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A new species of *Canalisporium* from Australia

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Abstract: *Canalisporium variabile* sp. nov. is described and illustrated based on several specimens from submerged wood and decaying palm rachis in Australia. It is most similar to *C. pallidum* in having pale conidia with clearly visible septa and canals, but they are two distinct species. In *C. pallidum*, conidia are more stable in shape, size and septation, with mostly a single column of vertical septa. In *C. variabile*, however, conidia are more variable in morphology, with mostly two columns of vertical septa, and the cells are more constricted. Conidia of *C. pallidum* are generally longer and more slender than those of *C. variabile*, which are generally shorter and broader. *Canalisporium variabile* is also compared with *C. pulchrum* and *C. kenyense*.

Key Words: dematiaceous hyphomycetes, freshwater fungi, lignicolous fungi, mitosporic fungi, septal pores, systematics

In a continuing study of the fungi occurring on submerged wood in tropical streams (Hyde et al 1998, Lee et al 1998, Wong et al 1999) we collected a previously undescribed species of *Canalisporium*. *Canalisporium* Nawawi & Kuthub. was introduced to accommodate species of *Berkleasmiium* Zobel having complanate conidia with orderly arranged septa in rows and columns and with narrow canals in the septa connecting adjacent cell lumens (Goh et al 1998, Nawawi and Kuthubutheen 1989). The genus has recently been reviewed by Goh et al (1998) and currently comprises six species, namely *C. caribense* (Hol.-Jech. & Mercado) Nawawi & Kuthub., *C. exiguum* Goh & K. D. Hyde, *C. pulchrum* (Hol.-Jech. & Mercado) Nawawi & Kuthub., *C. elegans* Nawawi & Kuthub., *C. kenyense* Goh, W. H. Ho & K. D. Hyde, and *C. pallidum* Goh, W. H. Ho & K. D. Hyde.

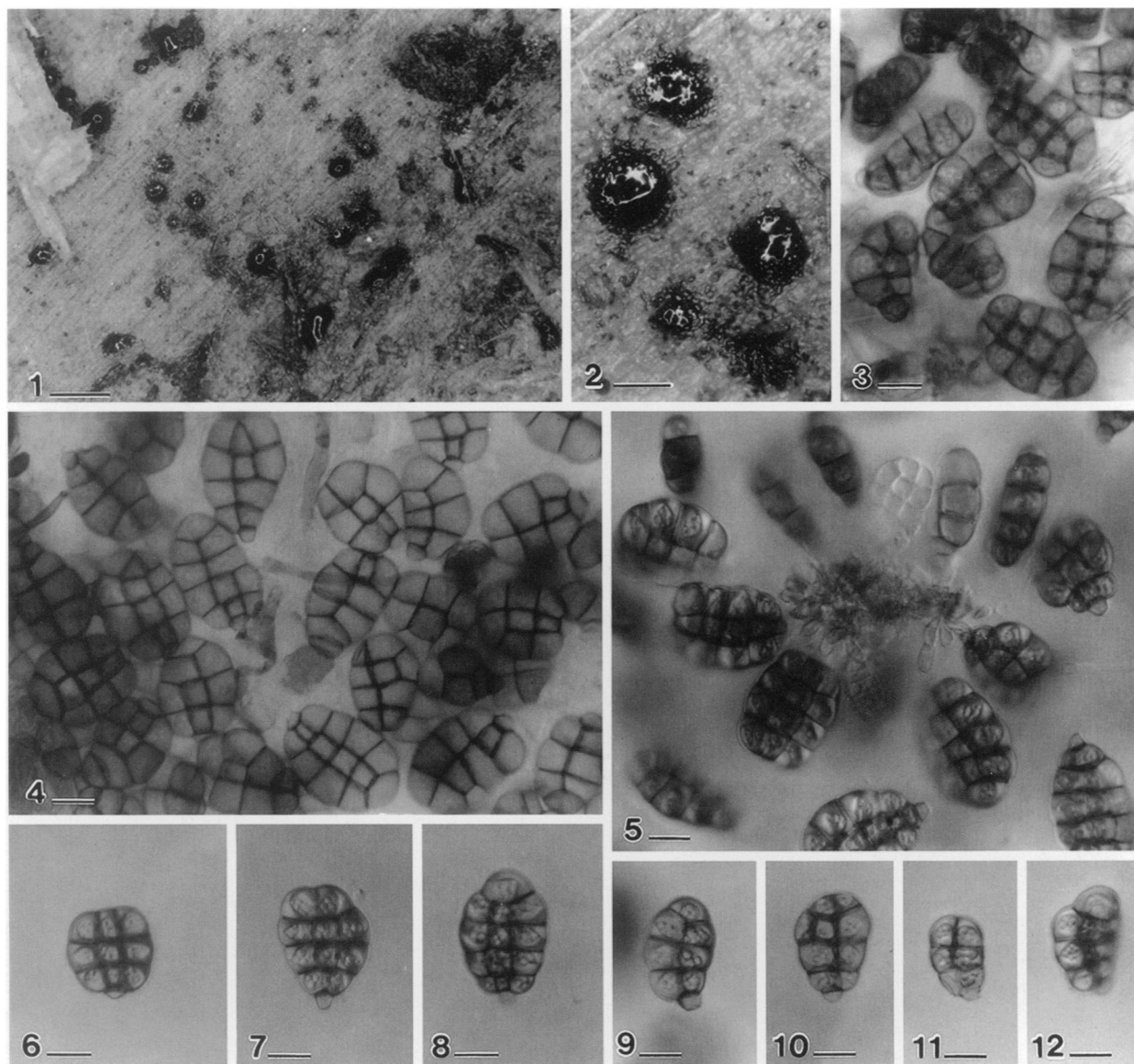
The new species superficially resembles *C. pallidum* in having pale conidia, but differs in the number and arrangement of conidial septa. It is therefore described in this paper as a new species, and compared with *C. pallidum* as well as with other species (TABLE I). A composite diagram illustrating conidia of all seven *Canalisporium* species is provided to facilitate comparison (see FIGS. 13–21).

Canalisporium variabile Goh et K.D. Hyde, sp. nov.

FIGS. 1–12, 19–21

Sporodochia in substrato naturali punctiformia, dispersa, atrogrisea, granulata et in humido nitida, hemisphaerica, 200–400 µm lata. Mycelium plerumque in substrato immersum, ex hyphis ramosis, septatis, subhyalinis, 2–3 µm latis, laevibus, compositum. Conidiophora micronemata vel semi-macronemata, mononemata, fasciculata, simplicia vel sparse ramosa, laevia, hyalina vel subhyalina, usque 20 µm longa, 1.5–2 µm lata. Cellulae conidiogenae in conidiophoris incorporatae, terminales, determinatae, cylindricae vel leniter vesiculosae. Conidia 22–35 × 15–23 × 10–10.5 µm, acrogena, solitaria, complanata, laevia, in conspectis superficialibus plus minusve ellipsoidea vel obovoidea, interdum subglobosa vel cubica vel subtriangularia, in conspectis lateralibus cylindrica vel late clavata, fere recta, pallide olivacea vel flavidobrunnea, muriformia, plerumque cum septis longitudinalibus biserialis vel raro uniserialis et 2–4(–5) septis transversis in ordinem, non vittatis, tenuis praedita, interdum cum 1–2 septis verticalis additis praedita, ad septa conspicue constricta, lumina cellularum canaliculis conspicue connexa, cellula basali cuneiformia, subhyalina, tenuitunicata, 2.5–5 µm lata, conidiorum secessio rhexolytica.

Sporodochia on natural substratum punctiform, scattered, dark gray, granular, glistening when wet, hemispherical, 200–400 µm wide (FIGS. 1, 2). Mycelium mostly immersed in the substratum, composed of branched, septate, subhyaline to golden brown, 2–3 µm wide, smooth hyphae. Conidiophores micronematous or semi-macronematous, mononematous, fasciculate, simple or sparsely branched, smooth, hyaline or subhyaline, up to 20 µm long and 1.5–2 µm wide. Conidiogenous cells integrated, terminal, determinate, cylindrical, becoming vesiculate as conidia mature (FIG. 5). Conidial secession rhexolytic. Conidia 22–35 × 15–23 × 10–10.5 µm, acrogenous, solitary, one-cell thick and flattened, smooth, variable in shape: in surface view more or less ellipsoidal or obovoid, sometimes subglobose or cubical to subtriangular.



FIGS. 1–12. *Canalisporium variabile*, from HOLOTYPE (HKU(M) 7438). 1. Colony on submerged wood. 2. Close-up of wet sporodochia on natural substratum. Note the glistening conidial mass. 3. Conidia with septal canals in focus. 4. A mass of conidia with septa in focus. 5. Squash mount illustrating a mass of vesiculate conidiogenous hyphae with developing and mature conidia. 6–12. Conidia illustrating a variation of shape, size, and septal arrangement. Bars: 1 = 500 μm , 2 = 200 μm , 3–12 = 10 μm .

gular; in lateral view cylindrical or broadly clavate and mostly straight, pale olivaceous to yellowish brown, muriform, usually moderately to strongly constricted at conidial septa and thus the cells appear to bulge in outline; septa unpigmented, thin and septal canals clearly visible, the majority with two columns of vertical septa and 2–4(–5) rows of transverse septa, some with a single column of septa and usually slightly curved, occasionally one or two of the central rows of cells may have additional 1–2 vertical septa, apex comprising a single cell or two to three cells, basal

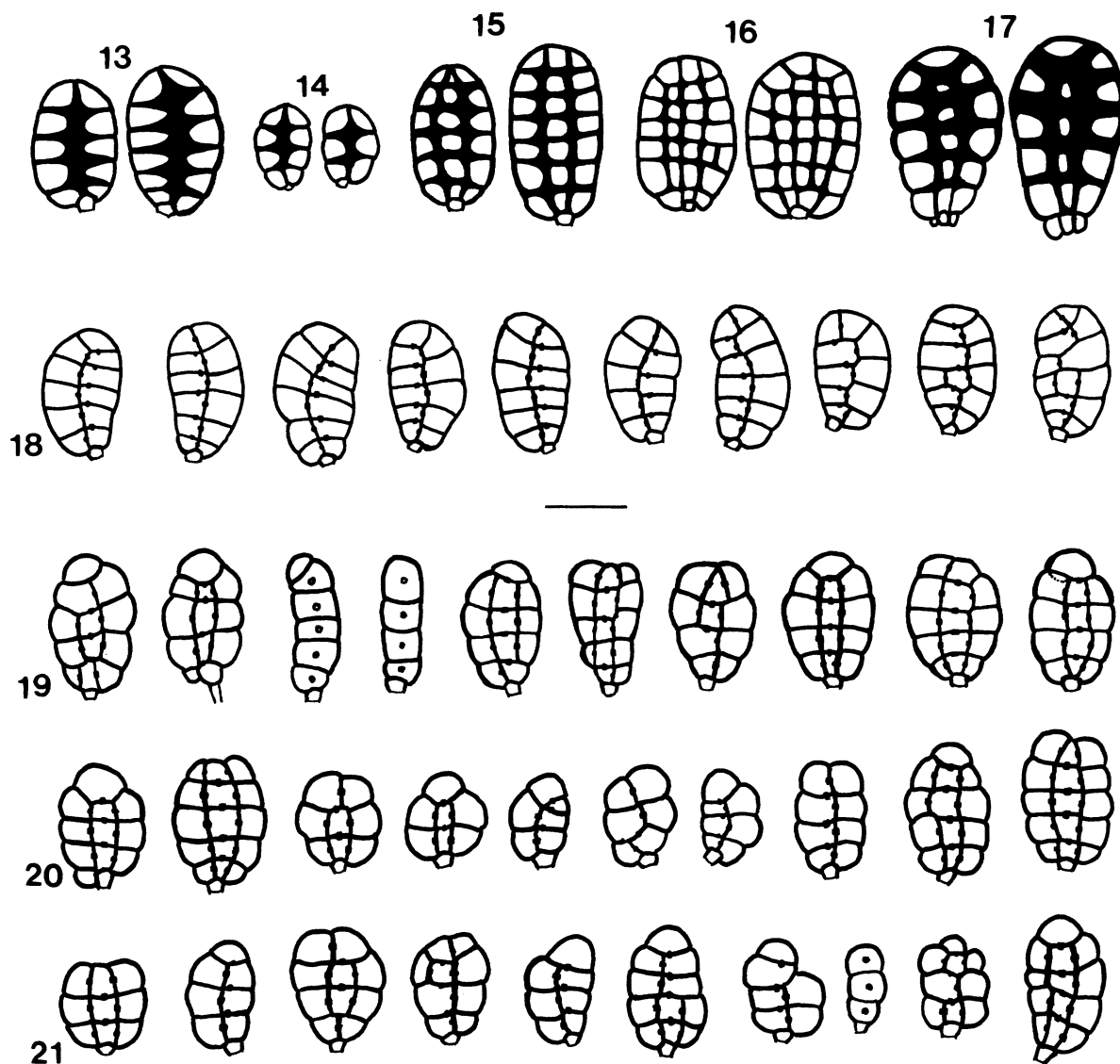
cell cuneiform, subhyaline, thin-walled, 2.5–5 μm wide (FIGS. 3–12, 19–21).

Known distribution. Australia.

Teleomorph. Unknown.

Specimens examined. AUSTRALIA. QUEENSLAND: Atherton Tablelands, Cowry Creek, on wood submerged in creek, 1 May 1998, K. D. Hyde, HOLOTYPE: HKU(M) 7438; *ibid.* HKU(M) 7441; *ibid.* HKU(M) 7442; *ibid.* on submerged decaying rachis of *Oraniopsis appendiculata* (Arecaceae), 1 May 1998, K. D. Hyde, HKU(M) 8243.

Etymology. Variabile, in reference to the conidia, which vary in shape and number and arrangement



FIGS. 13–21. Conidia of *Canalisporium* spp. drawn to the same scale for comparison. 13. *C. caribense*. 14. *C. exiguum*. 15. *C. pulchrum*. 16. *C. elegans*. 17. *C. kenyense*. 18. *C. pallidum*. 19–21. *C. variable*. Bar = 20 μm .

TABLE I. Comparison of conidial morphology in *Canalisporium* species (Goh et al 1998)

Species	Pigmentation	Length (μm)	Width (μm)	Lateral thickness (μm)	Accentuation of septa	Columns of vertical septa	Rows of transverse septa	Cells in apical row	Basal cells
<i>C. caribense</i>	moderate to dark	21–51	15–29	9–12.5	yes	1	3–6	2	single
<i>C. exiguum</i>	moderate to dark	18–25	13–15	5–8	yes	1	2–3(–4)	2	single
<i>C. pulchrum</i>	moderate to dark	25–63	(16–)20–32	(10–)12–17	yes	2	3–9	1–3	single
<i>C. elegans</i>	moderate	32–58	25–38	10–13	moderately	(3–)4–5	5–8	1–5	single
<i>C. kenyense</i>	dark	34–56	24–34	14–18	yes	2	(3–)4–5(–7)	1	triple
<i>C. pallidum</i>	pale	25–39	15–20(–22)	8–10	no	mostly 1	4–5	1–2	single
<i>C. variable</i>	pale	22–35	15–23	10–10.5	no	mostly 2	2–4(–5)	1–3	single

of septa, as compared to other known species which normally have characteristic shapes and particular arrangement of conidial septa.

Notes. The conidia in *C. variabile* are not heavily pigmented and the septal canals are clearly visible. Each vertical septum is perforated near its center by a canal. In the case of conidia having two columns of vertical septa (i.e., with three columns of cells), only the central column of cells have canals in the transverse septa (FIG. 19). In such conidia, all septal canals are central in position. Conidia having only a single column of vertical septa (i.e., with two columns of cells) are usually slightly curved. In those conidia, all the vertical septa possess a centrally positioned canal, but only the cells on the concave side of such conidia possess canals in their transverse septa and those on the convex side are not perforated (FIGS. 20, 21). The canals in the transverse septa of those conidia are not centrally situated, but assume a position very close to the corresponding vertical septa. This feature also occurs in conidia of *C. pallidum* (FIG. 18).

Canalisporium variabile can be distinguished from the other six species in the genus by comparing their conidial pigmentation and septation (see FIGS. 13–21; TABLE I). It is however most similar to *C. pallidum* (see Goh et al 1998), which also has pale-colored conidia, with unaccentuated septa and therefore the septal canals are clearly visible. A few conidia in *C. variabile* having two columns of cells also resemble those of *C. pallidum* in having the canals in transverse septa being closer to the vertical septa. Despite these similarities, there are several features that distinguish *C. variabile* from *C. pallidum*. The major difference is that in *C. variabile* the majority of the conidia have two columns of vertical septa and 2–4 rows of transverse septa. In *C. pallidum* conidia predominately have a single column of vertical septa, but with 4–5 rows of transverse septa (FIG. 18), although occasion-

ally in both species there are a few conidia with irregularly arranged septa. The conidia in *C. variabile* are however, more variable in shape due to the variation in conidial septation (FIGS. 19–21). They are relatively shorter and wider when compared with those of *C. pallidum* (which measure $25\text{--}39 \times 15\text{--}20 \mu\text{m}$). Moreover, in *C. variabile* the conidial cells are distinctly constricted and thus bulge in outline, whereas those in *C. pallidum* are more or less smooth in conidial contour.

The majority of conidia of *C. variabile* are also comparable to those of *C. pulchrum* (FIG. 15) and *C. kenyense* (FIG. 16), since they all possess two columns of vertical septa. In the latter two species, however, conidia are usually darker, with the septa heavily accentuated and thus the septal canals are often obscured. The conidia in these three species also differ in size and in other morphological characters. For comparison of conidial morphology in *Canalisporium* species, refer to TABLE I and Goh et al (1998).

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