

The genus *Hypoxylon*, Wood Decay Fungi - II. Teleomorph of *Annulata* Section.

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The section of *Annulata* under genus *Hypoxylon* is a member of the Xylariaceae which has ascomata with ostioles papillate in a flattened disc. The isolates of *Hypoxylon* collected from the Tropic to the Temperate are compared with similar taxa and described. These isolations under *Annulata* section are illustrated with a light microscopy and a scanning electron microscopy. *Hypoxylon archeri* is newly recorded from Korea. A key to the species is also included.

KEYWORDS: *Annulata*, *Hypoxylon archeri*, papillate ostioles

A central core of genera of the Xylariaceae are *Xylaria*, *Hypoxylon*, *Rosellinia Daldinia* and *Biscogniauxia*, even though the generic limits are still arguable (Rogers, 1979; Eriksson and Hawksworth, 1991; Laessle, 1994). *Hypoxylon* Bull. ex Fr. is one of the largest and best known genera of the Xylariaceae; its members are worldwide in distribution being especially well represented in the tropics (Whalley and Taligoola, 1978). Four main characters of the genus *Hypoxylon* are *Nodulisporium*-like anamorphs, solid and homogeneous umipartite stromata, stromatal tissue below the perithecial layer and not upright stromata (Ju and Rogers, 1996). Miller (1961) tried to divide the genus into 3 sections with their stromatal characters: *Hypoxylon*, *Papillata* and *Annulata* sections. However, Ju and Rogers (1996) recently proposed the genus of *Hypoxylon* into 2 sections: *Hypoxylon* section with 4 groups and 2 subgroups and *Annulata* section. a number of *Hypoxylon* species have been recorded and described from Asia, such as Taiwan (Ju and Tzsen, 1985a, b), Japan (Abe, 1984, 1986a,b), China (Abe and Liu, 1995) and Malaysia (Whalley, *et al.*, 1994).

This paper deals with a comprehensive account of the *Annulata* section on the genus *Hypoxylon* in Tropical and Temperate region. Four species are found in Malaysia, England, Hong Kong, Philippine and Korea. Three species (*H. archeri*, *H. bovei* var. *microsporum*, *H. stygium*) belong to the section *Hypoxylon* are described in detail, including ascospores, asci and surface of stroma with light and electron microscopy.

Materials and Methods

Each description was based on macro- and microscopical analysis of the materials collected from over the world. To observe stromata and perithecium, stereomicroscopy was used. To observe ascospores and asci, squash slides were

made from fresh ascomata and light microscopy was used. For removing dirty particles on the surface of stromata, 1% KOH was used, and for staining of apical apparatus of the ascus, the Melzer's reagent was used.

The measurement based on samples of 20 fully mature ascospores and asci are presented length × width ± standard deviation.

Taxonomy

*.The section of *Annulata*: Ascomata ostioles papillate in a flattened disc.

1a. Stromata predominately appanate to applano-pulvinate, with minute ostiolar disc less than 0.3 mm in diameter

2

1b. Stromata predominately appanate to applano-pulvinate, with wide ostiolar disc 0.3~1 mm in diameter

3

2a. Ostiolar disc convex, less than 0.3 μm, sometimes missing; ascospores 8.4~9.6 × 3.6~5.4 μm.

H. archeri Berk. (Illustrated in Figs. 1 and 2)

2b. Ostiolar disc flat to concave, less than 0.3 μm; ascospores smaller 6.0~6.6 × 3.0~3.6 μm.

H. stygium (Lév.) Sacc. (Illustrated in Figs. 4 and 5)

3a. Ostiolar disc 0.7~1 mm in diameter; stromata pulvinate, sometimes separating into individual ascomata; ascospores 9.0~10.2 × 5.1~6.0 μm.

H. bovei var. *microsporum* Mill. (Illustrated in Fig. 3)

Hypoxylon archeri Berk., Fl. of Tasmania II, in Hook., Bot. Antarctic Voy. II: 280 (1860). 민암갈색풍뎉섯 (신칭)

Stromata pulvinate to appanate and widely diffused, often composed of almost entirely free ascomata, 0.2~5.6 × 0.2~1.1 cm and 2 mm thick. Exterior black, smooth surface, and shiny, but uneven due to the protruding ascomata. Interior dark brown. Ostiolar papillate slightly opened in center of a minute disc, thick-walled angularis near ostioles, and thin-walled globosal 1.5~2.5 mm in diameter. Ascomata partially

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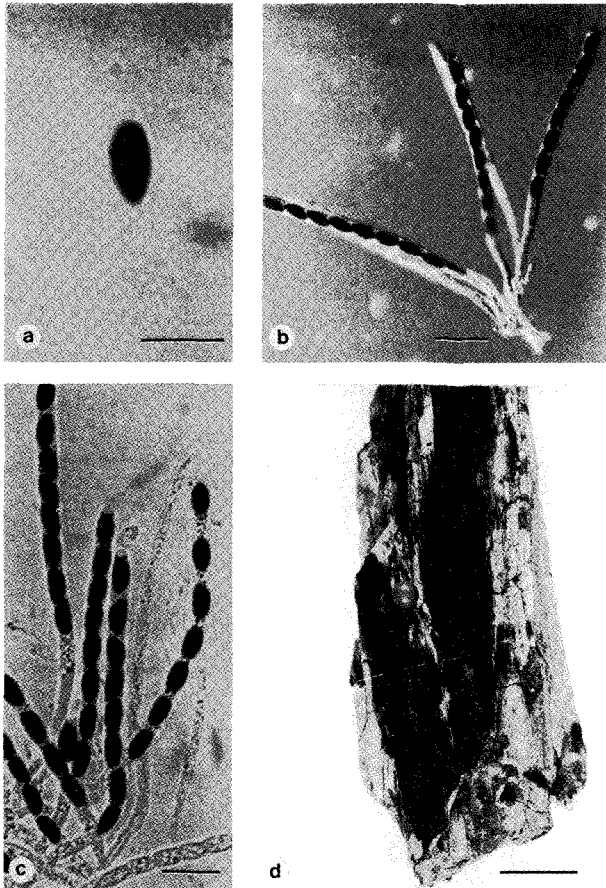


Fig. 1. Interference light microscope micrographs of *Hypoxylon archeri*. a. Dark-coloured ascospore with germ slit (Bar: 10 μm). b. Immature and mature asci with uniseriate ascospores. Septate, hyaline paraphyses observed (Bar: 20 μm). c. Immature asci and paraphyses (Bar: 15 μm). d. Habit photograph of stroma (Bar: 20 μm).

immersed or almost entirely free, ovoid to oblong, or sub-globose, 0.3–0.4 mm in diameter. Asci cylindrical, 8-spored, long stalked 111–147 \times 4.0–7.2 μm , apical apparatus inconspicuous. Ascospores obliquely uniseriate, inaequilaterally ellipsoid, brown, smooth, 8.4–9.6 \times 3.6–5.4 μm , with straight and almost full length germ slit.

Anatomy: Ascomata-bearing part seems to be divided into three layers; inner layer very narrow with thick-walled to matrix; middle layer thin-walled textura angularis; outer layer thick-walled textura angularis.

Habitat: on dead wood, lying on the forest floor.

Known distribution: Brazil, Cuba, Mexico, Puerto Rico, Zaire, China, Japan, Papua New Guinea, Tasmania, India.

Specimens collected: Malaysia, Hong Kong, Mt. Naejang, Mt. Boogui in Korea (Illustrated in Figs. 1 and 2).

Note: The fungus examined corresponds well with Miller (1961) and Abe (1984) descriptions. It is the first record from Korea although *H. archeri* has been reported from in China (Miller, 1961) and Japan (Abe, 1984).

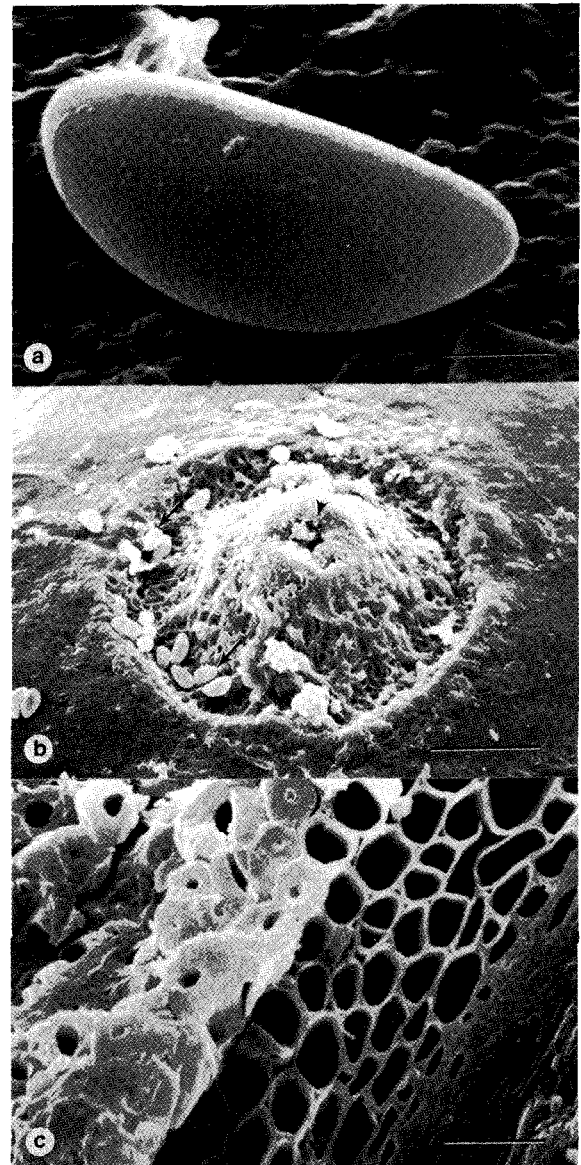


Fig. 2. Scanning electronic microscope micrographs of *Hypoxylon archeri*. a. Ascospore a showing smooth wall (Bar: 1 μm). b. Papillate ostiole arrowed with discharged ascospores (Bar: 2 μm). c. Structure of wall layer of ascoma (Bar: 100 μm).

***Hypoxylon bovei* Speg. var. *microspora* Mill., Monograph: 95 (1961).**

Rosellinia areolata Sacc., Ann. Mycol. 11:314. 1913; non.

Hypoxylon marginatum (Schwein.) Berk. var. *mammiforme* Rehm, Leafl. Philipp. Bot. 8: 2958. 1916.

Hypoxylon chalybeum Berk. & Broome var. *effusum* Sacc. apud Sacc. & Trott., Syll. Fung. XXIV, p. 1080. 1920.

Stromata erumpent to superficial, globose or semiglobose to elongate, consisting 7–20 perithecia, carbonaceous. Exterior dark purplish brown with a black ostiolar disc, smooth surface. Interior dark brown. Ascomata globose to subglobose, large, and only partially immersed. Ostiola papillate,

surrounded by a very flattened annular disc with $0.7\text{--}0.8\ \mu\text{m}$ in diameter. Ascospores dark brown, diagonally uniseriate or uniseriate, obtuse at both ends, $9.0\text{--}10.2\ (9.51 \pm 0.38) \times 5.1\text{--}6.0\ (5.28 \pm 0.85)\ \mu\text{m}$, with straight full germ slit.

Anatomy: small and distinct annulate disc. Ascomata-bearing part seems to be divided into three layers: inner layer very narrow, thin-walled textura prismatica; middle layer very thick-walled textura angularis with a very small pore in the cell, and decreasing thickness along with the distance outside the ascomata.

Known habitat: on dead wood

Known distribution: South America, Java, New Zealand, Papua New Guinea, Tasmania, India, Philippines.

Specimens collected: Pasoh in Malaysia (Illustrated Fig. 3)

Note: This differs from *H. bovei* Speg. in having smaller ascospores which measure, $9.0\text{--}10.2\ (9.51 \pm 0.38) \times 5.1\text{--}6.0\ (5.28 \pm 0.85)\ \mu\text{m}$ as against *H. bovei* with $11\text{--}15 \times 6\text{--}7\ \mu\text{m}$ according to Miller (1961). Perez-Silva (1983) mentioned an incomplete germ slit for the spores but van der Gucht (1994) observed a germ slit of full spore length. In the present collection, a full straight germ slit was observed. However, this fungus is very much like *H. bovei* var. *microsporium* as described by Miller (1961) ($8\text{--}10 \times 3\text{--}4\ \mu\text{m}$)

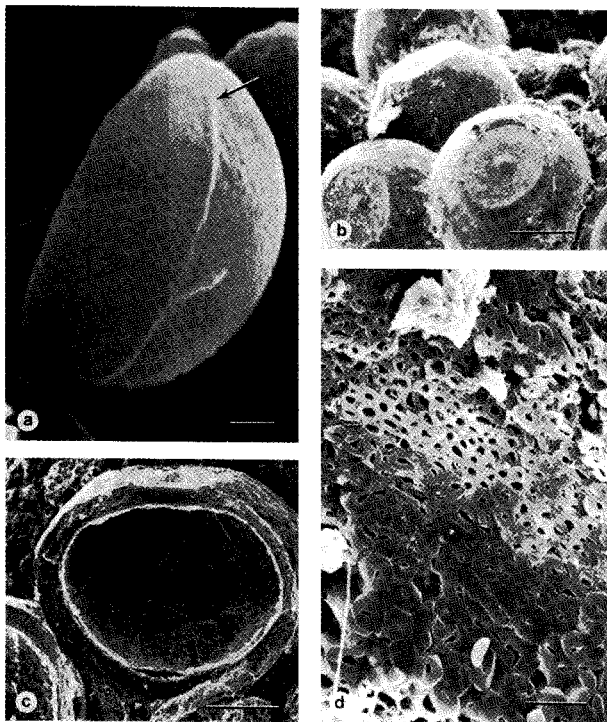


Fig. 3. Scanning electron microscopic micrographs of *Hypoxylon bovei* var. *microspora*. a. Ascospore with a longitudinal slit (arrowed) (Bar: $1\ \mu\text{m}$). b. Stromata with papillate ostioles in the centre of a flat annular disc (Bar: $500\ \mu\text{m}$). c. Longitudinal section of an ascoma (Bar: $200\ \mu\text{m}$). d. Section of ascus with 2 wall layers of cells, an outer with cubical small cells and an inner layer with thick walled cells (Bar: $20\ \mu\text{m}$).

and van der Gucht (1992) ($9\text{--}10.5 \times 4\text{--}5\ \mu\text{m}$), differing in its somewhat broader ascospores $9.0\text{--}10.2\ (9.51 \pm 0.38) \times 5.1\text{--}6.0\ (5.28 \pm 0.85)\ \mu\text{m}$.

***Hypoxylon stygium* (Lev.) Sacc., Syll. F. 1: 379 (1882).**
Nummularia annulata Rehm, Ann. Mycol. 11: 399. 1913

Stromata erumpent-superficial, very irregularly pulvinate to smooth and applanate, and indefinitely diffused, sometimes nearly free ascomata, at first reddish-brown to purplish brown, finally very shining black and very hard, and carbonaceous; perithecia densely gregarious, subglobose to ovoid, $0.1\text{--}0.3\ \text{mm}$ in diameter, with very papillate ostiola in the center of an apical annulate disc which is circularly flattened, and small, $0.1\text{--}0.2\ \text{mm}$ in diameter. Asci cylindrical, 8-spored, $55\text{--}80 \times 3.5\text{--}4.0\ \mu\text{m}$, and very small lenticular apical apparatus. Ascospore uniseriate or diagonally uniseriate, oblong to navicular, frequently inequilateral, obtuse at both ends, light brown to brownish and $6.0\text{--}6.6\ (6.42 \pm 0.25) \times 3.0\text{--}3.6\ (3.21 \pm 0.25)\ \mu\text{m}$, straight or slightly curved, and half to $2/3$ length germ slit. Paraphyses filiform

Anatomy: sometimes matrix hyphae observed on surface of stroma, distinct ostioles, pore of annulae disc globose to pentagonal angular.

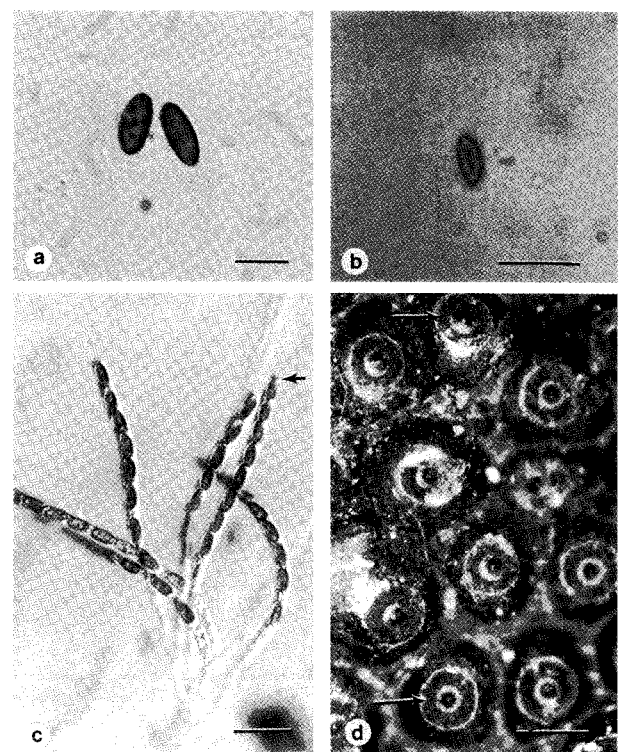


Fig. 4. Light microscope micrographs of *Hypoxylon stygium* (Lev.) Sacc. a, b. Ascospores (Bar: $5\ \mu\text{m}$). c. Asci with apical apparatus (arrowed) (Bar: $10\ \mu\text{m}$). d. Stromata with papillate ascomata and ostioles in the centre of an annular disc (arrowed) (Bar: $150\ \mu\text{m}$).

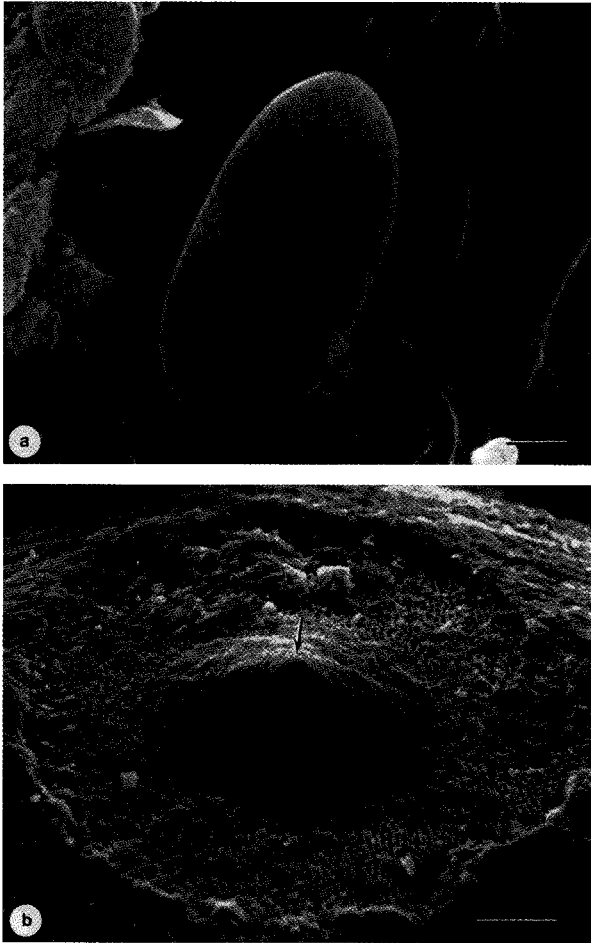


Fig. 5. Scanning electron microscope micrographs of *Hypoxylon stygium* (Lev.) Sacc. a. Ascospores smooth-walled (Bar: 2 μ m). b. papillate ostiole (arrowed) and annular disc (Bar: 40 μ m).

Known habitat: on many kinds of dicotyledonous wood.

Known distribution: Southern United States, Hawaii, Central and South America, Africa, Australia, India, South East Asia, Philippines, Japan, and China.

Specimen collected: Pasoh in Malaysia; Liverpool in England; Hong Kong; Boracay Island in Philippines (Illustrated in Figs. 4 and 5).

Note: This species has a very small annulate disc around

the ostiole, but not so distinct as those of *H. truncatum* (Abe, 1984). This fungus is a common member of the genus *Hypoxylon*.

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