

The genus *Xylaria* in the south of China – 7. Two penzigoid *Xylaria* species

Hai-Xia Ma^{1,2,*}, Larissa Vasilyeva³ & Yu Li²

¹ Institute of Tropical Bioscience and Biotechnology, Chinese Academy of Tropical Agricultural Sciences, Haikou 571101, People's Republic of China

² Institute of Mycology, Jilin Agricultural University, Changchun 130118, People's Republic of China

³ Institute of Biology and Soil Science, Far East Branch of the Russian Academy of Sciences, Vladivostok 690022, Russia

Ma H.-X., Vasilyeva L. N. & Li Y. (2013) The genus *Xylaria* in the south of China – 7. Two penzigoid *Xylaria* species. – *Sydowia* 65 (2): 329–335.

A new xylariaceous fungus, *Xylaria fanjingensis* sp. nov., is described and illustrated from the subtropical forest of Guizhou Province, southern China. The new species is characterized by small, sessile, subglobose stromata attached to the substrate by a narrow connective, the ascus apical ring staining light rust or rust in Melzer's iodine reagent, and the ascospores (37.5)38–44.5(46.5) × 18–20 µm. Another penzigoid *Xylaria* species, *X. cf. berteri* is reported in China for the first time. Morphological descriptions and photographs of stromata and microstructures are provided based on the Chinese collections.

Keywords: Ascomycota, xylariaceous fungi, taxonomy.

Xylaria Hill ex Schrank is one of the most complex and difficult genera in the Xylariaceae because of variable stromatal characteristics (Rogers 1985, Van der Gucht 1995). Penzigoid *Xylaria* species have small, sessile to subsessile stromata, attached to the substrate by a narrow connective (Rawla & Narula 1983, Ju *et al.* 2012). These penzigoid fungi have been originally assigned to the genus *Penzigia* Sacc. (Saccardo & Paoletti 1888), which was shown to be synonymous to *Xylaria* (Ju & Rogers 2001, Hsieh *et al.* 2011), and thus they are currently treated as *Xylaria* species (Læssøe 1989, Rogers 1990, Rogers & Ju 2012). This group has been studied by many mycologists, and many new species have been described (Petch 1924; Chardon *et al.* 1940; Martín 1970; Rawla & Narula 1983, 1984; Callan & Rogers 1990; Ju & Rogers 2001; Ju *et al.* 2009, 2012; Rogers & Ju 2012). However the diversity and richness of these fungi are still poorly known and there are still many unidentified specimens of penzigoid fungi from China. During the examination of the specimens from Guizhou province, southern China, an undescribed species was found. In addition, *X. cf. berteri* is described for the first time from China based on Chinese collections.

* e-mail: mahaixia@itbb.org.cn

Materials and methods

Morphological studies

The specimen studied were collected in southern China and are deposited in the Herbarium of the Institute of Mycology, Jilin Agricultural University (HMJAU). Photographs of stromata were taken using a Sony H50x digital camera, and those of stromatal surface were taken with a ZSA30w microscope and S70 Canon camera. Microscopic features and measurements were made from slide preparations mounted in water and Melzer's iodine reagent. The photographs of asci, ascial apical ring, and ascospores were taken by using a VHX-600E microscope of the Keyence Corporation. The methods of collecting, preservation, and identification of the specimens follow Ju & Rogers (1999).

DNA extraction and sequencing

Total DNA from the tissue of stromata was extracted by using a modified cetyltrimethylammonium bromide (CTAB) method. The internal transcribed spacer (ITS) regions were amplified with the primer pair ITS4/ITS5 (White *et al.* 1990). PCR conditions for ITS was an initial denaturation step at 94 °C for 4 min, 30 cycles of 94 °C for 30 s, 56 °C for 30s, 72 °C for 60s and a final extension at 72 °C for 10 min. Reaction components for PCR included approximately 0.1–0.5 ng μL^{-1} of total DNA, 2.5 μM of each primer, 200 μM dNTP, 2 mM MgCl_2 , 0.03 U μL^{-1} of Taq polymerase (Invitrogen, Carlsbad, California), and 1 \times standard PCR buffer supplied with the Taq polymerase. DNA sequencing was performed at Beijing Genomics Institute.

Taxonomy

Xylaria fanjingensis H.-X. Ma, Lar. N. Vassiljeva & Yu Li, **sp. nov.** – Fig. 1.
Mycobank no.: MB 804353

Differs from other *Xylaria* species in the ascial apical ring staining light rust or rust in Melzer's iodine reagent and larger ascospores.

Holotypus. – CHINA, Guizhou Prov., Fanjing Mountain, alt. 2000 m, on dead twigs in mixed evergreen and deciduous broad-leaved forest, 21 Aug 2010, *leg.* Haixia Ma, HM-JAU 23624.

Stromata gregarious, hemispherical, subglobose to depressed-spherical, attached to substrate with a narrow central connective, 1.5–2.5 mm high \times 1.5–3.5 mm in diam., containing 2–3 perithecia; surface plane or with inconspicuous perithecial mounds, blackish, internally white, woody; texture soft. Perithecia embedded in stromata, subspherical, 0.8–1.5 mm in diam.; ostioles papillate. Asci with eight ascospores obliquely arranged in uniseriate occasionally biseriate manner, cylindrical, long-stipitate, (155)240–290(305) \times 20–27 μm , the spore-bearing part 190–218 μm long, with an apical ring staining light rust or rust in Melzer's iodine reagent, urn-shaped, 8.5–10.5(11.5)



Fig. 1. *Xylaria fanjingensis*, holotype. **a-c.** Stromata. **d, e.** Vertical section of stroma. **f.** Ascospores and germ slits. **g.** Ascus apical ring. **h.** Ascus and ascospores. Scale bars: a, d, e 0.5 mm, b, c 1 mm, f, g 15 μ m, h 30 μ m.

μm high \times (7)8–9.5(10) μm broad. Ascospores dark brown to blackish brown, ellipsoid, almost equilateral, unicellular, with narrowly rounded ends, smooth, (37.5)38–44.5(46.5) \times 18–20 μm , with a straight, spore-length germ slit on the less convex side.

Etymology. – Refers to the the mountain name in southern China where the new species was found.

Habitat. – *Xylaria fanjingensis* grows on corticated twigs in mixed evergreen and deciduous broad-leaved forest at the altitude of about 1800 metres in a subtropical monsoon climate.

Distribution. – Known only from the type locality in southern China.

Remarks. – The fungus is easily separated from other *Xylaria* species by its small, subspherical stromata, ascal apical ring staining light rust or rust in Melzer's iodine reagent. Ju *et al.* (2012) described the ascal apical ring of *Xylaria discolor* (Berk. & Broome) Y.-M. Ju, H.-M. Hsieh, J. D. Rogers & Jaklitsch as not staining blue or staining pale blue only at the base in Melzer's iodine reagent, but *X. discolor* can be separated by its smaller stromata 0.5 mm high \times 0.5–2 mm in diam., smaller perithecia 0.2–0.3 mm in diam, and smaller ascospores (8.5–)9–12 \times 5.5–7(7.5) μm . *Xylaria lechatii* Y.-M. Ju, H.-M. Hsieh, J. D. Rogers & Fournier has a pale blue apical ring staining only at its base in Melzer's iodine reagent; however, it can be recognized by its pulvinate stromata, obovoid and smaller perithecia, 0.4–0.5 mm high \times 0.3–0.4 mm in diam., and smaller ascospores 12–15 \times 6.5–8 μm (Ju *et al.* 2012).

The new species is similar to *Penzigia indica* Rawla & Narula in perithecial morphology and the same size of perithecia, but the latter has irregularly circular stromata with a short flat or slightly lobed base. In addition, *P. indica* has smaller ascospores 30–37.5 \times 12–18 μm . Furthermore, the apical rings in asci of *P. indica* do not stain in Melzer's iodine reagent, whereas those of *X. fanjingensis* stains light rust in Melzer's iodine reagent (Rawla & Narula 1984). Callan & Rogers (1990) described the ascal ring of *P. cf. indica* from South America as staining blue in Melzer's iodine reagent and being larger with 12–14 \times 6 μm . In addition, the South American collections have slightly smaller ascospores (35)36–40(41) \times 12–14(15) μm , with non-cellular appendages on one end. Stromata of the South American material often have remnants of paler, tan to brown, small plates or scales on their surface (Callan & Rogers 1990).

Xylaria fanjingensis somewhat resembles *X. glebulosa* (Ces.) Y.-M. Ju & J. D. Rogers in stromatal morphology, but the latter has smaller perithecia 0.6–0.8 mm in diam. and smaller ascospores 27–31 \times 8–10 μm , with oblique germ slits. In addition, the apical ring of asci of *X. glebulosa* stains blue in Melzer's iodine reagent (Ju & Rogers 1999).

Penzigia orientalis Rawla & Narula (Rawla & Narula 1984) from India has similar globose to subglobose stromata, 2 mm high \times 3 mm in diam., but its ascospores are small, 21–24 \times 7.5–8.5 μm , and the ascal apical ring stains deep blue in Melzer's iodine reagent.

Xylaria cf. *berteri* (Mont.) Cooke, Grevillea 11: 126. 1883. – Fig. 2.

Stromata gregarious, peltate to discoid, attached to substrate with a narrow connective, 1.5–2.5 mm high × 0.4–1.5 cm in diam., surface plane or with inconspicuous perithecial mounds, cracked, dark brownish to blackish, external carbonaceous crust hard, interior white, woody. Perithecia embedded

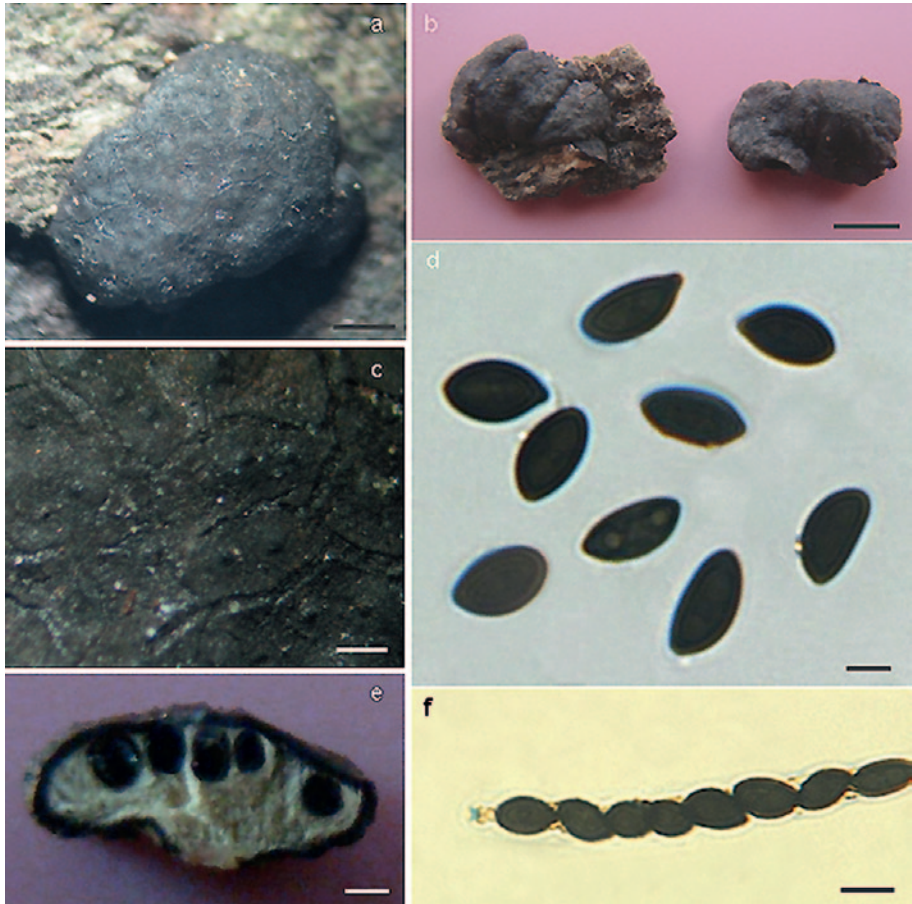


Fig. 2. *Xylaria* cf. *berteri*. **a, b.** Stromata. **c.** Stromatal surface. **d.** Ascospores **e.** Vertical section of stroma. **f.** Asci, apical ring and ascospores. Scale bars: a 1 mm, b 5 mm, c 0.2 mm, d 5 μ m, e 0.5 mm, f 10 μ m.

in stromata, subspherical, 0.5–0.8 mm. Ostioles slightly papillate. Asci with eight ascospores, obliquely arranged in uniseriate manner, occasionally biseriate, cylindrical, long-stipitate, 130–180 μ m total length × 8–9 μ m, the spore-bearing part 84–94 μ m long, with an apical ring staining blue in Melzer's iodine reagent, discoid-flattened, 1–1.5 μ m high × 2–2.5 μ m broad.

Ascospores dark brown to blackish brown, ellipsoid, equilateral, unicellular, with narrowly rounded or minutely pinched ends, sometimes with a tiny cellular appendage on one end, smooth, (12.5)13–14(15) × 7–8.5 µm, with a straight germ slit, inconspicuous.

Material examined. – CHINA, Yunnan Province, Hekou County, Dawei Mountain, on the bark of dead wood, 24 Dec 1974, *leg.* Zang M. (HKAS 2585); Hunan Province, Zhangjiajie City, National Forest Park, on the bark of dead wood, 16 Aug 2010, *leg.* He S. H. (HMJAU 23497).

Habitat. – The fungus was growing on the bark of dead wood in mixed evergreen broad-leaved forests in subtropical monsoon climate.

Remarks. – *Xylaria berteri* is difficult to separate from *Xylaria enteroleuca* (Speng.) P. Martin (Callan & Rogers 1990). *Xylaria enteroleuca* was originally described from Argentina, reported from Brazil, Costa Rica, USA, and is already known from China (Chardon *et al.* 1940, Martín 1970, Callan & Rogers 1990). Martín (1970) reported the species from Sikang, China, but we could not find the collections. Ju & Rogers noted that *X. enteroleuca* is probable a synonym of *X. berteri* (Ju & Rogers 1999, Rogers & Ju 2012). The materials collected in China seem to be typical for *X. enteroleuca* collected in USA (Callan & Rogers 1990). Through a Blast search in the GenBank DNA database, the rDNA-ITS (ITS1–5.8S–ITS2 segment) sequence with 569 bps of *X. cf. berteri* (HMJAU 23497) can be compared with 1029 max scores and 99 % maximal percent identities, 1027 max scores and 99 % maximal percent identities to those of *X. berteri* (JQ936295, GU324749), respectively. So, we designated the Chinese material as *X. cf. berteri* following the concept of Rogers & Ju (2012).

Acknowledgements

This study was supported by the Natural Science Foundation of Hainan Province (grant no. 312048) and the Start-up Costs for Doctors in Institute of Tropical Bioscience and Biotechnology, Chinese Academy of Tropical Agricultural Sciences (ITBB 120301). We are also grateful to Chinese Academy of Tropical Agricultural Sciences for funding in the project entitled „The Project of the Basic Scientific Research by the Central Public Welfare Institutes“ (grant no. 1630052013001).

References

- Callan B. E., Rogers J. D. (1990) Teleomorph-anamorph connections and correlations in some *Xylaria* species. *Mycotaxon* **34**: 343–369.
- Chardon C. E., Miller J. H., Muller A. Y. (1940) Ascomycetes from the state of Minas Geraes (Brazil). *Mycologia* **32**: 172–204.
- Hsieh H. M., Lin C. R., Fang M. J., Rogers J. D., Fournier J., Lechat C., Ju Y. M. (2010) Phylogenetic status of *Xylaria* subgenus *Pseudoxylaria* among taxa of the subfamily Xylarioideae (Xylariaceae) and phylogeny of the taxa involved in the subfamily. *Molecular Phylogenetics and Evolution* **54**: 957–969. doi:10.1016/j.ympev.2009.12.015.
- Ju Y. M., Rogers J. D. (1999) The Xylariaceae of Taiwan (excluding *Anthostomella*). *Mycotaxon* **73**: 343–440.

- Ju Y. M., Rogers J. D. (2001) *Xylaria cranioides* and *Poronia pileiformis* and their anamorphs in culture, and implications for the status of *Penzigia*. *Mycol Res* **105**: 1134–1136.
- Ju Y. M., Hsieh H. M., Vasilyeva L., Akulov A. (2009) Three new *Xylaria* species from Russian Far East. *Mycologia* **101**: 548–553, doi:10.3852/08-188.
- Ju Y. M., Hsieh H. M., Rogers J. D., Fournier J., Jaklitsch W. M., Courtecuisse R. (2012) New and penzigiid *Xylaria* species with small, soft stromata. *Mycologia* **104**(3): 766–776.
- Læssøe T. (1989) Notes on *Penzigia*, *Sarcoxylon*, and *Hypoxylina*. *Systema Ascomycetum* **8**: 25–28.
- Martín P. (1970) Studies in the Xylariaceae VIII. *Xylaria* and its allies. *Journal of South African Botany* **36**: 73–138.
- Petch T. (1924) Xylariaceae Zeylanicae. *Annals of the Royal Botanic Gardens Peradeniya* **8**: 119–166.
- Rawla G. S., Narula A. M. (1983) Himalayan Xylariaceae: The genus *Penzigia* Sacc. & Paol. *Nova Hedwigia* **38**: 747–756.
- Rawla G. S., Narula A. M. (1984) Two new species of *Penzigia* from eastern Himalayas. *Indian Phytopathology* **37**: 312–315.
- Rogers J. D. (1985) Anamorphs of *Xylaria*: Taxonomic considerations. *Sydowia* **38**: 255–262.
- Rogers J. D. (1990) Comments on *Penzigia*. *Systema Ascomycetum* **8**: 93–95.
- Rogers J. D., Ju Y. M. (2012) The Xylariaceae of the Hawaiian Islands. *North American Fungi* **7**(9): 1–35.
- Saccardo P. A., Paoletti G. (1888) *Mycetes malacenses*. Funghi della Penisola di Malacca raccolti nei 1885 dall'Ab. Benedetto Scortechini. *Atti del Istituto Veneto di Scienze, Lettere et Arti* **6**: 387–428.
- Van der Gucht K. (1995) Illustrations and descriptions of Xylariaceous fungi collected in Papua New Guinea. *Bulletin du Jardin Botanique National de Belgique* **64**: 219–403.
- White T. J., Bruns T., Lee S., Taylor J. W. (1990) Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenetics. In: *PCR Protocols: A guide to methods and applications* (eds. Innis M. A., Gelfand D. H., Sninsky J. J., White T. J.) Academic Press, Inc., New York: 315–322.

(Manuscript accepted 5 August 2013; Corresponding Editor: I. Krisai-Greilhuber)

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Sydowia](#)

Jahr/Year: 2013

Band/Volume: [65](#)

Autor(en)/Author(s): Ma Hai-Xia, Vasilyeva Larissa N., Li Yu

Artikel/Article: [The genus *Xylaria* in the south of China - 7. Two penzigioid *Xylaria* species 329-335](#)