguishing between the species with 2-celled conidia, *C. mycophilum* and *C. varium*, and tabulated the conidial measurements given by

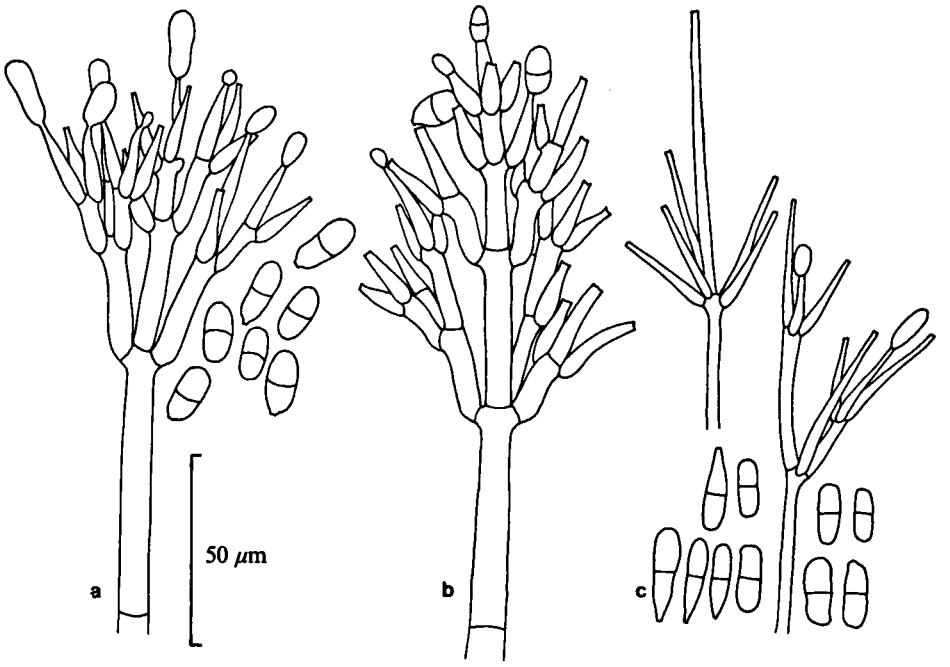

Fig. 2. *Cladobotryum penicillatum*. CBS 697.71, from freshly isolated culture on 2% MEA. — a. Young conidiophore and conidia. — b. Old conidiophore and conidia. — c. Conidiophores and conidia drawn in 1980 from 12-day-old culture on OA.

various authors for these species. A more complete comparison of fresh isolates of these two species and *C. penicillatum* is given in Table I.

As this comparison illustrates, the three taxa can reliably be distinguished on the natural substrate and in fresh isolates. The conidial measurements may show a considerable overlap as shown by de Hoog (*1978*). Consequently, the shape of conidiophores and chlamydospores appears more important than conidial sizes when discriminating between these species. The preferential substrates, polypores in *C. varium*, fleshy agarics in *C. mycophilum*, and other fungi in *C. penicillatum*, provide additional clues for their distinction.

CONIDIOGENESIS.—*Cladobotryum varium* is a well-known example of retrogressive conidiogenesis (Cole & Kendrick, *1971*; Cole & Samson, *1979*). *Cladobotryum mycophilum* did not show much change in phialide length under continuous observation (Gams & Hoozemans, *1970*), but the occurrence of broadly truncate tips in older conidiogenous cells suggests a similar mechanism being operative. *Cladobotryum penicillatum* has not been observed continuously, but the comparison of young and old conidiophores shows a very conspicuous shortening of the conidiogenous cells (Figs. 1a, 1b, 2a, and 2b). An unusual, as yet unmentioned feature of this

type of conidiogenesis is the gradually increasing wall thickening inside the tip of the conidiogenous cell (Fig. 1b) which is typical of phialidic conidiogenesis. This shows that the various modes of conidiogenesis observed in the genus *Cladobotryum* as circumscribed by Gams & Hoozemans (*1970*) and de Hoog (*1978*), all anamorphs of *Hypomyces* species, are in principle not very different from phialides.

TABLE I

Comparison of fresh isolates of *Cladobotryum varium*, *C. penicillatum*, and *C. mycophilum*

	C. varium	*C. penicillatum*	*C. mycophilum*
Colony diameter in 10 days	>9 cm	*c.* 3 cm	>9 cm
Colony colour (reverse)	white to amber	red and ochreous	red to purple and ochreous
Odour	not pronounced	suggesting actinomycetes	suggesting camphor
Conidiophore branching	diffusely verticillate	apically penicillate	diffusely verticillate
Conidial size (most commonly observed range)	10.5–16 × 5–7 μm	15–20 × 6.0–8.0 (–9.0) μm	(15–)22–25(–32) × (7.5–)8.5–12 μm
Chlamydospores	1–4-celled; cells 15–19 μm diam.	in ± long chains, rarely branched; cells 8–18 μm diam.	densely branching chains of swollen thick-walled cells, tending to form sclerotium-like clusters; cells 11–15 μm diam.

REFERENCES

COLE, G. T. & KENDRICK, W. B. (1971). Conidium ontogeny in Hyphomycetes. Development and morphology of *Cladobotryum*. *In* Can. J. Bot. **49**: 595–599.

COLE, G. T. & SAMSON, R. A. (1979). Patterns of development in conidial fungi. Pitman, London, San Francisco, Melbourne.

GAMS, W. & HOOZEMANS, A. C. M. (1970). *Cladobotryum*-Konidienformen von *Hypomyces*-Arten. *In* Persoonia **6**: 95–110.

GRAY, D. J. & MORGAN-JONES, G. (1980). Notes on Hyphomycetes. XXXIV. Some mycoparasitic species. *In* Mycotaxon **10**: 375–404.

HOOG, G. S. DE (1978). Notes on some fungicolous Hyphomycetes and their relatives. *In* Persoonia **10**: 33–81.

MATSUSHIMA, T. (1975). Icones microfungorum a Matsushima lectorum. Kobe.