

Six Dematiaceous Conidial Fungi New to Japan from Yakushima Island

Hiroaki Yonezawa¹, Genki Sato¹, Yusuke Hiro², Kazuaki Tanaka¹ and Tsuyoshi Hosoya³

¹ Faculty of Agriculture and Life Science, Hirosaki University,
Bunkyo-cho 3, Hirosaki, Aomori, 036–8561, Japan
E-mail: k-tanaka@cc.hirosaki-u.ac.jp

² Research Center for Pathogenic Fungi and Microbial Toxicoses, Chiba University,
Inohara 1–8–1, Chuo-ku, Chiba, 260–8673, Japan

³ Department of Botany, National Museum of Nature and Science,
Amakubo 4–1–1, Tsukuba, 305–0005, Japan
E-mail: hosoya@kahaku.go.jp

Abstract Six anamorphic fungi new to Japan are described and illustrated. They are *Acrogenospora altissima*, *Bactrodesmium microleucurum*, *Canalisporium exiguum*, *Endophragmiella ontariensis*, *Pestalotiopsis maculiformans* and *Spadicoides bambusicola*. Some taxonomical and ecological information on these species is briefly noted.

Key words: Coelomycetes, Hyphomycetes, mycobiota, saprophytic fungi, taxonomy.

Introduction

Yakushima Island in southern Japan was registered as the World Heritage Area in 1993, due to very rich and unique biological diversity. In the course of a research program of the National Museum of National and Science (Taxonomic research for plants and fungi in areas with remarkable biodiversity in Japan), we observed 114 fungal taxa (49 taxa of ascomycetes and 65 taxa of anamorphic fungi) belonging to 90 genera from Yakushima Island (Tanaka and Hosoya, 2006; Hosoya and Tanaka, 2007a, 2007b). These collected fungi included several species new to Japanese mycobiota. As to Ascomycota, six Loculoascomycetes new to Japan were reported with taxonomic notes (Tanaka and Hosoya, 2006). In this paper, six anamorphic fungi are described from Japan for the first time, and their information on the habitats is noted.

Materials and Methods

Fungal materials on plant substrata were collected during the exploration in October in 2005. Some young materials were matured on moist

paper towels in plastic boxes and stored at ambient temperature for one or two weeks. Specimens were kept in the herbaria of the National Museum of Nature and Science (TNS) and Hirosaki University (HHUF). Cultures were obtained using a Skaerman's micromanipulator (Skerman, 1968) and were deposited in RIKEN BioResource Center (JCM).

Each fungus was observed and measured with an Olympus microscope (BX51) equipped with a Nomarski interference differential contrast objective. In most cases, they were mounted in water, but sometimes mounted in lactophenol (20 g phenol, 20 g lactic acid, and 40 g glycerol in 20 ml distilled water) for long-term observations.

Descriptions

1. *Acrogenospora altissima* (Goid.) Goh, K. D. Hyde et K. M. Tsui, *Mycol. Res.* **102**: 1310, 1998. [Figs. 1, 7]

Teleomorph: *Farlowiella australis* Dennis, *Results Norweg. Exped. T. da Cunha* **36**: 10, 1955.

Colonies effuse, black. Conidiophores dark brown to black, 7–10-septate, 150–300 μm long, 6–7 μm wide at the base, 4–5 μm wide at the

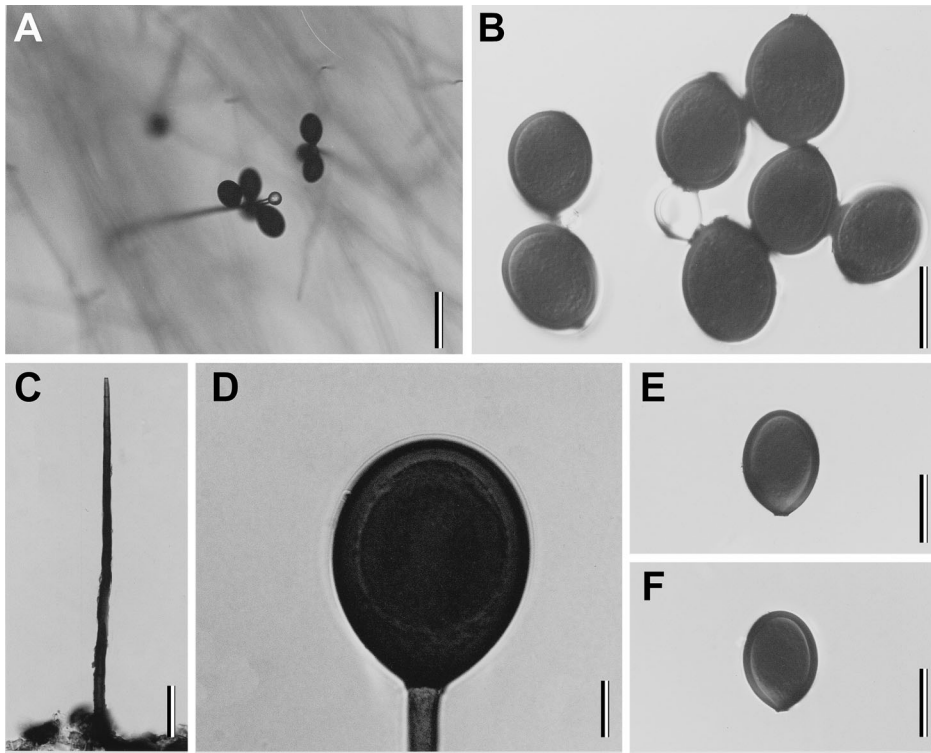


Fig. 1. *Acrogenospora altissima* (TNS-F-12466). A, Conidiophores and conidia on water agar. B, E, F, Conidia. C, Conidiophore. D, Apex of conidiophore and conidium. Scales. A, 100 μm ; B, C, 30 μm ; D–F, 10 μm .

apex, with percurrent proliferations. Conidia black, broadly ellipsoidal, smooth, non-septate, 42–52 \times 29–38 μm (mean 47.6 \times 34.6 μm , $n=30$), truncate at the base.

Material examined: TNS-F-12466=HHUF 29663 (KT 2065), Shiratani-unsui-kyo, Isl. Yakushima, Kagoshima Pref., 18-X-2005, on submerged wood; single conidium culture JCM 15435.

Known distribution: Italy (Goidànich, 1933), Tristan da Cunha (Ellis, 1972).

Note: Species of *Acrogenospora* M. B. Ellis were noted as freshwater fungi in “Genera of freshwater fungi” (Cai *et al.*, 2006a). Actually, we collected this fungus on a submerged wood. Single conidium isolates of *A. altissima* produced conidia abundantly on water agar (20 g agar, 1000 ml distilled water). However, the teleomorph of this species was not observed in natural substratum and culture condition.

We identified this fungus as *A. altissima* based

on the conidial dimension of the specimen. *Acrogenospora altissima* is similar to *A. gigantospora* S. Hughes in the conidial size and blackish color of the conidia, but they differ from each other in the shape of conidia (Goh *et al.*, 1998b). Goh *et al.* (1998b) observed that the conidia of *A. altissima* are more elongated and slightly narrower than those of *A. gigantospora*.

2. ***Bactrodesmium microleucurum*** (Speg.) M. B. Ellis, Mycol. Pap. **103**: 37, 1965. [Figs. 2, 8] Teleomorph: Unknown.

Sporodochia scattered, black, punctiform. Conidiophores short, formed from sporodochia, fasciculate, usually unbranched, flexuous, smooth, septate. Conidiogenous cells monoblastic, terminal, cylindrical. Conidia obovate to clavate, 35–46 \times 20–28 μm (mean 40.4 \times 23.7 μm , $n=30$), L/W 1.5–2.1 (mean 1.7, $n=30$), mostly with 4 (rarely 5) transverse septa with broad black band, dark brown to black at the upper

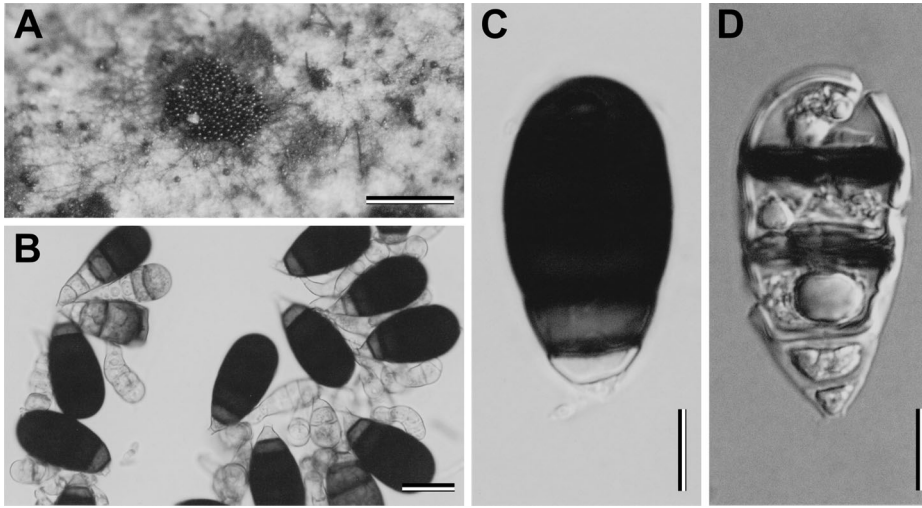


Fig. 2. *Bactrodesmium microleucurum* (TNS-F-12423). A. Sporodochia on host. B. Immature and mature conidia. C. Conidium. D. Bleached conidium. Scales. A, 200 μm ; B, 20 μm ; C, D, 10 μm .

cells, subhyaline to pale brown at the lower cells, truncate at the base (2.5–3.5 μm wide).

Material examined: TNS-F-12423=HHUF 29664 (KT 1879), Miyanoura, Isl. Yakushima, Kagoshima Pref., 19-X-2005, on *Phyllostachys heterocyclus* var. *pubescens* stem; single conidium culture JCM 15433.

Known distribution: Chile (Ellis, 1971), Hong Kong (Lu *et al.*, 2000).

Note: *Bactrodesmium microleucurum* could be a rare species as compared to other species of the genus *Bactrodesmium* Cooke. Until now, it has been recorded two times: in Chile from *Chusquea cummingii* (Bambusaceae) (Ellis, 1971) and in Hong Kong from a bamboo (Lu *et al.*, 2000). We also obtained this fungus from culms of *Phyllostachys pubescens*. Therefore, this fungus is considered to have high host preference on bamboos. Sometimes, it was difficult to observe black-banded septa in the conidia of this fungus, although the presence or absence of a band is a very important criterion for specific identification of *Bactrodesmium* species (Ellis, 1971). We tried to bleach the conidia by a sodium hypochlorite solution, and could detect clearly two black bands from the conidia, after few minutes (Fig. 2D).

3. ***Canalisporium exiguum*** Goh et K. D. Hyde, Can. J. Bot. **76**: 145, 1998. [Figs. 3, 9] Teleomorph: Unknown.

Sporodochia scattered, black, punctiform, minute, granular. Conidiophores formed shortly from sporodochia, usually unbranched, septate, hyaline to subhyaline, flexuous, smooth. Conidiogenous cells monoblastic, terminal, cylindrical or inflated. Conidia 17–25 \times 11–15 μm (mean 21.1 \times 12.7 μm , $n=30$), 8–10 μm thick at side, L/W 1.3–1.9 (mean 1.7, $n=30$), flattened, ellipsoidal to obovate in surface view, clavate in lateral view, reddish brown to brown, subhyaline to pale brown at the basal cell, straight or curved, with a vertical septum and 3–4 (rarely 5) transverse septa with black band.

Material examined: TNS-F-12450=HHUF 29669 (KT 1920), forest road along Awao river, Isl. Yakushima, Kagoshima Pref., 21-X-2005, on dead leaf of *Alpinia speciosa*; single conidium culture JCM 15434.

Known distribution: Australia (Goh *et al.*, 1998a; Hyde and Goh, 1998), Thailand (Samrithipol *et al.*, 2004).

Note: This fungus is easily recognized by the most small-sized conidia in the genus *Canalisporium* Nawawi et Kuthub. This species is generally accepted as a freshwater species (Goh *et al.*,

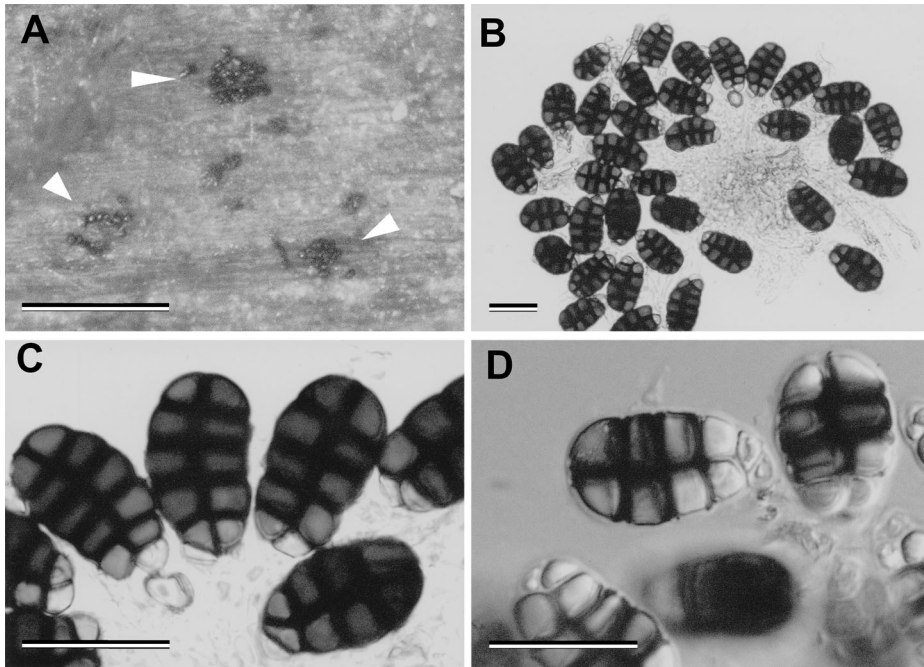


Fig. 3. *Canalisporium exiguum* (TNS-F-12450). A. Sporodochia on host (arrowheads). B. Conidiogenous hyphae and conidia. C. Conidia. D. Bleached conidia. Scales. A, 250 μm ; B, 20 μm ; C, D, 20 μm .

1998a; Hyde and Goh, 1998), because the first record of *C. exiguum* was from a submerged wood in Australia. Recently, the species was reported from Thailand as a seed decay fungus (Samrithipol *et al.*, 2004). We obtained this fungus on a dead leaf of *Alpinia speciosa* fallen on the ground. Therefore, *C. exiguum* probably has various host plants in the aquatic and terrestrial environments.

4. ***Endophragmiella ontariensis*** S. Hughes, *Fungi Canadenses*, Ottawa 128, 1978.

[Figs. 4, 10]

Teleomorph: Unknown.

Colonies effuse, black. Conidiophores brown, unbranched, $42\text{--}52 \times 3\text{--}4 \mu\text{m}$, with percurrent proliferation. Conidia broadly obovoid to oblong, blastic, 2-euseptate, brown at the 2 upper cells, pale brown at the basal cell, $18\text{--}23 \times 10\text{--}13 \mu\text{m}$ (mean $21.1 \times 11.4 \mu\text{m}$, $n=30$).

Material examined: TNS-F-12406=HHUF 29673 (KT 1844), Shiratani-unsui-kyo, Isl. Yakushima, Kagoshima Pref., 18-X-2005, on

bark of *Stewartia monadelphica*. No culture obtained.

Known distribution: Canada (Hughes, 1978b, 1979; Matsushima, 1983), China (Wu and Zhang, 2005).

Note: We identified the above material as *E. ontariensis* (Hughes, 1978b) based on the conidial morphology. This species is similar to *E. fallacia* P. M. Kirk (1981) in the conidial dimension, but differs in having obovoid conidia rather than broadly ellipsoid to cylindrical conidia. *Endophragmiella ontariensis* superficially resembles *E. biseptata* (Peck) S. Hughes, but the latter has larger conidia (vs. $(21\text{--}) 23\text{--}30 \times 12.6\text{--}16.2$ (-18) μm ; Hughes, 1978a).

5. ***Pestalotiopsis maculiformans*** (Guba et Zeller) Steyaert, *Bull. Jard. Bot. État Brux.* **19**: 329, 1949.

[Figs. 5, 11]

Teleomorph: Unknown.

Conidiomata acervular, scattered, punctiform, black, subepidermal. Conidiogenous cells, hyaline, smooth, cylindrical. Conidia annellidic,

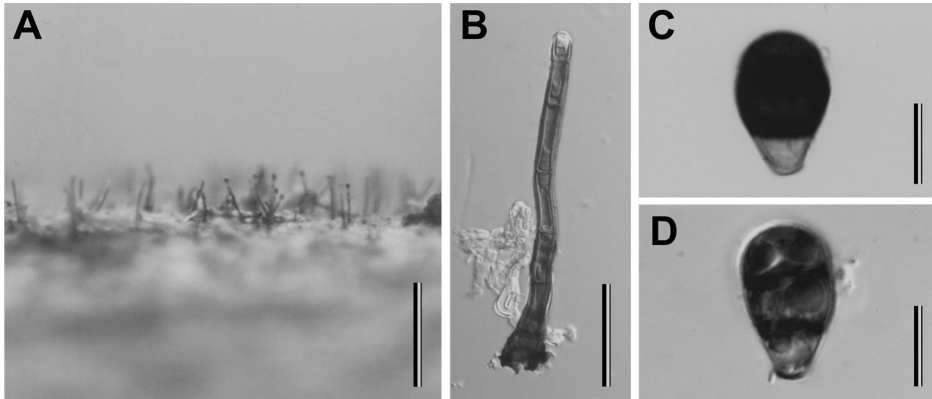


Fig. 4. *Endophragmiella ontariensis* (TNS-F-12406). A. Conidiophores and conidia on host. B. Conidiophore. C, D. Conidia. Scales. A, 250 μm ; B, 30 μm ; C, D, 10 μm .

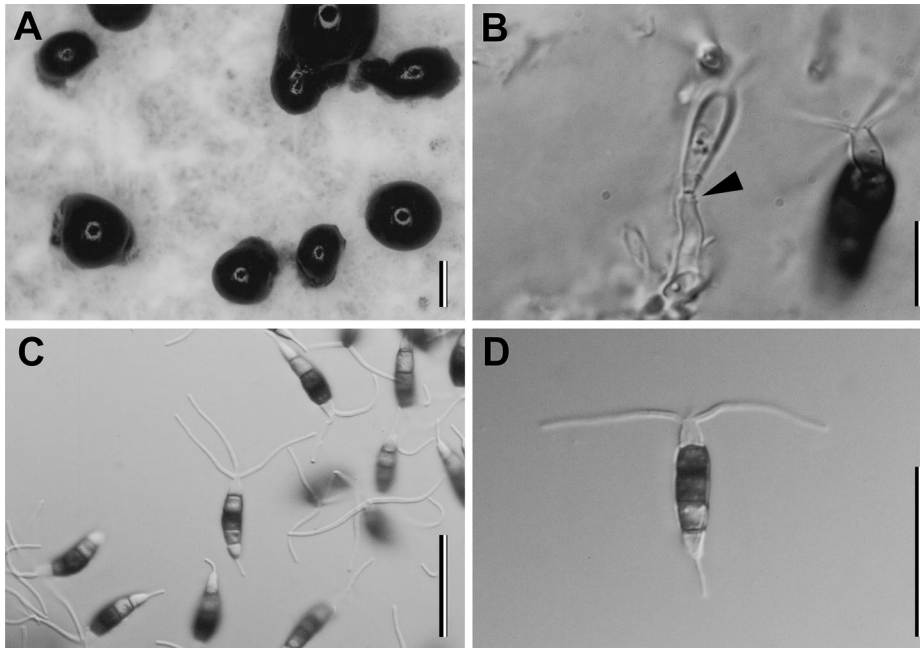


Fig. 5. *Pestalotiopsis maculiformans* (from culture JCM 15437). A. Hyphae and conidiomata on water agar. B. Conidiogenous cell and annellide (arrowhead). C. Conidia with three appendages. D. Conidium with two appendages. Scales. A, 500 μm ; B, 10 μm ; C, D, 30 μm .

fusiform, straight or slightly curved, 20–30 \times 6–9 μm (mean 23.8 \times 8.2 μm , $n=50$), 5-celled; apical cell hyaline, 3–5 μm long, with 3 (rarely 2 or 4) appendages; 3 median colored cells 13–18 μm long, olive-green at the lowest cell, blackish olive at the upper two cells; basal cell hyaline, 3–7 μm long, with single appendage. Apical appendages unbranched, flexuous, 15–30 μm long (mean 20.2

μm , $n=50$). Basal appendages unbranched, flexuous, 3–7 μm long (mean 5 μm , $n=50$).

Material examined: TNS-F-12408, Shiratani-unsui-kyo, Isl. Yakushima, Kagoshima Pref., 18-X-2005, on *Rhododendron* leaf; single conidium culture JCM 15437.

Known distribution: Widespread in the world.

Note: This fungus has been reported from

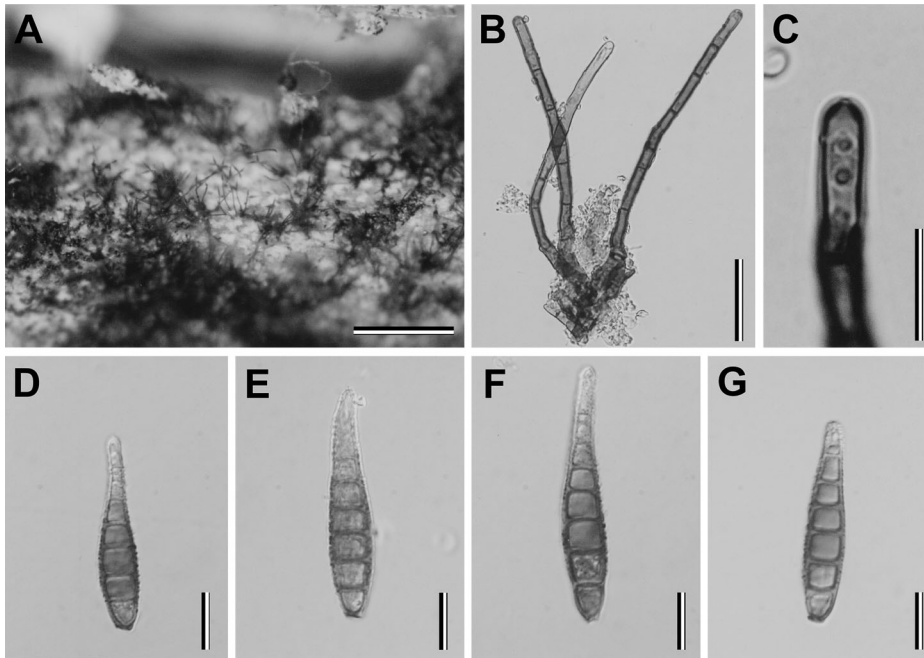


Fig. 6. *Spadicoides bambusicola* (TNS-F-12425). A. Conidiophores and conidia on host. B. Conidiophores. C. Pores of conidiophore. D–G. Conidia. Scales. A, 500 μm ; B, 30 μm ; C–G, 10 μm .

worldwide area including Africa, China (Zhang *et al.*, 2003) and USA (Guba, 1961). However, there had been no report of *P. maculiformans* from Japan. This fungus produced conidia abundantly on water agar. It produced numerous conidiomata-like tar spots on the white-colored colonies under culture (Fig. 5A). Colony growth was very fast; attaining almost 9 cm diameter at 3 days on the water agar.

6. ***Spadicoides bambusicola*** D. Q. Zhou, Goh et K. D. Hyde, in Zhou, Goh, Hyde and Vrijmoed, *Fungal Diversity* 3: 179, 1999. [Figs. 6, 12]

Teleomorph: Unknown.

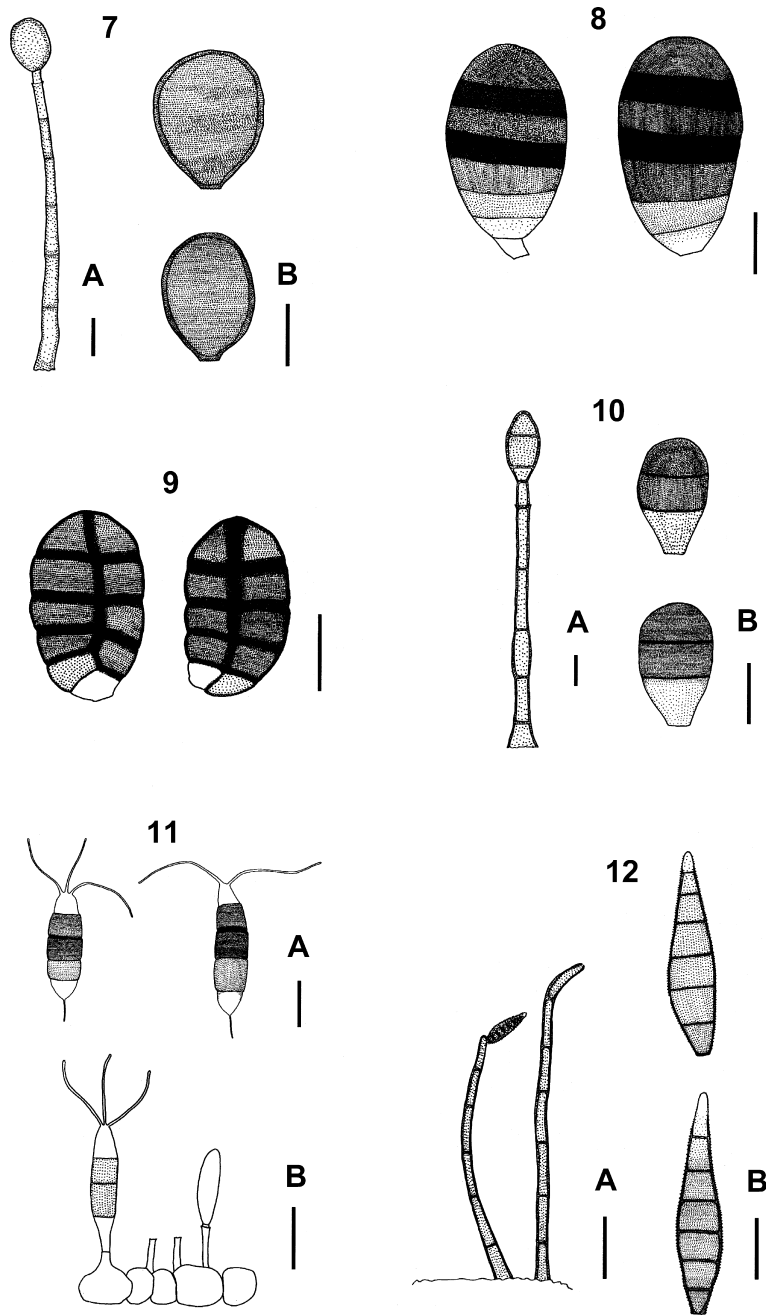
Colonies dense, black to viridescant black. Conidiophores unbranched, brown to dark brown, 10–14-septate, 145–265 \times 3.5–5 μm . Conidiogenous cells polytretic, terminal and lateral. Conidia clavate, brown to pale brown, verrucose, 5–7-septate, 35–45 \times 6–8 μm (mean 40.7 \times 7.3 μm , $n=30$).

Material examined: TNS-F-12425=HHUF 29686 (KT 1881), Miyanoura, Isl. Yakushima,

Kagoshima Pref., 19-X-2005, on *Phyllostachys heterocyclus* var. *pubescens* stem, single conidium culture JCM 15436.

Known distribution: Hong Kong (Zhou *et al.*, 1999), China (Cai *et al.*, 2006b).

Note: The genus *Spadicoides* Hughes is similar to *Diplococcium* Grove in the conidial ontogeny. They have terminal or intercalary, polytretic conidiogenous cells. Goh and Hyde (1996) reviewed the genus *Spadicoides* and distinguished these two genera based on the branching of conidiophores and catenation of conidia. They accepted 21 species in *Spadicoides* (Goh and Hyde, 1996). Later, two species were added recently: *S. palmicola* Goh et K. D. Hyde and *S. heterocolorata* (R. F. Castañeda, Guarro et Cano) Goh et K. D. Hyde (Goh and Hyde, 1998). *Spadicoides bambusicola* has been reported from *Bambusa textilis* (Zhou *et al.*, 1999) and *Phyllostachys bambusoides* (Cai *et al.*, 2006b). The species was found from a bamboo, in the present study. *Phyllostachys heterocyclus* var. *pubescens* was found as a new host of *S. bambusicola*.



Figs. 7–12. Illustrations of conidiophores and conidia of the six fungal species. Fig. 7. *Acrogenospora altissima* (TNS-F-12466) A. Conidiophore and conidium (Bar 50 μm). B. Conidia (Bar 20 μm). Fig. 8. Conidia of *Bactrodesmium microleucurum* (TNS-F-12423) (Bar 10 μm). Fig. 9. Conidia of *Canalisporium exiguum* (TNS-F-12450) (Bar 10 μm). Fig. 10. *Endophragmiella ontariensis* (TNS-F-12406) A. Conidiophore and conidium (Bar 10 μm). B. Conidia (Bar 10 μm). Fig. 11. *Pestalotiopsis maculiformans* (from culture JCM 15437) A. Conidia (Bar 10 μm). B. Conidiogenous cells and immature conidia (Bar 10 μm). Fig. 12. *Spadicoides bambusicola* (TNS-F-12425) A. Conidiophores and conidium (Bar 25 μm). B. Conidia (Bar 10 μm).

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