



Additions to hyphomycetes from Yungui Plateau, China with three new species (Ascomycota, Sordariomycetes)

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Abstract

Background

Yungui Plateau is rich in fungal diversity. Hyphomycetes, growing on submerged wood, can promote the degradation of organisms and the reuse of rotten wood energy. During an investigation of hyphomycetes in this region, 19 species of dematiaceous hyphomycetes were collected in Yungui Plateau.

New information

Both morphological identification and multi-gene phylogenetic analyses of ITS, *tef1* and LSU sequences supported *Coryneum sevenseptatis* as a new species. *Phaeoisaria guizhouensis* and *Pleurothecium yunanensis* were introduced, based on morphology. Morphological descriptions and illustrations of the new species were detailed. Known species are listed with notes.

Keywords

Guizhou, karst area, new taxa, phylogenetic analysis, taxonomy

Introduction

Coryneum firstly described by Nees based on the *C. umbonatum* Nees, 1816 (Nees von Esenbeck 1816). Some synapomorphies between Coryneaceae and Pseudovalsaceae like having black perithecia, often immersed in wood, asci that deliquesce at maturity and an asexual morph with transversely distoseptate brown conidia, are regarded as the character of Coryneaceae and many species of this genus have been reported as phytopathogens causing tree canker (Sutton 1975, Rossman et al. 2007, Senanayake et al. 2017). In the recent decade, tens of species of *Coryneum* have been reported, and five species have been found in China (Rossman et al. 2015, Senanayake et al. 2017, Jiang et al. 2018, Senwana et al. 2018, Jiang et al. 2019, Boonmee et al. 2021).

Phaeoisaria was firstly described by Höhnelt (1909) to accommodate *P. bambusae* Höhn., 1909 as the type species. This genus is characterised by conidiophores adpressed in parallel with numerous sympodially extending denticulate conidiogenous cells and aseptate or septate ellipsoidal, obovoidal, fusiform-cylindrical to falcate, hyaline conidia (Höhnelt 1909, Hyde et al. 2018, Boonyuen et al. 2021) In the recent decade, increasing numbers of species of *Phaeoisaria* have been considered as new species (Crous et al. 2017, Hyde et al. 2018, Luo et al. 2019, Boonmee et al. 2021, Crous et al. 2021, Liu et al. 2022, Jayawardena et al. 2023).

Pleurothecium was firstly described by Höhnelt (1919) to accommodate *P. recurvatum* (Morgan) Höhn. the type species. This genus is characterised by distinct brown conidiophores and polyblastic sympodially extended denticulate conidiogenous cells. The conidia are solitary, unicellular or septate, hyaline or pigmented (Matsushima 1975, Matsushima 1980, Cooper 2005, Réblová et al. 2012). In the recent decade, five species of *Pleurothecium* have been reported (Monteiro et al. 2016, Hyde et al. 2017, Luo et al. 2018, Shi et al. 2021, Jayawardena et al. 2023).

Yungui Plateau is a typical karst landform including Guizhou and Yunnan Provinces in south-western China (Wang et al. 2004). Guizhou Province is located in the east of Yungui Plateau. Its warm climate has led to the development of various subtropical flora in this

region. In the high-temperature area of the low latitude valley in the south, there are tropical elements and near-tropical vegetation types (Wu 2000). The environmental and biological factors resulting from the complicated geography and topography, highly variable climate conditions, diversified vegetation and forest type etc. provide an abundant and wide variety of favourable habitats and symbiotic hosts for the growth and reproduction of the fungi such as hyphomycetes (Wu 2000, Gulis and Suberkropp 2003, Wu and Zhuang 2008, Wijayawardene et al. 2021). Hyphomycetous taxa are mainly saprobic on plant residues, such as rotten wood, dead branches, bark and fallen leaves, as well as in soil and submerged substrates of freshwater (Pirozynski and Hodges 1973, Gönczöl and Révay 2003, Shirouzu and Harada 2008, Shirouzu et al. 2010, Ma 2012, Yen et al. 2012, Ma et al. 2015) and have a strong ability to degrade wood fibres (Shearer and Webster 1991, Hoffmann and Hering 2000, Zhang 2018). Amongst them, hyphomycetes growing on rotten wood account for a large part. At present, more than 1400 genera of asexual hyphomycetes have been recognised all over the world (Seifert and Gams 2011). Fungal diversity in Yungui Plateau is high, but still mostly unexplored. During an investigation of hyphomycetes associated with plant residues in this region, nineteen species were identified from rotting wood, including three new species that are described below.

Materials and methods

Sample collection and isolation

Decaying wood with fungi were collected from forests in Guizhou and Yunnan Provinces. The samples were placed in paper bags and brought to the laboratory. Specimens were examined using an OLYMPUS SZ6 dissecting microscope. Photomicrographs were taken using a Cannon EOS 700D camera attached to a Nikon ECLIPSE Ni compound microscope. Measurements were made using the Tarosoft (R) Image Frame Work programme. Dimensions of anatomical features were shown followed Kurniawati et al. (2010). Figures were processed with Adobe Photoshop CS6 software (Adobe Systems, USA) without modification of morphological characteristics (Dong et al. 2020). Singer spore isolations were used for obtaining pure cultures (Choi et al. 1999). Germinating conidia with a small amount of medium were individually transferred to potato dextrose agar (PDA) medium plates under a stereomicroscope (Luo et al. 2018). Specimens were deposited at the Herbarium of Guizhou Medical University (GMB) and the Herbarium of Kunming Institute of Botany (KUN). The cultures were preserved in Guizhou Medical University Culture Collection (GMBC) (Table 1).

Table 1.

Strains used in the phylogenetic tree and their culture accession and GenBank numbers. Strains from this study are in bold.

SPECIES	Strain number		GenBank Accession number		
			ITS	LSU	tef
<i>Asterosporium asterospermum</i>	KT2125		NA	AB553743	NA
<i>Asterosporium asterospermum</i>	KT2138		NA	AB553744	NA
<i>Chaetoconis polygoni</i>	CBS 405.95		NA	EU754141	NA
<i>Coryneum castaneicola</i>	CFCC 52315		MH683559	MH683551	MH685731
<i>Coryneum castaneicola</i>	CFCC 52316		MH683560	MH683552	MH685732
<i>Coryneum depressum</i>	AR 3897		NA	EU683074	NA
<i>Coryneum gigasporum</i>	G14		MK799957	MK799944	MK799830
<i>Coryneum gigasporum</i>	G15		MK799958	MK799945	MK799831
<i>Coryneum heveanum</i>	MFLUCC 17-0369		MH778707	MH778703	NA
<i>Coryneum heveanum</i>	MFLUCC 17-0376		MH778708	MH778704	MH780882
<i>Coryneum ilicis</i>	CFCC 52994		MK799948	MK799935	NA
<i>Coryneum ilicis</i>	CFCC 52995		MK799949	MK799936	NA
<i>Coryneum modonia</i>	AR 3558		NA	EU683073	NA
<i>Coryneum perniciosum</i>	CBS 130.25		MH854812	MH866313	NA
<i>Coryneum sinense</i>	X60	MK799952	MK799939	MK799825	
<i>Coryneum sinense</i>	X23	MK799953	MK799940	MK799826	
<i>Coryneum septemseptatum</i>	GMB0393	OQ540748	OQ540743	OQ540767	
<i>Coryneum septemseptatum</i>	GMB0392	OQ560328	OQ560329	NA	
<i>Coryneum songshanense</i>	CFCC 52997	MK799946	MK799933	MK799822	
<i>Coryneum songshanense</i>	CFCC 52998	MK799947	MK799934	MK799823	
<i>Coryneum suttonii</i>	Z17	MK799955	MK799942	MK799828	
<i>Coryneum suttonii</i>	Z63	MK799956	MK799943	MK799829	
<i>Coryneum umbonatum</i>	CBS 199.68	MH859114	MH870828	NA	
<i>Coryneum umbonatum</i>	AR 3541	NA	EU683072	NA	
<i>Crinitospora pulchra</i>	CPC 22807	KJ710466	KJ710443	NA	
<i>Cytospora centrivillosa</i>	IT 2132	MF190122	MF190068	NA	
<i>Cytospora centrivillosa</i>	MFLU 17-0887	MF190123	MF190069	NA	
<i>Cytospora fertilis</i>	AR 3514	NA	EU255210	EU222018	
<i>Cytospora melanodiscus</i>	Jimslanding2	JX438621	NA	JX438605	
<i>Cytospora translucens</i>	CZ320	FJ755269	FJ755269	NA	
<i>Diaporthe azadirachtae</i>	TN 01	KC631323	NA	NA	
<i>Diaporthe eres</i>	AR 5193	KJ210529	MT378367	KJ210550	

SPECIES	Strain number	GenBank Accession number		
		ITS	LSU	tef
<i>Diaporthe eres</i>	T-098	MF190138	MF190081	MF377595
<i>Diaporthe maytenicola</i>	CPC 21896	KF777157	KF777210	NA
<i>Hyaliappendispora galii</i>	MFLU 15-2269	MF190150	MF190095	MF377587
<i>Lamproconium desmazieri</i>	MFLUCC 15-0870	KX430134	KX430135	MF377591
<i>Lamproconium desmazieri</i>	MFLUCC 15-0872	KX430138	KX430139	MF377593
<i>Macrohilum eucalypti</i>	CPC 10945	DQ195781	DQ195793	NA
<i>Macrohilum eucalypti</i>	CPC 19421	KR873244	KR873275	NA
<i>Pachytrype princeps</i>	Rogers s.n.	NA	FJ532382	NA
<i>Pachytrype rimosa</i>	FF1066	NA	FJ532381	NA
<i>Phaeoacremonium aleophilum</i>	CBS 631.94	AF266647	AB278175	KF764643
<i>Phaeoacremonium vibratile</i>	CBS 117115	KF764573	DQ649065	KF764645
<i>Phaeoappendicospora thailandensis</i>	TL 19	MF190157	MF190102	NA
<i>Phaeoappendicospora thailandensis</i>	MFLU 12-2131	MF190158	MF190103	NA
<i>Phaeodiaporthe appendiculata</i>	D77	KF570156	KF570156	NA
<i>Prosopidicola mexicana</i>	CBS 113529	AY720709	KX228354	NA
<i>Prosopidicola mexicana</i>	CBS 113530	AY720710	NA	NA
<i>Rossmania ukurunduensis</i>	AR 3484	NA	EU683075	NA
<i>Stegosporium acerophilum</i>	D5	EU039982	EU039993	EU040027
<i>Stegosporium pyriforme</i>	D2	EU039971	EU039987	EU040001
<i>Stilbospora macrosperma</i>	CBS 121883	JX517290	JX517299	KF570235
<i>Stilbospora macrosperma</i>	WJ 1840	NA	AY616229	NA
<i>Sydowiella depressula</i>	CBS 813.79	NA	EU683077	NA
<i>Sydowiella fenestrans</i>	CBS 125530	JF681956	EU683078	MK524463

DNA extraction, polymerase chain reaction (PCR) amplification and sequencing

The mycelia cultured on PDA medium were scraped out and put into a 1.5 ml centrifuge tube for DNA extraction. DNA Extraction Kit (E.Z.N.A.® Forensic DNA Kit, D3591, BIOMEGA, USA) was used for extraction of total DNA following its instructions. Three gene regions were amplified with universal primers. ITS1/ITS4 for the internal transcribed spacer regions of ribosomal DNA (ITS) (White et al. 1990), LR0R/LR5 for the large subunit nuclear ribosomal DNA (LSU) (Vilgalys and Hester 1990), EF1-983F/EF1-2218R for the translation elongation factor 1-alpha gene (*tef*) (Rehner and Buckley 2005, Hosaka et al. 2006) were used for PCR amplification. The PCR amplification solution included 12.5 µl of 2 × Taq PCR master mix, 9.5 µl of ddH₂O, 1 µl of DNA extraction, 1 µl of forward primer and 1 µl of

reverse primer. The PCR products were sent to Sangon Biotech, Shanghai, China, for sequencing.

Phylogenetic analyses

The sequences were pasted into the BLASTN for preliminary identification. All sequences were selected, based on the top hits and the latest literature (Boonyuen et al. 2021). The sequences were aligned with the Multiple Sequence Alignment Programme MAFFT (MAFFT 7.205) software (Katoh and Standley 2013). Then spurious sequences or poorly-aligned regions from a multiple sequence alignment were removed with the tool of TrimAl (Capella-Gutiérrez et al. 2009). Alignment Transformation EnviRonment (<http://www.sing-group.org/alter/>) was performed to convert the FASTA format to the phylp format (Glez-Peña et al. 2010). The Maximum Likelihood analysis was carried out with GTR+G+I model of site substitution by using RAXML 7.4.2 black box (<https://www.phylo.org/>, Stamatakis et al. (2008)). Bayesian analysis was performed with MrBayes v. 3.1.2 (Huelsenbeck and Ronquist 2001). The branch support was evaluated with a bootstrapping method of 1000 replicates (Hillis and Bull 1993). Posterior probabilities (PP) were determined by Markov Chain Monte Carlo sampling (MCMC) in MrBayes v. 3.2.2 (Ronquist et al. 2012). The nucleotide substitution model was estimated by MrModelTest v.2.3 (Posada and Crandall 1998). Six simultaneous Markov chains were run for 2,000,000 generations and the trees were sampled each 100th generation. The first 25% of trees, greater than 0.95, are indicated at the nodes. When the value is less than 75/0.95, the value is represented by -/-. The tree is rooted to *Phaeoacremonium aleophilum* (CBS 631.94) and *P. vibratile* (CBS 117115). The new collections are in bold (Fig. 1).

Taxon treatments

Coryneum septemseptatum C.S. Long, Q.R. Li & Jian Ma, sp. nov.

- MycoBank [844574](#)

Materials

Holotype:

- scientificName: *Coryneum septemseptatum*; acceptedNameUsage: *Coryneum septemseptatum* C.S. Long, Q.R. Li & Jian Ma, 2021, sp. nov; parentNameUsage: *Coryneum* Nees 1816; kingdom: fungi; phylum: Ascomycota; class: Sordariomycetes; order: Diaporthales; family: Coryneaceae; taxonRank: species; verbatimTaxonRank: species; genus: *Coryneaceae*; scientificNameAuthorship: C.S. Long, Q.R. Li & Jian Ma; continent: Asia; country: China; stateProvince: Guizhou; county: Luodian county; locality: Daxiaoqing Forest Park; verbatimElevation: 562 m; locationRemarks: label transliteration : "Guizhou, Daxiaoqing Forest Park , 2021.10.21,Long chun-sheng"[贵州罗甸县大小井森林公园, 2021年10月21日, 龙春升]; verbatimCoordinates: 23.2328N, 101.2364E; georeferenceProtocol: label; samplingProtocol: collecting; eventDate: 10/21/2021; habitat: decaying wood; recordedBy: Chun-Sheng Long; identifiedBy: Chun-Sheng Long, Qi-Rui Li & Jian Ma; type: PhysicalObject; language: en; institutionID: KUN-HKAS 12345; collectionID: GMB0392; institutionCode: The Herbarium of Cryptogams

Kunming Institute of Botany AcademiaSinica; occurrenceID:
15C96932-06C5-5908-8A9A-309902D78913

Other material:

- a. scientificName: *Coryneum septemseptatum*; continent: Asia; country: China;
stateProvince: Guizhou; county: Luodian county; locality: Daxiaojing Forest Park;
verbatimElevation: 544 m; verbatimCoordinates: 23.8287°N, 101.4264°E; type:
PhysicalObject; institutionID: KUN-HKAS 12345; collectionID: GMBC0393;
institutionCode: The Herbarium of Cryptogams Kunming Institute of Botany Academia
Sinica; occurrenceID: 3ADA3585-EE9E-58A8-882A-ADDA0B36DA2

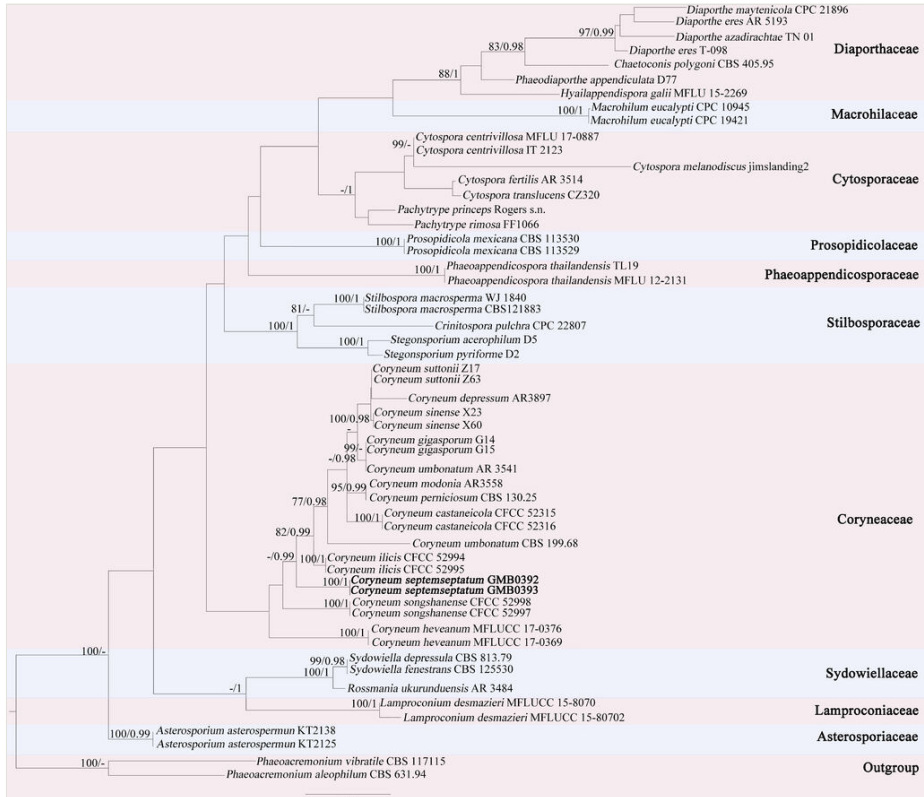


Figure 1. [doi](#)

The Maximum Likelihood (RAxML) tree, based on a combined dataset of ITS, LSU and *tef1* sequences. Bootstrap support values for Maximum Likelihood (ML, left) equal to or greater than 75% and Bayesian posterior probabilities (BY, right), equal to or greater than 0.95, are indicated at the nodes. When the value is less than 75/0.95, the value is represented by *-/-*. The tree is rooted to *Phaeoacremonium vibratile* (CBS 117115) and *Phaeoacremonium aleophilum* (CBS 631.94). The new collections are in bold. [MH780882](#) (*tef1* sequence of *Coryneum heveanum*) cannot be used in Phylogenetic analyses due to the abnormal Phylogenetic tree.

Description

Saprobic on the surface of decaying wood (Fig. 2). **Asexual morph:** Colonies on natural substratum effuse, brown, hairy. Mycelium superficial and immersed, composed of branched, septate, pale brown to brown, smooth-walled hyphae. Sporodochia on natural substrate scattered or clustered, punctiform, dark brown, 77–99 μm wide, 27–44 μm high. Conidiophores micronematous or semi-macronematous, simple, 0–3-septate, pale brown, 12–31 μm long (\bar{x} = 20 μm , SD = 4.8, n = 15), 2.5–4 μm wide (\bar{x} = 3.1 μm , SD = 0.5, n = 15). Conidiogenous cells holoblastic, integrated, terminal, indeterminate, cylindrical and hyaline, with 0–1 percurrent extensions. Conidia solitary, acrogenous, dry, ellipsoidal to broadly fusiform, 34–46 μm long (\bar{x} = 40 μm , SD = 3.7, n = 20), 14.5–17 μm wide (\bar{x} = 15.5 μm , SD = 0.9, n = 20), 7–8-septate, smooth, brown, hyaline at the top, 4.5–8.5 μm (\bar{x} = 5.9 μm , SD = 1.1, n = 20) wide at the truncate base. **Sexual morph:** Undetermined.

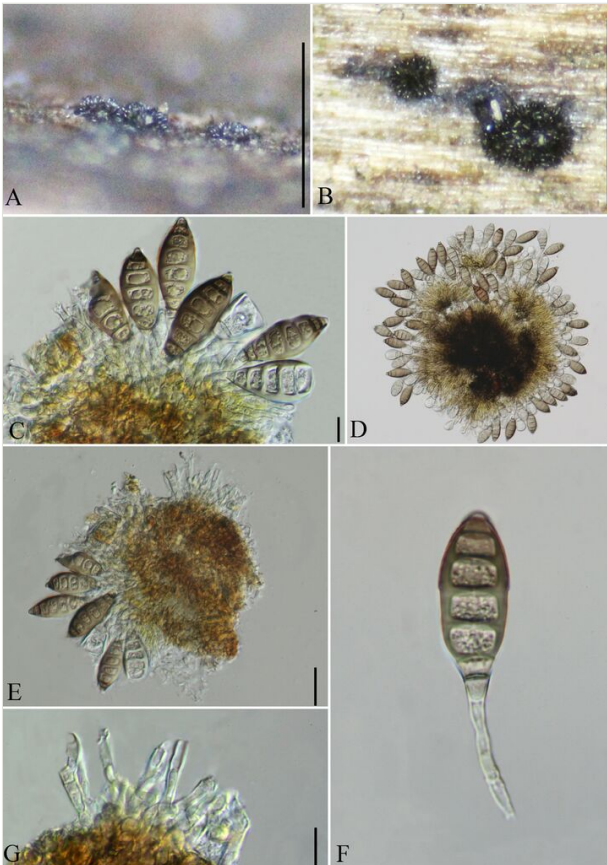


Figure 2. [doi](#)

Coryneum septemseptatum (holotype, GMB0392). **A, B** Conidiomata on the natural substratum; **C–F** Conidiogenous cells and Conidia; **G** Conidiophores. Scale bars: A, B = 0.5 mm, C, F, G = 10 μm , D = 50 μm , E = 25 μm .

Etymology

With reference to the conidia with 7–8 septa.

Notes

Amongst the known species of *Coryneum*, *C. betulinum* Schulzer, *C. gregoryi* B. Sutton, *C. japonicum* (Sacc.) B. Sutton and *C. psidii* B. Sutton are similar to *C. sevenseptatum* in conidial shape (Senawanna et al. 2018, Shavrin and Smetana 2020). However, the conidia of *C. septemseptatum* have 7–8 septa which differ from those of *C. betulinum* (4–5-septate), *C. gregoryi* (5–9-septate), *C. japonicum* (5–7-septate) and *C. psidii* (5–6-septate). Both morphological and molecular data (Fig. 1) supported *C. septemseptatum* as a new species (Table 2).

Species name	Conidia size (μm)	No. of distosepta	Reference
<i>Coryneum acaciae</i>	49-52 × 5-6	5-6	Mcalpine (1903)
<i>Coryneum affine</i>	20-22 × 7	7	Saccardo (1882)
<i>Coryneum arausiacum</i>	42–56 × 13–16	4–6	Senanayake et al. (2017)
<i>Coryneum betulinum</i>	31–36 × 14–17	4–5	Sutton (1975)
<i>Coryneum berkeleyi</i>	30 × 8	3-5	Cooke (1906)
<i>Coryneum calophylli</i>	38–48 × 12.5–14.5	5–6	Sutton (1975)
<i>Coryneum canadense</i>	45-75 × 13-15	3-5	Bubak (1916)
<i>Coryneum carpinicola</i>	50-68 × 8-11	7-11	Sutton (1975)
<i>Coryneum castaneicola</i>	56–80 × 9.5–13	5-8	Sutton (1975)
<i>Coryneum clusiae</i>	30–40 × 20–30	3-5	Sutton (1975)
<i>Coryneum compactum</i>	40–58 × 15–21	4-6	Sutton (1975)
<i>Coryneum cesatii</i>	80-90 × 13-15	6-7	Sutton (1975)
<i>Coryneum cocois</i>	40-42 × 3-4	2	Hennings (1903)
<i>Coryneum concolor</i>	10-11 × 4.5-5	3	Penzig (1882)
<i>Coryneum depressum</i>	44–53 × 19–23	4-6	Sutton (1975)
<i>Coryneum elevatum</i>	56-59 × 20-25	5-7	Sutton (1975)
<i>Coryneum eriobotryae</i>	5-9 × 5-7	1	Saccardo and Traverso (1906)
<i>Coryneum fagi</i>	45–75 × 10–15.5	6–12	Boonmee et al. (2021)

Species name	Conidia size (μm)	No. of distosepta	Reference
<i>Coryneum foliorum</i>	15-20 x 6-8	3	Saccardo and Traverso (1902)
<i>Coryneum gigasporum</i>	93-108 x 19-21	7-9	Jiang et al. (2018)
<i>Coryneum gregoryi</i>	32.5-43 x 12-16	5-9	Sutton (1975)
<i>Coryneum heveanum</i>	43-53 x 15-20	4-6	Senwana et al. (2018)
<i>Coryneum ilicis</i>	82-105 x 9.5-12.5	10-11	Jiang et al. (2019)
<i>Coryneum japonicum</i>	45-60 x 11-12	5-7	Sutton (1975)
<i>Coryneum lanciforme</i>	45-53 x 16-18	4-6	Sutton (1975)
<i>Coryneum longistipitatum</i>	18-20 x 8-9	3	Saccardo and Traverso (1892)
<i>Coryneum megasperum</i>	52-110 x 12-15	8-14	Theissen (1912)
<i>Coryneum megasperum</i> var. <i>cylindricum</i>	100-125 x 10-13	7-8	Sutton (1975)
<i>Coryneum modonium</i>	50-71 x 14-19	5-8	Sutton (1975)
<i>Coryneum neesii</i>	68-82 x 18-22	6-8	Sutton (1975)
<i>Coryneum pruni</i>	14-23 x 5.5-9	4-5	Wijayawardene et al. (2016)
<i>Coryneum psidii</i>	25-40 x 14-17	5-6	Sutton (1975)
<i>Coryneum pyricola</i>	61-70 x 24-32	5-7	Sutton (1975)
<i>Coryneum septemseptatum</i>	34-46 x 14.5-17	7-8	This study
<i>Coryneum quercinum</i>	45-60 x 14-16	6-7	Muthumary and Sutton (1986)
<i>Coryneum sinense</i>	50-76 x 13-17	5-7	Jiang et al. (2018)
<i>Coryneum songshanense</i>	51-76 x 9-11.5	5-7	Jiang et al. (2019)
<i>Coryneum stromatoideum</i>	105-180 x 16-20	9-17	Sutton (1975)
<i>Coryneum suttonii</i>	60-76 x 10-14.5	4-5	Jiang et al. (2018)
<i>Coryneum sydowianum</i>	50-58 x 14-17	5-6	Jiang et al. (2018)
<i>Coryneum umbonatum</i>	57-72 x 13-16	5-7	Sutton (1975)

***Phaeoisaria guizhouensis* C.S. Long, Q.R. Li & Jian Ma, sp. nov.**

- MycoBank [844575](https://www.mycobank.org/844575)

Materials

Holotype:

- a. scientificName: *Phaeoisaria guizhouensis*; acceptedNameUsage: *Phaeoisaria guizhouensis* C.S. Long, Q.R. Li & Jian Ma, 2021, sp. nov.; taxonRemarks: species;

parentNameUsage: *Phaeoisaria* Höhn. 1909; kingdom: fungi; phylum: Ascomycota; class: Sordariomycetes; order: Pleurotheciales; family: Pleurotheciaceae; verbatimTaxonRank: species; scientificNameAuthorship: C.S. Long, Q.R. Li & Jian Ma; continent: Asia; country: china; stateProvince: Guizhou; county: Luodian County; locality: Daxiaojing Forest Park; verbatimElevation: 653 m; locationRemarks: label transliteration: "Guizhou, Daxiaojing Forest Park, 2021.10.21, Long chun-sheng"; [贵州罗甸县大小井森林公园, 2021年10月21日]; verbatimCoordinates: 23.5663N, 101.3213E; georeferenceProtocol: Lable; samplingProtocol: collecting; eventDate: //2021; habitat: decaying wood; recordedBy: Chun-Sheng Long; identifiedBy: Chun-Sheng Long, Qi-Rui Li & Jian Ma; language: en; institutionID: KUN-HKAS 12346; collectionID: GMB0394; institutionCode: The Herbarium of Cryptogams Kunming Institute of Botany Academia Sinica; occurrenceID: 18602EC9-B7A5-5621-B1D0-ABE14D58CE17

Other material:

- a. scientificName: *Phaeoisaria guizhouensis*; continent: Asia; country: china; stateProvince: Guizhou; county: Luodian county; locality: Daxiaojing Forest Park; verbatimElevation: 541 m; verbatimCoordinates: 23.5667°N, 101.3032°E; collectionID: GMB0394; occurrenceID: 58591A4C-D09E-5853-BF69-2AA3AD86987E

Description

Saprobic on the surface of decaying wood (Fig. 3). **Asexual morph:** Colonies on natural substratum. Conidial secession schizolytic. Conidia solitary, acropleurogenous, 9–13 µm long (\bar{x} = 11.0 µm, SD = 1.9, n = 18), 1.9–3.6 µm wide (\bar{x} = 3.0 µm, SD = 0.6, n = 15), ellipsoidal to obovoidal, rounded at the apex, hyaline, aseptate, guttulate, smooth-walled. **Sexual morph:** Undetermined.

Etymology

With reference to Guizhou Province where the type specimen was found.

Notes

Phaeoisaria guizhouensis morphologically resembles *P. aquatic* Z. L. Luo et al. and *P. pseudoclematidis* D.Q. Dai & K.D. Hyde, but they differ in conidial size (6.5–7.5 × 2.5–3.5 µm for *P. aquatic*; 9–13 × 1.9–3.6 µm for *P. guizhouensis*; 5–8.5 × 3–4 µm for *P. pseudoclematidis*) and the conidial of *P. aquatic* and *P. pseudoclematidis* appears around the conidiophores, but *P. guizhouensis* only appears at the apex (Liu et al. 2015, Luo et al. 2018).

Pleurothecium yunanensis C.S. Long, Q.R. Li & Jian Ma, sp. nov.

- MycoBank [844576](https://www.mycobank.org/844576)

Materials

Holotype:

- a. scientificName: *Pleurothecium yunanensis*; acceptedNameUsage: *Pleurothecium yunanensis* C.S. Long, Q.R. Li & Jian Ma, 2021, sp. nov.; taxonRemarks: species;

parentNameUsage: *Pleurothecium* Höhn. 1919; kingdom: Fungi; phylum: Ascomycota; class: Sordariomycetes; order: Pleurotheciales; family: Pleurotheciaceae; taxonRank: species; genus: *Pleurothecium*; scientificNameAuthorship: C.S. Long, Q.R. Li & Jian Ma; continent: Asia; country: China; stateProvince: Yunnan; county: Nanjian county; locality: Lingbaoshan National Forest Park; verbatimElevation: 2532 m; locationRemarks: Labeltransliteration: "Nanjian County, Lingbaoshan National Forest Park, 18/8/2021, Long Chun-Sheng"; [云南省南涧县灵宝山国家森林公园, 18/8/2021, 龙春升]; verbatimCoordinates: 22.7324°N, 100.4232° E; georeferenceProtocol: label; samplingProtocol: collecting; eventDate: 18/8/2021; habitat: decaying wood; identifiedBy: Chun-Sheng Long, Qi-Rui Li & Jian Ma; language: en; institutionID: KUN-HKAS 12347; collectionID: GMB0396; institutionCode: KUN-HKAS 12347; occurrenceID: 65AEAD76-F2A2-565F-9174-B0DB52CDA91C

- b. scientificName: *Pleurothecium yunanensis*; continent: Asia; country: China; stateProvince: Yunnan; county: Nanjian county; locality: Lingbaoshan National Forest Park; verbatimElevation: 2567 m; verbatimCoordinates: 22.7431N 100.4334E; collectionID: GMB0394; occurrenceID: 4FC9ABFC-435F-533D-931D-15AD95398CFF

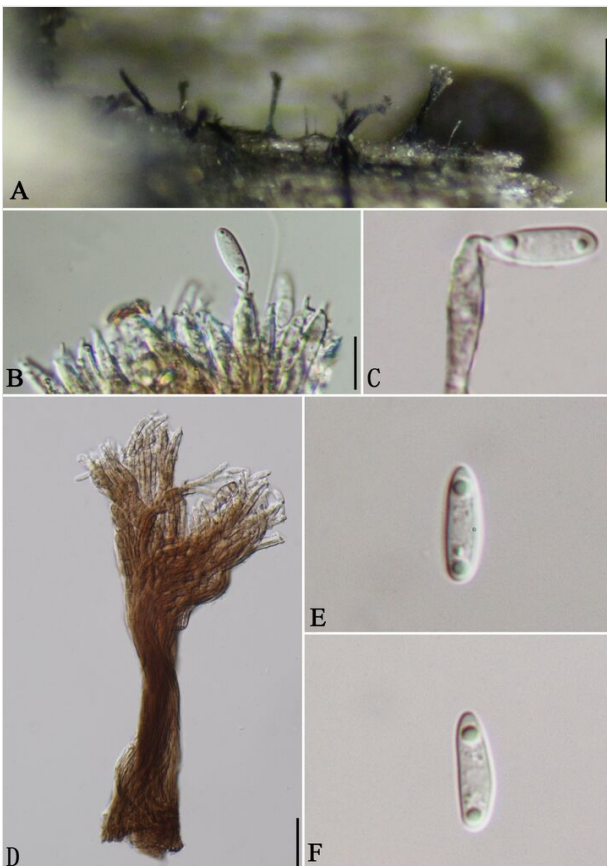


Figure 3. [doi](#)

Phaeoisaria guizhouensis (GMB0394). **A** Conidiomata on natural substratum; **B, C** Conidiogenous cells and conidia; **D** Synnema with conidiophores and conidia; **E, F** Conidia. Scale bars: A = 0.5 mm, B–F = 10 μm.

Description

Saprobic on the surface of decaying wood (Fig. 4). **Asexual morph:** Conidiophores 370–206 μm long (\bar{x} = 270.9 μm , SD = 81.8, n = 18), 9.8–4.2 μm wide (\bar{x} = 6.5 μm , SD = 2.1, n = 18), mononematous, unbranched, erect, straight to slightly flexuous towards the apex, single, 4–5-septate, the lower part is black and the upper one is light brown or hyaline, smooth. Conidiogenous cells 10–14 μm long (\bar{x} = 12 μm , SD = 2, n = 20), 2.5–3.5 μm wide (\bar{x} = 3 μm , SD = 0.5, n = 20), polyblastic, integrated, terminal, sometimes becoming intercalary, sympodially elongated, denticulate, denticles narrow cylindrical, hyaline. Conidial secession schizolytic. Conidia 17–25.6 μm long (\bar{x} = 22.1 μm , SD = 3.6, n = 25), 2.8–9 μm wide (\bar{x} = 7.8 μm , SD = 1.3, n = 25), solitary, acropleurogenous, half-moon, guttulate, hyaline, 2–3-septate, smooth-walled. **Sexual morph:** Undetermined.

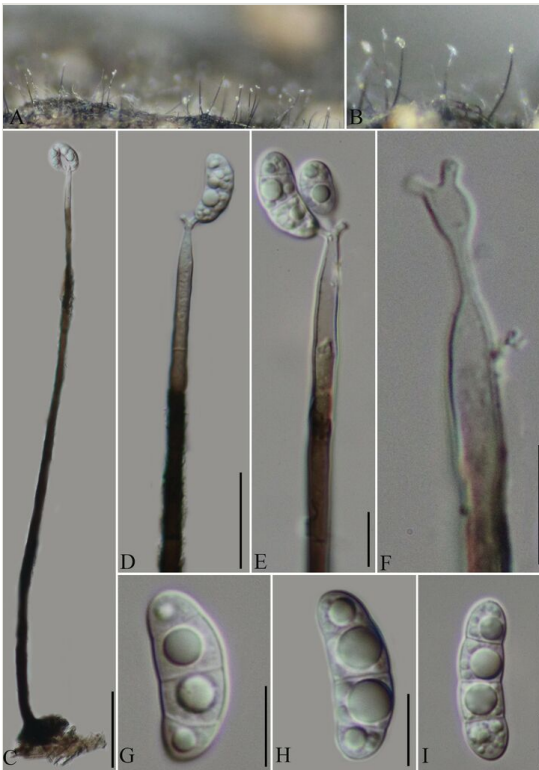


Figure 4. [doi](#)

Pleurothecium yunnanensis (GMB0395, holotype). **A, B** Colonies on natural substratum; **C** Conidiophore; **D, E** Conidiogenous cells and conidia; **F** Conidiogenous cells; **G–I** Conidia. Scale bars: A=0.5 mm, B = 0.5 mm, C = 50 μm , D = 30 μm , E = 15 μm , F–I = 10 μm .

Etymology

With reference to Yunnan Province where the type specimen was found.

Notes

Pleurothecium is characterised by the distinct brown conidiophores and polyblastic, sympodially extended, denticulate conidiogenic cells (Monteiro et al. 2016). *Pleurothecium yunanensis* superficially resembles *P. leptospermi* J.A. Cooper and *P. pulneyense* Subram. & Bhat, but *P. leptospermi* differs by its smaller ($15\text{--}18 \times 4\text{--}5 \mu\text{m}$ vs. $17\text{--}25.6 \times 2.8\text{--}9 \mu\text{m}$) versicolored conidia with three eusepta (Cooper 2005); *P. pulneyense* differs by its cylindrical to fusiform, larger conidia ($23\text{--}30 \times 7\text{--}8.4 \mu\text{m}$ vs. $17\text{--}25.6 \times 2.8\text{--}9$) with three eusepta (Subramanian and Bhat 1987).

***Brachysporiella pulchra* (Subram.) S. Hughes, New Zeal. J. Bot. 17(2): 184 (1979)**

- MycoBank [555675](https://www.mycobank.org/555675)

Material

- a. scientificName: *Brachysporiella pulchra*; continent: Asia; country: China; stateProvince: Yunnan; county: Nanjian Yi Autonomous County; locality: Lingbaoshan National Forest Park; verbatimElevation: 2338 m; verbatimCoordinates: 24.7864N, 100.4352E; eventDate: 18/8/2021; habitat: on decaying wood; recordedBy: Chun-Sheng Long; identifiedBy: Chun-Sheng Long, Qi-Rui Li & Jian Ma; collectionID: GMB0410; occurrenceID: E1A38663-4F73-5C35-9B0B-3985BFA64030

Description

Conidiophores $151\text{--}395 \mu\text{m}$ long ($\bar{x} = 269.9 \mu\text{m}$, SD = 65.7, n = 20), $3.6\text{--}6.5 \mu\text{m}$ wide ($\bar{x} = 5 \mu\text{m}$, SD = 1.0, n = 20), mononematous, erect, single, brown or dark brown, smooth. Conidiogenous cells $6\text{--}12 \mu\text{m}$ long ($\bar{x} = 9.1 \mu\text{m}$, SD = 2, n = 20), $2.5\text{--}3.5 \mu\text{m}$ wide ($\bar{x} = 3 \mu\text{m}$, SD = 0.5, n = 20) ampulliform to cylindrical, brown to dark brown, Conidia $15\text{--}20 \mu\text{m}$ long ($\bar{x} = 17.3 \mu\text{m}$, SD = 1.4, n = 20), $7.9\text{--}12 \mu\text{m}$ wide ($\bar{x} = 10 \mu\text{m}$, SD = 1.2, n = 20), solitary, clavate, guttulate, truncated in base, hyaline, 3-septate, smooth-walled

Also see Hughes (1979).

Notes

Brachysporiella pulchra superficially resembles *B. gayana* Bat, but the conidia in *B. pulchra* are smaller ($24\text{--}26 \times 10.5\text{--}12.5 \mu\text{m}$ vs. $30\text{--}38 \times 13\text{--}21.5 \mu\text{m}$) (Li et al. 2019) and its conidiophores are branched. *B. pulchra* has been recorded from China, India and Japan (Gao 2016).

***Brachysporiella setosa* (Berk. & M.A. Curtis) M.B. Ellis, Mycol. Pap. 72: 17(1959)**

- MycoBank [293842](#)

Material

- a. scientificName: *Brachysporiella setosa*; continent: Asia; country: China; stateProvince: Qiannan Buyei and Miao Autonomous Prefecture; county: Libo County; locality: unknown mountain; verbatimElevation: 877 m; verbatimCoordinates: 25.1203N, 107.3243E; eventDate: 21/11/2021; habitat: On decaying wood; recordedBy: Chun-Sheng Long; identifiedBy: Chun-Sheng Long, Qi-Rui Li & Jian Ma; collectionID: GMB0399; occurrenceID: 8E2A7219-6507-5A85-BC9D-828B5DC7DA54

Description

Conidiophores 300–450 µm long (\bar{x} = 360.4 µm, SD = 30.8, n = 20), 3.6–6.5 µm wide (\bar{x} = 4.7 µm, SD = 0.92, n = 20), mononematous, branched in apex, erect, single, 5–7 septate, brown or dark brown, smooth. Conidiogenous cells lacking. Conidia 20–38 µm long (\bar{x} = 25.8 µm, SD = 4.9, n = 20), 17–23 µm wide (\bar{x} = 18.4 µm, SD = 2.2, n = 20). Pyriform or obovoid brown or dark brown.

Also see Hughes (1958) and Ellis (1959).

Notes

This species was originally assigned to *Monotospora* Corda by Berk and Curtis and later was transferred to *Phragmocephala* E.W. Mason & S. Hughes, *Monosporella* S. Hughes and *Monotosporella* S. Hughes (Hughes 1958). Ellis (1959) transferred it to *Brachysporiella* Bat. as *Brachysporiella setose*. Gao (2016) found this species in Shunhuang Mountain, Hunan Province. This fungus is mainly distributed in South Carolina and usually found on rotten wood (Sadowski et al. 2012). *B. setosa* is very close to *B. rhizoidea* (V. Rao & de Hoog) W.P. Wu in morphology, but the conidiophores of *B. setosa* are shorter (140–260 × 4.5–6 µm vs. 50–80 × 4–5 µm) (Tsui et al. 2001, Sadowski et al. 2012).

***Catenularia catenulata* (Z.L. Luo, K.D. Hyde & H.Y. Su) Réblová & A.N.Mill., MycoKeys 81: 13 (2021)**

- MycoBank [839462](#)

Material

- a. scientificName: *Chaetosphaeria catenulata*; continent: Asia; country: China; stateProvince: Guizhou; county: Libo; locality: Lanting Mountain Forest Park; verbatimElevation: 866 m; verbatimLatitude: 25.1203N, 107.3431E; eventDate: 21/11/2021; habitat: On decaying wood; recordedBy: Chun-Sheng Long; identifiedBy:

Chun-Sheng Long, Qi-Rui Li & Jian Ma; collectionID: GMB0397; occurrenceID: A52EDDA7-0CB8-59C1-ACD4-F1651B5C5D4A

Description

Conidiophores 200–283 μm long (\bar{x} = 346.2 μm , SD = 21.3, n = 20), 6–10 μm wide (\bar{x} = 7.5 μm , SD = 1.8, n = 20), cylindrical. Conidiogenous cells 21–40 μm long (\bar{x} = 28.5 μm , SD = 5.6, n = 20), 5.4–6.5 μm wide (\bar{x} = 6 μm , SD = 0.36, n = 20), monophialidic, integrated, terminal, cylindrical-clavate, with flared collarette. Conidia 13–15 μm long (\bar{x} = 14 μm , SD = 0.79, n = 20), 12–14 μm wide (\bar{x} = 13.2 μm , SD = 0.84, n = 20), formed in chains, aseptate, turbinate-triangular, with three blunt protruding edges at the broader distal end, hyaline to subhyaline when young, greyish-brown at maturity, smooth-walled.

Also see Réblová et al. (2021).

Notes

Chaetosphaeria catenulata was firstly reported on submerged wood on the side of Nujiang River, Yunnan Province (Luo et al. 2019). Réblová et al. (2021) transferred it to *Catenularia* Grove as *Catenularia catenulata*. Morphologically, it is similar to *C. cubensis* Hol.-Jech, but the latter has smaller conidia (13–15 \times 12–14 μm vs. 5.5–9 \times 3.5–5.5 μm) (Luo et al. 2019).

***Chloridium gonytrichii* (F.A. Fernández & Huhndorf) Réblová & Seifert, IMA Fungus 7(1): 134 (2016)**

- MycoBank [816827](#)

Material

- scientificName: *Chloridium gonytrichii*; continent: Asia; country: China; stateProvince: Guizhou; county: Luodian; locality: Hongshui River; verbatimElevation: 39 m; verbatimCoordinates: 25.2239N, 106.5340E; eventDate: 18/9/2021; habitat: On decaying wood; recordedBy: Chun-Sheng Long; identifiedBy: Chun-Sheng Long, Qi-Rui Li & Jian Ma; collectionID: GMB0409; occurrenceID: 619B5938-2358-5CCE-831B-AFAA7FA04C90

Description

Conidiophores 190–346 μm long (\bar{x} = 294.1 μm , SD = 52.6, n = 20), 4.5–6.5 μm wide (\bar{x} = 5.5 μm , SD = 1.8, n = 20), mononematous, single, unbranched, septate, with 3–4 whorls of phialides in the mid-section and a single phialide at the apex, dark brown and paler towards the apex. Conidiogenous cells 10–14 μm long (\bar{x} = 12.5 μm , SD = 52.6, n = 20), 3–4 μm wide (\bar{x} = 5.5 μm , SD = 3.5, n = 20), cylindrical to lageniform, phialides, producing conidia from multiple entero-blastic conidiogenous loci and phialides borne on collar hyphae around the conidiophore. Conidia 3.5–4.5 μm long (\bar{x} = 4 μm , SD =

1.1, $n = 20$), 2.5–3.0 μm wide ($\bar{x} = 2.5 \mu\text{m}$, $\text{SD} = 1.4$, $n = 20$), globose to subglobose, aseptate and hyaline to subhyaline.

Also see Fernández et al. (1999), Réblová et al. (2016b) and Luo et al. (2019).

Notes

This species was originally collected on decaying wood in the Caribbean national forest and described as *Melanopsammella gonytrichii* F.A. Fernández & Huhndorf (Fernández and Huhndorf 2005), but later it was renamed as *Chloridium gonytrichii* by Réblová et al. (2016b).

Dictyocheirospora rotunda M.J. D'souza, Bhat & K.D. Hyde, Fungal

Diversity: 80(1), 457-482

- MycoBank [551581](https://www.mycobank.org/551581)

Material

- a. scientificName: *Dictyocheirospora rotunda*; continent: Asia; country: China; stateProvince: Guizhou; county: Libo county; locality: Lanting Mountain Forest Park; verbatimElevation: 850 m; verbatimCoordinates: 25.1206N, 107.3298E; eventTime: 11/21/2021; recordedBy: Chun-Sheng Long, Qi-Rui Li & Jian Ma; identifiedBy: Chun-Sheng Long; collectionID: GMB040; occurrenceID: EB9BB9B1-B71A-54A2-93F3-392E6A6859EC

Description

Conidiophores 3–5 μm long ($\bar{x} = 2.8 \mu\text{m}$, $\text{SD} = 0.5$, $n = 20$), 19.5–22.5 μm wide ($\bar{x} = 3.6 \mu\text{m}$, $\text{SD} = 0.5$, $n = 20$), micronematous, pale brown, smooth. Conidiogenous cells holoblastic, integrated, terminal, pale brown, cylindrical, smooth-walled. Conidia 49–55 μm long ($\bar{x} = 52 \mu\text{m}$, $\text{SD} = 52.6$, $n = 20$), 19.5–22.5 μm wide ($\bar{x} = 21 \mu\text{m}$, $\text{SD} = 2.4$, $n = 20$), solitary, acrogenous, cheiroid, pale brown to brown, consisting of 5–7 rows of cells, rows digitate, cylindrical, inwardly curved at the tip, arising from a basal cell euseptate, guttulate.

Also see Phukhamsakda et al. (2020).

Notes

Dictyocheirospora rotunda, the type species of *Dictyocheirospora*, was collected on submerged wood in freshwater from Thailand (Boonmee et al. 2016). It has been reported in Guizhou, China (Yang et al. 2018). *Dictyocheirospora rotunda* is similar to *D. heptaspora* (Garov.) M.J. D'souza, Boonmee & K.D. Hyde in morphology, but the rows of *D. rotunda* are not separable without manual force, whereas those of *D. heptaspora* are easily separable (Boonmee et al. 2016).

***Diplococcium dendrocalami* Goh, K.D. Hyde & Umali, Mycologia 90(3): 515 (1998)**

- MycoBank [443599](#)

Material

- a. scientificName: *Diplococcium dendrocalami*; continent: Asia; country: China; stateProvince: Guizhou; county: Guiyang; locality: Guizhou Medical University Campus; verbatimElevation: 1199 m; verbatimCoordinates: 26.5921N, 106.7143E; eventDate: 15/9/2021; habitat: On decaying wood; recordedBy: Chun-Sheng Long; identifiedBy: Chun-Sheng Long, Qi-Rui Li & Jian Ma; collectionID: GMB0404; occurrenceID: 5BA2D587-84EB-502E-B734-32CCAC974E59

Description

Conidiophores 211–345.6 µm long (\bar{x} = 52.3 µm, SD = 52.3 n = 20), 4.4–9.5 µm wide (\bar{x} = 7.1 µm, SD = 2.1, n = 20), unbranched, erect, straight, attenuated, distinctly 5-8-septate, thick-walled, medium yellowish-brown, uniform in colour. Conidiogenous cells 120–280 µm long (\bar{x} = 199.1 µm, SD = 52.9, n = 20), 10–12 µm wide (\bar{x} = 10.8 µm, SD = 1.8, n = 20), integrated, polytretic with pores 0.8–1 µm diam., terminal and intercalary. Conidia 49–55 µm long (\bar{x} = 52 µm, SD = 5.2, n = 20), 19.5–22.5 µm wide (\bar{x} = 21 µm, SD = 3, n = 20), solitary, acrogenous, cheiroid, pale brown to brown, consisting of 5–7 rows of cells, rows digitate, cylindrical, inwardly curved at the tip, arising from a basal cell, without appendages, with each row composed of 8–12 cells, euseptate, guttulate, slightly constricted at septa.

Also see Goh et al. (1998) and Xia et al. (2017).

Notes

Diplococcium dendrocalami was firstly introduced in the culms of *Dendrocalamus* sp. in the Philippines (Goh et al. 1998) and later was found in Chongqing, China (Xia et al. 2017). *Diplococcium dendrocalami* is similar to *D. clavariarum* (Desm.) Hol.-Jech in morphology, but the conidiophores of *D. clavariarum* are branched and slender (10–12 µm vs. 3.5–6 µm) (Goh et al. 1998).

***Endophragmiella curvata* (Corda) S. Hughes, New Zeal. J. Bot. 17(2): 148(1979)**

- MycoBank [313581](#)

Material

- a. scientificName: *Endophragmiella curvata*; continent: Asia; country: China; stateProvince: Guizhou; county: Guiyang; locality: Guiyang Forest Park; verbatimElevation: 1190 m; verbatimCoordinates: 26.5702N, 106.7108E; eventDate: 25/9/2021; habitat: On decaying wood; recordedBy: Chun-Sheng Long; identifiedBy: Chun-Sheng Long, Qi-Rui Li & Jian

Ma; collectionID: GMB0407; occurrenceID: A160A11E-BDCF-5472-B720-D322C6180316

Description

Conidiophores 37–66 μm long (\bar{x} = 52 μm , SD = 11.3, n = 20), 2.5–4.8 μm wide (\bar{x} = 3.1 μm , SD = 0.7, n = 20), macronematous, mononematous, single, unbranched, erect, straight or flexuous, septate, smooth, brown. Conidiogenous cells 3.6–5.6 μm long (\bar{x} = 4.4 μm , SD = 0.3, n = 20), 2.5–4.8 μm wide (\bar{x} = 3.6 μm , SD = 0.3, n = 20), monoblastic, integrated, terminal, cylindrical, smooth, brown to pale brown. Conidia 14.5–21 μm long (\bar{x} = 17.8 μm , SD = 3.3, n = 20), 6–7.5 μm wide (\bar{x} = 6.7 μm , SD = 0.5, n = 20), holoblastic, solitary, acrogenous, dry, clavate, smooth, lower two cells brown, apical cell pale brown, 2-septate.

Also see Hughes (1979) and Ma (2012).

Notes

Endophragmiella curvata has been found on dead branches from Guangdong Province, China (Ma 2012). Morphologically, *E. curvata* is similar to *E. novae-zelandiae* S. Hughes (Hughes 1979), but the conidia of *E. novae-zelandiae* are larger than those of *E. curvata* (27–40 \times 9.3–12.6 μm vs. 14.5–21 \times 6–7.5 μm) and the *E. novae-zelandiae* also has two septa conidia (Hughes 1979).

***Hemicorynespora clavata* (Corda) S. Hughes, New Zeal. J. Bot. 17(2): 148(1979)**

- MycoBank [510760](#)

Material

- a. scientificName: *Hemicorynespora clavata*; continent: Asia; country: China; stateProvince: Guizhou; municipality: Guiyang; locality: Guizhou Medical University Campus; verbatimElevation: 1123 m; verbatimCoordinates: 26.5231N, 106.7163E; eventTime: 15/9/2021; habitat: On decaying wood; recordedBy: Chun-Sheng Long; identifiedBy: Chun-Sheng Long, Qi-Rui Li & Jian Ma; collectionID: GMB0405; occurrenceID: 93225A11-2AB4-5DAB-900A-620C60B6C12A

Description

Conidiophores 110–140 μm long (\bar{x} = 127.9 μm , SD = 10, n = 20), 2.5–4.5 μm wide (\bar{x} = 2.9 μm , SD = 1.9, n = 20), macronematous, mononematous, single, unbranched, erect, straight or flexuous, septate, smooth, brown. Conidiogenous cells 12–13 μm long (\bar{x} = 12.4 μm , SD = 0.34, n = 20), 3–4 μm wide (\bar{x} = 2.9 μm , SD = 0.4, n = 20), monoblastic, integrated, terminal, cylindrical, smooth, brown, percurrently proliferating. Conidia 12–17 μm long (\bar{x} = 14.1 μm , SD = 2.8, n = 20), 2–5 μm wide (\bar{x} = 3.4 μm , SD = 1.1, n = 20) holoblastic, solitary, acrogenous, dry, clavate, smooth, lower two cells brown, apical cell pale brown, 2–septate.

Also see Delgado et al. (2007).

Notes

Delgado et al. (2007) originally described this species on the stems of dead liana in Cuba and later Ma (2012) discovered it on dead branches in China. It superficially resembles *Hemicorynespora fusispora*, but the latter has spindle to inverted rods and longer conidia (12–20 µm vs. 15–30 µm) and its conidiogenous cells are shorter than those of *H. clavata* (12.5–21 vs. 15–18 µm) (Delgado et al. 2007).

***Kylindria excentrica* Bhat & B. Sutton, Trans. Br. mycol. Soc. 84(4): 728 (1985)**

- MycoBank [105413](#)

Material

- scientificName: *Kylindria excentrica*; continent: Asia; country: China; stateProvince: Guizhou; county: Libo county; verbatimElevation: 875 m; verbatimCoordinates: 25.1205N, 107.3634E; eventDate: 11/21/2021; habitat: on decaying wood; recordedBy: Chun-Sheng Long; identifiedBy: Chun-Sheng Long, Qi-Rui Li & Jian Ma; collectionID: GMB0398; occurrenceID: C1A8F2EF-0EC1-5EDB-B7AD-6279AD758FF5

Description

Conidiophores 200–350 µm long (\bar{x} = 280.6 µm, SD = 45, n = 20), 7–10 µm wide (\bar{x} = 8.6 µm, SD = 1.9, n = 20), mononematous, erect, simple, straight or flexuous, thick-walled, dark brown, paler towards the apex, 8–10 septate. Conidiogenous cells 48.5–60 µm long (\bar{x} = 53.5 µm, SD = 3.9, n = 20), 9–12 µm wide (\bar{x} = 10.2 µm, SD = 1.3, n = 20), with a narrow cytoplasmic channel and marked periclinal thickening in the upper quarter, lacking a collarete, proliferating enteroblastically to produce successive conidia at the same level. Conidia 21.5–40 µm long (\bar{x} = 29.3 µm, SD = 6.8, n = 20), 7.5–10 µm wide (\bar{x} = 8.2 µm, SD = 0.5, n = 20), holoblastic, solitary, accumulating in translucent slimy masses at the apices of conidiogenous, cylindrical, obtuse at the apex, slightly tapered towards the truncate base, hyaline, 3–euseptate, smooth, eguttulate.

Also see Bhat and Sutton (1985) and Xia et al. (2013).

Notes

Kylindria excentrica was firstly found on rotten wood in Ethiopia (Bhat and Sutton 1985). *Kylindria excentrica* is similar to *K. milletiae* Y.D. Zhang & X.G. Zhang in morphology, but differs markedly in conidial dimensions (19.5–24 × 6.5–9 µm vs. 27.5–35 × 7.5–8.5 µm) (Zhang et al. 2010). In addition, *K. excentrica* has a lateral flat scar in the conidial base, whereas those of *K. milletiae* have a lateral flat scar in the excentric (Zhang et al. 2010).

***Neohelicosporium griseum* (Berk. & M.A. Curtis) Y.Z. Lu & K.D. Hyde,
Fungal Diversity 92: 241 (2018)**

- MycoBank [GMB0412](#)

Material

Holotype:

- scientificName: *Neohelicosporium griseum*; continent: Asia; country: China; stateProvince: Yunnan; county: Nanjian Yi Autonomous County; locality: Lingbaoshan National Forest Park; verbatimElevation: 2418 m; verbatimCoordinates: 24.7342N, 100.4234E; eventTime: 18/8/2021; habitat: on decaying wood; recordedBy: Chun-Sheng Long; identifiedBy: Chun-Sheng Long, Qi-Rui Li & Jian Ma; collectionID: GMB0412; occurrenceID: 308A8DB4-3FA1-502F-B26E-7F5F12FE9F90

Description

Conidiophores 3.5–4 µm diam. (\bar{x} = 3.6 µm, SD = 1.2, n = 20), arising from a dark repent mycelium, more or less erect, dark brown, septate, irregularly branched, often forming a loop and network by anastomosing. Conidiogenous cells 1–1.5 µm long (\bar{x} = 1.3 µm, SD = 0.6, n = 20), 0.5–1 µm wide (\bar{x} = 0.8 µm, SD = 0.5, n = 20), holoblastic, monoblastic, integrated, intercalary or terminal, denticulate; denticles on the lower parts of conidiophores or directly arising on lateral of creeping fertile hyphae. Conidia diameter of coiled spores 12–15 µm (\bar{x} = 14.1 µm, SD = 1.9, n = 20), pleurogenous, borne singly on minute hyaline sporogenous teeth, hyaline, tightly coiled 2½–3¼ times, indistinctly 18–20 septate.

Also see Lu et al. (2018).

Notes

Goos (1989) classified *Helicosporium cinereum* Peck, *H. leptosporum* Sacc. and *H. lumbricoides* Sacc. as *H. griseum*. Lu et al. (2018) placed *H. griseum* and *H. lumbricoides* in *Neohelicosporium* Y.Z. Lu, J.C. Kang & K.D. Hyde as *N. griseum*, based on phylogenetic analysis. *Neohelicosporium ovoideum* Y.Z. Lu et al. and *N. griseum* are similar in morphology, but the conidium of *N. ovoideum* has fewer curls (3–4 vs. 2–3) (Lu et al. 2018).

***Phaeoisaria guttulata* J. Yang & K.D. Hyde, Mycosphere 9(2): 401 (2018)**

- MycoBank [554233](#)

Material**Holotype:**

- scientificName: *Phaeoisaria guttulata*; continent: Asia; country: China; stateProvince: Guizhou; county: Sandu Autonomous County; locality: Yaorenshan National Forest Park; verbatimElevation: 632 m; verbatimCoordinates: 26.5535N, 106.7533E; eventDate: 9/9/2021; habitat: on decaying wood; identifiedBy: Chun-Sheng Long, Qi-Rui Li & Jian Ma; collectionID: GMB0402; occurrenceID: 2041B2E4-5BBA-5C4F-8136-70A7BEDE99A4

Description

Conidiophores 480–520 µm long (\bar{x} = 280.6 µm, SD = 4.5, n = 20), 2–5 µm wide (\bar{x} = 3.7 µm, SD = 1.3, n = 20) macronematous, synnematous, erect, septate, smooth, mid-brown to dark brown. Conidiogenous cells 14.5–35.9 µm long (\bar{x} = 26.6 µm, SD = 4.4, n = 20), 1.6–3.8 µm wide (\bar{x} = 3.0 µm, SD = 0.6, n = 20) integrated, terminal, polyblastic, pale brown to hyaline, sympodial, splaying out with one to several denticulate conidiogenous cells loci. Conidia 3.5–5.5 µm long (\bar{x} = 4.5 µm, SD = 1.1, n = 20), 2.5–4.8 µm wide (\bar{x} = 3.5 µm, SD = 1.4, n = 20), globose to obovoid, hyaline, smooth-walled, guttulate, aseptate.

Also see Hyde et al. (2018).

Notes

This species was originally discovered on decaying wood in Guizhou Province, China (Hyde et al. 2018). It is similar to *P. clavulata* (Grove) E. W. Mason & S. Hughes in conidial shape, but the latter has smaller globose conidia (3.5–5.5 µm vs. 1–2 µm) (Révay 1985, Hyde et al. 2018).

***Phragmocephala atra* (Berk. & Broome) E.W. Mason & S. Hughes, Naturalist: 97 (1951)**

- MycoBank [303243](#)

Material**Holotype:**

- scientificName: *Phragmocephala atra*; continent: Asia; country: China; stateProvince: Guizhou; municipality: Guiyang; locality: Guiyang Forest Park; verbatimElevation: 1187 m; verbatimCoordinates: 26.5723N, 106.7432E; eventTime: 9/9/2021; habitat: On decaying wood; recordedBy: Chun-Sheng Long; identifiedBy: Chun-Sheng Long, Qi-Rui Li & Jian Ma; collectionID: GMB0406; occurrenceID: 4FC3FA5F-FE62-5C51-8700-C051B063DE42

Description

Conidiophores 128–157 μm long (\bar{x} = 142.5 μm , SD = 14.5, n = 20), 6.5–8.5 μm wide (\bar{x} = 7.5 μm , SD = 1, n = 20), synnematosus, macronematous, septate, unbranched or branched, erect, dark brown at the base, pale brown at fertile, flared apex, sometimes proliferating, 5–8-septate. Conidiogenous cells 37–44 μm long (\bar{x} = 37.3 μm , SD = 2.1 μm , n = 20), 2.3–4 μm wide (\bar{x} = 2.5 μm , SD = 1.3 μm , n = 20), monoblastic, terminal, integrated, elongated, pale brown, often separating from the conidium through a break or frill below the base of conidium. Conidia 30–35 μm long (\bar{x} = 32.5 μm , SD = 2.5 μm , n = 20), 16–19 μm wide (\bar{x} = 17.5 μm , SD = 1.5 μm , n = 20), 4–septate, ellipsoidal to subglobose, dark brown, pale brown at apical and basal cells, with dark brown to black central cells, with a thick dark band on the central septum; smooth, rounded at apex, truncate at base, sometimes released with part of conidiogenous cell.

Also see Mason and Hughes (1951).

Notes

Phragmocephala atra is the type species of *Phragmocephala*, which is characterised by the dark brown to black central cells (Mason and Hughes 1951, Su et al. 2015). *Phragmocephala atra* has been reported in Yunnan Province, China (Su et al. 2015).

Cryptophiale udagawae Piroz. & Ichinoe, Can. J. Bot. 46: 1126 (1968)

- MycoBank [329371](#)

Material

- scientificName: *Cryptophiale udagawae*; continent: Asia; country: China; stateProvince: Guizhou; county: Luodian County; locality: Hongshui river; verbatimElevation: 399 m; verbatimCoordinates: 25.2239N, 106.5349E; eventDate: 18/9/2021; habitat: on decaying wood; recordedBy: Chun-Sheng Long; identifiedBy: Chun-Sheng Long, Qi-Rui Li & Jian Ma; collectionID: GMB0408; occurrenceID: F7EFF95D-CA2D-566D-A743-FAC90D454F35

Description

Conidiophores 97–120 μm long (\bar{x} = 99.7 μm , SD = 8.3, n = 20), 4.5–9 μm wide (\bar{x} = 6.2 μm , SD = 1.3, n = 20), straight or flexuous, septate, smooth, brown, with 3–4 branches at the apex. Conidiogenous cells 39–46 μm long (\bar{x} = 42.1 μm , SD = 4.0, n = 20), 7.6–12 μm wide (\bar{x} = 8.7 μm , SD = 2.4, n = 20) enteroblastic, phialidic, obscured by a shield of sterile cells. Conidia solitary, 1–septate, falcate, simple, smooth, hyaline, produced in slimy masses, 15.5–18 μm long (\bar{x} = 16.4 μm , SD = 1, n = 20), 1.2–1.4 μm wide (\bar{x} = 1.3 μm , SD = 1.1, n = 20), solitary, 1–septate, falcate, simple, smooth, hyaline, produced in slimy masses.

Also see Pirozynski (1968).

Notes

Pirozynski (1968) described the species from fallen leaves in Japan. Ma et al. (2010) and Yang et al. (2019) discovered the species in China. *Cryptophiale udagawae* shows a variable number of branches in the conidiophore. There are 1–3 branches on *C. udagawae* in Pirozynski (1968), three in Matsushima (1971), 5–8 in Mercado-Sierra et al. (1997) and three in our specimen.

***Ellisembia brachypus* (Ellis & Everh.) Subram., Proc. Indian natn Sci. Acad., Part B. Biol. Sci. 58(4): 183 (1992)**

- MycoBank [306280](#)

Material

- a. scientificName: *Ellisembia brachypus*; continent: Asia; country: China; stateProvince: Guizhou; municipality: Guiyang; locality: Guizhou Medical University Campus; verbatimElevation: 1217 m; verbatimCoordinates: 26.5943°N, 106.734513°E; eventDate: 15/9/2021; habitat: on decaying woo; recordedBy: Chun-Sheng Long; identifiedBy: Chun-Sheng Long, Qi-Rui Li & Jian Ma; collectionID: GMB0401; occurrenceID: 8AE6F3F9-5C0F-533E-BB66-C60F6DECAD67

Description

Conidiophores 86–114 µm long (\bar{x} = 100 µm, SD = 5.3, n = 20), 5–7 µm wide (\bar{x} = 100 µm, SD = 5.3, n = 20) macronematous, mononematous, solitary, erect, unbranched, 7–9 septate, straight or flexuous, percurrently growing, dark brown, smooth. Conidiogenous cells 5–7 µm long (\bar{x} = 5.3 µm, SD = 2.2, n = 20), 4–5 µm long (\bar{x} = 4.8 µm, SD = 2.4, n = 20), monoblastic, integrated, terminal, dark brown. Conidia 45–63 µm long (\bar{x} = 54 µm, SD = 5.3, n = 20), 13–17 µm wide (\bar{x} = 15 µm, SD = 2.3, n = 20), acrogenous, solitary, ovoid to fusiform, 5–6-pseudoseptate, truncate at base, with a short and hyaline rostrate tip at apex, brown, smooth-walled.

Also see Hughes (1958) and Luo et al. (2019).

Notes

Ellisembia brachypus was firstly reported as *Sporidesmium branchypus* in Shiwaliks (Prasher and Singh 2014) and previously collected on dead branches of *Moringa aoleifera* Lam. in Kerela and Rajasthan (Bilgrami et al. 1991, Jamaludeen et al. 2004). Later, it was found in Yunnan, China (Luo et al. 2019).

***Vanakripa menglensis* D.M. Hu, L. Cai, K.D. Hyde, Sydowia 62(2): 199(2010)**

- MycoBank [518634](#)

Material

- a. scientificName: *Vanakripa menglensis*; continent: Asia; country: China; stateProvince: Yunnan; county: Nanjian Yi Autonomous County; locality: Lingbaoshan National Forest Park; verbatimElevation: 2231 m; verbatimCoordinates: 24.7861N, 100.4846E; eventDate: 18/8/2021; habitat: on decaying wood; recordedBy: Chun-Sheng Long; identifiedBy: Chun-Sheng Long, Qi-Rui Li & Jian Ma; collectionID: GMB0411; occurrenceID: 609FEB39-B6F6-59E8-B300-07FE401FC962

Description

Conidiophores 7.5–8.3 µm long (\bar{x} = 7.9 µm, SD = 3.2, n = 20), 2.5–3 µm wide (\bar{x} = 2.6 µm, SD = 2, n = 20), micronematous, hypha-like, cylindrical, aseptate, simple or sparsely branched, smooth, hyaline. Conidiogenous cells 20–40 µm long (\bar{x} = 34.2 µm, SD = 4.3, n = 20), 4–6 µm wide (\bar{x} = 5.3 µm, SD = 2.3, n = 20), hyaline, clavate to vermiform. Conidia 17–23 µm long (\bar{x} = 20.4 µm, SD = 4.1, n = 20), 8–13 µm wide (\bar{x} = 11.3 µm, SD = 3.3, n = 20), acrogenous, solitary, clavate to obpyriform, smooth, brown to dark brown, aseptate.

Also see Hu et al. (2010).

Notes

The genus *Vanakripa* was originally established by Bhat and Kendrick (1993). So far, ten epithets for *Vanakripa* are listed in Index Fungorum (1 June 2022). *Vanakripa menglensis* is distinguished by its clavate to obpyriform conidia (Hu et al. 2010). *V. menglensis* has been reported from Yunnan Province, China (Hu et al. 2010).

***Sporidesmium conversum* W.P. Wu, Fungal Diversity Res. Ser. 15: 27(2005).**

- MycoBank [356332](#)

Material

Holotype:

- a. scientificName: *Sporidesmium conversum*; continent: Asia; country: China; stateProvince: Guizhou; municipality: Guiyang; locality: Guizhou Medical University Campus; verbatimElevation: 1207 m; verbatimCoordinates: 26.3967N, 106.7161E; eventDate: 15/9/2021; habitat: on decaying wood; recordedBy: Chun-Sheng Long; identifiedBy: ChunSheng Long, Qi-Rui Li & Jian Ma; collectionID: GMB0403; occurrenceID: B43EED21-3E28-5941-9C29-64A4C7DFA7C8

Description

Conidiophores 37–50 μm long (\bar{x} = 42.2 μm , SD = 4.6, n = 20), 5–6.8 μm wide (\bar{x} = 5.9 μm , SD = 0.6, n = 20), macronematous, mononematous, solitary, erect, unbranched, 1–3 septate. Conidiogenous cells 10–12 μm long (\bar{x} = 10.8 μm , SD = 0.5, n = 20), 4–5 μm long (\bar{x} = 4.8 μm , SD = 2.4, n = 20), monoblastic, integrated, terminal, dark brown. Conidia 36–52 μm long (\bar{x} = 36.6 μm , SD = 12.7, n = 20), 8–10 μm wide (\bar{x} = 9.4 μm , SD = 2.5, n = 20), acrogenous, solitary, clavate to broadly fusiform, 5–6 septate, with a short and hyaline rostrate tip at apex, brown, smooth-walled.

Also see Wu (2005).

Notes

Wu (2005) firstly described this species from China. Species similar to *S. conversum*, that produce conidia with barrel- to ampoule-shaped layers and inverted rod to spindle-shaped conidia include *S. australiense* M.B. Ellis, *S. clarki* P.M. Kirk, *S. hamatum* M.B. Ellis, *S. pedunculatum* (Peck) M.B. Ellis, *S. rubi* M. B. Ellis and *S. uapacae* M.B. Ellis (Wu and Zhuang 2008). The difference between *S. conversum* and all these species is that the conidial apex in *S. conversum* has cap-like and conical mucinous appendages (Wu and Zhuang 2008).

Discussion

Many genera of hyphomycetes were found in Karst areas, such as *Acrogenospora* M.B. Ellis, *Craspedodidymum* Hol.-Jech, *Corynesporopsis* P.M. Kirk, *Dactylella* Grove, *Dendryphiopsis* S. Hughes, *Digitoramispora* R.F. Castañeda & W.B. Kendr., *Diplocladiella* G. Arnaud, *Endophragmiella* B. Sutton, *Elegantimyces* Goh, C.K.M. Tsui & K.D. Hyde, *Exosporium* Link, *Gangliostilbe* Subram. & Vittal, *Helminthosporium* Link, *Heteroconium* Petr., *Microclava* F. Stevens, *Monodictys* S. Hughes, *Mucispora* Jing Yang, Bhat & K.D. Hyde, *Phalangispora* Nawawi & J. Webster, *Phragmocephala* E.W. Mason & S. Hughes, *Repetophragma* Subram., *Spadicoides* S. Hughes, *Sympodioplanus* R.C. Sinclair & Boshoff, *Synnemacrodictys* W.A. Baker & Morgan-Jones, *Tretospeira* Piroz. and *Ulocladium* Preuss (Gao et al. 1997, Zhao and Li 1997, Wang et al. 2008, Yang et al. 2012, Li et al. 2017, Li et al. 2014, Li et al. 2019, Guo et al. 2019). Through the investigation of Zhang (2012), 4000 samples were collected in China including Fujian, Guangdong, Guangxi, Guizhou, Hainan, Hunan, Sichuan and Yunnan Provinces. Here, nineteen species on decaying wood were recorded from south China including Karst areas. However, after many attempts, we only obtained a very small amount of pure cultures.

After consulting the relevant literature and our experimental experience, the authors found that numerous hyphomycetes occurring on wood cannot be cultured which led to lack of DNA sequences, resulting in confusion in identification and classification (Réblová et al. 2016a). For example, *Chloridium gonytrichii* was originally considered as the genus

Melanopsammella, based on its morphology (Fernández and Huhndorf 2005). However, Crous et al. (2012) confirmed that *M. gonytrichii* was more closely related to *Chloridium* according to its phylogenetic analyses. Most conidia are difficult to germinate on artificial medium (Rousseau and Halvorson 1969, Zhu et al. 2016, Wijayawardene et al. 2021). Therefore, the identification of hyphomycetes, based on DNA sequences, is limited (Zhang 2018). Direct DNA extraction would be the solution (Wijayawardene et al. 2021). However, there are also some problems with direct DNA extraction methods. The requirements for picking a small number of conidia or *mycelium* are relatively high. For some species with smaller conidia and fewer hyphae on the substrate, especially those with colourless or hyaline conidia, it is difficult to obtain a sufficient amount of material for direct DNA extraction. Moreover, it is often difficult to amplify the protein gene when the directly extracted DNA is amplified by PCR.

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