
New species and new Chinese records of *Bionectriaceae* and *Nectriaceae* (*Hypocreales*, *Ascomycetes*) from Hubei, China

Wen-Ying Zhuang^{1*}, Ye Nong^{1,2} and Jing Luo^{1,2}

¹Key Laboratory of Systematic Mycology and Lichenology, Institute of Microbiology, Chinese Academy of Sciences, Beijing 100080, P.R. China

²Graduate School of Chinese Academy of Sciences, Beijing 100039, P.R. China

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Recent collections of the *Bionectriaceae* and *Nectriaceae* from Hubei Province were examined. Twenty-six species of 11 genera were identified. Among them 3 new species, *i.e.*, *Ijuhya hubeiensis* with anamorph unknown, *Leuconectria grandis* with *Gliocephalotrichum cylindrosporum* anamorph, and *Neonectria hubeiensis* with *Cylindrocarpon* cf. *orthosporum* anamorph, are described; and 5 new records for China were found in the genera *Bionectria*, *Ijuhya* and *Neonectria*. Distinctions between the new species and their closely related fungi are discussed.

Key words: *Ijuhya hubeiensis*, *Leuconectria grandis*, *Neonectria hubeiensis*, taxonomy.

Introduction

Hubei Province is located in the central area of China and has a subtropical climate. Fungi of the *Bionectriaceae* and *Nectriaceae* from Hubei were seldom investigated except for a single gift collection of *Nectria cinnabarina* (Tode : Fr.) Fr. from Institute of Botany, Chinese Academy of Sciences on deposit in the Mycological Herbarium, Institute of Microbiology, Chinese Academy of Sciences (HMAS). In our recent field trip to Hubei, 115 specimens of fungi in the above two families were collected from Houhe Nature Reserve of Wufeng County south of the Yangtze River and Shennongjia Nature Reserve and Longmenhe Forest Station north of the Yangtze River at elevations of 800–2400 m in September, 2004. Twenty-six species in the genera *Albonectria*, *Bionectria*, *Cosmospora*, *Gibberella*, *Haematonectria*, *Hydropisphaera*, *Ijuhya*, *Lanatonectria*, *Leuconectria*, *Nectria*, and *Neonectria* were identified. Three new species are discovered and

*Corresponding author: W.Y. Zhuang; e-mail: zhuangwy@sun.im.ac.cn

5 new Chinese records are reported. This study is the continuation of our work on nectriaceous fungi from central regions of China (Nong and Zhuang, 2005).

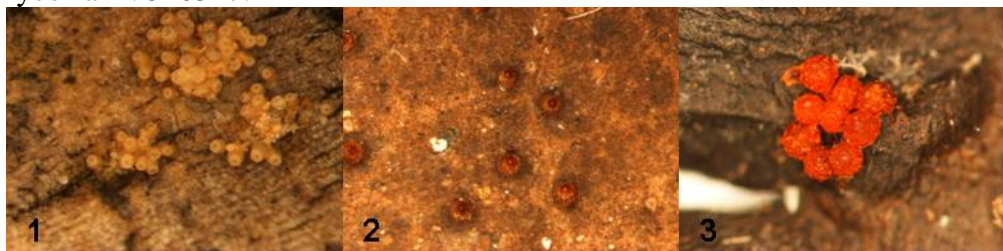
Materials and methods

Methods used, taxonomic treatments, and terms used in descriptions generally follow Rossman *et al.* (1999). Longitudinal sections and squash mounts were made and examined. Morphology of each Chinese collection was compared with morphological characteristics of the related fungi in published literature by either the original authors or monographic revisions of the groups (Booth, 1966; Wiley and Simmons, 1971; Samuels, 1988; Brayford and Samuels, 1993; Rossman *et al.*, 1993; Rossman *et al.*, 1999; Mantiri *et al.*, 2001; Schroers, 2001; Brayford *et al.*, 2004).

Taxonomy

New species

Ijuhya hubeiensis Y. Nong & W.Y. Zhuang, **sp. nov.** (Figs 1, 4, 5, 14, 17)
MycoBank: 510347.



Figs 1-3. Ascomata on substrates. **1.** *Ijuhya hubeiensis* (HMAS 98285). **2.** *Leuconectria grandis* (HMAS 98302). **3.** *Neonectria hubeiensis* (HMAS 98331). Magnifications: **1** $\times 12.5$, **2** $\times 12$, **3** $\times 20$.

Etymology: The specific epithet refers to the locality of the fungus.

Ab *Ijuhya parilis* peritheciis parvis, 130–250 μm diam.; ascis 4-sporis, parvis, 32–41 \times 5.3–6.3(–7.2) μm ; ascosporis angustis, (15–)16–20 \times 3–3.3 μm differt.

Ascomata perithecial, densely gregarious up to 28 in a group, superficial on subiculum, non-stromatic, subspherical with a discoidal apex, 130–250 μm diam. and 130–150 μm high, with apical disc 100–110 μm wide, surface slightly roughened with short, undulate hairs, not collapsing when dry, pinkish when fresh and with the apical disc paler, not changing colour in 3% KOH and lactic acid. *Ascomatal wall* of two layers, 17–22 μm thick, apical disc wall 33–38 μm thick; outer layer 8–10 μm thick, cells subspherical, ca 2.5–5 μm

diam., walls ca 1.2 μm wide; inner layer 8–10 μm wide, cells elongate, cell walls ca 0.7 μm wide. *Asci* clavate, with an apical ring, 4-spored, occasionally 2-spored, $32\text{--}41 \times 5.3\text{--}6.3\text{--}(7.2)$ μm . *Ascospores* fusiform, uniseptate, evenly two-celled, hyaline, spinulose, markings unevenly distributed, biseriate to irregularly biseriate, $(15\text{--})16\text{--}20 \times 3\text{--}3.3$ μm .

Anamorph: Unknown.

Holotype designated here: China. Hubei, Shennongjia, alt. 1200 m, on rotten twig associated with other fungi, 15 IX 2004, W.Y. Zhuang & Y. Nong 5699, HMAS 98285.

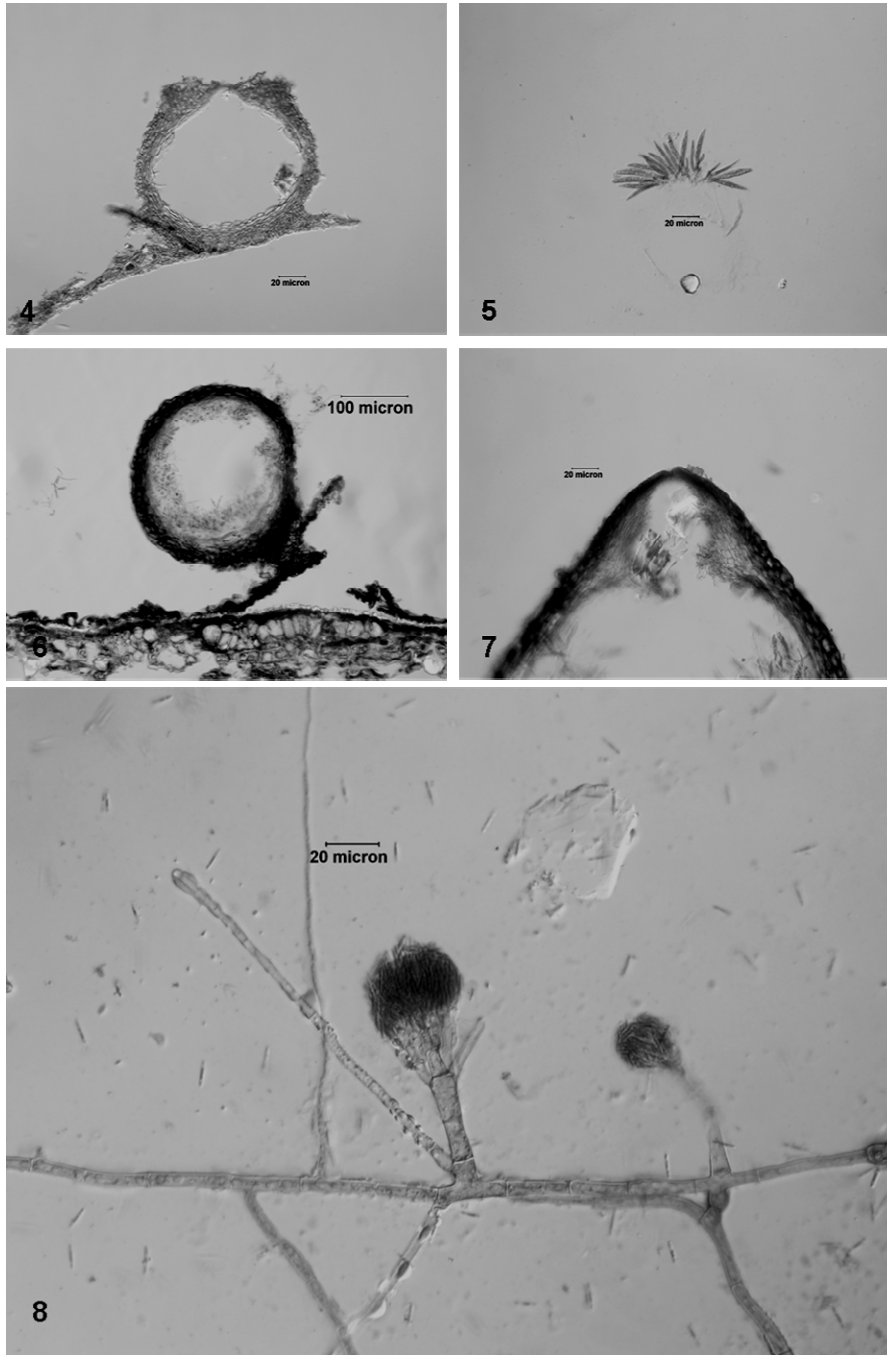
Notes: Combination of the perithecial shape, size, and reactions to KOH and lactic acid, presence of an apical disc, and ascospore characters indicates the position of the fungus in *Ijuhya* Starbäck (Rossman *et al.*, 1999). *Ijuhya hubeiensis* is characterized by its 4-spored asci. *Ijuhya parilis* (Syd.) Rossman & Samuels is similar to our fungus except for the large perithecia 180–340 μm diam., large asci $(40\text{--})45\text{--}65\text{--}(75) \times 8\text{--}11\text{--}(13)$ μm and with 8 spores, and much wider ascospores $14.5\text{--}20 \mu\text{m} \times (2.5\text{--})3\text{--}5\text{--}(5.4)$ μm . *Ijuhya paraparilis* (Samuels) Rossman & Samuels is similar to *I. hubeiensis* in perithecial shape, size and wall structure but differs in 8-spored and much larger asci $(63\text{--})65\text{--}75\text{--}(80) \times (12.5\text{--})13.5\text{--}17$ μm , and larger ascospores $(19.5\text{--})21.5\text{--}24.5\text{--}(25.5) \times 4\text{--}5$ μm with striations on surface (Samuels, 1988).

Leuconectria grandis Y. Nong & W.Y. Zhuang, **sp. nov.** (Figs 2, 6-9, 15, 18)
MycoBank: 510348.

Etymology: The specific epithet refers to the large perithecia compared with the only other known species of the genus.

Ab *Leuconectria clusiae* peritheciis magnis, 300–330 μm diam.; ascis angustis, $73\text{--}84 \times 5.4\text{--}7.5$ μm ; ascosporis parvis, $7\text{--}8.3 \times 2.7\text{--}3.3$ μm ; conidiis angustis, $8.6\text{--}12 \times 1.5\text{--}1.9$ μm differt.

Ascomata perithecial, solitary, superficial on a basal stroma, pyriform, papillate, 300–330 μm diam. and 360–425 μm high, with a conical apex 110–123 μm wide, surface at middle and lower portion covered by whitish to yellowish amorphous substances not dissolved in water or KOH, with papillae smooth, not collapsing when dry, red to reddish brown with papilla darker when fresh, turning slightly dark in 3% KOH, not changing colour obviously in lactic acid. *Cells* at ascomatal wall surface of *textura angularis* and the adjacent surface cells joined by fine pores. *Ascomatal wall* 19–30 μm thick, walls thicker near the apical region and at base, of two layers, outer layer 16–27 μm thick, with cells somewhat rectangular, cell walls $(1.1\text{--})2.1\text{--}3.2$ μm thick; inner layer 5–8 μm thick. *Asci* clavate, with a truncate apex, a long and narrow stalk and an apical ring, 8-spored, $73\text{--}84 \times 5.4\text{--}7.5$



Figs 4-8. Morphology of *Ijuhya hubeiensis* and *Leuconectria grandis*. **4-5.** *Ijuhya hubeiensis* (HMAS 98285): **4.** Structure of ascomatal wall. **5.** Asci with ascospores. **6-8.** *Leuconectria grandis* (HMAS 98302): **6.** Perithecium on leaf in section. **7.** Structure at perithecial apex. **8.** Conidiophores, “seta” with a blunt end, and conidia.

μm . *Ascospores* ellipsoid, nonseptate, with 2–3 oil drops, hyaline, nearly smooth to roughened, biseriate at the upper portion and uniseriate below, $7\text{--}8.3 \times 2.7\text{--}3.3 \mu\text{m}$.

Anamorph: Glioscephalotrichum cylindrosporum Wiley & Simmons.

Colony on PDA very dark brown to nearly black, hyphae light brown to brown. *Conidiophores* simple, stout, septate, slightly pigmented, walls smooth to slightly granulate at the upper cell, bearing at the apex a series of primary and secondary branches which terminate in phialides, fertile area subtended by a few long “setae” with a blunt end, sometimes covered by amorphous substances on surface, and $16\text{--}123 \times 2\text{--}4.2 \mu\text{m}$. *Conidiogenous cells* phialidic, ampulliform, tapering towards the tip, $7\text{--}9.5 \times 2.1\text{--}3.3 \mu\text{m}$. *Conidia* cylindrical, unicellular, hyaline, smooth-walled, aggregating to form a head, $8.6\text{--}12 \times 1.5\text{--}1.9 \mu\text{m}$. *Chlamydospores* brown, smooth- and thick-walled, $18\text{--}28 \mu\text{m}$ diam.

Holotype designated here: China. Hubei, Wufeng County, Houhe Nature Reserve, alt. 800 m, on lower surface of rotten leaf of an unidentified plant associated with other fungi, 13 IX 2004, W.Y. Zhuang & Y. Nong 5630, HMAS 98302, dried ex type culture HMAS 97511; **paratype:** Wufeng County, Houhe Nature Reserve, alt. 800 m, on lower surface of rotten leaf of an unidentified plant associated with other fungi, 13 IX 2004, W.Y. Zhuang & Y. Nong 5625, HMAS 98301.

Notes: *Leuconectria* Rossman, Samuels & Lowen has been monotypic and with a *Glioscephalotrichum* J.J. Ellis & Hesselt. anamorph (Rossman *et al.*, 1999). The Hubei collections differs from the type species of the genus in larger perithecia $300\text{--}330 \mu\text{m}$ vs. $180\text{--}260 \mu\text{m}$ diam., substances covering the perithecial surface not dissolved in 3% KOH aqueous solution, longer and narrower asci $73\text{--}84 \times 5.4\text{--}7.5 \mu\text{m}$ vs. $50\text{--}70 \times 7\text{--}10 \mu\text{m}$ and with a long and narrow stalk, smaller ascospores $7\text{--}8.3 \times 2.7\text{--}3.3 \mu\text{m}$ vs. $(8\text{--})9\text{--}11 \times (2.5\text{--})3\text{--}4(4.5) \mu\text{m}$, and much narrower conidia $8.6\text{--}12 \times 1.5\text{--}1.9 \mu\text{m}$ vs. $3.7\text{--}9.9 \times 2.5\text{--}3.7 \mu\text{m}$ (Rossman *et al.*, 1993).

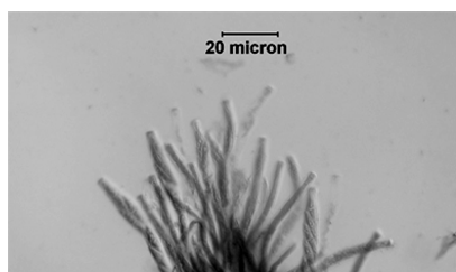
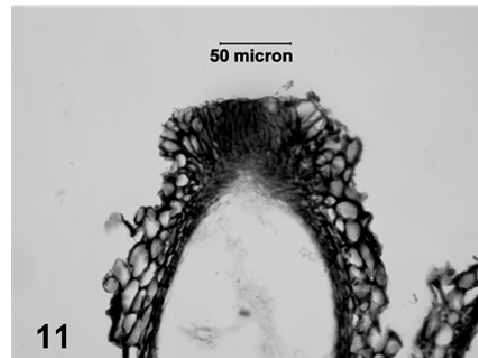
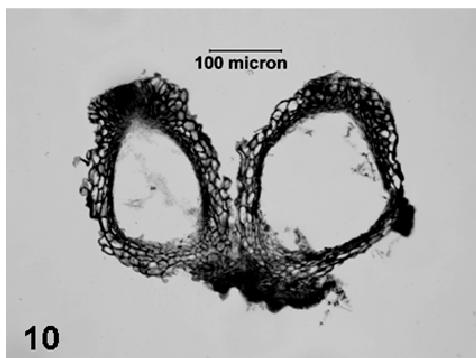
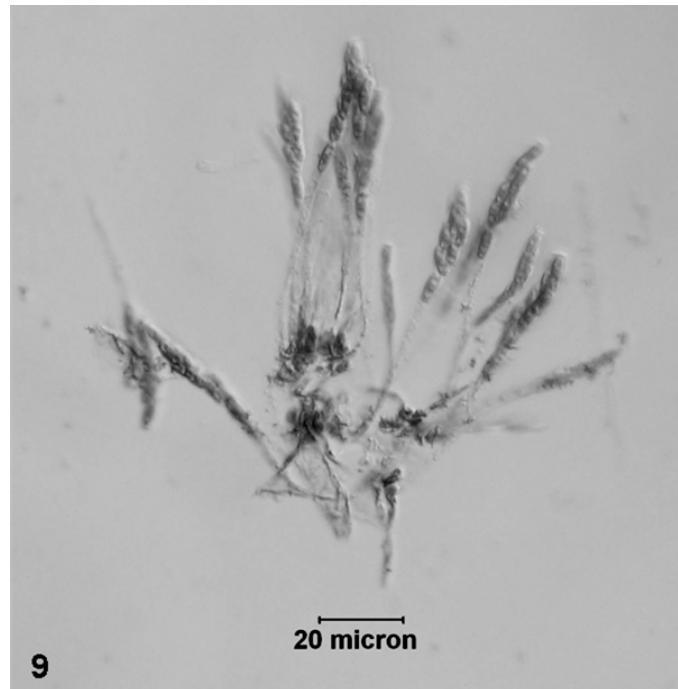
The anamorph of *Leuconectria grandis* is very similar to *Glioscephalotrichum cylindrosporum* originally described from 3 different localities in a dry evergreen forest near Pak Thong Chai, Thailand (Wiley and Simmons, 1971) except for a slightly granulate upper cell of some conidiophores and presence of lightly pigmented amorphous substances on surface of the long “setae”. We treat these differences as infraspecific variations. This is the first time that *G. cylindrosporum* is connected with a *Leuconectria* teleomorph.

***Neonectria hubeiensis* W.Y. Zhuang, Y. Nong & J. Luo, sp. nov.**

MycoBank: 510349.

(Figs 3, 10–13, 16, 19)

Etymology: The specific epithet refers to the locality of the fungus.

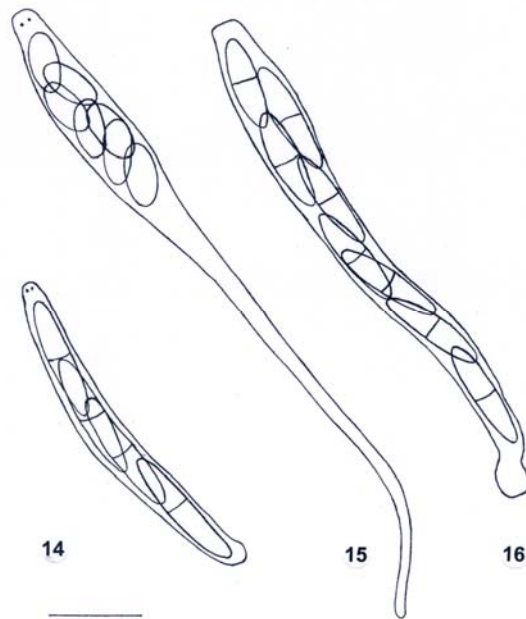


Figs 9-13. *Leuconectria grandis* and *Neonectria hubeiensis*. **9.** *Leuconectria grandis* (HMAS 98302): Long stalked asci with ascospores. **10-13.** *Neonectria hubeiensis* (HMAS 98331): **10.** Structure of perithecia in section. **11.** Perithecial wall at upper portion. **12.** Asci with ascospores. **13.** Conidiophores and conidia.

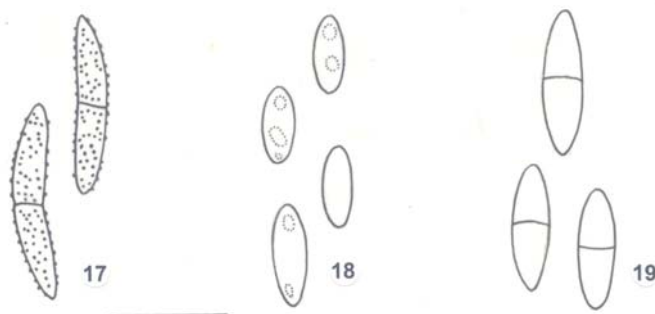
Ab *Neonectria ramulariae* peritheciis 205-250 μm diam., superficiebus peritheciis verruculosus; ascis 4-8-sporis, $54-66 \times 4.3-6.3 \mu\text{m}$; ascosporis brevibus, $11.8-14 \times 3.2-3.8 \mu\text{m}$; conidiis angustis, $15-30 \times 1.8-2.7 \mu\text{m}$ differt.

Ascomata perithecial, solitary to gregarious up to 13 in a group, superficial, non-stromatic, pyriform with a truncate apex, 205-250 μm diam. and 275-360 μm high, with a broad apex 135-205 μm wide, surface somewhat warted, not collapsing when dry, red when fresh and red to dark red when dry, turning dark in 3% KOH, orange-yellow in lactic acid. *Ascomatal wall* 33-46 μm wide, of two layers; outer layer 22-33 μm thick, cells commonly angular to rectangular, $11-28 \times 7.5-16(-21) \mu\text{m}$, cell walls ca 2.1 μm and up to 4 μm thick; inner layer 10-14 μm thick. *Asci* subcylindrical, with a blunt apex and an apical ring, 4-8-spored, $54-66 \times 4.3-6.3 \mu\text{m}$. *Ascospores* subellipsoid to subfusoid, uniseptate, not constricted at the septum, evenly two-celled, pale yellow, smooth, uniseriate to irregularly uniseriate, $11.8-14 \times 3.2-3.8 \mu\text{m}$.

Anamorph: *Cylindrocarpon* cf. *orthosporum* (Sacc.) Wollenw.



Figs 14-16. Morphology of asci. **14.** *Ijuhya hubeiensis* (HMAS 98285). **15.** *Leuconectria grandis* (HMAS 98302). **16.** *Neonectria hubeiensis* (HMAS 98331). Scale bar = 10 μm .



Figs 17-19. Morphology of ascospores. **17.** *Ijuhya hubeiensis* (HMAS 98285). **18.** *Leuconectria grandis* (HMAS 98302). **19.** *Neonectria hubeiensis* (HMAS 98331). Scale bar = 10 μ m.

Colony on PDA with sparse aerial mycelia. *Conidiophores* branched. *Conidiogenous cells* subcylindrical, slightly tapering towards the tip, colourless, 38–75 μ m long, 1–2 μ m at upper portion and 2–4 μ m wide at base. *Conidia* cylindrical with both ends slightly narrow to rod-shaped, 1(–3)-septate, colourless, smooth-walled, aggregated in small droplets of mucilage, 15–30 \times 1.8–2.7 μ m.

Holotype designated here: China. Hubei, Wufeng County, Houhe Nature Reserve, alt 800 m, on fruits of *Rhododendron* sp. 13 IX 2004, W.P. Wu, W.Y. Zhuang & Y. Nong 5620, HMAS 98331, dried ex type culture HMAS 97512.

Notes: Among species of *Neonectria* Wollenw. which produce uniseptate ascospores and a *Cylindrocarpon* anamorph (Brayford and Samuels, 1993; Rossman *et al.*, 1999; Mantiri *et al.*, 2001; Brayford *et al.*, 2004), the Hubei collection is most similar to *N. ramulariae* Wollenw. in perithecia superficial, non-stromatic, pyriform with a broad apex, perithecial wall thickness and number of layers, and smooth ascospores. Our new species is distinguished from the latter in slightly larger perithecia with a warted instead of smooth surface, cells in the outer layer of the perithecial wall angular to rectangular instead of irregularly elongate perpendicular to the ascomatal wall, 4–8-spored instead of 8-spored asci, somewhat smaller ascospores [11.8–14 \times 3.2–3.8 μ m vs. (11–)12–15(–20) \times 3–4(–4.5) μ m], much narrower conidia (15–30 \times 1.8–2.7 μ m vs. 19–27 \times 3–5 μ m), and a different substrate. Since the conidiogenous cells of *C. orthosporum* (12–20 \times 2.5–3 μ m) (Booth, 1966) is much shorter than that of our fungus. The anamorph of *Neonectria hubeiensis* is here indicated as *C. cf. orthosporum*.

New records for China

Bionectria gibberosa Schroers, Stud. Mycol. 46: 198, 2001.

Material examined: China. Hubei, Shennongjia, Zhangbaohe, alt. 1100 m, on branch, 16 IX 2004, W.Y. Zhuang & Y. Nong 5794, HMAS 98274.

Ijuhya paraparilis (Samuels) Rossman & Samuels, Stud. Mycol. 42: 35, 1999.

Anamorph: *Acremonium* sp.

Material examined: China. Hubei, Shennongjia, Zhangbaohe, alt. 1100 m, on dead branch, 17 IX 2004, W.Y. Zhuang & Y. Nong 5798, HMAS 98284.

Notes: According to Samuels (1988), *Ijuhya paraparilis* and *I. parilis* (Syd.) Rossman & Samuels are similar in shape of perithecia and ascomatal wall structure and differ from each other in size of perithecia, of asci and of ascospores, and ascospore ornamentation. The Hubei material fits that the description of the fungus well.

Neonectria discophora (Mont.) Mantiri & Samuels, Can. J. Bot. 79: 339, 2001. var. ***discophora***

Anamorph: *Cylindrocarpon* sp.

Material examined: China. Hubei, Wufeng County, Houhe Nature Reserve, alt. 800 m, on twig, 12 IX 2004, W.Y. Zhuang & Y. Nong 5542, HMAS 98333; *ibid.* on bark, 13 IX 2004, W.Y. Zhuang & Y. Nong 5621, HMAS 98327.

Notes: This fungus was erroneously recorded as *Nectria mammoidea* W. Phillips & Plowr. var. *rubi* (Osterw.) Weese [\equiv *Neonectria discophora* var. *rubi* (Osterw.) Brayford & Samuels] based on collections from Hainan Province in tropical China (Zhang and Zhuang, 2003). Our recent study shows that the correct name for the fungus from both tropical and central China should be *Neonectria discophora* var. *discophora* since no specimens from China are associated with root canker of *Rubus*, which is critical in distinguishing different varieties of this species (Brayford *et al.*, 2004).

Neonectria galligena (Bres.) Rossman & Samuels, Stud. Mycol. 42: 159, 1999.

Anamorph: *Cylindrocarpon* sp.

Material examined: China. Hubei, Shennongjia, alt. 1200 m, on branch, 15 IX 2004, W.Y. Zhuang & Y. Nong 5692, HMAS 99208; Hubei, Shennongjia, Jinhoulung, alt. 1800 m, 16 IX 2004, W.Y. Zhuang & Y. Nong 5742, 5743, 5748, 5749, HMAS 98328, 99206, 98329, 98330.

Neonectria veuillotiana (Sacc. & Roum.) Mantiri & Samuels, Can. J. Bot. 79: 339, 2001.

Anamorph: *Cylindrocarpon* sp.

Diagnostic features: *Ascomata* solitary to gregarious up to 39 in a group, superficial, non-stromatic, pyriform with a broad apex, 195–305 µm diam. and 250–430 µm high, with a broad apex 112–166 µm wide, surface roughened, not collapsing when dry, red when fresh and red to dark red when dry, turning dark in 3% KOH, orange-yellow in lactic acid. *Ascomatal wall* 19–35 µm wide, of two layers; outer layer 17–25 µm thick, cells angular to rectangular 5–22 × 4–14 µm, cell walls ca 2.5–4 µm thick; inner layer 8–12 µm thick; walls at apical region 44–57 µm thick, cells 8.5–25 × 5.5–13 µm, cell walls 2.5–4.5 µm thick. *Asci* clavate, with a blunt apex and an apical ring, 8-spored, 72–90 × 9–13.7 µm. *Ascospores* ellipsoid, uniseptate, not constricted or slightly constricted at the septum, evenly two-celled, hyaline, warted, uniseriate to irregularly uniseriate, 14.4–17.3 × 5.4–7.5 µm. *Conidia* subcylindrical, hyaline, with mostly 3–4 and up to 6 septa, 3-septate: 32–37(–45) × 4.1–4.7(–5.5) µm, 4-septate: 45–62 × (4.3–)5–5.6 µm, 5-septate: 44–64 × 5.4–5.9 µm.

Material examined: China. Hubei, Shennongjia, alt. 1200 m, on rotten twig associated with other fungi, 15 IX 2004, W.Y. Zhuang & Y. Nong 5686, HMAS 98332; Hubei, Xingshan County, Longmenhe, alt. 1800 m, on dead twig associated with other fungi, 18 IX 2004, W.Y. Zhuang & Y. Nong 5832, HMAS 99207.

Notes: Morphology of the Chinese collections differs slightly from that described based on materials from other regions of the world (Brayford and Samuels, 1993) in the perithecial wall lacking an interwoven middle layer, ascospores slightly smaller [14.4–17.3 × 5.4–7.5 µm vs. (12.4–)14.7–19.3 (–25) × (5–)6.5–7.8(–9.3) µm], and associated with other fungi on dead twigs instead of bark of deciduous trees. We treat the above distinctions as infraspecific variations.

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