

SHORT COMMUNICATION

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## Bambusicolous fungi in Japan (7): a new coelomycetous genus, *Versicolorisporium*

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**Abstract** A new genus, *Versicolorisporium*, is established for the coelomycetous fungus collected in Japan on dead culms of the bamboos *Pleioblastus chino* and *Sasamorpha borealis*. The type species of the genus, *V. triseptatum*, is characterized by the production of holoblastic, 3-septate, obovoid, versicolored conidia. *Versicolorisporium* is similar to *Toxosporiella*, *Neohendersonia*, *Toxosporiopsis*, and *Scolicosporium* in having versicolored conidia, but differs from these genera by the uniloculate pycnidial conidiomata with a periphysate ostiole, lacking paraphyses, and the conidia without black-banded septa. A BLAST search using LSU nrDNA sequence indicates that the new genus is a member of Pleosporales, Dothideomycetes.

**Key words** Bamboo · Coelomycetes · Dothideomycetes · Pleosporales · Taxonomy

Bamboo culms, twigs, and leaves are known as substrata with high fungal diversity. Among the anamorphic groups, hyphomycetes represent 21% of the total number (more than 1100 species) of bambusicolous fungi (Hyde et al. 2002). By contrast, only about 100 species of coelomycetes are found on bamboos (Hyde et al. 2002), although some genera with high host preference on bamboos, such as *Pseudolachnella* Teng (Hino 1961; Nag Raj 1993) and *Cytoplea* Bizz. & Sacc. (Kobayashi 1965; Sutton 1980; Hyde et al. 1996), are well studied.

In our ongoing study of bamboo fungi (Shirouzu and Harada 2004; Tanaka and Harada 2004, 2005a,b; Hatakeyama et al. 2005; Tanaka et al. 2005), an interesting coelo-

mycete with versicolored conidia was encountered. However, we could not find any appropriate genus for this fungus based on morphological studies using the available literature (e.g., Morgan-Jones and Kendrick 1972; Morgan-Jones et al. 1972a–d; Morgan-Jones 1974, 1977; Nag Raj 1974, 1977, 1993; Nag Raj and DiCosmo 1978; Michaelides et al. 1979; Carmichael et al. 1980; Sutton 1980; Kiffer and Morelet 2000). Phylogenetic information derived from DNA sequences of the large subunit of the nuclear ribosomal DNA (LSU nrDNA) did not identify an appropriate genus. Therefore, the fungus is described here as a new genus, *Versicolorisporium*.

*Versicolorisporium triseptatum* Sat. Hatak., Kaz. Tanaka & Y. Harada, gen. et sp. nov.

Figs. 1–15

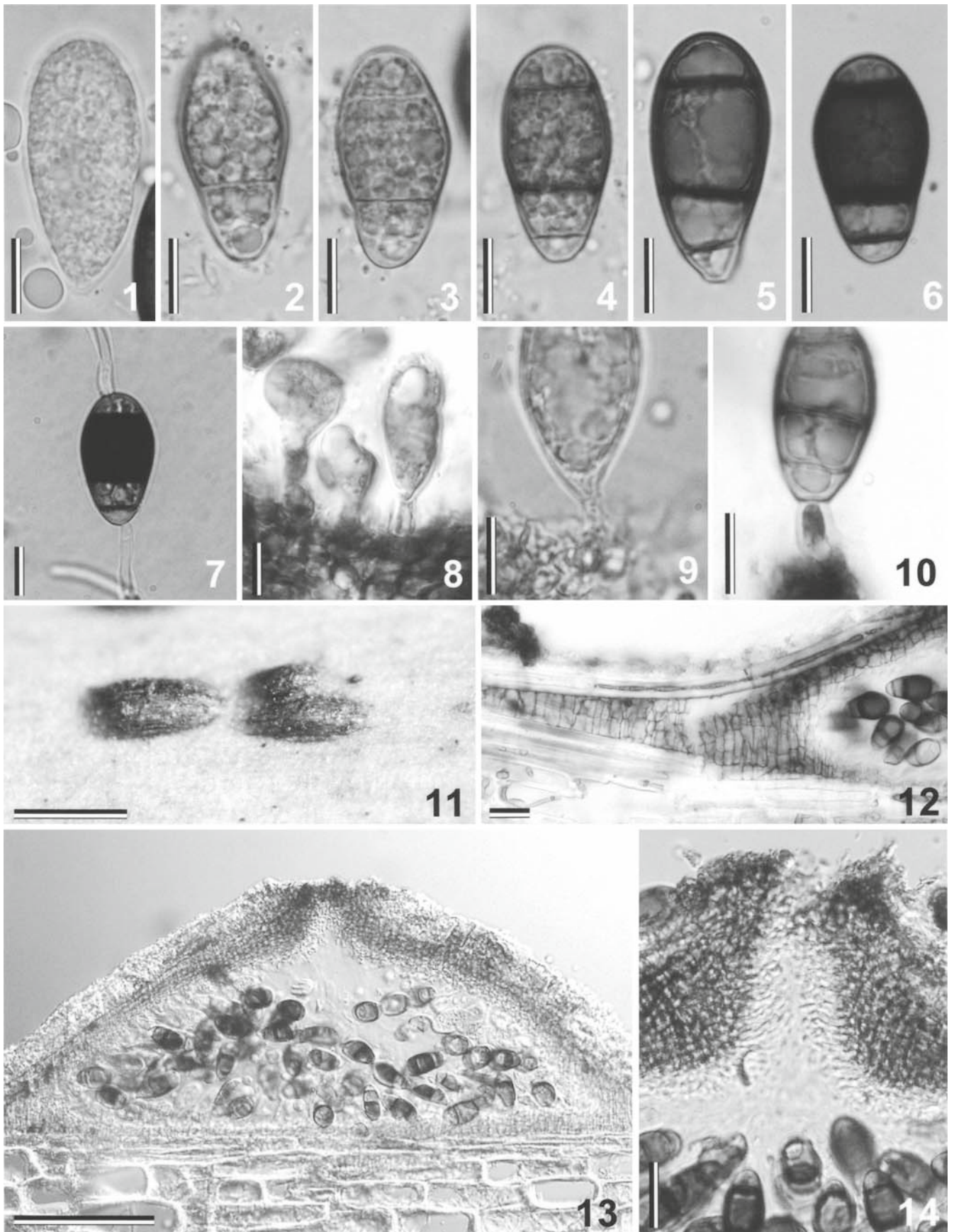
Conidiomata pycnidioidea, subepidermalia, solitaria vel gregaria, unilocularia. Ostiolum leviter papillatum, cum periphysibus hyalinis. Paries conidiomatis ex cellulis pallide brunneis compositus. Paraphyses absentes. Conidiophora absentia. Cellulae conidiogenae ampulliformes vel cylindricae, determinatae, holoblasticae. Conidia obovata, ad apicem rotundata, ad basim truncata, triseptata, cum septo primo submedio, laevia; cellula apicalis pallide brunnea; cellula secunda atrobrunnea; cellula tertia pallide brunnea; cellula basalis hyalina.

Conidiomata pycnidioideum, subepidermale, solitaria vel gregaria, subglobose to depressed globose, black, 100–120 (–200)  $\mu\text{m}$  high, 600–750  $\mu\text{m}$  wide (including rim-like side wall), with a single locule of 250–400  $\mu\text{m}$  diameter. Ostiole slightly papillate, 50–65  $\mu\text{m}$  high, 30–45  $\mu\text{m}$  diameter, provided with short hyaline periphyses of 1.5–2  $\mu\text{m}$  wide. Conidiomatal wall at sides 150–230  $\mu\text{m}$  wide, rim-like, composed of vertically orientated rectangular pale brown cells of 2–12.5  $\times$  2–7.5  $\mu\text{m}$ ; wall around the ostiole composed of globose to polygonal cells of 2–5  $\mu\text{m}$  diameter; wall at the base flattened, poorly developed, 5–10  $\mu\text{m}$  thick, composed of polygonal cells of 2–5  $\mu\text{m}$  diameter. Paraphyses absent. Conidiophores absent. Conidiogenous cells ampulliform to cylindrical, not branched, determinate, holoblastic, bearing

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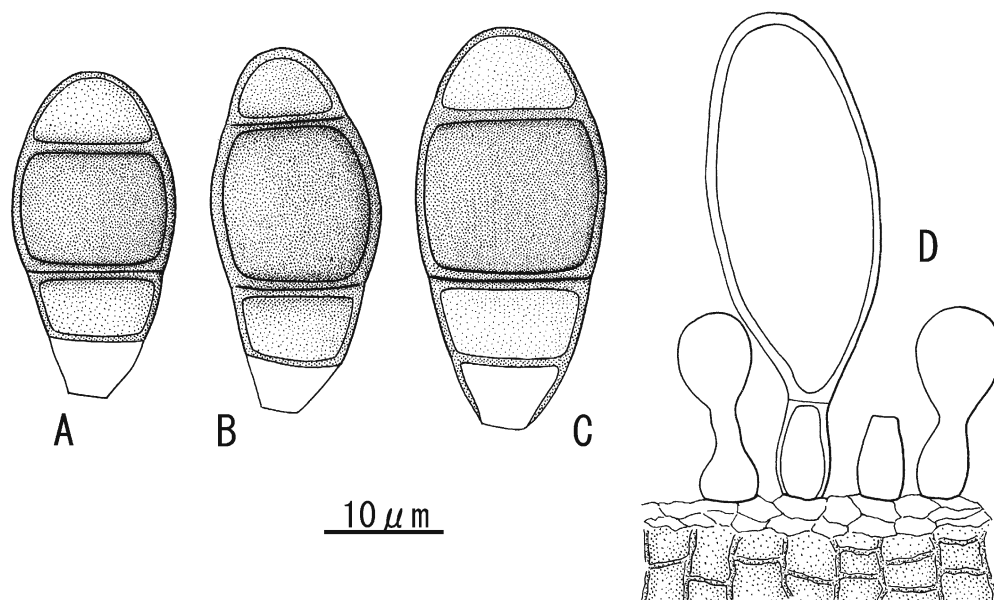
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**Figs. 1–14.** *Versicolorisporium triseptatum*. **1–6** Conidia. **7** Germinating conidium. **8–10** Conidiogenous cells with immature conidia (**8** and **10**, trypan blue stain). **11** Conidiomata on culm surface. **12** Cells at periphery of conidioma. **13** Conidioma in longitudinal section. **14** Ostiole with inner periphyses. **1, 5, 9, 10, 12, 14** from HHUF 28815; **8, 11, 13** from HHUF 28816; **2–4, 6, 7** from culture JCM 14775. *Bars* **1–10** 10  $\mu$ m; **11** 500  $\mu$ m; **12, 14** 20  $\mu$ m; **13** 100  $\mu$ m

**Fig. 15.** Line drawings of *Versicolorisporium triseptatum*. **A–C** Conidia. **D** Conidiogenous cells with immature conidia. **A** from HHUF 28815; **B** from culture JCM 14775; **C, D** from HHUF 28816



a single terminal conidium,  $5\text{--}12 \times 3\text{--}5 \mu\text{m}$ , formed from the inner layer of the conidiomatal wall. Conidia  $26\text{--}36 \times 12.5\text{--}16 \mu\text{m}$  ( $\bar{x} = 30.5 \times 14.7 \mu\text{m}$ ,  $n = 50$ ),  $L/W = 1.8\text{--}2.4$  ( $\bar{x} = 2.1$ ,  $n = 50$ ), obovoid, rounded at the apex, truncate at the base, 3-septate, with a submedian (0.62–0.67) primary septum, smooth; apical cell  $3\text{--}5 \mu\text{m}$  long, pale brown; second cell from the apex  $14\text{--}19 \mu\text{m}$  long, dark brown; third cell  $4\text{--}7 \mu\text{m}$  long, pale brown; basal cell  $3\text{--}5 \mu\text{m}$  long, hyaline.

Holotype: HHUF 28815.

Etymology: “*Versicolorisporium*” from Latin *versicolor* and *spora*, meaning having versicolored conidia; “*triseptatum*” referring to the number of conidial septum.

Cultural characters: Conidia germinate from both poles at room temperature. Colonies on potato dextrose agar attaining a diameter of about 3.3 cm within 3 weeks at  $20^\circ\text{C}$  in the dark, surface velvety in appearance, Dark Green (30F4; Kornerup and Wanscher 1978) with an entire margin; reverse similar; no pigment produced. On malt extract agar attaining a diameter of about 2.1 cm in the same conditions, surface velvety in appearance, Sepia (4F4) with an entire margin; reverse similar; no pigment produced. On rice straw agar (RSA; Tanaka and Harada 2003), abundant conidiomata produced within 2 months. Conidia resemble those found on the host, measuring  $26\text{--}31 \times 14\text{--}16 \mu\text{m}$  ( $\bar{x} = 29.2 \times 14.9 \mu\text{m}$ ,  $n = 50$ ).

Materials examined: On dead culms of *Pleioblastus chino*, Asamizu, Gonohe, Aomori,  $141^\circ 18.0' \text{E}$ ,  $40^\circ 28.1' \text{N}$ , Dec. 2, 2003, K. Tanaka, N. Nakagawara, and S. Hatakeyama 130 (HHUF 28815 holotype; LE 230734 isotype; single conidium isolate JCM 14775); on dead culms of *Sasamorpha borealis*, Hokkaido University Botanical Garden, Sapporo, Hokkaido,  $141^\circ 20.4' \text{E}$ ,  $43^\circ 03.4' \text{N}$ , June 6, 2004, K. Tanaka 198 (HHUF 28816). Dried culture specimens: grown on RSA from culture JCM 14775 (HHUF 28817, 28818).

Notes: One of the most striking features of *Versicolorisporium triseptatum* is the versicolored conidia, which are

formed from holoblastic conidiogenous cells. Papillate conidial initials singly arise as buds from conidiogenous cells. Immature conidia are hyaline, nonseptate, and ellipsoidal (Fig. 1). The primary septum is formed at the submedian position (0.62–0.67), and sequentially apical and basal septa are formed in turn, i.e., the septation sequence (Shoemaker 1984) is 2:1:3 (Figs. 2–6). Subsequently, conidia are pigmented dark brown at the second cell from the apex. Both the first and third cells are also less pigmented than the median cell, and the basal cell remains hyaline.

This fungus superficially resembles the monotypic genus *Toxosporiella* B. Sutton, based on *T. bactrodesmioides* B. Sutton, but differs from the latter in its conidial features. Conidia of *T. bactrodesmioides* have darkly pigmented middle septa (black-banded) and a single oblique septum in the apical and basal cells (Sutton 1986), but the new fungus has no such septa. Other coelomycetous genera with versicolored conidia include *Neohendersonia* Petr., *Toxosporiopsis* B. Sutton & Sellar, and *Scolicosporium* Lib. ex Roum. These genera, however, differ from the new fungus based on the following characteristics. Species of *Neohendersonia* have uni- or multilocular stromatic conidiomata and an ostiole without inner periphyses (Sutton 1975; Sutton and Dyko 1989); species of *Toxosporiopsis* have conidiomata with long paraphyses and without obvious ostiole (Sutton and Sellar 1966; Sutton and Dyko 1989); and species of *Scolicosporium* have acervular conidiomata (Sutton 1980).

Based on the methods provided by Ogata et al. (2000), internal transcribed region (ITS)-5.8S and partial LSU nrDNA were amplified by polymerase chain reaction (PCR) using the primer pairs ITS1–ITS4 (White et al. 1990) and LROR–LR7 (Rehner and Samuels 1994), respectively. As sequences of *V. triseptatum*, 518 bp of the ITS regions (AB365596) and 1315 bp of the LSU nrDNA (AB330081) were obtained. A BLAST search of GenBank

using the LSU sequence indicated that it is close to some loculoascomycetous taxa, such as *Arthopyrenia salicis* A. Massal. (AY538339; 95% identity = 1262/1316, with 6/1316 gaps), *Lepidosphaeria nicotiae* Parg.-Leduc (DQ678067; 95% identity = 1260/1320, with 13/1320 gaps), and *Byssothecium circinans* Fuckel (AY016357; 95% identity = 1259/1321, with 11/1321 gaps). The lichenized ascomycete, *Arthopyrenia* A. Massal. (Arthopyreniaceae), was placed in an uncertain order as “Dothideomycetes et Chaetothyriomycetes incertae sedis” by Eriksson (2006), but Kruys et al. (2006) suggested that the genus is a member of the Pleosporales based on molecular phylogenetic analyses. *Lepidosphaeria* Parg.-Leduc (Testudinaceae: Hawksworth 1979; Schoch et al. 2006) and *Byssothecium* Fuckel (Teichosporaceae: Barr 2002; Eriksson 2006) are also pleosporalean genera. No anamorphic fungi with versiclosed conidia such as those of *Versicolorisporium* are reported to these families in Pleosporales. Among anamorphic members, *Helicoma isiola* R.T. Moore (EF01926), having helicoid conidia, was shown as a closest species (95% identity = 1263/1323, with 19/1323 gaps) to *V. triseptatum* from a BLAST search and a neighbor-joining tree generated from the “Distance tree of results” option of the same website. Tsui and Berbee (2006) reported that most species of *Helicoma* Corda belonged to Tubeufiaceae (Dothideomycetes, inc., sed.), but *H. isiola* deviated from the family. Although the phylogenetic placement of *H. isiola* is uncertain, the species is considered to be closely related to Pleosporales (Tsui and Berbee 2006). According to our analysis, the genus *Versicolorisporium* has affinities with Pleosporales, an order of Dothideomycetes, but more precise molecular analyses using type species of related genera are required to infer the phylogenetic position of the genus at the family level.

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