Mycobiology 30(4): 193-196 (2002)

Taxonomical Characteristics of *Xylaria* spp. Collected from Malaysia

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(*Received October 2, 2002*)

Five species of the genus *Xylaria* are recognized on Malaysia materials: *X. hypoxylon* (L. FR.) Grev., *X. allantoidea* (Berk.) Fr., *X. cubensis* (Mont.) Fr., *X. curta* Fr. and *X. grammica* (Mont.) Fr.. The collection of *Xylaria allantoidea* from Malaysia is compared to the collection from Taiwan in morphological characters. The species are described their the host and cultural characteristics by a bright microscope and a scanning electron microscope.

KEYWORDS: Malaysia, *Xylaria allantoidea X. cubensis, X. grammica*

Central cores 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; Laessoe, 1994). *Xylaria* Hill ex Schrank is a complex (Rogers, 1979). Stromata of a given species often vary greatly in color, size, and in general shape as well. These variations can, in part, be associated with stages of development of stromata (Thienhirun, 1997). A number of taxa have shown similarities to known *Xylaria* species but deviate in a number of features such as ascospores, asci and stromata. This paper deals with a comprehensive account of the tropical *Xylaria* from Malaysia. Four species (*X. allantoidea*, *X. cubensis*, *X. curta* and *X. grammica*) are found in Malaysia and 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 on wood in Malaysia. To observe stromata and perithecium, stereomicroscopy was used and Ascospores and asci were observed by light microscopy. 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 were presented lengthwidthstandard deviation.

Taxonomy

Xylaria Hill ex Schrank, Bayer, FI. 1: 200 (1789), nom. Cons.
Acrosphaeria Corda, Anleitung zum Studium der Mykologie: 136 (1842)
Carnostroma Lloyd, Mycological Writings 5, The large pyrenomycetes, 2. paper: 27
Hypoxylon Mentzel ex Adans., Familles des Plantes 2: 9 (1763), non Hypoxylon Bull.
Moelleroclavus Henn., Hedwigia 41: 15 (1902)
Penzigia Sacc., in Sacc. & Paol. Atti del Reale Instituto Veneto di Scienze, Lettere er Arti ser. 6,6: 406 (1888)
Pseudoxylarria Boedijn Persoonia 1: 18 (1959)
Spirogramma Ferd. & Winge, Vidensk. Meddel Dansk Naturhist. Foren. Kjobenhavn 60: 142-143 (1909)
Xylariodiscus Henn., Hedwigia 38, Beibl: 63 (1899)
Xylosphaera Dumort., Commentationes botanicae: 91 (1982)
Diagnosis (modified after Rogers & Samuels, 1986)

Key to the Species of *Xylaria*

The genus *Xylaria*: Stromata usually upright on short or long stipes with clavate to filliform or capitate, branched, not flat topped with fertile or infertile tapering.

1a. Stromata large, over 0.5 in diameter on wood, ascospores up to 12.5 um long ····· 2

1b. Stromata large, over 0.5 in diameter on wood, ascospores over 12.5 um long ····· 4

2a. Stromata cylindrical, with short or long stipes. Blackish with grayish scales on surface; ostiola papilate ·····

2b. Stromata at first white, becoming black, often branched, flattened, with spices acute and sterile; ascospores 1.0~3.0 × 0.1~0.5 um, with straight germ slit. ····· ····· ***X. hypoxylon***

3a Stromata various, solitary to gregarious, not branched, cylindricalallantoid to clavate, with rounded fertileapices,withshortandill-definedstipes,1.0~6.0 × 0.6~1.2 cm. ***X. cubensis***

3b. Stromata with peeling or clacking grayish or brownish outer layer, 0.4~2.4 × 0.9 cm in diameter, osti-

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ola papillae; ascospores 9.0~10.8 × 3.9~5.4 um. ····· ····· ***X. curta*** ·····

4a. Stromata solitary or in small in cluster, cylindrical allantoid to clavate, with rounded or tapered apices, on short, stout stipes, 2.5~9.0 × 1~2.5 cm in diameter. ····· ····· ***X. allantoidea***

4b. Stromata clavate, unbranched, surface dull-brown, longitudinally cracking into paralleled straps covered by minute, black granules, with dark underlying layer; ascospores 3.6~5.7 × 6.6~9.6 um. ····· ***X. grammica***

***Xylaria allantoidea* (Berk.) Fr. Nova Acta Regiae Soc. Sci. Upsal. (ser.3) 1: 126(1851) (Fig. 1)**

Stromata solitary or in small clusters, not branched or only branched near the base, cylindrical allantoid to clavate, sometimes flattened subglobose to penzigioid, with obtusely rounded, surface of stroma smooth and shiny and carbonaceous, usually short, often ill-defined, stout stipes, 2.5~9 × 11~2.5 cm in diameter. Exterior dark brown to black with age. Interior white to beige, becoming hollow with age, the texture becoming hard. Ascomata completely immersed, subglobose - navicular, with narrowly rounded ends, light brown to brownish, smooth, 13.5~16.5 (14.6 + 0.9) × 4.8~6.3 (5.8 + 0.6) um with germ slit, straight and slightly less than full length, on the ventral side of the spore.

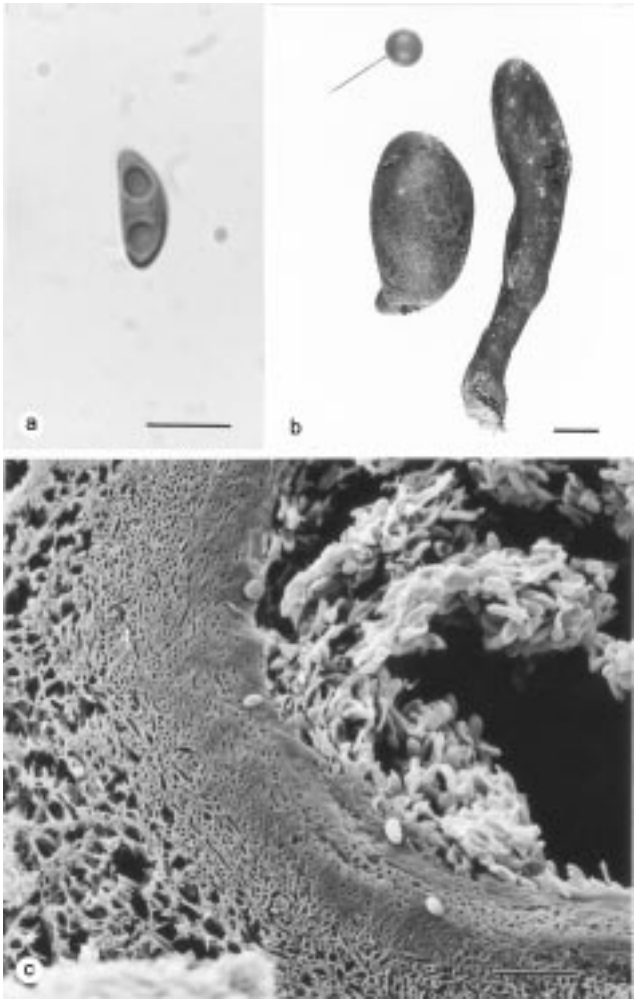

Fig. 1. Light micrographs (a, b) and scanning electron micrographs (c) of *Xylaria allantoidea*. a. Ascospores with oil guttule (bar: 10 um). b. Stromata cylindrical allantoid and clavate (bar: 10 um), c. Cross section of ascoma, inner layer of thick cell walls and an outer layer more mycelial in appearance. Released ascospores in the centrum (bar: 10 um).

Anatomy: Ascomata-bearing part in stroma very thick, seems to be divided into 3 layers, inner layer very thick matrix textura; middle layer thick-walled textura intricate with angularis; out layer thin walled textura angularis becoming loose in texture to the outside perithecia.

Known habitat: on dead wood, lying on the ground in lowland rain forest, or on stumps

Known distribution: Pan-tropical, Southern America and Central America, Africa, Australia, India, Malaysia, Thailand, Sri Lanka, Papua New Guinea.

Specimen collected: Pasoh in Malaysia

Note: This fungus was collected in Malaysia and seems to be typical X. allantoidea. However, it differs in the larger spores, 13.5~16.5 (14.6 ± 0.9) × 4.8~6.3 (5.8 ± 0.6) um to 12~14.5 × 3.5~5 um. Dennis (1961) recognized the difficulty in delineating taxa of this group; van der Gucht (1994) separated species based on their telemorphic and anamorphic characteristics. Unfortunately, the ascus was not found.

***Xylaria cubensis* (Mont.) Fr., Nova Acta Regiae Soc. Sci. Upsal. (ser.3) 1: 126 (1851) (Fig. 2)**

Stromata variable, solitary or gregarious, unbranched, cylindrical allantoid to clavate, occasionally flattened, sometimes penzigioid, with very rounded fertile apices; stalks short or ill-defined, arising from tomatoes discoid bases, hairless, 1~6 cm, in total height and 0.6~1.2 cm, in diameter. Surface hairless, smooth, surface conspicuously cracked into small polygonal surface scales. Exterior bronze to copper colored, becoming dark, chocolate-brown with age, carbonaceous. Interior white and soft solid, becoming hollow with age, hard. Ascomata completely immersed, subglobose to globose, sometime crescent-shaped or obtuse oblong when condensed. Ostiola papillae; Asci cylindrical, 8-spored, 84~117 × 4.2~6.0 um, cubic to rectangular apical apparatus, bluing in Melzers iodine reagent. Ascospores uniseriate to obliquely ellipsoid, rounded at both ends, brown to dark brown, smooth, 8.7~9.9 × 3.6~5.4 um, without germ slit. Paraphyses filliform.

Anatomy: Ascomata-bearing part could be divided into three layers: inner layer is narrow and textura oblita; middle layer thick-walled nearly textura intricate; outer layer textura intricate, around neck or ascoma are long textura prismatica.

Known habitat: on decaying, usually decorticated,

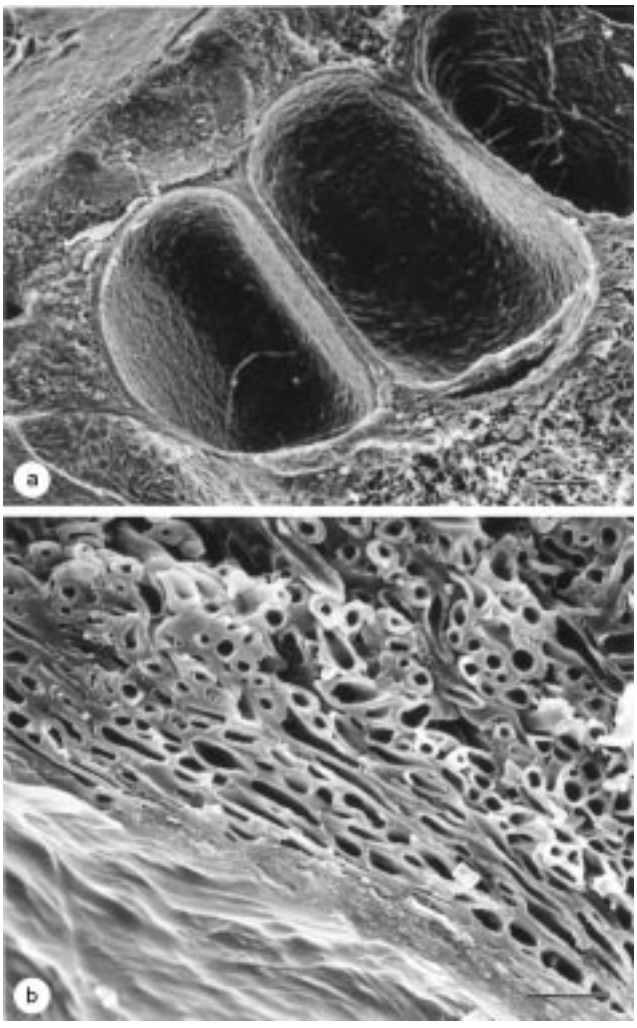

Fig. 2. Scanning electron micrographs of *Xylaria cubensis*. a. Longitudinal section of ascoma embedded in a stroma (bar: 100 um). b. Structure of ascoma wall with an inner layer of elongated cells and an outer layer of thick walled small cuboidal cells (bar: 5 um).

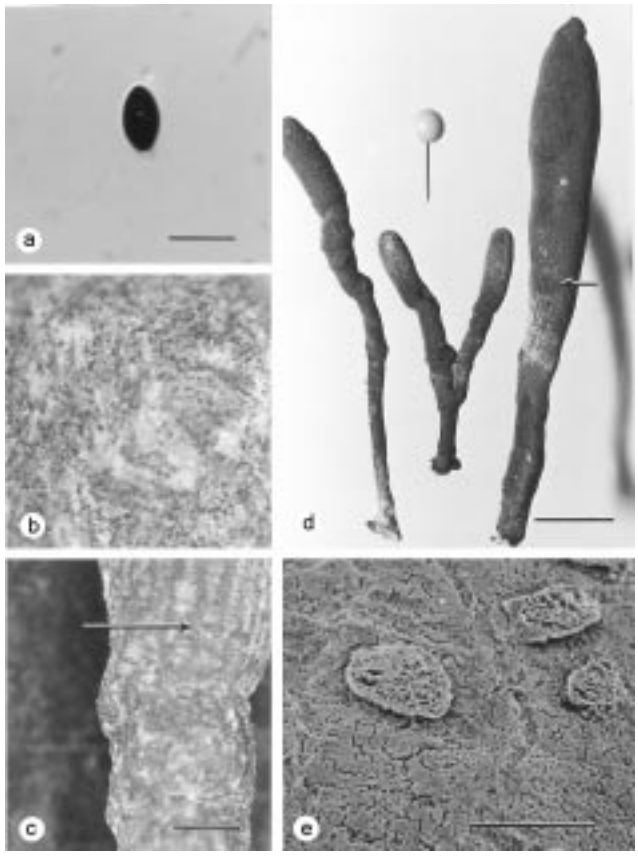

Fig. 3. Light micrographs (a-d) and scanning electron micrographs (e) of *Xylaria grammica*. a. Ascospore (bar: 5 um). b. Surface of stroma (bar: 20 um), c. Unbranched and branched with striations on the stroma (bar: 2 mm). d. Surface of stroma with longitudinal striations on the surface (bar: 500 um).

dicotyledonous wood, lying on the forest floor.

Known distribution: various tropical, subtropical temperate zones of the world, Central America, Southern United States, Africa, Australia, South East Asia, China, South pacific Islands.

Species collected: Malaysia

Note: This collection is identical with the description of van der Gucht (1994). The typical characteristics, dark chocolate brown and black with moisture, and the smooth surface with papillate ostioles with delicate cracking around them, were observed. However, there is difference in the length of the asci in this fungus (84~117 × 4.2~6.0 um) is shorter than the description of *X. Cubensis* (135~180 × 5.7 um).

***Xylaria grammica* (Mont.) Fr. Nova Acta Regiae Soc. Sci. Upsal. (ser.3) 1:126 (1851) (Fig. 3)**

Stromata cylindrical clavate to cylindrical fusiform, solitary, unbranched but sometimes branched near the base, with the apex obtusely rounded or tapering to a sterile point, on short to long, well defined, slender, smooth, black stipes. Arising from somewhat discoid base, 4~8 cm total height and 0.7 to 1.5 cm in diameter. Exterior dull brown, longitudinal cracks to expose the underlying, the dark area and cream colored remained appear as vertical stripes, the crust very minutely granulate in parallel. Interior white to yellowish brown, becoming hollow, loosen irregular rhombus texture. Ascomata completely immersed, subglobose, 0.4~1.2 mm in diameter. Ostiole punctiform, situated in the dark stripes. Asci not observed. Ascospores uniseriate, inequilaterally ellipsoid, dark brown smooth wall, straight germ slit.

Known habitat: on dead wood, in rather wet sites.

Known distribution: Tropical. Pan-tropical regions through the world.

Specimen collected: Malaysia

Note: The cracking of the stromata and the rows of ostioles with in the cracks of *X. grammica* is the most distinct character (Dennis 1958, 1961; van der Gucht, 1992).

In the present collection the material was not mature for positive diagnosis. Even though van der Gucht (1992) collected two specimens, which have bifurcate apices, the specimens in the present collection with bifurcate stromata has not been previously reported.

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