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## Lignicolous dematiaceous hyphomycetes in Japan: five new records for Japanese mycoflora, and proposals of a new name, *Helminthosporium magnisporum*, and a new combination, *Solicorynespora foveolata*

Received: July 30, 2007 / Accepted: November 5, 2007

**Abstract** Through investigations on dematiaceous hyphomycetes on dead ligneous plant substrata, mainly in northern Japan, five species were newly added to the Japanese mycoflora: *Corynespora trichiliae*, *Diplococcium stoveri*, *Ellisembia folliculata*, *Monodictys melanopa*, and *Paratomenticola lanceolata*. Morphological characters with line drawings and cultural characteristics of these anamorphic fungi are reported. A new name, *Helminthosporium magnisporum* for *H. gigasporum*, and a new combination, *Solicorynespora foveolata* for *H. foveolatum*, are proposed.

**Key words** Dematiaceous hyphomycetes · Japanese mycoflora · Lignicolous · New combination · New name

### Introduction

The purpose of this study is to enrich the inventory of microfungi, especially saprophytic hyphomycetes, in Japan. The most extensive study of this fungal group in this country is Matsushima's works (Matsushima 1975, 1981, 1983, 1985, 1987, 1995, 1996, 2001). He reported more than 600 species of this group of fungi including about 200 new species, based on materials mainly collected from central to southern areas of Japan. Although collection localities of his materials also included some places in the northern part of Japan, the materials from these districts were relatively few, 6% of the total collections.

In this study, to enrich the floristic list of saprophytic hyphomycetes in northern Japan, we investigated lignicolous dematiaceous hyphomycetes, which are easily found on dead branches of trees or culms of bamboos. As a result,

we found five newcomers to the Japanese mycoflora: *Corynespora trichiliae* M.B. Ellis, *Diplococcium stoveri* (M.B. Ellis) R.C. Sinclair, Eicker & Bhat, *Ellisembia folliculata* (Corda) Subram., *Monodictys melanopa* (Ach. ex Turner) M.B. Ellis, and *Paratomenticola lanceolata* (Cooke) M.B. Ellis. In the following, morphological characters of these species are described and illustrated, and their cultural characteristics on artificial media are also reported. A new name, *Helminthosporium magnisporum* for *H. gigasporum* Shirouzu & Y. Harada, and a new combination, *Solicorynespora foveolata* (Pat.) Shirouzu & Y. Harada for *Helminthosporium foveolatum* Pat., are proposed.

Methods of fungal observation and cultural studies followed Shirouzu and Harada (2004). The fungal specimens studied were deposited in the Herbarium of the Faculty of Agriculture and Life Science, Hirosaki University, Fungi (HHUF). The collector's name, T. Shirouzu, is abbreviated as T.S. Pure cultures were established by single conidial isolation. All strains treated in this study were deposited in MAFF Genebank, National Institute of Agrobiological Sciences, Tsukuba, Ibaraki, Japan.

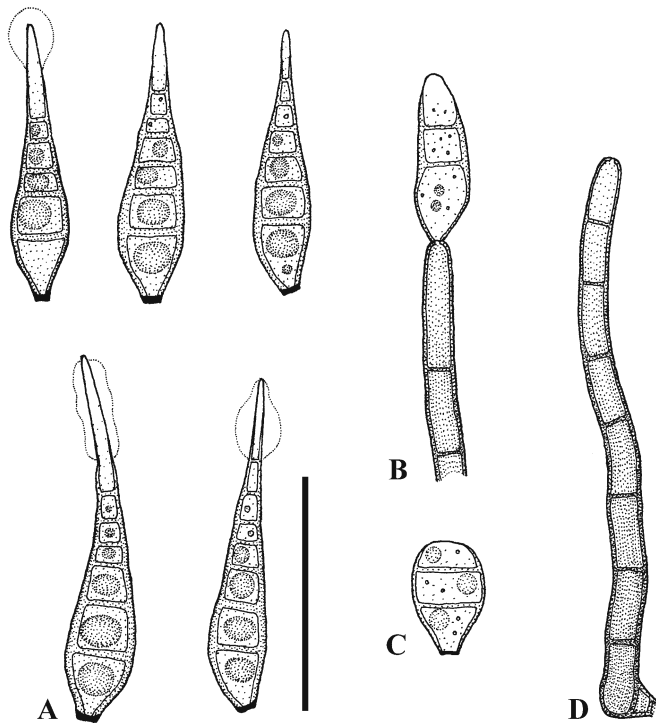
### Descriptions of species examined

1. *Corynespora trichiliae* M.B. Ellis, Mycol. Pap. 76:23, 1960. Fig. 1

Colonies on the natural substratum effused, dark brown, hairy. Mycelium immersed, composed of branched, septate, pale brown, 2.5- to 4.5- $\mu\text{m}$ -wide hyphae. Stromata immersed, globose to subglobose, black, pseudoparenchymatous, 20–32.5  $\mu\text{m}$  high, 25–50  $\mu\text{m}$  wide. Conidiophores macronematous, mononematous, single or fascicle, straight or flexuous, smooth-walled, septate, brown, with 0–1 cylindrical proliferation, 108–300  $\mu\text{m}$  long, 4.5–5  $\mu\text{m}$  wide at the apex, 5.5–8.5  $\mu\text{m}$  wide at the base. Conidiogenous cells monotretic, integrated, apical, cylindrical, with a single apical conidiogenous pore. Conidia acrogenous, solitary, straight or slightly curved, obclavate, smooth, straw-colored, paler toward the

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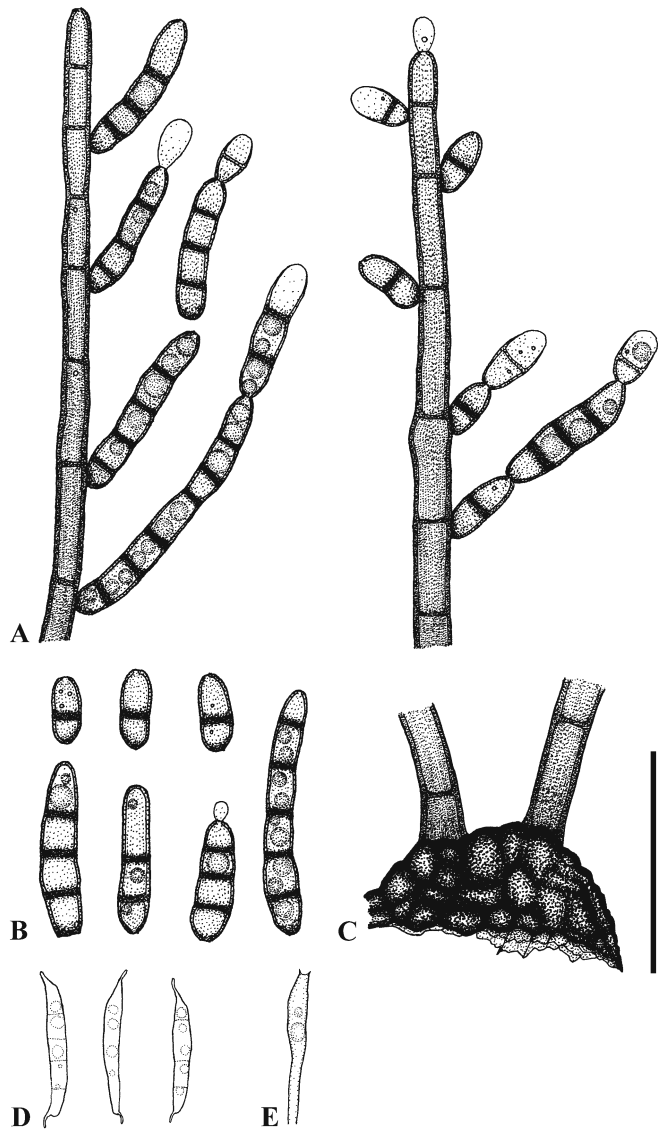
**Fig. 1.** *Corynespora trichiliae* (HHUF 28239). **A** Conidia. **B** Conidiophore with developing conidium. **C** Developing conidium. **D** Conidiophore. Bar 40  $\mu$ m

apex, with hyaline gelatinous sheath at the apex when fresh, conicotruncate at the base, 5–7-distoseptate, 42.5–65  $\times$  7.5–11  $\mu$ m (mean, 51  $\times$  10  $\mu$ m,  $n = 50$ ), 1.5–2.5  $\mu$ m wide at the apex, dark brown, and 3–5  $\mu$ m wide at the base.

Material examined: Campus of Iwate University, Morioka City, Iwate Pref. (141°08' E, 39°42' N), on dead branches of *Spiraea thunbergii* Siebold ex Blume, Mar. 28, 2003, T.S. (HHUF 28239, MAFF 240274).

Cultural characteristics: Conidia germinated from its apical and/or basal cell on water agar (WA) at 20°C in a 12-h photoperiod after 24 h. Colonies on potato dextrose agar (PDA) at 20°C were panniform, Olive (1E3; Kornerup and Wanscher 1978) to Olive Grey (1E2), White (1A1) near the margin, 31–33 mm in diameter after 20 days. Conidiophores were formed on the margin of V-8 juice agar (V8A) discs with mycelia incubated on a WA plate. Conidia bearing an apical sheath were formed on the conidiophores for 7 days.

Notes: In our collection, *C. trichiliae* has somewhat shorter conidia (42.5–65  $\mu$ m) in comparison with the original description (53–74  $\mu$ m; Ellis 1960), and the fresh conidia bear a gelatinous sheath around the apical part. The latter characteristic, a gelatinous sheath, was not described by Ellis (1960). However, we thought this character cannot be used as a stable criterion of the identification because it was lost in senescent conidia. The range of conidial length of our and Ellis's material overlapped well, and other morphological traits of our fungus satisfy the description of *C. trichiliae*. This fungus is reported as a newcomer to Japanese mycoflora.



**Fig. 2.** *Diplococcium stoveri* (HHUF 27964). **A** Conidiophores with catenate conidia. **B** Conidia. **C** Stroma. **D** Conidia of a synanamorph on V8A discs. **E** Conidiophore of a synanamorph on V8A discs. Bar 40  $\mu$ m

**2. *Diplococcium stoveri*** (M.B. Ellis) R.C. Sinclair, Eicker & Bhat, Trans. Br. Mycol. Soc. 85:736, 1985. Fig. 2

$\equiv$  *Spadicoides stoveri* M.B. Ellis, Mycol. Pap. 131:22, 1972.

Colonies on the natural substratum effused, black. Mycelium immersed, composed of branched septate hyaline to pale brown, 2.5- to 3.5- $\mu$ m-wide hyphae. Stromata superficial, dark brown, pseudoparenchymatous, 12–20  $\mu$ m high, 50–190  $\mu$ m wide. Conidiophores macronematous, mononematous, single, straight or flexuous, smooth-walled, septate, brown, paler toward the apex, 142.5–250  $\mu$ m long, 4.5–5  $\mu$ m wide at the apex, 6–9.5  $\mu$ m wide at the base. Conidiogenous cells polytretic, integrated, cylindrical, terminal and intercalary, each with hyaline conidiogenous pores. Conidia acropleurogenous, solitary or in 2–5 chains,

straight or curved, cylindrical, rounded at the apex, smooth, brown, sometimes paler toward the apex, 1–5(–6)-euseptate,  $15\text{--}50 \times 5\text{--}7.5 \mu\text{m}$  (mean,  $27 \times 6 \mu\text{m}$ ;  $n = 50$ ).

Material examined: Kudoji Mt., Hirosaki-City, Aomori Pref. ( $140^{\circ}25' \text{ E}$ ,  $40^{\circ}31' \text{ N}$ ), on dead branches of *Morus australis* Poir., Oct. 8, 2002, T.S. (HHUF 27964, MAFF 240275).

Cultural characteristics: Conidia germinated from the apical and basal cell on WA at  $20^{\circ}\text{C}$  in a 12-h photoperiod after 24 h. Colonies on PDA at  $20^{\circ}\text{C}$  were lanose, Dark Green (30F8), velvety and White (1A1) near the margin, 25–26 mm in diameter after 20 days. Sporulation occurred at the margin of V8A discs with mycelia incubated on WA plate for 10 days. Occasionally, conidia were produced from the conidiogenous cell borne directly on vegetative hypha. A phialidic synanamorph was formed together with the *Diplococcium* anamorph on the same hypha on V8A discs, and its characters are described next.

Conidiophores macronematous, mononematous, single, clavate or cylindrical, septate, pale brown. Conidiogenous cells monophialidic, integrated, cylindrical, terminal, with a narrow collarette at the apex,  $11\text{--}15 \times 5\text{--}5.5 \mu\text{m}$ . Conidia solitary, aggregated at the apex of conidiogenous cells, straight or curved, elongate, cylindrical, tapering toward both ends, truncate at the base, hyaline, 0–4-septate,  $25\text{--}32.5 \times 3.5\text{--}4.5 \mu\text{m}$ , with a  $2.5\text{-}\mu\text{m}$ -long setula at the apex and a point adjacent to the base.

Notes: *Spadicoides* S. Hughes and *Diplococcium* Grove share similar conidiogenesis and features of conidiophores and conidia. For separating these two genera, Wang and Sutton (1982) used the unbranched conidiophores as an important character of *Spadicoides*. Sinclair et al. (1985), however, adopted the catenation of conidia to separate these genera, and they removed four *Spadicoides* species, including *S. stoveri*, to *Diplococcium*. Twenty-one species were accepted in the review of *Diplococcium* by Goh and Hyde (1998). To date, among the accepted 21 *Diplococcium* species, only *D. spicatum* Grove has been reported from Japan (Matsushima 1975). In this study, *D. stoveri* is added as a newcomer to the Japanese mycoflora.

### 3. *Ellisembia folliculata* (Corda) Subram., Proc. Indian Natn. Sci. Acad. B58:183, 1992. Fig. 3

≡ *Helminthosporium folliculatum* Corda, Icon. Fung. 1:12, 1837.

≡ *Sporidesmium folliculatum* (Corda) E.W. Mason & S. Hughes, in Hughes Can. J. Bot. 31:609, 1953.

For other synonyms, see Hughes (1958).

Colonies on the natural substratum effused, black. Mycelium superficial or immersed, composed of branched, septate, pale brown to brown, 2- to  $4\text{-}\mu\text{m}$ -wide hyphae. Conidiophores macronematous, mononematous, arising from small stroma, erect, single or fascicles, straight or flexuous, cylindrical, smooth, brown to dark brown, 1–4-septate,  $27.5\text{--}60 \mu\text{m}$  long,  $3\text{--}4 \mu\text{m}$  wide at the apex,  $5 \mu\text{m}$  wide at the base. Conidiogenous cells monoblastic, integrated, terminal, determinate, cylindrical, conicotruncate at the apex. Conidia acrogenous, solitary, usually cylindrical, occasion-

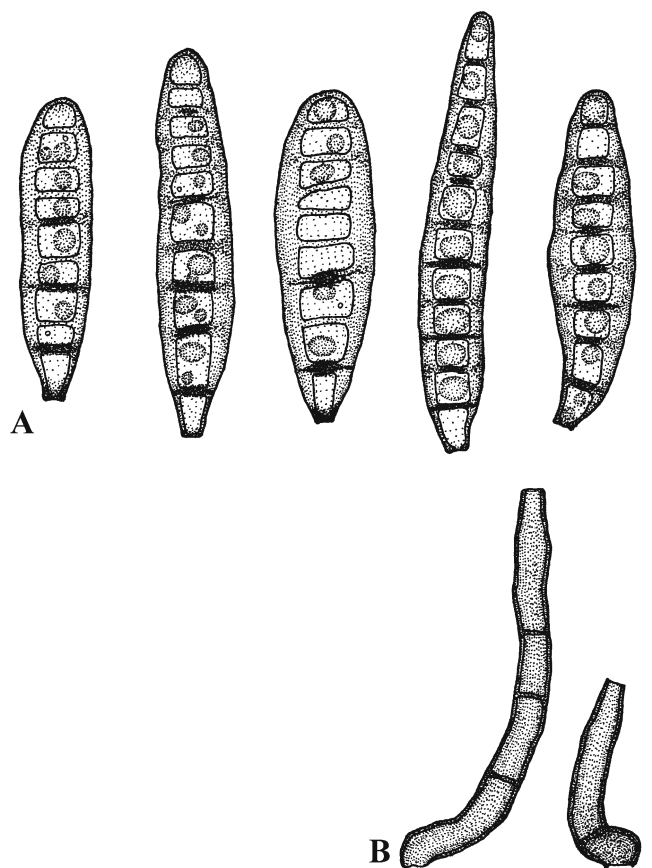


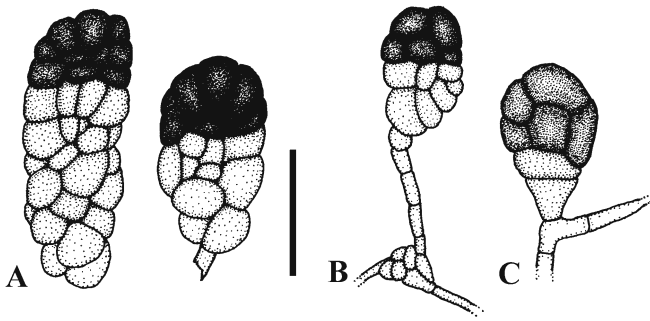
Fig. 3. *Ellisembia folliculata* (HHUF 28256). A Conidia. B Conidiophores. Bar  $20 \mu\text{m}$

ally obclavate, rounded at the apex, conicotruncate at the base, straight or slightly flexuous, olive-brown to reddish-brown, 6–11-distoseptate,  $45\text{--}70 \times 10\text{--}11 \mu\text{m}$  (mean,  $53 \times 10 \mu\text{m}$ ;  $n = 30$ ),  $3\text{--}4.5 \mu\text{m}$  wide at the base.

Materials examined: Moiwa Mt., Sapporo City, Hokkaido ( $141^{\circ}19' \text{ E}$ ,  $43^{\circ}01' \text{ N}$ ), on dead culms of *Sasa senanensis* (Franch. & Sav.) Rehder, Oct. 12, 2003, Y. Harada (HHUF 28256, MAFF 240276); Shiretoko Mt. Pass, Rausu, Menashi-gun ( $145^{\circ}03' \text{ E}$ ,  $44^{\circ}04' \text{ N}$ ), on dead culms of *S. kurilensis* (Rupr.) Makino & Shibata, Sept. 8, 2003, K. Tanaka and S. Hatakeyama (HHUF 28250); Nishimeya, Nakatsugaru-gun, Aomori Pref. ( $140^{\circ}07' \text{ E}$ ,  $40^{\circ}34' \text{ N}$ ), on dead vines of *Vitis coignetia*, Sept. 11, 2003, T.S. and N. Asama (HHUF 28253).

Cultural characteristics: Conidia germinated from the base on WA at  $20^{\circ}\text{C}$  in a 12-h photoperiod after 24 h. Colonies on PDA at  $20^{\circ}\text{C}$  were velvety, Brownish-Grey (6E2–6F2) near the center, White (1A1) toward the margin, 27–29 mm in diameter after 20 days. Sporulation had not occurred.

Notes: *Ellisembia folliculata* has been collected on dead wood of various tree species from Czechoslovakia, England, United States (Ellis 1958), and New Zealand (Hughes 1978). There is no record of this species from Japan according to our literature review. Dark pigmentation at septa of the conidia described by Ellis (1958) was not remarkable in



**Fig. 4.** *Monodictys melanopa* (HHUF 28262). **A** Conidia. **B** Conidiophore with conidium. **C** Developing conidium on conidiogenous cell. Bar 20  $\mu\text{m}$

our materials. Although Ellis (1958) succeeded in conidiogenesis on PDA, we failed to induce sporulation on both PDA plates and V8A discs with mycelia incubated on WA plates.

**4. *Monodictys melanopa*** (Ach. ex Turner) M.B. Ellis, More Dematiaceous Hyphomycetes: 43, 1976. Fig. 4

$\equiv$  *Spiloma melanopum* Ach., Methodus 10 t.l f.3, 1803; Turner, Spec. Lichen brit.: 29, 1839.

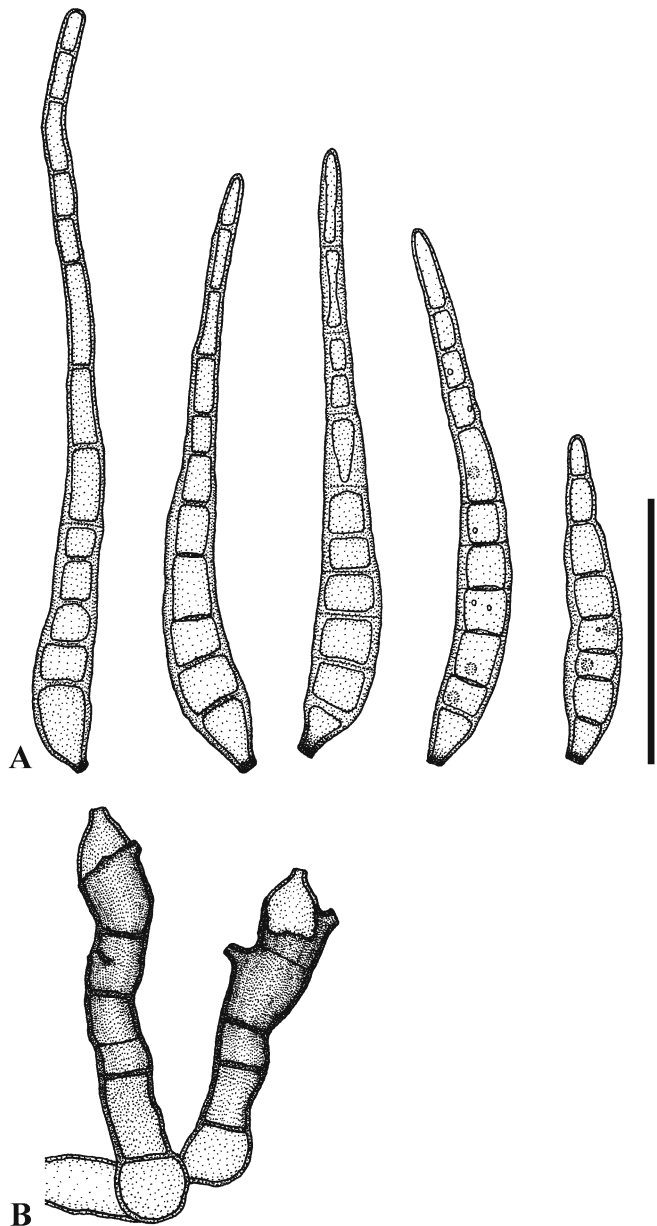
$\equiv$  *Sporidesmium melanopum* (Ach. ex Turner) Berk. & Broome, Ann. Mag. Nat. Hist. 2:5, 1850.

Colonies on the natural substratum effused, black. Mycelium superficial or immersed, composed of branched, septate, hyaline to pale brown, 2- to 6- $\mu\text{m}$ -wide hyphae. Conidiophores micronematous, mononematous, pale brown. Conidiogenous cells holoblastic, integrated, determinate, pale brown. Conidia acrogenous, solitary, muriform, composed of globose 5- to 7.5- $\mu\text{m}$ -diameter cells, ellipsoidal or obovoid, straight or flexuous, in lower 3/10-7/10 part (almost 5/10 part) straw-colored to pale brown, in upper remaining part black, (17.5-)22.5-40(-50)  $\times$  15-25.5  $\mu\text{m}$  (mean, 31  $\times$  19  $\mu\text{m}$ ;  $n = 30$ ).

Material examined: Near Mawarizeki Reservoir, Tsuruta, Kitatsugaru-gun, Aomori Pref. (140°23' E, 40°44' N), on dead branches of *Malus toringo* (Siebold) Siebold ex de Vriese, Nov. 20, 2003, Y. Harada and T.S. (HHUF 28262, MAFF 240277).

Cultural characteristics: Conidia germinated by producing one or more germ tube from straw-colored part of conidia on WA at 20°C in a 12-h photoperiod after 24 h. Colonies on PDA were lanose, irregular margin, Brown (6E4) near the center and Light Grey (1D1) toward the margin, Yellowish-White (4A2) near the margin, 23-24 mm in diameter after 20 days. Sporulation occurred at the margin of V8A discs with mycelia incubated on WA plate for 10 days.

Notes: When Ellis (1976) made this combination, he described this fungus as occurring on bark of apple trees. The present fungus was also collected from dead branches of a crabapple, *Malus toringo*. Dark coloration in almost half of the conidia is an important feature of this species.



**Fig. 5.** *Paratomenticola lanceolata* (HHUF 28259). **A** Conidia. **B** Conidiophores. Bar 40  $\mu\text{m}$

**5. *Paratomenticola lanceolata*** (Cooke) M.B. Ellis, More Dematiaceous Hyphomycetes: 175, 1976 (as *lanceolatus*). Fig. 5

$\equiv$  *Helminthosporium lanceolatum* Cooke, Grevillea 12:29, 1883 (as *Helmisporium*).

$\equiv$  *Sporidesmium lanceolatum* (Cooke) S. Hughes, Can. J. Bot. 36:808, 1958.

Colonies on the natural substratum effused, dark brown, velvety. Mycelium immersed, composed of branched, septate, hyaline to pale brown, 2- to 4- $\mu\text{m}$ -wide hyphae. Stromata absent. Conidiophores formed from the vegetative hypha, macronematous, mononematous, erect, usually fascicles occasionally single, flexuous, smooth, septate,

brown to dark reddish brown, sometimes paler toward the base, 50–135 × 8–10 µm. Conidiogenous cells polyblastic, sympodial, integrated, terminal becoming intercalary, cylindrical, denticulate, brown to dark reddish brown, 13.5–25 × 8.5–10 µm; denticule cylindrical, 1.5–2.5 × 2.5–3 µm, conicotruncate at the apex. Conidia solitary, obclavate, straight or slightly flexuous, pale brown to brown, paler toward the apex, (6–)7–13-distoseptate, 55–125 × 7.5–10.5 µm (mean, 88 × 9 µm; *n* = 30), tapering gradually to 3–5 µm wide near the apex, with a dark brown to black, 2.5–3.5-µm-wide scar at the base.

Materials examined: Nishine, Iwate-gun, Iwate Pref. (141°04' E, 39°52' N), on dead vines of *Berchemia racemosa* Siebold & Zucc., Oct. 19, 2003, T.S. and K. Tanaka (HHUF 28259, MAFF 240278); Mohei Pond, Hirosaki-City, Aomori Pref. (140°26' E, 40°34' N), on dead vines of *B. racemosa*, Oct. 25, 2003, K. Tanaka and N. Asama (HHUF 28260).

Cultural characteristics: Conidia germinated from the scar on WA at 20°C in a 12-h photoperiod after 24 h. Colonies on PDA at 20°C were panniform, Dark Grey (1F1), White (1A1) toward the margin, 15–16 mm in diameter after 20 days. Conidiophores were formed from a vegetative hypha. Sporulation occurred at the margin of V8A discs with mycelia incubated on WA plate for 10 days.

Notes: The genus *Paratomenticola* M.B. Ellis consists of two species, *P. lanceolata* and *P. georgiana* Crane & Schoknecht. This genus was erected by Ellis (1976) based on *H. lanceolatum*, which was collected from bark of *Berchemia* sp. (Cooke 1883). We found this species on dead vines of *B. racemosa* gathered from two places. It is considered that this fungus preferentially occurs on *Berchemia*. The number of conidial septa in Ellis's description (5–9 septa; Ellis 1976) is somewhat fewer than in our specimen [(6–)7–13]. However, according to our observation based on natural and cultural materials, it is thought that the number of septa is a changeable character. Other features of our specimen almost coincide with Ellis's description. *Paratomenticola lanceolata* is the first record of this species from Japan.

## 6. *Helminthosporium magnisporum* Shirouzu & Y. Harada, nom. nov.

≡ *Helminthosporium gigasporum* Shirouzu & Y. Harada, Mycoscience 45:19, 2004 (Nom. invalid. Art 53.1) (replaced synonym).

Culture: MAFF 239278 from holotype.

Notes: *Helminthosporium gigasporum* Shirouzu & Y. Harada (2004) is a later homonym of *H. gigasporum* Berk. & Broome (Berkeley and Broome 1875).

## 7. *Solicorynespora foveolata* (Pat.) Shirouzu & Y. Harada, comb. nov.

≡ *Helminthosporium foveolatum* Pat., Journ. de Bot. 5:321, 1891 (as *Helmisporium*) (basionym).

= *Helminthosporium cantonense* Sacc., Philipp. J. Sci. 18:604, 1921 (as *Helmisporium*).

≡ *Corynespora foveolata* (Pat.) S. Hughes, Can. J. Bot. 36:757, 1958.

Culture: MAFF 240273 from HHUF 27965.

Notes: The genus *Solicorynespora* R.F. Castañeda & W.B. Kendr., characterized with solitary, euseptate conidia produced monotretically, was established by Castañeda Ruíz and Kendrick (1990). Up to the present, many *Corynespora* species having euseptate conidia were transferred to this genus (Castañeda Ruíz and Kendrick 1990; Delgado-Rodríguez et al. 2003; Castañeda Ruíz et al. 2004). In this study, we moved this fungus to the genus *Solicorynespora* based on having solitary, monotretic, euseptate conidia. This fungus was reported on dead branches of woody trees and dead culms of bamboos in Japan (Shirouzu and Harada 2004, as *Corynespora foveolata*).

**Acknowledgments** We thank Dr. Kazuaki Tanaka, Faculty of Agriculture and Life Science, Hirosaki University, for collecting samples and kindly reviewing the manuscript. We also thank Mr. Noritaka Asama and Mr. Satoshi Hatakeyama for collecting samples.

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