New records and species of Canalisporium (Hyphomycetes), with a revision of the genus


Abstract: Three new species of Canalisporium, namely Canalisporium exiguum Goh & K.D. Hyde, Canalisporium kenyense Goh, W.H. Ho & K.D. Hyde, and Canalisporium pallidum Goh, W.H. Ho & K.D. Hyde, are described and illustrated. New records of Canalisporium caribense, Canalisporium pulchrum, and Canalisporium elegans, are given. They are also illustrated from fresh material and briefly discussed. Comparisons of conidial morphology of all species from different localities are made and a key to the species of the genus is provided.

Key words: Berkleasmiun, dematiaceous hyphomycetes, freshwater fungi, lignicolous fungi, systematics.


Mots clés : Berkleasmiun, hyphomycètes dématiés, champignons d’eau douce, champignons lignicoles, systématique.

[Intaduit par la rédaction]

Introduction

The genus Canalisporium Nawawi & Kuthubutheen (1989) was introduced to accommodate Berkleasmiun caribense Hol.-Jech. & Mercado, Berkleasmiun pulchrum Hol.-Jech. & Mercado (Holubová-Jechová and Mercado Sierra 1984), and a third new species, Canalisporium elegans Nawawi & Kuthubutheen (1989). Conidia of Canalisporium species are muriform; however, they differ from those of Berkleasmiun species in being flattened dorsiventrally, comprising a single layer of regularly arranged cells, which are supported by a small, thin-walled, cuneiform, pale basal cell.

In Canalisporium caribense (Hol.-Jech. & Mercado) Nawawi & Kuthub., conidia possess a single column of vertical septa, and 3–6 equally spaced rows of transverse septa. In Canalisporium pulchrum (Hol.-Jech. & Mercado) Nawawi & Kuthub., conidia have 2 columns of vertical septa, and 4–6 rows of transverse septa, while in C. elegans, conidia possess 4–5 columns of vertical septa, and 5–7 rows of transverse septa (Nawawi and Kuthubutheen 1989). These conidia, the septa of which usually become progressively darker with maturity, resemble cockroach cocoons. The most striking feature of the conidia, as suggested by the generic etymology, is the presence of narrow canals connecting adjacent cell lumens. Each of these canals is surrounded by a marked ring of pigmentation, visible as a circular disc in lateral view or a barrel shape in dorsiventral view. Conidia in species of Berkleasmiun (Moore 1959; Ellis 1971, 1976) are distinctly cylindrical with randomly arranged septa and lack connecting canals between the cell lumens. The teleomorphs of Canalisporium species are presently unknown.

Canalisporium species are common saprophytes on rotten wood, and have a pantropical distribution. The genus has been recorded in Cuba (Holubová-Jechová and Mercado Sierra 1984), India (Rao and de Hoog 1986), Kenya (Kirk 1985), Malaysia (Nawawi and Kuthubutheen 1989), Taiwan (Matsushima 1987), and Uganda (Matsushima 1987). During our investigations of microfungi on submerged wood and other decaying plant material in the tropics, we have obtained several collections of C. caribense, C. pulchrum, and C. elegans. In one north Queensland collection, the conidia were similar to C. caribense, but were distinctly smaller. We therefore describe this fungus here as Canalisporium exiguum sp.nov. The conidial sizes of C. caribense, C. pulchrum, and C. elegans collected from various localities are compared in Tables 1, 2, and 3 and each species is illustrated and briefly discussed.

The type material of B. pulchrum (sensu Holubová-Jechová and Mercado Sierra 1984; PRM 831528) has conidia that are evenly pigmented, with a single, paler basal cell. We have examined a collection of "Berkleasmiun pulchrum" (sensu Kirk 1985; IMI 285428a) from Kenya. The conidia in this collection were typical of Canalisporium, but do not conform to the above species, as the conidial body is borne on a horizontal row of three, thin-walled, subhyaline, small basal cells. Each horizontal row of cells differs clearly in wall thickness and pigmentation from the next row and the apical rows are

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Table 1. Comparison of conidial morphology in *Canalisporium caribense* from various localities.

<table>
<thead>
<tr>
<th>Locality</th>
<th>Herbarium No.</th>
<th>Habitat</th>
<th>Length (μm)</th>
<th>Width (μm)</th>
<th>Lateral thickness (μm)</th>
<th>No. of columns of vertical septa</th>
<th>No. of rows of transverse septa</th>
<th>No. of cells in apical row</th>
<th>No. of cells per conidium*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brunei</td>
<td>HKUM 3192</td>
<td>submersed wood</td>
<td>30-40</td>
<td>20-22</td>
<td>12-15</td>
<td>2</td>
<td>4-5</td>
<td>1-3</td>
<td>14-17</td>
</tr>
<tr>
<td>HKUM 2911</td>
<td>submersed wood</td>
<td></td>
<td>25-50</td>
<td>16-25</td>
<td>10-16</td>
<td>2</td>
<td>4-5</td>
<td>1-3</td>
<td>11-31</td>
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<tr>
<td>Cuba</td>
<td>PRM 831566</td>
<td>rotten wood</td>
<td>31-50</td>
<td>23-32</td>
<td>13-16</td>
<td>2</td>
<td>3-7</td>
<td>1-3</td>
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<td>5-6</td>
<td>1-3</td>
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<td>rotten wood</td>
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<td>20-29</td>
<td>15-17</td>
<td>2</td>
<td>5-6</td>
<td>1-3</td>
<td>11-20</td>
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<tr>
<td>Malaysia</td>
<td>IMI 326602</td>
<td>submersed wood</td>
<td>36-52</td>
<td>22-27</td>
<td>12-15</td>
<td>2</td>
<td>4-7</td>
<td>1-3</td>
<td>14-25</td>
</tr>
</tbody>
</table>

*Includes basal cell.

Table 2. Comparison of conidial morphology in *Canalisporium pulchrum* from various localities.

<table>
<thead>
<tr>
<th>Locality</th>
<th>Herbarium No.</th>
<th>Habitat</th>
<th>Length (μm)</th>
<th>Width (μm)</th>
<th>Lateral thickness (μm)</th>
<th>No. of columns of vertical septa</th>
<th>No. of rows of transverse septa</th>
<th>No. of cells in apical row</th>
<th>No. of cells per conidium*</th>
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<td>23-32</td>
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<td>13-21</td>
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<tr>
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<td>20-23</td>
<td>14-17</td>
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<td>5-6</td>
<td>1-3</td>
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<td>India</td>
<td>CBS-H 3852</td>
<td>rotten wood</td>
<td>28-50</td>
<td>20-29</td>
<td>15-17</td>
<td>2</td>
<td>3-6</td>
<td>mostly 1</td>
<td>11-20</td>
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<tr>
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<td>IMI 326602</td>
<td>submersed wood</td>
<td>36-52</td>
<td>22-27</td>
<td>12-15</td>
<td>2</td>
<td>4-7</td>
<td>1-3</td>
<td>14-25</td>
</tr>
</tbody>
</table>

*Includes basal cell.

Table 3. Comparison of conidial morphology in *Canalisporium elegans* from various localities.

<table>
<thead>
<tr>
<th>Locality</th>
<th>Herbarium No.</th>
<th>Habitat</th>
<th>Length (μm)</th>
<th>Width (μm)</th>
<th>Lateral thickness (μm)</th>
<th>No. of columns of vertical septa</th>
<th>No. of rows of transverse septa</th>
<th>No. of cells in apical row</th>
<th>No. of cells per conidium*</th>
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<td>Brunei</td>
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<td>11-31</td>
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<td>Cuba</td>
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<td>rotten wood</td>
<td>31-50</td>
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<td>rotten wood</td>
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<td>20-29</td>
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<td>11-20</td>
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<tr>
<td>Malaysia</td>
<td>IMI 326602</td>
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<td>36-52</td>
<td>22-27</td>
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<td>2</td>
<td>4-7</td>
<td>1-3</td>
<td>14-25</td>
</tr>
</tbody>
</table>

*Includes basal cell.

darker than the basal rows. These basal rows have also been commented on by Rao and de Hoog (1986) and Nawawi and Kuthubheen (1989). It is obvious that this species differs from *B. pulchrum* (sensu Nawawi and Kuthubheen 1989) and it is therefore described here as *Canalisporium kenyense* sp.nov.

We have collected a further species from Hong Kong that superficially resembles *C. caribense*, but produces very pale conidia. Basically, these conidia possess a single column of vertical septa and 4–5 rows of transverse septa. In some of these conidia, one or two central rows of cells may possess 1–2 additional vertical septa. Each of these additional septa is provided with a septal canal. All the septa in the conidium are thin and unpigmented and the canals are clearly visible. These features separate this fungus from any of the described species of *Canalisporium* and it is therefore described here as *Canalisporium pallidum* sp.nov. With the addition of three species, the genus *Canalisporium* now consists of six taxa. Illustrations of conidia from various collections, drawn to the same scale for comparison, are provided (Figs. 49–63), as well as a key to the species of the genus.

**Taxonomy**


Figs. 1–11, 49–56


*Specimens examined: BRUNEI, Temburong, Batu Apoi Forest Reserve, Sungai Belalong, Kuala Belalong Field Studies*
Figs. 1–11. 

**Canalisporium caribense** from various localities. Figs. 1–4. Collection from Malaysia (HKU(M) 2883). Fig. 1. Sporodochia on submerged wood. Fig. 2. Squash mount of a portion of a sporodochium showing vesiculate conidiogenous hyphae and conidia. Figs. 3, 4. Conidia. Figs. 5, 6. Collection from Hong Kong (HKU(M) 3401) showing conidia with vesiculate cells. Note that the banding at the septa is very broad in this collection. Fig. 7. Squash mount in sterile water showing conidia and chains of vesiculate cells (HKU(M) 2910, Brunei). Figs. 8–10. Conidia (HKU(M) 2883, Malaysia), two in surface view and one in lateral view showing canals. Fig. 11. High magnification of a conidium (HKU(M) 2910, Brunei) showing minute frill (arrowed) at the basal cell resulting from rheolytic conidial secession. Figs. 12–15. Conidia of *Canalisporium exiguum* (HKU(M) 3349, holotype, Australia). Note canals in conidia (Fig. 13). Scale bars for Fig. 1 = 200 μm; Figs. 2, 7, 12 = 20 μm; Figs. 3–6, 8–11, 13–15 = 10 μm.
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Known distribution: Brunei, Cuba, Hong Kong, Kenya, Malaysia, Philippines, Taiwan, Uganda, Vanuatu.

Notes: The characteristic darkened pigmentation around the septa of the conidia tends to be rather variable. For example, the variation is shown in two of our collections; the conidia of HKU(M) 3401 (Hong Kong) have thick dark banding at septa (Figs. 5, 6, 51), whereas those of HKU(M) 2883 (Malaysia) have comparatively less pigmentation around the septa (Figs. 2–4, 54). The canals are often difficult to see in surface view because of the darkened pigmentation; however, they are normally visible in lateral view (Figs. 10, 53, 55). Most of the conidia from various localities have three rows of transverse septa, although some may have up to six rows. Because of the variation in the number of rows of transverse septa, there is also a corresponding variation in cell number and size (Table 1).

Canalisporium exiguum Goh & K.D. Hyde, sp.nov.

Fig. 12–15, 57

Etymology: exiguum: Latin: small, in reference to the size of the conidia.


Sporodochia on natural substratum punctiform, minute, scattered, granular, black, glistening, up to 135 µm in diameter, consisting of conidiophores and up to 60 conidia. Mycelium mostly immersed in the substratum, composed of branched, septate, subhyaline to pale brown, 1.5–2.5 µm wide, smooth hyphae. Conidiophores micronematous or semimicronematous, fasciculate, simple or sparsely branched, smooth, hyaline to subhyaline, up to 25 µm long, 2–3.5 µm wide. Conidiogenous cells integrated, terminal, determinate, cylindrical or often becoming swollen. Conidial secession rheoxytolytic. Conidia 18–25 × 13–15 × 5–8 µm, acrogenous, solitary, flattened, one cell thick, smooth, thick-walled, broadly ellipsoidal to obvoid in surface view, cylindrical to clavate in lateral view, pale olivaceous brown to pale pinkish brown, mufiform, comprising of a single, straight to slightly curved column of vertical septa and 2–3–4 rows of transverse septa, slightly constricted at the septa; septa becoming progressively darker with conidial maturity; cell lumen connected by narrow canals; basal cell subhyaline to very pale brown, cutiniform, 2.5–3.5 µm wide, with thinner wall.

Known distribution: Australia.

Notes: Conidia of C. exiguum are similar to those of C. carinense in having a single column of vertical septa, although they have fewer rows of transverse septa (i.e., 2–3–4 in the former versus 3–6–7 in the latter). The range of conidial sizes of C. carinense from various localities (Table 1; Figs. 49–56) are larger than the conidia of C. exiguum (Fig. 57) from Lake Barrine, Australia. In C. exiguum, the maximum length, width, and lateral thickness of its conidia are equal to the minimum of each respective dimension of those C. carinense collections.


Figs. 16–22, 61–63


Known distribution: Australia, Brunei, Cuba, Hong Kong, India, Malaysia.

Notes: In comparing the five collections of C. pulchrum from different localities (Table 2), the conidia of the Brunei collection (HKU(M) 2911) are relatively larger and the species has the widest range in conidial dimensions, including number of cells per conidium (Figs. 16–18, 21, 62).

Canalisporium elegans Nawawi & Kuthub., Mycotaxon, 34: 484. 1989

Figs. 23–31, 60


Known distribution: Brunei, Malaysia.

Notes: This species is relatively rare and it probably has a restricted distribution. In addition to the Malaysian specimens (IMI 3266013, Nawawi & Kuthubuthen 1989), three collections were obtained from Brunei, two on submerged wood and the other from a decaying leaf of Freycinetia sp. (Table 3). The
Figs. 16-22. Canalisporium pulchrum. Figs. 16–18. Collection from Brunei (HKU(M) 2911). Fig. 16. Sporodochia on submerged wood. Fig. 17. Squash mount of a young sporochium showing fascicle of conidiogenous hyphae with swollen cells. Fig. 18. Conidia. Figs. 19, 20. Collection from Australia (HKU(M) 3192). Conidia. Note that banding in the septa is thinner in this collection and canals are visible in Fig. 20. Fig. 21. Collection from Brunei (HKU(M) 2911). Conidia. Note that the conidia have 8 rows of cells from this collection. Fig. 22. High magnification of a conidium (HKU(M) 2911) showing minute frill (arrowed) at the basal cell resulting from rhizolastic conidial secession. Scale bars for Fig. 16 = 200 μm; Fig. 19 = 20 μm; Figs. 17, 18, 20–22 = 10 μm.
Figs. 23–31. *Canalisporium elegans*. Collection from Brunei *(HKU(6) 2922)*. Fig. 23. Sporodochia on submerged wood. Fig. 24. A conidium with a degenerated, vesiculate conidiogenous hypha attached to the base. Figs. 25, 26. Two conidia with vesiculate cells attached at the base. Figs. 27–29. Conidia. Fig. 30. Higher magnification of a conidium showing canals in the septa. Note that the majority of the canals are in the vertical septa. Fig. 31. High magnification of a conidium showing minute frill (arrowed) at the basal cell resulting from rheology of conidial accension. Scale bars for Fig. 23 = 200 μm; Figs. 24–31 = 10 μm.
conidia of these collections are all identical in morphology. The canals that link the cell lumens are fairly distinct (Fig. 30), although the septa are delicately pigmented. Each vertical septum has a single canal, whereas along the transverse septa, canals are only present in the middle column of cells. Under the light microscope, these canals resemble the dolipore septa of many basidiomycetes.

**Canalisporium kenyense** Goh, W.H. Ho & K.D. Hyde, sp.nov.  
Figs. 32–41, 59

≡ *Berkleasmium pulchrum* Hol.-Jech & Mercado sensu P.M. Kirk, Mycotaxon, 23: 313. 1985

**ETYMOLOGY:** *kenyense*: in reference to the type locality in Kenya.


**HOLOTYPE:** KENYA, Mt. Kenya, Castle Forest, on rotten wood, 25 Jan. 1984, P.M. Kirk, 1593a, IMI 285428a.

**ISOTYPE:** HKU(M) 3350, slides.

Sporodochia on natural substrate scattered, punctiform, pulvinata, black, 100–140 μm in diameter. Mycelium immersed in the substrate, composed of branched, septate, smooth, subhyaline to pale brown, 2–3 μm wide hyphae. Conidiophores micronematous or semi-macronematous, mononematous, fasciculate, simple or sometimes branched, septate, hyaline to very pale brown, smooth, up to 25 μm long, 2–4 μm wide. Conidial secession rheolytic. Conidia acrogenous, solitary, flattened, one cell thick, broadly ellipsoidal or pyriform in surface view, narrowly ellipsoidal to clavate in lateral view, 34–56 × 24–34 × 14–18 μm, smooth, thick-walled, reddish brown to dark brown, muriform, with 2 straight columns of vertical septa and (3–4–5(–7) rows of transverse septa, slightly constricted at the septa, apical rows of cells darker than the basal rows, dark and thickly banded at the septa, canals in the septa obscured by dark pigmentation, apex comprising a single cell (9–15 × 5–7 μm), base comprising three thin-walled, pale small cells (2–3 × 1.5–2 μm) in a row.

**KNOWN DISTRIBUTION:** Kenya.

**NOTE:** The conidia of this species are the darkest amongst all known species of *Canalisporium*. The species is unique in having conidia with three small cells in a row at the base.

**Canalisporium pulidum** Goh, W.H. Ho & K.D. Hyde, sp.nov.  
Figs. 42–48, 58

**ETYMOLOGY:** *pulidum*: in reference to the pale color of the conidia, compared with other known species, which normally have darkly pigmented conidia.


Sporodochia on natural substrate punctiformia, scattered, granular, dark grey, up to 200 μm wide. Mycelium mostly immersed in the substrate, composed of branched, septate, subhyaline, 1,5–2,5 μm wide, smooth hyphae. Conidiophores micronematous or semi-macronematous, mononematous, fasciculate, simple or sparsely branched, smooth, hyaline or subhyaline, up to 25 μm long and 2–3 μm wide. Conidigenous cells integrated, terminal, determinate, cylindrical or slightly vesiculate. Conidial secession rheolytic. Conidia 25–39 × (15–16–20(–22)) × 8–10 μm, acrogenous, solitary, one-cell thick and flattened, smooth, more or less ellipsoid or obovoid in surface view, slightly curved, cylindrical or broadly clavate in lateral view, pale olivaceous or very pale olivaceobrunneous, muriform, mostly with a slightly curved column of vertical septa and 4–5 rows of transverse septa, occasionally one or two of the central rows of cells may have additional 1–2 vertical
septa, septa unpigmented, thin and canals clearly visible, basal cell cuneiform, subhyaline, 2.5–3.5 μm wide, thin-walled.

**Known distribution:** Hong Kong.

**Note:** The conidia of this species are the palest amongst all known species of *Canalisporium*. The species is unique in having conidia with additional vertical septa besides the single, central column of septa. Each vertical septum is perforated by a canal. Along the rows of transverse septa, only those on the concave side of the conidia possess canals; those on the convex side are not perforated (Figs. 45–48).

**Discussion**

Nawawi and Kuthubutheen (1989) introduced *Canalisporium* based on *C. caribense*, *C. pulchrum*, and *C. elegans*, species that have several common characters. They are all lignicolous with black, punctiform, nonstriatous sporodochia, which contain muriform conidia that are complanate, generally brown, and have longitudinal and horizontal rows of septa that are darkly pigmented. They have a single basal cell that is delimited from the conidial body in pigmentation, size, and wall thickness. We have found further features that broaden the generic concept of *Canalisporium* and some of these features are noted below.

1. Species of *Canalisporium* are not restricted to a lignicolous habitat because they also occur on decaying parts of the monocotyledons, such as bamboo culms, palm rachides, and leaves of *Freyceina* and *Pandanus*. It is unknown if they also occur on fallen dicotyledonous leaves.

2. The septa in the conidia of most *Canalisporium* species are generally thickly banded and the canals are frequently obscured by this heavy pigmentation. This is not the case in *C. pallidum*, because the conidia are pale with clear septation and conspicuous canals.

3. The ordered arrangement of septa in the conidial body and the presence of septal canals in all *Canalisporium* species is unique amongst taxa of Hyphomycetes. We have examined the type material of *Berkleasmium leonense* M.B. Ellis (IMI 103399a), the conidia of which are composed of three-seriate cells (Ellis 1976) and similar to those of *C. pulchrum*. *Berkleasmium leonense*, however, is not a *Canalisporium* because its conidia lack septal canals, although the conidia are pale with thin, unpigmented septa.

4. The three smaller cells at the base of the conidia in *C. kenyense* are extraordinary, because most species have a single basal cell.

5. Nawawi and Kuthubutheen (1989) noted that conidial secession in *Canalisporium* was schizolytic and proposed this as one of the criteria separating *Canalisporium* species from *Berkleasmium*, which apparently has rhizolytic conidial secession. We have observed conidial secession in *Canalisporium* to be rhizolytic because minute frills of wall remnants are seen at the base of the conidia (Figs. 11, 22, 31). This mechanism is also seen in *Berkleasmium leonense*. In this case, the mechanism of conidial secession is no longer a separating feature between *Canalisporium* and *Berkleasmium*.  

6. The conidiophores in *Canalisporium* are described by Nawawi and Kuthubutheen (1989) as semi-macronematous to macronematous. We have observed the conidiophores to be hypha-like (micronematous) or barely distinguishable from vegetative hyphae (semi-macronematous). They are normally aggregated in a loose fascicle (Fig. 17). The conidiophores are initially more or less cylindrical (Figs. 47, 48) and eventually give rise to a single crop of conidia. Conidium ontogeny and maturation are synchronous so that conidia from each sporodochium are more or less the same in terms of size, number of cells, and pigmentation. Developing conidia are normally embedded in a hyaline gelatinous sheath that may persist when the conidia mature. No proliferation is seen in the conidiophores. When the conidia mature, the hypha-like conidiophores swell and the cells become vesiculate (Figs. 2, 5, 7, 24). These swollen cells eventually disintegrate and the crop of mature conidia are released. Occasionally, one or more of these vesiculate cells may still be attached to the base of the conidia after conidial secession (Figs. 3, 6, 25, 26). This phenomenon, however, is more frequently encountered in *C. caribense*. Detached conidia that occasionally or consistently bear one or more vesiculate cells at the base are also seen in other hyphomycetes, e.g., *Berkleasmium corticola* (Karst.) Moore (Sharma 1980), *Dictyosporium gauntii* Bhat and Sutton (1985), *Monodictys paradoxus* (Corda) S. Hughes (Hughes 1951), and *Onkopodium antonii* Sacc. (Ellis 1971). Whether this character is the result of conidogenesis and conidial sc-
Figs. 49–63. Conidia of *Canalisporium* spp. drawn at the same scale for comparison; scale bar = 20 μm. Figs. 49–56. *Canalisporium caribense* from various collections. Fig. 49. Brunei (*HKU(M) 2910*), on submerged wood. Fig. 50. Brunei (*HKU(M) 4902*), on *Freylinetta* sp. Fig. 51. Brunei (*HKU(M) 4904*), on Pandanus sp. Fig. 52. Hong Kong (*HKU(M) 3342*), on submerged wood. Fig. 53. Hong Kong (*HKU(M) 3401*), on bamboo culm. Fig. 54. Malaysia (*HKU(M) 2883*), on submerged wood. Fig. 55. Philippines (*HKU(M) 4006*), on *Freylinetta multiploa*. Fig. 56. Vanuatu (*HKU(M) 4901*), on Pandanus tectorius. Fig. 57. *Canalisporium exiguum* (*HKU(M) 3349*, holotype), on submerged wood from Australia. Note that the size of the conidia is distinctly smaller when compared with those of *C. caribense* and other *Canalisporium* species from various collections. Fig. 58. *Canalisporium pallidum* (*HKU(M) 5903*, holotype), on submerged wood from Hong Kong. Fig. 59. *Canalisporium kenyense* (*HKU(M) 3350*, isotype) on rotten wood from Kenya. Fig. 60. *Canalisporium elegans* (*HKU(M) 4907*) on *Freylinetta* sp. from Brunei. Figs. 61–63. *Canalisporium pulchrum* from various collections. Fig. 61. Australia (*HKU(M) 3192*), on submerged wood. Fig. 62. Brunei (*HKU(M) 2911*), on submerged wood. Note that this collection has a wide range of conidial size. Fig. 63. Hong Kong (*HKU(M) 4741*), on submerged wood.
cession similar to that found in *Canalisporium* species awaits further observations.

7. Species of *Canalisporium* have been successfully grown in pure culture (Matsushima 1987; Nawawi and Kuthubutheen 1989). We have also obtained several isolates of *C. caribense* from our collections. The colonies are slow-growing, dark brown, effuse, lacking aerial mycelium and comprise septate, straight, moderately branched, dark olivaceous, smooth hyphae. Chlamydoospores in culture have been reported by Matsushima (1987). Neither clamp connections nor septal canals have been observed in the mycelium.

8. Fossilized spores of *Pleospora farlowiana* Rehm and an unnamed fossilized fungus are illustrated by Pirozynski and Weresub (1979). These spores are fossilized conidia characteristic of *C. caribense*. This indicates that species of *Canalisporium* may have existed since the Miocene and represent a group of ancient fungi that were ecologically significant as saprobes on decaying plant material.

Based on the above information, the generic concept of *Canalisporium* is hereby emended as follows:

**Canalisporium** Nawawi & Kuthub. emend Goh & K.D. Hyde.  
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Habitat on decaying plant material. Sporangia on natural substrates scattered, punctiform, pulvinate, granular, black, glistening. Mycelium immersed in the substrata, composed of branched, septate, smooth-walled, pale to brown hyphae. Stromata none or rudimentary. Conidiophores micromatous to semi-macromatous, loosely fasciculate, simple or sparsely branched, subhyaline or lightly pigmented, smooth-walled, septate, becoming vesiculate and disintegrating as conidia mature. Conidigenous cells integrated, terminal, determinate, giving rise to a single crop of conidia that matures synchronously. Conidial secession rheolytic. Conidia acrogenous, holoblastic, developing in a hyaline gelatinous sheath, solitary, pale or pigmented, smooth-walled, muriform, with ordered arrangement of vertical and transverse septa, one-cell layer thick and flattened dorsiventrally, usually with a single basal cell, but one with three small cells at the base. Cell lumen connected by septal canals that are normally barrel shaped and pigmented.

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**References**


