

New species of *Cordana* and *Spadicoides* from decaying bamboo culms in China

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Cordana uniseptata sp. nov. occurring on submerged and terrestrial bamboo culms and *Spadicoides minuta* sp. nov. occurring on submerged bamboo culms were collected from Yunnan, China. Both species are described, illustrated and compared with similar taxa.

Keywords: anamorphic fungi, freshwater fungi, bambusicolous fungi, *Phyllostachys bambusoides*, systematics.

The genus *Cordana* Preuss was established for a single species, *C. pauciseptata* Preuss (Preuss 1851). *Cordana* is characterized by macronematous, mononematous, unbranched conidiophores with polyblastic, integrated, sympodial conidiogenous cells with small denticles and acropleurogenous, ellipsoid to ovoid, pale to dark brown conidia that often have a protuberant hilum (Ellis 1971, Markovskaja 2003). *Cordana* was reviewed by Castañeda Ruiz & al. (1999), 11 species were accepted and the other 6 names were transferred to other genera or treated as synonyms. However, Markovskaja (2003) pointed out that *C. miniumbonata* R.F. Castañeda (Castañeda Ruiz & al. 1999) should not be included in *Cordana* because the conidial shape and septation mode differ from those typical for the genus.

The genus *Spadicoides* S. Hughes was established by Hughes (1958) for *S. bina* (Corda) S. Hughes. It is characterized by macronematous, mononematous conidiophores with polytretic, integrated conidiogenous cells and acropleurogenous, solitary, obovoid to ellipsoid conidia (Ellis 1971, Holubová-Jechová 1982, Goh & Hyde 1996). The genus was reviewed by Goh and Hyde (1996) and 21 species were accepted. Recent additions include *Spadicoides palmicola* (Goh &

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Hyde 1998), *S. bambusicola* (Zhou & al. 1999), *S. mauritiana* (Dulyamamode & al. 1999), *S. hodgkissii* and *S. arengae* (Ho & al. 2002), and *S. versiseptatis* (Wong & al. 2002).

During our study of bambusicolous and freshwater fungi (e.g. Cai & al. 2002, 2003, Zhou & Hyde 2002), two anamorphic species were found on culms of the bamboo *Phyllostachys bambusoides* in Yunnan, China. Critical examination of their morphological characteristics showed that they are new species of *Cordana* and *Spadioides*. They are described, illustrated and compared to similar taxa.

Materials and methods

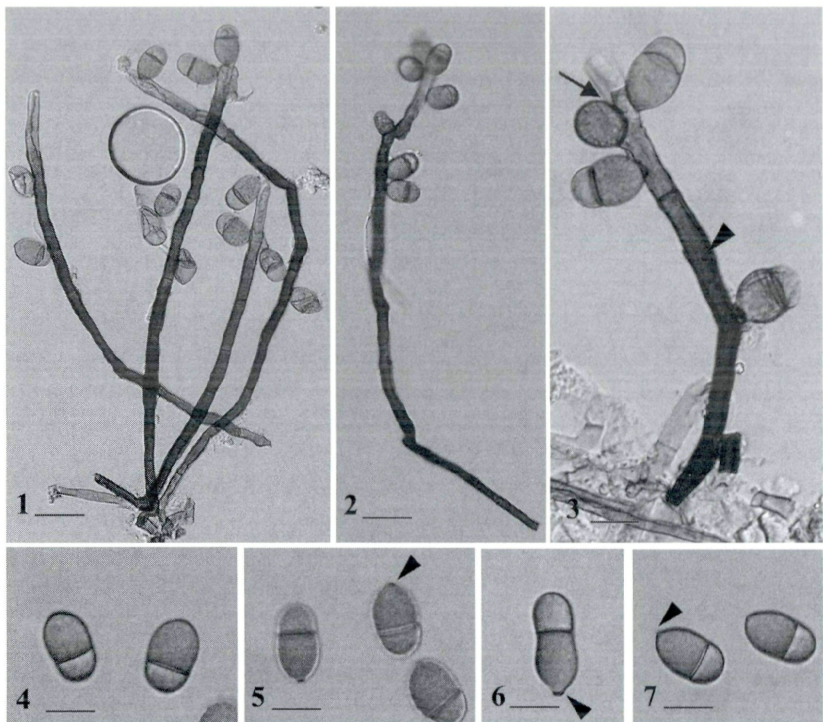
Dead bamboo culms of *Phyllostachys bambusoides* were collected from or near a small forest stream in Yiliang, Kunming, Yunnan, China. Some samples were collected from the stream in which the bamboo culms had been submerged for an undetermined period. Other samples were collected from the bank along the stream. Samples were processed and examined following the methods described in Cai & al. (2002). Single spore isolations were made on corn meal agar (CMA) (Choi & al. 1999). Cultures were deposited in HKUCC and CBS. Type specimens were deposited in HKU(M). Observations and photographs were made from materials mounted in water. The conidia were measured at their 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

Cordana uniseptata L. Cai, McKenzie & K. D. Hyde, **sp. nov.** – Figs. 1–7.

Coloniae effusae, atro-brunneae, pilosae. Mycelium partim superficiales, partim in substrato immersum, ex hyphis ramosis, septatis, laevibus, tenuitunicatum, subhyalinis vel pallide brunneis compositum. Conidiophora macronemata, mononemata, erecta, solitaria, laevia, crassitunicata, septata, non ramosa, recta vel flexuosa, 75–275 × 4.5–6 µm, proliferantes percurrente. Cellulae conidiogenae polyblastica, integratae, terminales, sympodiales, denticulatae. Conidia 13.5–23 × 8.5–11.5 µm, acropleurogena, solitaria, sicca, tenuitunicata, laevia, recta, 1-euseptata, ad septa leniter constricta, late ellipsoideae; cellula apicalis hemispherica, pallide brunneis; cellula basalis medius brunneis; hilum interdum protrusum, atro-brunneis.

Holotypus. – CHINA, Yunnan, Kunming, Yiliang, on *Phyllostachys bambusoides* submerged in a small forest stream, 6 July 2003, L. Cai, HKU(M) 17163 (Holotype); Living culture in HKUCC-OC00048. Paratypes: *ibid.*, HKU(M) 17164; China, Yunnan, Kunming, Yiliang, on decaying *Phyllostachys bambusoides* culms (terrestrial), 6 July 2003, L. Cai, HKU(M) 17162.



Figs 1–7. *Cordana uniseptata* (from holotype). 1–3. Conidiophores with conidia. Note the proliferation (arrow head) and small denticles (small arrow). 4–7. Conidia. Note the protruding hilum (arrow heads). Scale bars: 1–2 = 20 μm , 3–7 = 10 μm .

Etymology. – *uniseptata*, in reference to the 1-septate conidia.

Habitat. – Saprobic on bamboo submerged in freshwater and on terrestrial bamboo.

Known distribution. – China.

Colonies effuse, dark brown, hairy. Mycelium partly superficial, partly immersed, consisting of branched, septate, smooth, thin-walled, subhyaline to pale brown hyphae. Stroma none. Setae and hyphopodia absent. Conidiophores macronematous, mononematous, erect, solitary, usually smooth, thick-walled, septate, unbranched, straight to flexuous, brown to dark brown at the base, paler and becoming subhyaline towards the apex, 75–275 μm long, more or less uniform in width (4.5–6 μm), occasionally swollen at the apex or base, proliferating percurrently (Figs 1–3). Conidiogenous cells polyblastic, integrated, terminal, becoming intercalary, sympodial, denticulate, with dark brown denticles remaining at the conidiogenous loci (Fig. 3). Conidia 13.5–23 \times 8.5–11.5 μm (MV =

18 × 9.5 µm, n = 30), acropleurogenous, solitary, dry, thin-walled, smooth, straight, 1-euseptate, slightly constricted at the septa, mostly broadly ellipsoid; apical cell hemispherical, pale brown, rounded at the apex; basal cell slightly obconical at the base, medium brown, 1.5–2.5 times the length of the apical cell; hilum protuberant, dark brown (Figs 4–7).

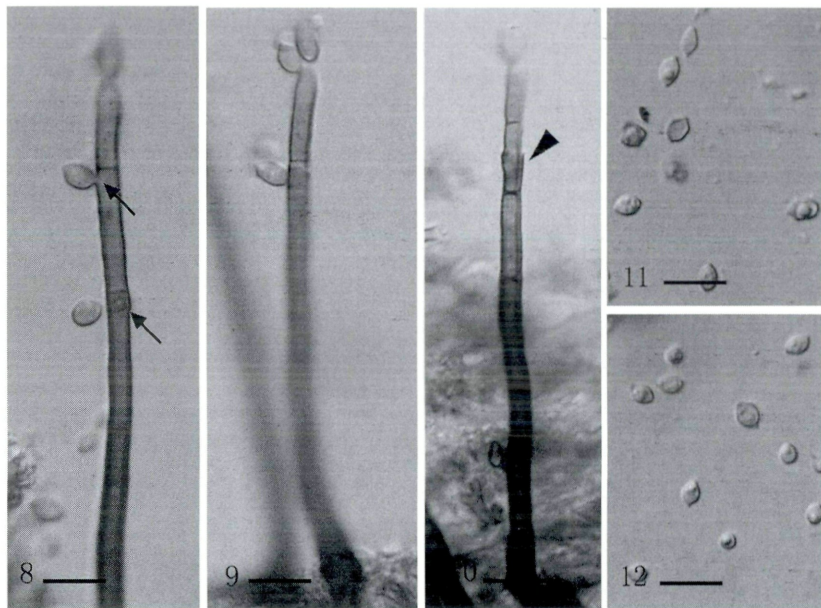
Colonies on CMA slow growing, up to 18 mm diam. after 2 weeks at room temperature (~23°C), superficial, woolly, with copious aerial growth, grey olivaceous, reverse dark brown to black, margin entire. Hyphae up to 3 µm wide, pale yellow, septate, branched and smooth-walled, numerous oil globules. Sterile after 2 months.

Notes. – *Cordana uniseptata* is distinct among *Cordana* species in having conidia with a paler apical cell. Only *C. crassa* Tóth (= *C. boothii* M. B. Ellis) is comparable to *C. uniseptata* in having versicoloured conidia. *Cordana crassa* however, differs in conidial shape (obpyriform vs. broadly ellipsoid) and in its more or less conical apical cell. These two species can also be separated by conidial size (18–27 × 11–15 µm in *C. crassa* vs. 13.5–23 × 8.5–11.5 µm in *C. uniseptata*). Other similar species include *C. andinopatagonica* Gamundí & Aramb., *C. inaequalis* S. Hughes, *C. johnstonii* M. B. Ellis and *C. musae* (Zimm.) Höhn. *Cordana andinopatagonica* differs in having conidia that are wider (10–13 µm vs. 8.5–11.5 µm), obovoid to ellipsoid and concolorous. *Cordana inaequalis* differs in having nodose conidiophores and ellipsoid to ovoid, concolorous conidia. *Cordana johnstonii* resembles *C. uniseptata* in conidial shape but differs in conidial size (20–30 × 12–18 µm vs. 13.5–23 × 8.5–11.5 µm) and its conidia are concolorous with a median septum. *Cordana musae* is similar in conidial size but differs in its obclavate to pyriform, concolorous conidia with the septum towards the base so that the basal cell is smaller than the apical cell (Ellis 1971, Hughes 1983, Castañeda Ruiz & al. 1999).

Spadicoides minuta L. Cai, McKenzie & K. D. Hyde, **sp. nov.** – Figs 8–12.

Coloniae effusae, atro-brunneae, pilosae. Mycelium partim superficiales, partim in substrato immersum, ex hyphis ramosis, septatis, laevibus, tenuitunicatum, subhyalinis, vel pallide brunneis compositum. Conidiophora macronemata, mononemata, erecta, solitaria, laevia, crassitunicata, septata, non ramosa, recta vel leniter flexuosa, atro-brunneae, apice versus pallidiora, 45–120 × 3–4 µm, ad basim 4–5 µm lata, proliferantes percurrente. Cellulae conidiogenae polytreticae, inconidiophoris incorporatae, terminales et intercalares. Conidia 3–6 × 2.5–3.5 µm, acropleurogena, enteroblastica, solitaria, sicca, tenuitunicata, laevia, recta, euseptata, ellipsoideae, mucronatus, guttulae, subhyalinae vel hyalinae.

Holotypus. – China, Yunnan, Kunming, Yiliang, on *Phyllostachys bambusoides* submerged in a small stream, 6 July 2003, L. Cai, HKU(M) 17165. Living culture in HKUCC 10147, CBS 114747. Paratypus: ibid, HKU(M) 17166.



Figs. 8–12. *Spadicoides minuta* (from holotype). 8–10. Conidiophores with conidia. Note the pale coloured pores remaining at the conidiogenous loci (small arrows) and the proliferation (arrow head). 11–12. Conidia. Note the mucronate ends. Scale bars: 8–12 = 10 μ m.

Etymology. – *minuta*, in reference to the conidia, which are very small.

Habitat. – Saprobic on bamboo submerged in freshwater.

Known distribution. – China.

Colonies effuse, dark brown, hairy. Mycelium partly superficial, partly immersed, consisting of branched, septate, smooth, thin-walled, subhyaline to pale brown hyphae. Stroma none. Setae and hyphopodia absent. Conidiophores macronematous, mononematous, erect, solitary, smooth, thick-walled, septate, unbranched, straight to slightly flexuous, dark brown at the base, becoming paler and subhyaline towards the apex or otherwise uniform in colour, 45–120 μ m long, more or less uniform in width at 3–4 μ m, 4–5 μ m wide at the base, occasionally swollen at the apex, proliferating percurrently (Figs 8–10). Conidiogenous cells polytretic, integrated, terminal and intercalary, determinate, with pale coloured pores remaining at the conidiogenous loci (Fig. 8). Conidia 3–6 \times 2.5–3.5 (MV = 4.5 \times 3 μ m, n = 30) μ m, acropleurogenous, enteroblastic, solitary, dry, thin-walled, smooth, straight, unicellular, ellipsoid, mucronate at both ends, guttulate, subhyaline to hyaline (Figs. 11–12).

Colonies on CMA slow growing, up to 12 mm diam. after 2 weeks at room temperature (~23°C), superficial, woolly, with copious aerial growth, grey olivaceous at center, dark brown to black at margin, reverse dark brown to black, concolorous, margin entire. Hyphae 2–3 µm wide, pale yellow, septate, branched and smooth-walled. Sterile after 2 months.

Notes. – Several species of *Spadicoides* have unicellular conidia: *S. arengae* W.H. Ho, Yanna & K.D. Hyde, *S. atra* (Corda) S. Hughes, *S. cuneata* Kuthub. & Nawawi, *S. macrocontinua* Matsush., *S. sphaerospermum* McKenzie and *S. verrucosa* V. Rao & de Hoog. *Spadicoides minuta* differs in conidial shape and size when compared to *S. cuneata* (cuneiform, 9–12 × 6–8 µm), *S. macrocontinua* (obovate, 16–37 × 11–22 µm) and *S. sphaerospermum* (globose, 6–7.5 µm) (Goh & Hyde, 1996). *Spadicoides arengae* has larger (11–18 × 4–6 µm vs. 3–6 × 2.5–3.5 µm) and verrucose conidia as compared to the smooth-walled conidia of *S. minuta*. *Spadicoides verrucosa* and *S. atra* have similar sized conidia to *S. minuta*. However, *S. verrucosa* has verrucose conidia and it grows on other fungi (Goh & Hyde 1996), while the conidia of *S. atra* are brown to dark brown and ellipsoid to obovoid. *Spadicoides minuta*, has subhyaline to hyaline, ellipsoid to broadly ellipsoid, smooth and pale coloured conidia which are mucronate at both ends.

Ho & al. (2002) inadvertently omitted to add the location of the holotype when describing *Spadicoides arengae* W. H. Ho, Yanna & K. D. Hyde. Under the ICBN Article 37.6 the name is invalid and therefore we rectify the situation here.

Spadicoides arengae W. H. Ho, Yanna & K. D. Hyde, *Mycologia* 94: 303, 2002.

Holotypus designated here: BRUNEI DARUSSALAM. TEMBURONG, Batu Apoi Forest Reserve, The University of Brunei Darussalam Kuala Belalong Field Studies Centre (KBFSC), Baki Tributary, on decaying rachis of *Arenga undulatifolia*, 13 Dec 1998, Yanna, HKU(M) 17476.

The orthography of *Spadicoides hodgkissa* also needs correcting to *S. hodgkissii*.

Spadicoides hodgkissii W.H. Ho, Yanna & K.D. Hyde [as '*hodgkissa*'], *Mycologia* 94: 302, 2002.

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