New species of *Dictyosporium* and *Digitodesmium* from submerged wood in Yunnan, China

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Dictyosporium canisporum sp. nov., *D. tetraploides* sp. nov. and *Digitodesmium heptasporum* sp. nov. collected from wood submerged in several forest streams of Yunnan, China, are described in this paper. Each new taxon is illustrated and compared with similar taxa.

Keywords: anamorphic fungi, freshwater fungi, lignicolous fungi, systematics, taxonomy.

In our investigation of freshwater fungi in southern China, we found that *Dictyosporium* is a common genus on submerged wood (Cai & al. 2002a, 2003). In recent collections, we have identified two further species of *Dictyosporium* from a forest stream in Tangchi, Kunming, Yunnan and from a small stream near Menglun, Xishuangbanna, Yunnan. Critical examinations show that they are new to science. These taxa are therefore, described, illustrated and compared with similar taxa.

Digitodesmium P. M. Kirk is similar to *Dictyosporium* Corda in having brown, cheiroid, euseptate conidia produced in sporodochia. Cai & al. (2002b) discussed the morphological distinctions between these two genera. In a recent collection from a small stream in Jinghong, Xishuangbanna, Yunnan, we identified a new species of *Digitodesmium* which produce conidia with 7 rows of cells. This taxon is described here.

Materials and methods

Submerged wood samples were collected by L. Cai from streams in Yunnan, China. Samples were processed and examined following

the methods described in Cai & al. (2002a). Single spore isolations were made on corn meal agar (CMA) (Choi & al., 1999) and the cultures were deposited in HKUCC. Type specimens were deposited in HKU(M). Observations and photographs were made from materials mounted in water. The widths of the conidia were measured at the widest point. The range between minimum and maximum values for microscopic measurements is given. Mean values are in brackets with "n" being the number of items measured.

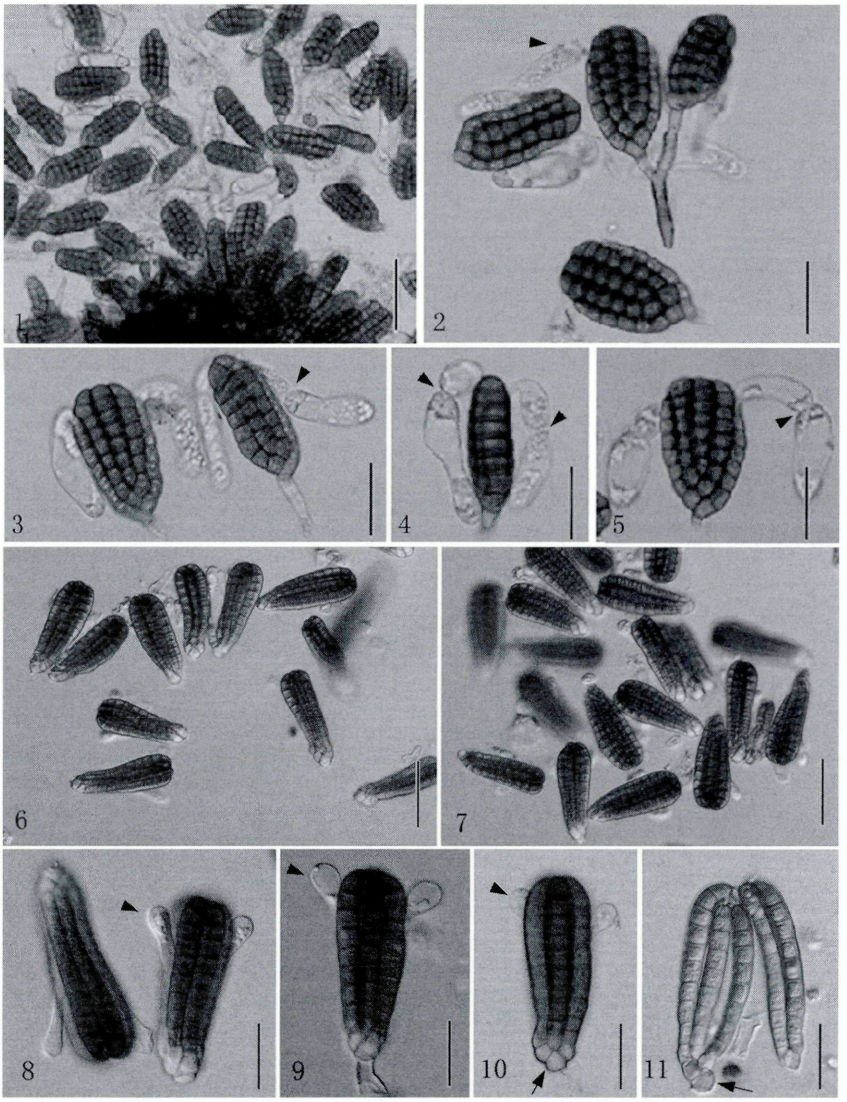
Taxonomy

Dictyosporium canisporum L. Cai & K. D. Hyde, **sp. nov.** – Figs. 1–5.

Sporodochia in substrato naturali 250–600 µm, punctiformia, dispersa, nigra, granulata. Conidiophora micronemata, mononemata, pallide brunnea, laevia, tenuitunicata, septata, ramosa, cylindrica. Cellulae conidiogenae monoblasticae, integratae, pallide brunneae, laeves, tenuitunicatae, cylindricae, cuneiformes, determinatae. Conidiorum secessio rhexolytica. Conidia (27.5–)32.5–47.5 × 20–25 µm, cheiroidea, complanata, atro-brunnea, laevia, euseptata, holoblastica, e 20–44 cellulis 4–5-seriatis composita, cellula apicalis brachii appendice hyalina, leptodermia, cylindrica, 24–51 × 10 6–10.5 µm.

Sporodochia on natural substratum 250–600 µm diam, punctiform, scattered, black, granular. Mycelium mostly immersed, composed of brown, smooth, thin-walled, septate, branched hyphae. – Conidiophores micronematous, mononematous, pale brown, smooth, thin-walled, septate, branched, cylindrical, some persistent at conidial maturity. – Conidiogenous cells monoblastic, integrated, pale brown, smooth, thin-walled, cylindrical, cuneiform, determinate. Conidial secession rhexolytic. – Conidia (27.5–)32.5–47.5 × 20–25 µm ($\bar{x}$ = 41.5 × 23 µm, n = 25), cheiroid, complanate, medium brown, becoming dark brown with maturity, smooth, euseptate, holoblastic, one-celled thick and flattened, in surface view fan-shaped, somewhat obovoid, in lateral view cylindrical or clavate, consisting of 20–44 cells arranged in 4–5 rows. Rows flattened, not separating, united by a 4–5 µm wide, pale brown, cubical, truncate basal cell. The outer rows are usually shorter. The terminal cells of the inner rows are usually larger than other cells in the conidium (Figs. 2–5). The apical cells of the outer two rows are provided with an appendage which is hyaline, thin-walled, cylindrical, membrane borne, 1–2 celled, constricted at septum, measuring 24–51 × 6–10.5 µm (Figs. 3–5).

Colonies on CMA reaching 1.5 cm diameter after 1 week at room temperature (~23 °C), cottony, with abundant aerial mycelium, margin entire, white from above, reverse pale yellow. Hyphae up to 3 µm wide, flexuous, hyaline, smooth-walled, septate, branched and sterile after 3 months incubation.



Figs. 1–11. – Figs. 1–5. Interference contrast micrographs of *Dictyosporium canisporum* (from holotype). – 1. Squash mount of sporodochium with conidia. – 2–5. Conidia with appendages (arrowhead). Note the appendages constricted at septa (arrowhead) in 3, 4 and 5. – 2. Conidia attached to conidiophore. – 4. Side view of conidium. – Bars: 1 = 40 µm; 2–5 = 20 µm. – Figs. 6–11. Interference contrast micrographs of *Dictyosporium tetraploides* (from holotype). – 6, 7. Squash mount of sporodochium with conidia. – 8–11. Conidia with appendages (arrowhead) and basal cells (small arrows). – 11. Conidium only show 5 arms divergent when under pressure. – Bars: 6, 7 = 40 µm; 8–11 = 20 µm.

Holotype. – China, Yunnan, Tangchi, on submerged wood, 21 June 2002, L. Cai, HKU(M) 17156; living culture in HKUCC 9176. Paratype: China, Yunnan, Tangchi, on submerged wood, 21 June 2002, L. Cai, HKU(M) 17157.

Teleomorph. – Unknown.

Etymology. – "*canisporum*", referring to the conidia which have two appendages hanging off like a dog's head.

Habitat. – Saprobic on submerged wood.

Distribution. – China.

Dictyosporium canisporum is distinct in having pluricellular conidia with two hyaline, constricted, long and massive appendages borne from the two outer rows of the conidia. The pluricellular appendages with constriction at septa have not been observed in other species of *Dictyosporium*. *D. canisporum* is most comparable to *D. alatum* Emden (Emden, 1975), which has complanate and similarly shaped conidia composed of 5 rows of cells. *Dictyosporium canisporum*, however, is distinguished in having conidia with 4–5 rows of cells; the conidia are consistently darker, longer (32.5–47.5 × 20–25 µm vs. 26–32 × 15–24 µm) and have larger appendages (24–51 × 6–10.5 µm vs. 20–25 × 5 µm).

Dictyosporium tetraploides L. Cai & K.D. Hyde, **sp. nov.** – Figs. 6–11.

Sporodochia in substrato naturali 180–310 µm diam, punctiformia, dispersa, nigra, granulata. Conidiophora micronemata, mononemata, hyalina, laevia, tenuitunicata, septata, ramosa, cylindrica, brevia. Cellulae conidiogenae monoblasticae, integratae, subhyalinae vel hyalinae, laeves, tenuitunicatae, cylindricae, cuneiformes, determinatae. Conidiorum secessio rhexolytica. Conidia 52.5–72.5 × 18.5–26.5 µm, cheiroidea, non-complanata, atro-brunnea, laevia, euseptata, holoblastica, cylindrica vel clavata, 5-seriata, cellula basilari 4–6 µm diam, subhyalinae vel hyalinae, cubica, truncata. Cellulae exterium serium appendicibus hyalinis, tenuitunicatis, cylindricis vel clavatis, 10–25 × 5–10 µm praeditae.

Sporodochia on natural substratum 180–310 µm diam, punctiform, scattered, black, granular. Mycelium mostly immersed, composed of brown, smooth, thin-walled, septate, branched hyphae. – Conidiophores micronematous, mononematous, hyaline, smooth, thin-walled, septate, branched, cylindrical, short, deteriorating at conidial maturity. Conidiogenous cells monoblastic, integrated, subhyaline to hyaline, smooth, thin-walled, cylindrical, cuneiform, determinate. Conidial secession rhexolytic. – Conidia 52.5–72.5 × 18.5–26.5 µm ($\bar{x}$ = 63 × 22 µm, n = 25), cheiroid, cell rows arranged in several layers, medium brown, becoming dark brown with maturity, smooth, euseptate, holoblastic, cylindrical to clavate, corn-shaped, consisting of 48–57 cells arranged in 5 rows. Rows compact, not separating, arised from a 4–6 µm wide, subhyaline to

hyaline, cubical, truncate basal cell (Figs. 8–10). Each row of cells 6–7 µm wide, consisting of 9–12 cells, terminating in an incurved hook. The subapical cells of the outer rows are provided with an appendage which is hyaline, thin-walled, cylindrical to clavate, membrane borne, unicellular, measuring 10–25 × 5–10 µm. Mostly 2 appendages on each conidium. These rows of cells are tightly appressed together as a cylinder and separate only under pressure (Fig. 11).

Colonies on CMA reaching 2 cm diameter after 1 week at room temperature (~23 °C), fully appressed, margin entire, white, reverse white.– Hyphae 2–3 µm wide, hyaline, septate, branched and smooth-walled, sterile after 3 months incubation.

Holotype. – China, Yunnan, Xishuangbanna, Menglun, a small stream, on submerged wood, 21 June 2002, L. Cai, HKU(M) 17146. Living culture in HKUCC 9177. Paratype: China, Yunnan, Xishuangbanna, Menglun, a small stream, on submerged wood, 21 June 2002, L. Cai, HKU(M) 17147.

Teleomorph. – Unknown.

Etymology. – "*tetraploides*", referring to the similarity of these conidia to those produced by species of the genus *Tetraploa*.

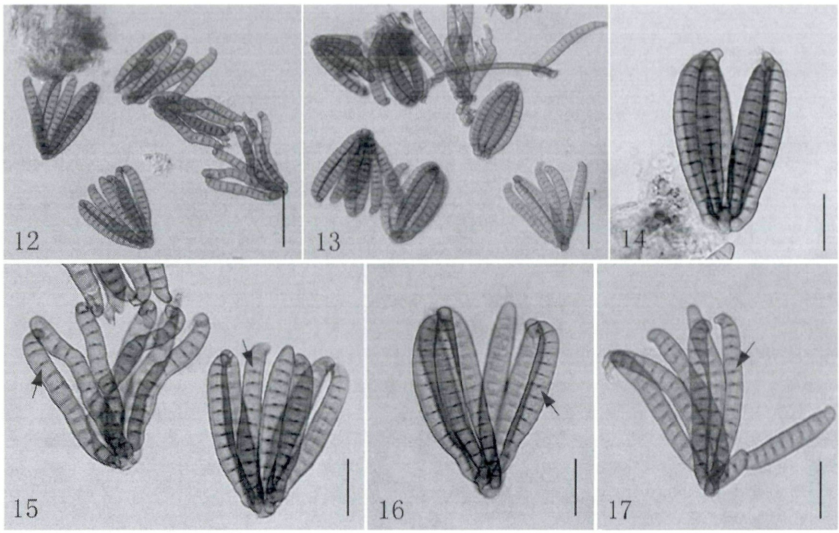
Habitat. – Saprobic on submerged wood.

Distribution. – China.

Dictyosporium tetraploides is most comparable to *D. musae* Photita (Photita & al. 2002) which superficially resembles our species in conidial shape, color and appendages. *Dictyosporium tetraploides*, however, has 5 rows of cells rather than 7 rows of cells as in *D. musae*. *Dictyosporium alatum* van Emden, *D. bulbosum* Tzean & J. L. Chen, *D. elegans* Corda and *D. zeylanicum* Petch have 5 rows of cells but their conidia are complanate. In addition, *Dictyosporium elegans* and *D. zeylanicum* differ in lacking appendages. *Dictyosporium alatum* and *D. bulbosum* also differ in having smaller conidia (26–32 × 15–24 µm in *D. alatum* and 27–46 × 11–30 µm in *D. bulbosum* vs. 52.5–72.5 × 18.5–26.5 µm in *D. tetraploides*), (Goh & al. 1999).

Digitodesmium heptasporum L. Cai & K.D. Hyde, **sp. nov. –** Figs. 12–17.

Sporodochia in substrato naturali 150–300 µm diam, punctiformia, dispersa, atro-brunnea vel nigra, granulata. Conidiophora semi-macronematosa, mononemata, pallide brunnea, laevia, tenuitunicata, non-ramosa, cylindrica, brevia, flexuosa. Cellulae conidiogenae monoblasticae, integratae, pallide brunneae, laeves, tenuitunicatae, cylindricae, determinatae. Conidiorum secessio schizolytica. Conidia 50–75 × 32.5–70 µm, cheiroidea, non-complanata, pallide brunnea, laevia, euseptata, holoblastica, solitaria, (6)–7-seriata, ramis 47–67.5 × 7–8.7 µm, 10–16-euseptatis, discretis, cylindrica, divergentia, septis poro praeditis, apicem incurvata, composita, non appendiculata.



Figs. 12–17. Interference contrast micrographs of *Digitodesmium heptasporum* (from holotype). – 12, 13. Squash mount of sporodochium with conidia. – 14–17. Conidia. Note the conspicuous septal pores (small arrows) – Bars: 12, 13 = 40 µm; 14–17 = 20 µm.

Sporodochia on natural substratum 150–300 µm diam, punctiform, scattered, grey to dark brown, granular. Mycelium mostly immersed, composed of brown, smooth, thin-walled, septate, branched hyphae. – Conidiophores semi-macronematous, mononematous, pale brown, smooth, thin-walled, unbranched, cylindrical, short, flexuous, deteriorating at conidial maturity. Conidiogenous cells monoblastic, integrated, pale brown, smooth, thin-walled, cylindrical, terminal, determinate. Conidial secession schizolytic. – Conidia 50–75 × 32.5–70 µm ($\bar{x}$ = 61 × 50.5 µm, n = 25), cheiroid, cell rows arranged in several layers, pale brown, smooth, euseptate, holoblastic, solitary, consisting of 70–110 cells arranged in (6)–7 rows. Rows mostly separating at the apex, united by a 5–6.5 µm wide, pale brown, cubical, truncate basal cell. Each row of cells 47–67.5 × 7–8.7 µm, consisting of 11–17 cells, discrete, unbranched, cylindrical, with conspicuous pores in the septa (Figs. 14–17), apical cells narrower than middle cells and mostly recurved, conidial appendages absent (Figs. 14–17).

Holotype.– China, Yunnan, Xishuangbanna, Menglun, a small stream, on submerged wood, 21 June 2002, L. Cai, HKU(M) 17158.

Teleomorph. – Unknown.

Etymology. – *heptasporum,* referring to the conidia with 7 rows of cells.

Habitat. – Saprobic on submerged wood.
Distribution. – China.

There are presently four species in the genus *Digitodesmium*. *D. heptasporum* is distinct from the other species in having conidia with 7 rows of cells (vs. 3–4 in *D. elegans* P. M. Kirk, 4–6 in *D. recurvum* W. H. Ho, K. D. Hyde & Hodgkiss and 3 in *D. bambusicola* L. Cai, K. Zhang, McKenzie, W. H. Ho & K. D. Hyde) (Cai & al. 2002b, Ho & al. 1999). No culture was obtained.

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