Article

Diversity and Distribution of Calonectria Species from Plantation and Forest Soils in Fujian Province, China

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Abstract: To meet the growing demand for wood and pulp products, Eucalyptus plantations have expanded rapidly during the past two decades, becoming an integral part of the southern China landscape. Leaf blight caused by various Calonectria spp., is a serious threat to these plantations. In order to explore the diversity and distribution of Calonectria spp. in Fujian Province soils, samples were collected in Eucalyptus plantations and adjacent plantings of Cunninghamia lanceolata, Phyllostachys heterocycle and Pinus massoniana as well as in natural forests. Three hundred and fifty-three Calonectria isolates were recovered from soil samples and they were identified based on a comparison of multilocus DNA sequence data for the act (actin), cmdA (calmodulin), his3 (histone H3), rpb2 (the second largest subunit of RNA polymerase), tef1 (translation elongation factor 1-alpha) and tub2 (β-tubulin) gene regions, as well as morphological characteristics. Six known taxa including Calonectria aconidialis, Ca. hongkongensis, Ca. ilicicola, Ca. kyotensis, Ca. pacifica, Ca. pseudoreteaudii and one novel species described here as Ca. minensis sp. nov. were identified. Of these, Ca. aconidialis and Ca. kyotensis were the most prevalent species, and found in eight and seven sites, and four and five forest types, respectively. Calonectria spp. were most abundant in soils from Eucalyptus stands, followed by P. heterocycle and natural forests. Relatively few species were found in the soils associated with Cunninghamia lanceolata and Pinus massoniana. The abundance of known Calonectria spp. suggests that these fungi have been relatively well sampled in Fujian. The results are also consistent with the fact that most Calonectria diseases are found on Angiosperm as opposed to Gymnosperm plants.

Keywords: Calonectria leaf blight; forest pathogens; fungal diversity; phylogeny; taxonomy

1. Introduction

Species of Eucalyptus are the most important trees used to establish plantations in the tropics and Southern Hemisphere, where they provide substantial resources for the global fibre market [1]. These trees were first introduced into China as ornamentals in 1890 and plantations of Eucalyptus spp. had reached 5.46 million hm² by 2018 [1]. Plantations of these trees are mainly distributed in 11 provinces of China, and over 75% can be found in the Guangxi, Guangdong, Yunnan and Fujian Provinces of southern China [1]. The Eucalyptus plantations in China have been established with a relatively narrow genetic base and consequently many disease problems, caused by a variety of pathogens, have emerged as threats to their sustainability [2–6].

Among the diseases threatening Eucalyptus plantations, leaf blight caused by species of Calonectria De Not. has become a major constraint in southern China [4,7–10]. Symptoms of infection are characterised by water-soaked spots on leaves in the lower and middle parts of the tree crowns. These coalesce and gradually develop into extended necrotic areas, which result in blight and often severe defoliation [9]. In China, Calonectria Leaf Blight (CLB) has
been observed in *Eucalyptus* plantations in Fujian, Guangdong, Guangxi, Hainan and Yunnan Provinces [4,7,9–11]. This is similar to the situation in Australia, Brazil, Indonesia, Thailand and Vietnam where *Eucalyptus* plantations have also suffered significant damage due to CLB [12–16].

The genus *Calonectria* includes many aggressive plant pathogens. These species are extensively distributed particularly in sub-tropical and tropical regions of the world, and they have a wide host range including more than 335 plant species [17]. *Calonectria* species are generally considered as soil-borne fungi and they can survive in the soil for extended periods due to their thick-walled microsclerotia [17].

A recent taxonomic revision of *Calonectria* by Liu and co-authors [18] accepted 120 species. Of these, 65 have been reported from soils samples; the remaining species are known from infections on plant tissues [10,18–22]. To date, 27 species of *Calonectria* have been recorded in China, 18 of which have been isolated from soil samples [4,7,10,11,18,21,23–26].

Plantations of *Eucalyptus* spp. are commonly established alongside those of *Cunninghamia lanceolata*, *Phyllostachys heterocycle* and *Pinus massoniana* and can also be in mixed plantings in the Fujian Province (Figure 1). In recent years, leaf blight has become a serious threat to *Eucalyptus* plantations in this province [7,8]. *Calonectria* species including *Ca. crousiana*, *Ca. eucalypti*, *Ca. fujianensis*, *Ca. pauciromosa* and *Ca. pseudoreteaudii* [7,8,18] have been isolated from diseased *Eucalyptus* tissues and are regarded as the important causal agents of CLB in Fujian. *Calonectria* infections initially arise from inoculum in the soil but very little is known regarding the species diversity and distribution of these fungi in Fujian soils. The aim of this study was thus to determine the identity and distribution of *Calonectria* spp. from a wide variety of soils in Fujian, with a particular focus on *Eucalyptus* spp. but also including other trees that are found in the area.

![Figure 1](image_url). Different forest plantations and natural forests in southern China. (a). mixed species plantations in Zhangzhou Region, Fujian Province, 1: *Eucalyptus* sp., 2: *Pinus massoniana*, 3: *Cunninghamia lanceolata*; (b). mixed species plantations in Jiangxi Province, 1: *Eucalyptus* sp., 3: *Cunninghamia lanceolata*; 4: *Phyllostachys heterocycle*; (c). *Eucalyptus* sp. in Yongan Region, Fujian Province; (d). *Cunninghamia lanceolata* in Jiangxi Province; (e). *Phyllostachys heterocycle* in Nanping Region, Fujian Province; (f). natural forests in Nanping Region, Fujian Province. Soil samples in this study were collected from Fujian Province.
2. Materials and Methods

2.1. Sample Collection and Fungal Isolation

Soil samples were collected from Eucalyptus plantations and adjacent plantings, including those of Cunninghamia lanceolata, Phyllostachys heterocycle and Pinus massoniana as well as in natural forests (Figure 1). These plantations and forests were distributed in nine counties or districts in five regions of Fujian Province (one site in Nanping Region, two sites in Fuzhou Region, two sites in Sanming Region, three sites in Longyan Region, one site in Zhangzhou Region) of southern China (Figure 2). These forests typically have thick layers of leaf litter, which was removed before collecting soil samples from the upper 0–20 cm of the humid soil profile. Between three and 37 soil samples (Table 1) were collected randomly at each site. The soil samples were placed in re-sealable plastic bags to maintain moisture and transported to the laboratory for further study.

Soil samples were placed in plastic cups and moistened using distilled water. Medicago sativa (alfalfa) seeds were surface-disinfested in 75% ethanol for 30 s and scattered onto the surface of the moistened soil to bait for Calonectria spp. as described by Crous [17]. After eight to ten days at 25 °C, conidiophores typical of Calonectria spp. were observed with a Zeiss Stemi 2000C dissection microscope on the germinating alfalfa plants. Conidial masses were transferred to 2% MEA (Malt Extract Agar) using a sterile needle. After 12 h of incubation at 25 °C, single hyphal tips were transferred to fresh MEA plates using a sterile needle and these cultures were incubated at 25 °C for seven days. Cultures were sorted based on their morphological characteristics and one to five isolates were retained for each of the soil samples.

Cultures were deposited in the Culture Collection (CSF) at the Research Institute of Fast-growing Trees (RIFT) (previous institution: China Eucalypt Research Centre, CERC), Chinese Academy of Forestry (CAF), ZhanJiang, Guangdong Province, China. Representative isolates have also been maintained in the China General Microbiological Culture Collection Centre (CGMCC), Beijing, China. Dried specimens were deposited in the Mycological Fungarium of the Institute of Microbiology, Chinese Academy of Sciences (HMAS), Beijing, China.

![Figure 2. Calonectria species collected from nine counties (districts) in Fujian Province. (a-i). the percentage of each species in nine different counties (districts). Different species are indicated by numbers with different colours.](image-url)
### Table 1. Details of soils sampled, associated forest types and Calonectria spp. isolated.

| Code | Sampling Site     | Substrate                        | Number of Samples | Number of Samples Obtained Calonectria | Number of Calonectria Isolates Obtained | Calonectria spp. (Number of Isolates) |
|------|-------------------|----------------------------------|-------------------|----------------------------------------|----------------------------------------|--------------------------------------|
| a    | Yanping District  | Eucalyptus plantation            | 5                 | 3                                      | 12                                     | Ca. aconidialis (7); Ca. pseudoreteaudii (5) |
|      |                   | natural forest                   | 13                | 3                                      | 10                                     | Ca. aconidialis (3); Ca. pacifica (7)    |
|      |                   | Cunninghamia lanceolata          | 10                | 0                                      | 0                                      | N/A a                                |
| b    | Minhou County     | Eucalyptus plantation            | 15                | 12                                     | 51                                     | Ca. aconidialis (28); Ca. kyotensis (17); Ca. hongkongensis (4); Ca. pacifica (2) |
| c    | Cangshan District | natural forest                   | 3                 | 3                                      | 11                                     | Ca. kyotensis (5); Ca. hongkongensis (6) |
| d    | Qingliu County    | natural forest                   | 10                | 0                                      | 0                                      | N/A                                  |
|      |                   | Cunninghamia lanceolata          | 11                | 2                                      | 9                                      | Ca. aconidialis (5); Ca. kyotensis (4)   |
|      |                   | Pinus massoniana                 | 10                | 1                                      | 5                                      | Ca. kyotensis (5)                       |
| e    | Yongan County     | Eucalyptus plantation            | 27                | 7                                      | 28                                     | Ca. aconidialis (12); Ca. kyotensis (8); Ca. pacifica (8) |
| f    | Liaocheng County  | Eucalyptus plantation            | 20                | 4                                      | 20                                     | Ca. kyotensis (20)                      |
|      |                   | natural forest                   | 17                | 8                                      | 40                                     | Ca. aconidialis (27); Ca. kyotensis (8); Ca. minensis (5) |
| g    | Zhangping County  | Eucalyptus plantation            | 20                | 15                                     | 71                                     | Ca. aconidialis (66); Ca. ilicicola (5)  |
| h    | Xinluo District   | Eucalyptus plantation            | 19                | 4                                      | 16                                     | Ca. aconidialis (6); Ca. kyotensis (7); Ca. minensis (3) |
|      |                   | Phyllostachys heterocycla        | 14                | 5                                      | 25                                     | Ca. aconidialis (5); Ca. kyotensis (20)  |
|      |                   | Eucalyptus plantation            | 15                | 12                                     | 55                                     | Ca. aconidialis (19); Ca. kyotensis (9); Ca. hongkongensis (27) |
|      |                   | In total                         | 209               | 79                                     | 353                                    | a                                      |

* N/A refers to samples that did not yield Calonectria isolates.

#### 2.2. DNA Extraction, PCR Amplifications and Sequencing

Mycelium was collected from axenic cultures grown on MEA for 5–7 days using a sterilised scalpel. Genomic DNA was extracted from the cultures using the CTAB method "5" described by Van Burik et al. [27]. Partial gene sequences were determined for the actin (act), calmodulin (cmdA), histone H3 (his3), the second largest subunit of RNA polymerase (rpb2), translation elongation factor 1-alpha (tef1) and β-tubulin (tub2) regions. Primer pairs ACT-512F/ACT-783R, CAL-228F/CAL-2Rd, CYLH3F/CYLH3R, fRpb2-5F/fRpb2-7cR, EF1-728F/EF2 and T1/CYLTUB1R [18] were used to amplify the six gene regions, respectively.

The PCR reaction mixtures contained 17.5 µL TopTaq™ Master Mix, 1 µL of each primer (10 mM), 2 µL DNA sample and RNase-Free H₂O to a final volume of 35 µL. The amplifications were conducted under conditions described by Liu and co-authors [18]. All PCR products were sequenced in both directions using the same primers used for amplification. Raw sequences were inspected and manually corrected in Geneious v. 9.1.4 (Biomatters, Auckland, New Zealand) [28]. All sequences generated in this study were submitted to GenBank (http://www.ncbi.nlm.nih.gov; accessed on 24 July 2022) (Table 2, Appendix A Table A1).
2.3. Phylogenetic Analyses

To obtain the preliminary identification of the isolates, a standard nucleotide BLAST search was conducted using sequences of the six (act, cmdA, his3, rpb2, tef1 and tub2) gene regions. Furthermore, sequences obtained in this study (Table 2) and sequences of other phylogenetically closely related Calonectria species downloaded from NCBI (http://www.ncbi.nlm.nih.gov; accessed on 24 July 2022) (Table 3) were used in the analyses. Sequence alignments were conducted online with MAFFT v. 7 (Suita, Japan) [29] and were manually adjusted in MEGA v. 6.0.5 software (Auckland, New Zealand) [30] when necessary. The final alignments used in phylogenetic analyses were submitted to TreeBASE (http://treebase.org; accessed on 3 October 2021).

Genotypes of all the isolates were determined based on the sequences for the six gene regions. Representative isolates for all the genotypes were selected for the phylogenetic analyses. All the isolates of the novel species were used in the analyses. Maximum Parsimony (MP) and Maximum Likelihood (ML) approaches were used for phylogenetic analyses. The sequence datasets for the six individual gene regions and a concatenated dataset for those regions were used to determine the phylogenetic relatedness of all the isolates. PAUP v. 4.0 b10 [31] was used to perform the MP analyses, and PhyML v. 3.0 [32] was applied to conduct the ML analyses. A partition homogeneity test (PHT) [33] was performed to assess whether the datasets for the six gene regions could be combined.

For MP analyses, all characters were unordered and equally weighted. Gaps were regarded as fifth character and phylogenetic trees were obtained using a heuristic tree search criterion including 1000 random stepwise additions and tree-bisection-reconstruction (TBR) branch swapping. Branches of zero-length were collapsed. Supports for tree-branching points were determined using bootstrap analyses with 1000 replicates [34]. Tree length (TL), retention index (RI), consistency index (CI), rescaled consistency indexes (RC) and homoplasy index (HI) (Table 4) were calculated for parsimony trees. For ML analyses, the best substitution model for each dataset was determined using JModeltest 2.1.7 [35]. Sequence data for two isolates of Curvicladiella cignea (CBS 109167 and CBS 109168) were used as outgroup taxa (Table 3).
Table 2. Isolates sequenced in this study and used for phylogenetic analyses and morphological studies.

| Species * | Isolate No. b,c | Genotype d | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. e |
|-----------|----------------|------------|-----------|---------------|---------------|----------|------------------------|
| Calonectria aconidialis | CSP9779 | AAA-AA | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53’49.369” N, 117°32’45.070” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253064 OK253135 OK253279 N/A f OK253491 OK253844 |
|          | CSP9857 | AAIAA | Soil (Eucalyptus plantation) | Longyan, Fujian, China | 25°17’10.882” N, 117°27’33.635” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253065 OK253136 OK253280 OK253423 OK253492 OK253845 |
|          | CSP9937 | AAAABA | Soil (Eucalyptus plantation) | Xinluo, Longyan, Fujian, China | 25°07’08.597” N, 116°44’42.257” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253066 OK253137 OK253281 OK253424 OK253493 OK253846 |
|          | CSP9938 | AAAABA | Soil (Eucalyptus plantation) | Xinluo, Longyan, Fujian, China | 25°07’08.597” N, 116°44’42.257” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253067 OK253138 OK253282 OK253425 OK253494 OK253847 |
|          | CSP9939 | AAAABA | Soil (Eucalyptus plantation) | Xinluo, Longyan, Fujian, China | 25°07’08.597” N, 116°44’42.257” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253068 OK253139 OK253283 OK253426 OK253495 OK253848 |
|          | CSP9809 | ABBBBAB | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53’49.369” N, 117°32’45.070” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253069 OK253140 OK253284 OK253427 OK253496 OK253849 |
|          | CSF10105 | ABBBBAB | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15’04.285” N, 119°02’38.917” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253070 OK253141 OK253285 OK253428 OK253497 OK253850 |
|          | CSP9789 | ABBBBAB | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53’49.369” N, 117°32’45.070” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253071 OK253142 OK253286 OK253429 OK253498 OK253851 |
|          | CSP9839 | ABBBBABC | Soil (Eucalyptus plantation) | Longyan, Fujian, China | 25°17’10.882” N, 117°27’33.635” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253072 OK253143 OK253287 OK253430 OK253499 OK253852 |
|          | CSP9844 | ABBBBABC | Soil (Eucalyptus plantation) | Longyan, Fujian, China | 25°17’10.882” N, 117°27’33.635” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253073 OK253144 OK253288 OK253431 OK253500 OK253853 |
|          | CSP9882 | ABBBBABD | Soil (Eucalyptus plantation) | Longyan, Fujian, China | 25°17’10.882” N, 117°27’33.635” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253074 OK253145 OK253289 OK253432 OK253501 OK253854 |
Table 2. Cont.

| Species a | Isolate No. b,c | Genotype d | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. e |
|-----------|----------------|------------|-----------|---------------|---------------|----------|------------------------|
|           |                |            | Soil      | Liancheng, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253075 OK253146 OK253290 OK253433 OK253502 OK253855 |
| CSP9987   | ABAAAD         |            | Soil      | Liancheng, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | Q.L. Liu and F.F. Liu | OK253076 OK253147 OK253291 OK253434 OK253503 OK253856 |
| CSP9841   | ABAACA         |            | Soil      | Liancheng, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253077 OK253148 OK253292 OK253435 OK253504 OK253857 |
| CSP9870   | ABBAAA         |            | Soil      | Liancheng, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | Q.L. Liu and F.F. Liu | OK253078 OK253149 OK253293 OK253436 OK253505 OK253858 |
| CSP9875   | ABB-AA         |            | Soil      | Liancheng, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253079 OK253150 OK253294 N/A OK253506 OK253859 |
| CSP9957   | ACBAAA         |            | Soil      | Liancheng, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253080 OK253151 OK253295 OK253437 OK253507 OK253860 |
|           |                |            | Soil      | Cangshan, Fuzhou, Fujian, China | 26°5′16.2" N, 119°14′19.8" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253081 OK253192 OK253336 OK253438 OK253669 OK253900 |
| CSF7124   | AAAAAA         |            | Soil      | Cangshan, Fuzhou, Fujian, China | 24°53′49.369" N, 117°32′45.070" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253082 OK253193 OK253337 OK253439 OK253670 OK253901 |
| CSP9794   | AAAAAA         |            | Soil      | Cangshan, Fuzhou, Fujian, China | 24°53′49.369" N, 117°32′45.070" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253083 OK253194 OK253338 OK253440 OK253671 OK253902 |
| CSP9799   | AAAAAA         |            | Soil      | Cangshan, Fuzhou, Fujian, China | 24°53′49.369" N, 117°32′45.070" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253084 OK253195 OK253339 OK253441 OK253672 OK253903 |
Table 2. Cont.

| Species a | Isolate No. b,c | Genotype d | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. e |
|-----------|-----------------|------------|-----------|---------------|---------------|----------|------------------------|
|           |                 |            |           |               |               |          | act cmdA his3 rpb2 tef1 tub2 |
| Ca. ilicicola | CSP9862 | AAAAAA     | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17′10.882″ N, 117°27′33.635″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253085 OK253202 OK253346 OK253442 OK253706 OK253910 |
|           | CSP9863 | AAAAAA     | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17′10.882″ N, 117°27′33.635″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253086 OK253203 OK253347 OK253443 OK253707 OK253911 |
|           | CSF7130 | AAAAAA     | Soil (natural forest area) | Cangshan, Fuzhou, Fujian, China | 26°5′16.2″ N, 119°14′19.8″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253087 OK253207 OK253351 OK253444 OK253711 OK253915 |
|           | CSF10088 | AAAAAA     | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253088 OK253208 OK253352 OK253445 OK253712 OK253916 |
|           | CSF9834 | AAA-AB     | Soil (Eucalyptus plantation) | Hu’a’an, Zhangzhou, Fujian, China | 24°58′22.263″ N, 117°31′09.708″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253089 OK253209 OK253353 N/A OK253713 OK253917 |
|           | CSF9910 | AAAAAAB    | Soil (Phyllostachys heterocycla) | Xinluo, Longyan, Fujian, China | 25°07′31.133″ N, 116°51′37.483″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253090 OK253210 OK253354 OK253446 OK253714 OK253918 |
|           | CSF10014 | AAAAAAC    | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55′10.860″ N, 117°16′39.591″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253091 OK253211 OK253355 OK253447 OK253715 OK253919 |
|           | CSF10080 | AAAAAAD    | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253092 OK253212 OK253356 OK253448 OK253716 OK253920 |
|           | CSF10086 | AAAAAAE    | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253093 OK253213 OK253357 OK253449 OK253717 OK253921 |
|           | CSF10053 | AAAABB     | Soil (Pinus massoniana) | Qingliu, Sanming, Fujian, China | 26°10′54.311″ N, 116°52′50.901″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253094 OK253214 OK253358 OK253450 OK253718 OK253922 |
|           | CSF10054 | AAAABB     | Soil (Pinus massoniana) | Qingliu, Sanming, Fujian, China | 26°10′54.311″ N, 116°52′50.901″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253095 OK253215 OK253359 OK253451 OK253719 OK253923 |
| Species a | Isolate No. b,c | Genotype d | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. e |
|-----------|----------------|------------|-----------|---------------|---------------|----------|------------------------|
| CSP9922   | AAAABF         | (Phyllostachys heterocycla) | Soil | Xinluo, Longyan, Fujian, China | 25°07′31.133″ N, 116°51′37.485″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253096 OK253216 OK253360 OK253452 OK253720 OK253924 |
| CSP9923   | AAAABF         | (Phyllostachys heterocycla) | Soil | Xinluo, Longyan, Fujian, China | 25°07′31.133″ N, 116°51′37.485″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253097 OK253217 OK253361 OK253453 OK253721 OK253925 |
| CSP9949   | AAAADB         | (Eucalyptus plantation) | Soil | Xinluo, Longyan, Fujian, China | 25°07′08.597″ N, 116°44′42.257″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253098 OK253218 OK253362 OK253454 OK253722 OK253926 |
| CSP9951   | AAAADB         | (Eucalyptus plantation) | Soil | Xinluo, Longyan, Fujian, China | 25°07′08.597″ N, 116°44′42.257″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253099 OK253219 OK253363 OK253455 OK253723 OK253927 |
| CSP9932   | AAAADG         | (Eucalyptus plantation) | Soil | Xinluo, Longyan, Fujian, China | 25°07′08.597″ N, 116°44′42.257″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253100 OK253220 OK253364 OK253456 OK253724 OK253928 |
| CSP9935   | AAAADG         | (Eucalyptus plantation) | Soil | Xinluo, Longyan, Fujian, China | 25°07′08.597″ N, 116°44′42.257″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253101 OK253221 OK253365 OK253457 OK253725 OK253929 |
| CSP9936   | AAAADG         | (Eucalyptus plantation) | Soil | Xinluo, Longyan, Fujian, China | 25°07′08.597″ N, 116°44′42.257″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253102 OK253222 OK253366 OK253458 OK253726 OK253930 |
| CSF10020  | AAAAEA         | (Eucalyptus plantation) | Soil | Yongan, Sanming, Fujian, China | 25°55′10.860″ N, 117°16′39.591″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253103 OK253223 OK253367 OK253459 OK253727 OK253931 |
| CSF10021  | AAAAEA         | (Eucalyptus plantation) | Soil | Yongan, Sanming, Fujian, China | 25°55′10.860″ N, 117°16′39.591″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253104 OK253224 OK253368 OK253460 OK253728 OK253932 |
| CSF10009  | AAABBH         | (Eucalyptus plantation) | Soil | Longyan, Fujian, China | 25°33′06.994″ N, 116°41′42.328″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253105 OK253225 OK253369 OK253461 OK253729 OK253933 |
| CSF10010  | AAABBH         | (Eucalyptus plantation) | Soil | Longyan, Fujian, China | 25°33′06.994″ N, 116°41′42.328″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253106 OK253226 OK253370 OK253462 OK253730 OK253934 |
| Species  | Isolate No. | Genotype | Substrate | Sampling Site | GPS Coordinate | Collector                  | GenBank Accession No. |
|----------|-------------|----------|-----------|---------------|----------------|---------------------------|----------------------|
|          |              |          |           |               |                |                           | act                  |
|          |              |          |           |               |                |                           | cmdA                 |
|          |              |          |           |               |                |                           | his3                 |
|          |              |          |           |               |                |                           | rpb2                 |
|          |              |          |           |               |                |                           | tef1                 |
|          |              |          |           |               |                |                           | tub2                 |
| J. Fungi | 2022, 8     | 811      |           |               |                |                           |                      |

Table 2. Cont.

| Species  | Isolate No. | Genotype | Substrate | Sampling Site | GPS Coordinate | Collector                  | GenBank Accession No. |
|----------|-------------|----------|-----------|---------------|----------------|----------------------------|----------------------|
|          |              |          |           |               |                |                           | act                  |
|          |              |          |           |               |                |                           | cmdA                 |
|          |              |          |           |               |                |                           | his3                 |
|          |              |          |           |               |                |                           | rpb2                 |
|          |              |          |           |               |                |                           | tef1                 |
|          |              |          |           |               |                |                           | tub2                 |
| CSP9997  | AABAAB      |          | Soil      | Liancheng, Fujian, China | 25°33'06.994" N, 116°41'42.328" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253107 OK253227 OK253371 OK253463 OK253731 OK253935 |
| CSP9969  | AABACB      |          | Soil      | Liancheng, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253108 OK253228 OK253372 OK253464 OK253732 OK253936 |
| CSP9972  | AABACB      |          | Soil      | Liancheng, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253109 OK253229 OK253373 OK253465 OK253733 OK253937 |
| CSP9973  | AABACB      |          | Soil      | Liancheng, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253110 OK253230 OK253374 OK253466 OK253734 OK253938 |
| CSF10126 | AACAAA      |          | Soil      | Minhou, Fuzhou, China   | 26°15'04.285" N, 119°02'38.917" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253111 OK253231 OK253375 OK253467 OK253735 OK253939 |
| CSP9962  | AACAAD      |          | Soil      | Liancheng, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253112 OK253232 OK253376 OK253468 OK253736 OK253940 |
| CSF10019 | AADABB      |          | Soil      | Yongan, Sanming, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253113 OK253233 OK253377 OK253469 OK253737 OK253941 |
| CSF10022 | AADABB      |          | Soil      | Yongan, Sanming, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253114 OK253234 OK253378 OK253470 OK253738 OK253942 |
| CSF10023 | AADABB      |          | Soil      | Yongan, Sanming, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253115 OK253235 OK253379 OK253471 OK253739 OK253943 |
| CSF10045 | ABAAAB      |          | Soil      | Qingliu, Sanming, Fujian, China | 26°27'23.497" N, 116°53'00.762" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253116 OK253236 OK253380 OK253472 OK253740 OK253944 |
| CSF10047 | ABAAAB      |          | Soil      | Qingliu, Sanming, Fujian, China | 26°27'23.497" N, 116°53'00.762" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253117 OK253237 OK253381 OK253473 OK253741 OK253945 |
| Species \(^a\) | Isolate No. \(^b,c\) | Genotype \(^d\) | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. \(^e\) |
|----------------|----------------|----------------|------------|---------------|--------------|----------|------------------------|
| **C. minensis sp. nov.** | CSF9941 g,h; CGMCC3.18877 | AAAAAA | Soil (Eucalyptus plantation) | Xinluo, Longyan, Fujian, China | 25°07'08.597" N, 116°44'42.257" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253121 OK253259 OK253403 OK253477 OK253814 OK253967 |
| | CSP9974 | AAAAAA | Soil (natural forest area) | Xinluo, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253122 OK253260 OK253404 OK253478 OK253815 OK253968 |
| | CSF9975 g,h; CGMCC3.18881 | AAAAAA | Soil (natural forest area) | Xinluo, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253123 OK253261 OK253405 OK253479 OK253816 OK253969 |
| | CSP9976 | AAAAAA | Soil (natural forest area) | Xinluo, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253124 OK253262 OK253406 OK253480 OK253817 OK253970 |
| | CSP9977 | AAAAAA | Soil (natural forest area) | Xinluo, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253125 OK253263 OK253407 OK253481 OK253818 OK253971 |
| | CSP9978 | AAAAAA | Soil (natural forest area) | Xinluo, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253126 OK253264 OK253408 OK253482 OK253819 OK253972 |
| | CSF9933 g,h; CGMCC3.18875 | ABBABB | Soil (Eucalyptus plantation) | Xinluo, Longyan, Fujian, China | 25°07'08.597" N, 116°44'42.257" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253127 OK253265 OK253409 OK253483 OK253820 OK253973 |
| | CSF9934 | ABBABB | Soil (Eucalyptus plantation) | Xinluo, Longyan, Fujian, China | 25°07'08.597" N, 116°44'42.257" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253128 OK253266 OK253410 OK253484 OK253821 OK253974 |
Table 2. Cont.

| Species                | Isolate No. | Genotype | Substrate                          | Sampling Site                          | GPS Coordinate                  | Collector                              | GenBank Accession No. |
|------------------------|-------------|----------|-------------------------------------|----------------------------------------|----------------------------------|----------------------------------------|-----------------------|
|                         |             |          |                                     |                                        |                                  |                                        |                       |
| Ca. pacifica           | CSF10024    | AAAAAA   | Soil (Eucalyptus plantation)        | Yongan, Sanming, Fujian, China         | 25°55’10.860” N, 117°16’39.591” E | S.F. Chen, Q.L. Liu and F.F. Liu       | OK253129 OK253267     |
|                         | CSF10129    | BAAAAA   | Soil (Eucalyptus plantation)        | Minhou, Fuzhou, Fujian, China          | 26°15’04.285” N, 119°02’38.917” E | S.F. Chen, Q.L. Liu and F.F. Liu       | OK253130 OK253268     |
|                         | CSF10070    | CABAAA   | Soil (natural forest area)          | Yanping, Nanping, Fujian, China        | 26°42’26.672” N, 118°07’58.317” E | S.F. Chen, Q.L. Liu and F.F. Liu       | OK253131 OK253269     |
|                         | CSF10077    | CABAAA   | Soil (natural forest area)          | Yanping, Nanping, Fujian, China        | 26°42’26.672” N, 118°07’58.317” E | S.F. Chen, Q.L. Liu and F.F. Liu       | OK253132 OK253270     |
| Ca. pseudoreteaudii    | CSF10059    | AAAAAA   | Soil (Eucalyptus plantation)        | Yanping, Nanping, Fujian, China        | 26°46’19.651” N, 117°57’32.233” E | S.F. Chen, Q.L. Liu and F.F. Liu       | OK253133 OK253274     |
|                         | CSF10060    | AAAAAA   | Soil (Eucalyptus plantation)        | Yanping, Nanping, Fujian, China        | 26°46’19.651” N, 117°57’32.233” E | S.F. Chen, Q.L. Liu and F.F. Liu       | OK253134 OK253275     |

a New species described in this study are indicated in bold. b CSF = Culture Collection from Southern Forests (CSF), ZhanJiang, Guangdong Province, China; CGMCC = China General Microbiological Culture Collection Center, Beijing, China. c Isolates used in phylogenetic analyses. d Genotype within each identified species, determined by sequences of act, cmdA, his3, rpb2, tef1 and tub2 regions; '-' means not available. e act = actin; cmdA = calmodulin; his3 = histone H3; rpb2 = the second largest subunit of RNA polymerase; tef1 = translation elongation factor 1-alpha; tub2 = β-tubulin. f N/A represents sequences that are not available. g Isolates used in morphological and culture growth studies. h Isolates used for mating studies. i Isolates that represent ex-type cultures are indicated in bold.
Table 3. Isolates from other studies and used in the phylogenetic analyses.

| Code  | Species                      | Isolates No. | Other Collection Number | Substrate                        | Area of Occurrence            | Collector                  | GenBank accession No. | References |
|-------|------------------------------|--------------|--------------------------|----------------------------------|--------------------------------|----------------------------|------------------------|------------|
| B1    | Calonectria acaciicola       | CMW 47173T   | CBS 143557               | Soil (Acacia auriculiformis      | Do Luong, Nghe An, Vietnam    | N.Q. Pham and T.Q. Pham | MT334933; MT335160; MT335389; MT412474; MT412690; MT412930 | [16,18]   |
|       |                              | CMW 47174    | CBS 143558               | Soil (A. auriculiformis          | Do Luong, Nghe An, Vietnam    | N.Q. Pham and T.Q. Pham | MT334934; MT335161; MT335400; MT412475; MT412691; MT412931 | [16,18]   |
| B2    | Ca. acicola                  | CMW 30996T   | –                        | Phoenix canariensis              | Northland, New Zealand        | H. Pearson                 | MT334935; MT335162; MT335403; MT412476; MT412692; MT412932 | [18,36,37]|
|       |                              | CBS 114812   | CMW 51216                | P. canariensis                   | Northland, New Zealand        | H. Pearson                 | MT334936; MT335163; MT335402; MT412477; MT412693; MT412933 | [18,36,37]|
| B3    | Ca. aciculata                 | CERC 5342T   | CBS 123983; CMW 47645    | Eucalyptus urophylla × E. grandis| Yunnan, China                 | S.F. Chen and J.Q. Li     | MT334937; MT335164; MT335403; MT412478; MT412694; MT412934 | [4,18]    |
| B4    | Ca. aconidialis               | CMW 35174T   | CBS 136086; CERC 1850    | Soil (Eucalyptus                 | Hainan, China                 | X. Mou and S.F. Chen      | MT334938; MT335165; MT335404; MT412479; MT412695; N/A | [11,18]   |
|       |                              | CMW 35384    | CBS 136091; CERC 1896    | Soil (Eucalyptus                 | Hainan, China                 | X. Mou and S.F. Chen      | MT334939; MT335166; MT335405; N/A; MT412696; N/A | [11,18]   |
| B5    | Ca. aeknaulienisis            | CMW 48253T   | CBS 143559               | Soil (Eucalyptus                 | Aek Nauli, North Sumatra,      | M.J. Wingfield            | MT334953; MT335180; MT335419; MT412486; MT412710; N/A | [16,18]   |
|       |                              | CMW 48254    | CBS 143560               | Soil (Eucalyptus                 | Aek Nauli, North Sumatra,      | M.J. Wingfield            | MT334954; MT335181; MT335420; MT412487; MT412711; N/A | [16,18]   |
| B8    | Ca. asiatica                  | CBS 114073T  | CMW 23782; CPC 3900      | Debris (leaf litter)             | Prathet Thai, Thailand         | N.L. Hywel-Jones          | GQ280428; AY725741; AY725688; N/A; AY725705; AY725616 | [23,37]   |
| B10   | Ca. australiensis             | CMW 23669T   | CBS 112954; CPC 4714     | Ficus pleurocarpa                | Queensland, Australia          | C. Pearce and B. Paulus   | MT334965; MT335192; MT335432; MT412486; MT412723; MT412946 | [18,37,38]|
| B17   | Ca. brassicicola              | CMW 112841T  | CMW 51206; CPC 4552      | Soil at Brassica sp.             | Indonesia                      | M.J. Wingfield            | N/A; KX784561; N/A; KX784689; KX784619 | [39]      |
| B19   | Ca. bunicola                  | CMW 48257T   | CBS 143575               | Soil (Eucalyptus                 | Aek Nauli, North Sumatra,      | M.J. Wingfield            | MT334975; MT335205; MT335445; MT412509; MT412736; N/A | [16,18]   |
| B20   | Ca. canadiana                 | CMW 23673T   | CBS 110817; STE-U 499    | Picea sp.                       | Canada                         | S. Greifenhagen            | MT334976; MT335206; MT335446; MT412510; MT412737; MT412958 | [17,18,40,41]|
|       |                              | CERC 8952    | –                        | Soil                            | Henan, China                  | S.F. Chen                 | MT335058; MT335209; MT335530; MT412587; MT412821; MT413035 | [18,25]   |
Table 3. Cont.

| Code B | Species                   | Isolates | Other Collection Number | Substrate | Area of Occurrence | Collector | GenBank accession No. | References |
|--------|---------------------------|----------|-------------------------|-----------|--------------------|----------|-----------------------|------------|
|        | **Ca. chinensis**         | CMW 23674T | CBS 114827; CPC 4101    | Soil      | Hong Kong, China   | E.C.Y. Liew | MT334990; MT335220; MT335460; MT412524; MT412751; MT412972; MT334991; MT335221; MT335461; MT412525; MT412752; MT412973 | [18,23,37] |
|        |                           | CMW 30986 | CBS 112744; CPC 4104    | Soil      | Hong Kong, China   | E.C.Y. Liew | MT334990; MT335220; MT335460; MT412524; MT412751; MT412972; MT334991; MT335221; MT335461; MT412525; MT412752; MT412973 | [18,23,37] |
| **B26**| **Ca. cochinchinensis**   | CMW 49915T | CBS 143567              | Soil      | Duong Minh Chau, Tay Ninh, Vietnam | N.Q. Pham, Q.N. Dang and T.Q. Pham | MT334995; MT335225; MT335465; MT412529; MT412756; MT412977; MT334996; MT335226; MT335466; MT412530; MT412757; MT412978 | [16,18] |
|        |                           | CMW 47186 | CBS 143568              | Soil      | Song May, Dong Nai, Vietnam | N.Q. Pham and T.Q. Pham | MT334995; MT335225; MT335465; MT412529; MT412756; MT412977; MT334996; MT335226; MT335466; MT412530; MT412757; MT412978 | [16,18] |
| **B27**| **Ca. coleoumii**         | CBS 293.79T | CMW 30999              | Camellia sinensis | Mauritius | A. Peerally | GQ280443; GQ267373; DQ190639; KY653376; GQ267301; DQ190564 | [17,37,38,42] |
| **B29**| **Ca. colombiensis**      | CMW 23676T | CBS 112220; CPC 723     | Soil      | La Selva, Colombia | M.J. Wingfield | MT334998; MT335228; MT335468; MT412532; MT412759; MT412980 | [18,23] |
|        |                           | CMW 30985 | CBS 112221; CPC 724     | Soil      | La Selva, Colombia | M.J. Wingfield | MT334998; MT335228; MT335468; MT412532; MT412759; MT412980 | [18,23] |
| **B30**| **Ca. crousiana**         | CMW 27249T | CBS 127198              | E. grandis | Fujian, China     | M.J. Wingfield | MT335000; MT335230; MT335470; MT412534; MT412761; MT412982 | [7,18] |
|        |                           | CMW 27253 | CBS 127199              | E. grandis | Fujian, China    | M.J. Wingfield | MT335000; MT335230; MT335470; MT412534; MT412761; MT412982 | [7,18] |
| **B31**| **Ca. curvispora**        | CMW 23693T | CBS 116159; CPC 765     | Soil      | Tamatave, Madagascar | P.W. Crous | MT335002; MT335232; MT335472; MT412536; MT412763; N/A | [11,17,18,37,43] |
|        |                           | CMW 48245 | CBS 143565              | Soil      | Aek Nauli, North Sumatra, Indonesia | M.J. Wingfield | MT335002; MT335232; MT335472; MT412536; MT412763; N/A | [11,17,18,37,43] |
| **B36**| **Ca. eucalypti**         | CMW 18444T | CBS 125275              | E. grandis | Aek Nauli, Sumatra Utara, Indonesia | M.J. Wingfield | MT335013; MT335243; MT335483; MT412545; MT412774; MT412992 | [18,37] |
|        |                           | CMW 18445 | CBS 125276              | E. grandis | Aek Nauli, Sumatra Utara, Indonesia | M.J. Wingfield | MT335013; MT335243; MT335483; MT412545; MT412774; MT412992 | [18,37] |
| **B39**| **Ca. fujiaensis**        | CMW 27257T | CBS 127201              | E. grandis | Fujian, China     | M.J. Wingfield | MT335019; MT335249; MT335489; MT412551; MT412780; MT412998 | [7,18] |
|        |                           | CMW 27254 | CBS 127200              | E. grandis | Fujian, China    | M.J. Wingfield | MT335019; MT335249; MT335489; MT412551; MT412780; MT412998 | [7,18] |
Table 3. Cont.

| Code | Species | Isolates | Other Collection Number | Substrate | Area of Occurrence | Collector | GenBank accession No. | References |
|------|---------|----------|--------------------------|-----------|--------------------|-----------|----------------------|-----------|
| B46  | Ca. heveicola | CMW 49913T | CBS 143570 | Soil (H. brasiliensis plantation) | Bau Bang, Binh Duong, Vietnam | N.Q. Pham, Q.N. Dang and T.Q. Pham | MT335025; MT335255; MT335495; N/A; MT412786; MT413004 | [16,18] |
|      |         |          | CBS 49928 | Soil | Bu Gia Map National Park, Binh Phuoc, Vietnam | N.Q. Pham, Q.N. Dang and T.Q. Pham | MT335048; MT335280; MT335520; MT412577; MT412811; MT413025 | [16,18] |
|      |         | CMW 49928 | CBS 143571 | Soil | | | | |
|      |         | CERC 5571 | CBS 142885; CMW 47669; CBS 142884; CMW 47668 | Soil (Eucalyptus plantation) | Honghe, Yunnan, China | S.F. Chen and J.Q. Li | MT335026; MT335256; MT335496; MT412557; MT412788; MT413006 | [4,18] |
| B47  | Ca. honghenisis | CERC 5572T | CBS 114828 | Soil | Hong Kong, China | M.J. Wingfield | MT335028; MT335258; MT335498; MT412559; MT412789; MT413016 | [18,23] |
|      |         | CERC 5571 | CMW 51217; CPC 4670 | Soil | Warambunga, Indonesia | M.J. Wingfield | MT335030; MT335260; MT335500; MT412561; MT412791; MT413009 | [4,18] |
|      |         | CERC 5572 | CMW 47271 | Soil (Eucalyptus plantation) | Beihai, Guangxi, China | S.F. Chen, Q.J. Li and G.Q. Li | MT335032; MT335259; MT335499; MT412558; MT412788; MT413005 | [4,18] |
| B51  | Ca. ilicicola | CMW 30998T | CBS 190.50; IMI 299389; STE-U 2482 | Solanum tuberosum | Bogor, Java, Indonesia | K.B. Boedijn and J. Reitsma | MT335036; MT335266; MT335506; MT412564; MT412797; N/A | [17,18,37,44] |
| B52  | Ca. indonesiae | CMW 23683T | CBS 112823; CPC 4508 | Syzygium aromaticum | Warambunga, Indonesia | M.J. Wingfield | MT335037; MT335267; MT335507; MT412565; MT412798; MT413015 | [18,23] |
|      |         | CBS 112840 | CMW 51205; CPC 4554 | S. aromaticum | Warambunga, Indonesia | M.J. Wingfield | MT335038; MT335268; MT335508; MT412566; MT412799; MT413016 | [18,23] |
| B53  | Ca. indusiata | CBS 144.36T | CMW 23699 | Camellia sinensis | Sri Lanka | N/A | GQ280536; GQ267453; GQ267262; KY653396; GQ267332; GQ267239 | [17,27,39,45] |
|      |         | CBS 114684 | CMW 51213; CPC 2446; UFV16 | Rhododendron sp. | Florida, USA | N.E. El-Gholl | GQ280537; GQ267454; DQ190653; N/A; GQ267333; AF232862 | [17,38,46] |
| B55  | Ca. kyoelensis | CBS 114525T | ATCC 18834; CMW 51824; CPC 2367 | Robinia pseudacacia | Japan | T. Terashita | MT335039; MT335271; MT335511; MT412569; MT412802; MT413019 | [17,18,39,47] |
|      |         | CBS 114530 | CMW 51825; CPC 2351 | Soil | China | M.J. Wingfield | MT335016; MT335246; MT335548; MT412548; MT412777; MT412995 | [18,39] |
| B57  | Ca. lantauensis | CERC 3302T | CBS 142888; CMW 47252 | Soil | LiDao, Hong Kong, China | M.J. Wingfield and S.F. Chen | MT335040; MT335272; MT335512; MT412570; MT412803; N/A | [4,18] |
|      |         | CERC 3301 | CBS 142887; CMW 47251 | Soil | LiDao, Hong Kong, China | M.J. Wingfield and S.F. Chen | MT335041; MT335273; MT335513; N/A; MT412804; N/A | [4,18] |
| Code B | Species | Isolates No. | Other Collection Number | Substrate | Area of Occurrence | Collector | GenBank accession No. | References |
|--------|---------|--------------|-------------------------|-----------|-------------------|-----------|----------------------|-----------|
| B58    | *Ca. lateralis* | CMW 31412<sup>T</sup> | CBS 136629 | Soil (Eucalyptus plantation) | Guangxi, China | X. Zhou, G. Zhao and F. Han | MT335042; MT335274; MT335514; MT412571; MT412805; MT413020 | [11,18] |
| B62    | *Ca. lichi* | CERC 8866<sup>T</sup> | – | Soil | Henan, China | S.F. Chen | MT335046; MT335278; MT335518; MT412575; MT412809; MT413023 | [18,25] |
|        |         | CERC 8850 | – | Soil | Henan, China | S.F. Chen | MT335047; MT335279; MT335519; MT412576; MT412810; MT413024 | [18,25] |
| B63    | *Ca. Lombardiana* | CMW 30602<sup>T</sup> | CBS 112634; CPC 4233; Lynfield 417 | Xanthorrhoea australis | Victoria, Australia | T. Baigent | MT335156; MT335395; MT412566; MT412926; MT413133 | [17,18,24,38] |
| B64    | *Ca. macroconidialis* | CBS 114880<sup>T</sup> | CMW 51219; CPC 307; PPRI 4000 | E. grandis | Sabie, Mpumalanga, South Africa | P.W. Crous | MT335050; MT335282; MT335522; MT412579; MT412813; MT413027 | [17,18,37,48] |
| B65    | *Ca. madagascariensis* | CMW 23686<sup>T</sup> | CBS 114572; CPC 2252 | Soil | Rona, Madagascar | J.E. Taylor | MT335052; MT335284; MT335524; MT412581; MT412815; MT413029 | [17,18,37,38] |
|        |         | CMW 30993 | CBS 114571; CPC 2253 | Soil | Rona, Madagascar | J.E. Taylor | MT335053; MT335285; MT335525; MT412582; MT412816; MT413030 | [17,18,37,38] |
| B66    | *Ca. male-siana* | CMW 23687<sup>T</sup> | CBS 112752; CPC 4223 | Soil | Northern Sumatra, Indonesia | M.J. Wingfield | MT335054; MT335286; MT335526; MT412817; MT413031 | [18,23] |
|        |         | CMW 51109; CPC 3899 | Leaf litter | Prathet, Thailand | N.L. Hywel-Jones | MT335055; MT335287; MT335527; MT412584; MT412818; MT413032 | [18,23] |
| B70    | *Ca. monticola* | CBS 140645<sup>T</sup> | CPC 28835 | Soil | Chiang Mai, Thailand | P.W. Crous | N/A; KT964771; N/A; KT964773; KT964769 N/A; KT964772; N/A; KT964774; KT964770 | [19] |
|        |         | CPC 28836 | – | Soil | Chiang Mai, Thailand | P.W. Crous | N/A; KT964771; N/A; KT964773; KT964769 N/A; KT964772; N/A; KT964774; KT964770 | [19] |
| B74    | *Ca. multi-septata* | CMW 23692<sup>T</sup> | CBS 112682; CPC 1589 | E. grandis | North Sumatra, Indonesia | M.J. Wingfield | MT335067; MT335299; MT335539; MT412956; MT412830; MT413044 | [17,18,38,50] |
| B80    | *Ca. pacifica* | CMW 16726<sup>T</sup> | A1568; CBS 109063; IMI 335452; STE-U 2534 | Araucaria heterophylla | Hawaii, USA | M. Aragaki | MT335079; MT335311; MT335551; MT412604; MT412842; N/A | [17,18,23,40] |
|        |         | CMW 30988 | CBS 114038 | Ipomoea aquatica | Auckland, New Zealand | C.F. Hill | MT335080; MT335312; MT335552; MT412605; MT412843; N/A | [17,18,23,37] |
| B81    | *Ca. para-colhounii* | CBS 114679<sup>T</sup> | CMW 51212; CPC 2445 | N/A | USA | A.Y. Rossman | N/A; KY784582; N/A; KY653423; KY784714; KY784644 | [39,45] |
|        |         | CBS 114705 | CMW 51215; CPC 2423 | Fruit of *Ammox reticulata* | Australia | D. Hutton | N/A; N/A; N/A; KY653424; KY784715; KY784645 | [39,45] |
| Code | Species | Isolates No. | Other Collection Number | Substrate | Area of Occurrence | Collector | GenBank accession No. | References |
|------|---------|--------------|------------------------|-----------|--------------------|----------|----------------------|-----------|
| B86  | Ca. penticilloides | CMW 23696<sup>T</sup> | CBS 174.55; STE-U 2388 | *Prunus* sp. | Hatizyo Island, Japan | M. Ookubu | MT335106; MT335338; MT335578; MT412631; MT412869; MT413081 | [17,18,51] |
| B97  | Ca. pseudoreteaudii | CMW 25310<sup>T</sup> | CBS 123694 | *E. urophylla* × *E. grandis* | Guangdong, China | M.J. Wingfield and X.D. Zhou | MT335119; MT335354; MT335594; MT412647; MT412885; MT413096 | [18,24] |
|     |         | CMW 25292 | CBS 123696 | *E. urophylla* × *E. grandis* | Guangdong, China | M.J. Wingfield and X.D. Zhou | MT335120; MT335355; MT335595; MT412648; MT412886; MT413097 | [18,24] |
| B104 | Ca. queenslandica | CMW 30604<sup>T</sup> | CBS 112146; CPC 3213 | *E. urophylla* | Lannercost, Queensland, Australia | B. Brown | MT335132; MT335367; MT335567; MT412660; MT412898; MT413108 | [18,24] |
|     |         | CMW 30603 | CBS 112155; CPC 3210 | *E. pellita* | Lannercost, Queensland, Australia | P.Q. Thu and K.M. Old | MT335133; MT335368; MT335568; MT412661; MT412899; MT413109 | [18,24] |
| B106 | Ca. reteaudii | CMW 30984<sup>T</sup> | CBS 112144; CPC 3201 | *E. camaldulensis* | Chon Thanh, Binh Phuoc, Vietnam | M.J. Dudzinski and P.Q. Thu | MT335135; MT335370; MT335610; MT412663; MT412901; MT413111 | [17,18,38,52] |
|     |         | CMW 16738 | CBS 112143; CPC 3200 | *Eucalyptus* leaves | Binh Phuoc, Vietnam | M.J. Dudzinski and P.Q. Thu | MT335136; MT335371; MT335611; MT412664; MT412902; MT413112 | [17,18,38,52] |
| B112 | Ca. sumatrensis | CMW 23698<sup>T</sup> | CBS 112829; CPC 4518 | Soil | Northern Sumatra, Indonesia | M.J. Wingfield | MT335145; MT335382; MT335622; MT412674; MT412913; N/A; MT335146; MT335383; MT335623; MT412675; MT412914; N/A | [18,23] |
|     |         | CMW 30987 | CBS 112934; CPC 4516 | Soil | Northern Sumatra, Indonesia | M.J. Wingfield | MT335145; MT335382; MT335622; MT412674; MT412913; N/A; MT335146; MT335383; MT335623; MT412675; MT412914; N/A | [18,23] |
| B113 | Ca. syzygiicola | CBS 112831<sup>T</sup> | CMW 51204; CPC 4511 | *S. aromaticum* | Sumatra, Indonesia | M.J. Wingfield | N/A; N/A; N/A; N/A; N/A; KX784736; KX784663 | [39] |
| B116 | Ca. unisepitata | CBS 413.67<sup>T</sup> | CMW 23678; CPC 2391; IMI 299577 | *Paphiopedilum callosum* | Celle, Germany | W. Gerlach | GQ280451; GQ267379; GQ267248; N/A; GQ267307; GQ267208 | [39] |
| B123 | Ca. xianrensis | CSF12909<sup>T</sup> | CGMCC3.19584 | Soil (near *Eucalyptus* plantation) | Dacheng Town, Gaozhou County, Maoming Region, Guangdong, China | S.F. Chen, Q.C. Wang and W. Wang | N/A; MK962845; MK962857; N/A; MK962869; MK962833 | [21] |
|     |         | CSF12908 | CGMCC3.19518 | Soil (near *Eucalyptus* plantation) | Dacheng Town, Gaozhou County, Maoming Region, Guangdong, China | S.F. Chen, Q.C. Wang and W. Wang | N/A; MK962844; MK962856; N/A; MK962868; MK962832 | [21] |
Table 3. Cont.

| Code B | Species | Isolates No. b,c | Other Collection Number b | Substrate | Area of Occurrence | Collector | GenBank accession No. d | References |
|--------|---------|-----------------|--------------------------|-----------|------------------|-----------|----------------------|-----------|
| B120   | Ca. yunnanensis | CERC 5339T | CBS 142897; CMW 47644 | Soil (Eucalyptus plantation) | Yunnan, China | S.F. Chen and J.Q. Li | MT335157; MT335396; MT335636; MT412687; MT412927; MT413134 | [4,18] |
| CERC 5337 | | | CBS 142895; CMW 47642 | Soil (Eucalyptus plantation) | Yunnan, China | S.F. Chen and J.Q. Li | MT335158; MT335397; MT335637; MT412688; MT412928; MT413135 | [4,18] |
| Curvicladiella cignea | CBS 109167T | CPC 1595; MUCL 40269 | Decaying leaf | French Guiana | C. Decock | KM231122; KM231287; KM231461; KM232311; KM231867; KM232002 | [11,38,53] |
| CBS 109168 | | CPC 1594; MUCL 40268 | Decaying seed | French Guiana | C. Decock | KM231121; KM231286; KM231460; KM232312; KM231868; KM232003 | [11,38,53] |

a Codes (B1 to B120) of the 120 accepted Calonectria species resulting from Liu and co-authors [18].

b ATCC = American Type Culture Collection, Virginia, USA; CBS = Westerdijk Fungal Biodiversity Institute, Utrecht, The Netherlands; CERC = China Eucalypt Research Centre, ZhanJiang, Guangdong Province, China; CGMCC = China General Microbiological Culture Collection Center, Beijing, China; CMW = Culture collection of the Forestry and Agricultural Biotechnology Institute (FABI), University of Pretoria, Pretoria, South Africa; CPC = Pedro Crous working collection housed at Westerdijk Fungal Biodiversity Institute; CSF = Culture Collection from Southern Forests (CSF), ZhanJiang, Guangdong Province, China; IMI = International Mycological Institute, CABI Bioscience, Egham, Bakeham Lane, UK; MUCL = Mycotheque, Laboratoire de Mycologie Systematique et Appliquee, l’Universite, Louvian-la-Neuve, Belgium; PPRI = Plant Protection Research Institute, Pretoria, South Africa; STE-U = Department of Plant Pathology, University of Stellenbosch, South Africa; '−' represent no other collection number.

c T = ex-type isolates of the species. d act = actin; cmdA = calmodulin; his3 = histone H3; rpb2 = the second largest subunit of RNA polymerase; tef1 = translation elongation factor 1-alpha; tub2 = β-tubulin.

e N/A represents information not available.

Table 4. Statistics resulting from phylogenetic analyses in this study.

| Dataset | No. of Taxa | No. of bp a | Maximum Parsimony |
|---------|-------------|-------------|-------------------|
|         |             |             | PIC b | No. of Trees | Tree Length | CI c | RI d | RC e | HI f |
| act     | 147         | 278         | 111   | 4           | 258         | 0.636 | 0.968 | 0.615 | 0.364 |
| cmdA    | 147         | 672         | 291   | 433         | 677         | 0.647 | 0.968 | 0.626 | 0.353 |
| his3    | 143         | 464         | 183   | 1000        | 830         | 0.475 | 0.928 | 0.440 | 0.525 |
| rpb2    | 134         | 863         | 269   | 1000        | 683         | 0.530 | 0.959 | 0.508 | 0.470 |
| tef1    | 149         | 532         | 267   | 1000        | 758         | 0.637 | 0.963 | 0.613 | 0.363 |
| tub2    | 135         | 597         | 286   | 1000        | 826         | 0.609 | 0.958 | 0.584 | 0.391 |
| act/cmdA/his3/rpb2/tef1/tub2 | 149 | 3406 | 1407 | 3000 | 4408 | 0.532 | 0.949 | 0.504 | 0.468 |

| Dataset | No. of Taxa | No. of bp a | Maximum Likelihood |
|---------|-------------|-------------|-------------------|
|         |             |             | Subst. Mode b | NST b | Rate Matrix | Rates |
| act     | 6           | 0.5990      | 4.0516          | 1.0000 | 8.0516         | 4.0516 |
| cmdA    | 6           | 1.0000      | 4.1556          | 1.0000 | 7.1231         | 7.1231 |
| his3    | 6           | 1.0000      | 6.0957          | 1.0000 | 6.0957         | 6.0957 |
| rpb2    | 6           | 1.0000      | 9.0443          | 1.0000 | 13.4319        | 13.4319 |
| tef1    | 6           | 0.9651      | 1.7160          | 1.1302 | 3.1484         | 3.1484 |
| tub2    | 6           | 1.4044      | 4.4908          | 1.0000 | 4.4908         | 4.4908 |
| act/cmdA/his3/rpb2/tef1/tub2 | 6 | 1.4593 | 4.5939 | 1.1370 | 0.9972 | 6.3874 |

a bp = Base pairs. b PIC = Number of parsimony informative characters. c CI = Consistency index. d RI = Retention index. e RC = Rescaled consistency index. f HI = Homoplasy index. g Subst. model = best fit substitution model. h NST = Number of substitution rate categories.
2.4. Sexual Compatibility

The mating system as either homothallic or heterothallic was determined for the novel species identified in this study. Representative isolates of this species were crossed with each other in all possible combinations. These crosses were made on minimum salt agar (MSA) with autoclaved toothpicks randomly placed on the agar surface. Petri dishes were then incubated at 25 °C for 2–8 wk, and they were observed regularly for the appearance of perithecia. When perithecia extruding ascospores emerged, germination tests were conducted to determine if the spores were viable. Production of viable ascospores was accepted as an indication of successful mating.

2.5. Morphology

Representative isolates of the novel species identified in this study were selected for morphological characterisation. Synthetic nutrient-poor agar (SNA) was used to induce the asexual morphs. Agar plugs from axenic cultures were transferred to SNA and incubated at 25 °C for seven days. Fungal structures were lifted from the plates using a sterile needle and transferred to a drop of 85% lactic acid on microscope slides. Microscopic structures were examined under a Zeiss Axio Imager A1 microscope (Carl Zeiss Ltd., Jena, Germany).

In the case of sexual structures, the perithecia were transferred to Jung tissue freezing medium (Leica Biosystems, Wetzlar, Germany), which was frozen at −20 °C for ten minutes. Vertical sections (10 µm thick) were cut through the perithecia on a HM550 cryostat microtome (Microme International GmbH, Termo Fisher Scientific, Walldorf, Germany) at −20 °C and examined under an Axio Imager A1 microscope.

For cultures selected as the ex-type isolates, 50 replicate measurements were made for each taxonomically characteristic structure. For other isolates, 30 replicate measurements were made. Minimum, maximum and average (mean) measurements were recorded as (minimum–) (average–standard deviation)–(average + standard deviation)–(maximum).

Optimal growth temperatures for the novel species were determined on MEA. Agar plugs were removed from the actively growing edges of 7-day-old cultures with a 5 mm diam. cork borer and transferred to the centres of 90 mm Petri dishes containing MEA. Cultures were grown at seven different temperatures ranging from 5 °C to 35 °C, at 5 °C intervals with five replicates per isolate. Colony diameters were measured after seven days. Colony colours were described using the colour charts of Rayner using seven-day-old cultures on MEA incubated at 25 °C. All descriptions were deposited in MycoBank (www.mycobank.org, accessed on 3 October 2021).

3. Results

3.1. Sample Collection and Fungal Isolation

A total of 209 soil samples were collected and 353 isolates having a morphology typical of Calonectria were isolated from 79 of these samples (Table 1, Appendix A Table A1). Of these, 121 soil samples were from seven Eucalyptus plantations, of which 57 samples yielded 253 Calonectria isolates. Forty-three soil samples were collected from four natural forests, of which 14 samples yielded 61 Calonectria isolates; 21 soil samples were collected from two C. lanceolata plantations, two of which yielded nine Calonectria isolates; and 14 soil samples collected from a single P. heterocycle plantation, of which five samples yielded 25 Calonectria isolates. In addition, ten soil samples were collected from the Pi. massoniana plantation, only one of which yielded five Calonectria isolates (Table 1).

3.2. Phylogenetic Analyses

The tef1 fragment was amplified for all of the 353 isolates (Appendix A Table A1), and based on sequence differences for this region and the sampling sites, 144 isolates were selected to amplify the cmdA, his3 and tub2 gene regions. Subsequently, based on the 37 genotypes revealed by these four gene regions, 71 representative isolates were chosen to amplify the act and rpb2 gene regions (Appendix A Table A1). All of the 71 isolates, representing the 40 genotypes determined from the sequence data for the six gene regions, were used for
phylogenetic inference (Table 2). Amplicons generated for the act, cmdA, his3, rpb2, tef1, and tub2 gene regions were approximately 300, 700, 500, 860, 550, and 600 bp, respectively.

Sequence data for 46 *Calonectria* species closely related to those collected in this study were downloaded from GenBank and a total of 78 sequences (for ex-type and other strains) from previous studies were included in the phylogenetic analyses (Table 3). Phylogenetic analyses based on the six individual gene regions and the concatenated dataset for those regions were conducted using both MP and ML methods. The results showed that the overall topologies generated from the MP analyses were essentially similar to those from the ML analyses, and consequently, only the ML trees are presented (Figure 3, Appendix B Figures A1–A6).

Figure 3. Cont.
Figure 3. Phylogenetic tree of *Calonectria* species based on maximum likelihood (ML) analyses of combined DNA dataset of *act, cmdA, his3, rpb2, tef1, and tub2* gene sequences. Bootstrap value ≥70% for ML and MP analyses are presented above the branches. Bootstrap values lower than 70% are marked with “*”, and absent analyses values are marked with “-”. Ex-type isolates are marked with “T”. Isolates sequenced in this study are highlighted in blue and bold type. The “B” species codes are consistent with the recently published results in Liu and co-authors [18]. The tree was rooted to *Curvicladiella cignea* (CBS 109167 and CBS 109168).
The partition homogeneity test carried out on the datasets, for the combined six gene regions, generated p values of 0.001. This showed that the accuracy of the combined data did not suffer relative to the individual partitions [57]. Sequence data for the six gene regions were thus combined for analyses. The sequence alignments based on the individual six gene regions and the combination of these were deposited in TreeBASE (No. S28845). Statistics and important parameters emerging from the phylogenetic analyses are presented in Table 4.

Based on the six-gene combined phylogenetic tree (Figure 3), for the 71 isolates used in the phylogenetic analyses, eight isolates resided in the Ca. colhounii species complex, two isolates in the Ca. reteaudii species complex and 61 isolates in the Ca. kyotensis species complex.

3.3. Species in the Calonectria colhounii Species Complex

Six isolates (CSF9941, CSF9974, CSF9975, CSF9976, CSF9977 and CSF9978), representing one genotype, formed a distinct lineage in the cmdA and tub2 analyses as well as in the six-gene combined phylogenetic tree (Figure 3, Appendix B Figures A2 and A6). The total number of SNP differences between the six isolates and other phylogenetically closely related species [Ca. aciculata (ex-type isolate CERC 5342), Ca. colhounii (ex-type isolate CBS 293.79), Ca. eucalypti (ex-type isolate CMW 18444) and Ca. honghensis (ex-type isolate CERC 5572)] for six gene regions combined, varied between 13 and 31. Thus, this fungus can be regarded as a novel species. Two isolates (CSF9933 and CSF9934) formed an independent clade and were phylogenetically most closely related to the six isolates in the six-gene phylogenetic tree (Figure 3). These two isolates were consequently considered as the same species as the six isolates CSF9941, CSF9974, CSF9975, CSF9976 and CSF9978 and were identified as the novel species.

3.4. Species in the Calonectria reteaudii Species Complex

Two isolates (CSF10059 and CSF10060) were phylogenetically closely related to Ca. pseudoreteaudii and various other species based on act and cmdA trees (Appendix B Figures A1 and A2), and clustered with Ca. pseudoreteaudii based on his3, rpb2, tef1, tub2 and the six-gene combined trees (Figure 3, Appendix B Figures A3–A6). In comparisons of DNA sequences for these six gene regions, all the sequences for the two isolates (CSF10059 and CSF10060) were 100% identical to the ex-type isolate (CMW 25310) of Ca. pseudoreteaudii. Consequently, they were identified as Ca. pseudoreteaudii (Figure 3).

3.5. Species in the Calonectria kyotensis Species Complex

Thirty-four isolates representing 20 genotypes were phylogenetically closest to Ca. kyotensis in each of the cmdA, his3, rpb2 (sequence data for the rpb2 were not available for isolate CSF9834), tef1, tub2 and the six-gene combined trees (Figure 3, Appendix B Figures A2–A6), and clustered with Ca. kyotensis based on the act tree (Appendix B Figure A1). Some isolates formed distinct clades based on the six-gene combined trees (Figure 3), while the total number of SNP differences between the 34 isolates and the ex-type isolate of Ca. kyotensis (CBS 114525) for six gene regions combined varied between 2 and 8. Based on the phylogenetic analyses, these 34 isolates were identified as Ca. kyotensis.

Four isolates (CSF7124, CSF9784, CSF9794 and CSF9799), representing two genotypes, were phylogenetically closest to Ca. hongkongensis in each of the cmdA, his3, rpb2 and six-gene combined tree (Figure 3, Appendix B Figures A2 and A6), and clustered with Ca. hongkongensis based on the act, his3, rpb2 and tef1 trees (Appendix B Figures A1 and A3–A5). There were only three or four SNP differences between these four isolates and the ex-type isolate of Ca. hongkongensis (CBS 114828) when sequences for six gene regions were combined. Thus, these four isolates were identified as Ca. hongkongensis.

Two isolates (CSF9862 and CSF9863), representing one genotype clustered with Ca. ilicicola in the his3 tree (Appendix B Figure A3), formed independent clades but closely related to Ca. ilicicola in the act, cmdA, rpb2, tef1 and six-gene combined trees (Figure 3, Appendix B Figures A1, A2 and A4–A6). There were only six SNP differences between the
two isolates and the ex-type isolate of *Ca. ilicicola* (CMW 30998) for five gene regions (*tub2* sequence data were not available for *Ca. ilicicola*) combined. Consequently, these isolates were regarded as *Ca. ilicicola*.

Four isolates (CSF10024, CSF10070, CSF10077 and CSF10129), representing three genotypes, were phylogenetically related to *Ca. pacifica* and various other closely related species based on *act* and *tef1* trees (Appendix B Figures A1 and A5). They were, however, phylogenetically closest to *Ca. pacifica* based on *his3* and six-gene combined trees (Appendix B Figure A3), and clustered with *Ca. pacifica* based on *cmdA* and *rpb2* trees (Appendix B Figures A2 and A4). There were only one or three SNP difference(s) between the four isolates and the ex-type isolate of *Ca. pacifica* (CMW 16726) for five gene regions (*tub2* sequence data were not available for *Ca. pacifica*) combined. These four isolates were thus identified as *Ca. pacifica*.

Seventeen isolates representing 11 genotypes were phylogenetically closest to *Ca. aconidialis* based on *cmdA*, *his3*, *tef1* and six-gene combined trees (Figure 3, Appendix B Figures A2, A3 and A5), and clustered with *Ca. aconidialis* based on *act* and *rpb2* (*rpb2* sequence data were not available for CSF9779 and CSF9875) trees (Appendix B Figures A1 and A4). Some isolates formed distinct clades based on the six-gene combined trees (Figure 3), while the total number of SNP differences between the 17 isolates and the ex-type isolate of *Ca. aconidialis* (CMW 35174) for five gene regions (sequence data for the *tub2* region were not available for *Ca. aconidialis*) combined varied between 0 and 4. Therefore, the 17 isolates were identified as *Ca. aconidialis*.

Seventy-one of the 353 isolates collected in this study were identified based on the DNA sequence of the six gene regions. According to the species identification results, we further identified the remaining 282 isolates based on the DNA sequences for two or four gene regions (Appendix A Table A1). Consequently, for the entire collection of 353 isolates, these were identified as *Ca. aconidialis* (178), *Ca. kyotensis* (103), *Ca. hongkongensis* (37), *Ca. pacifica* (17), *Ca. ilicicola* (five), *Ca. pseudoreteaudii* (five) and a novel species (eight), respectively.

### 3.6. Sexual Compatibility

Three isolates (CSF9933, CSF9941 and CSF9975) of the novel species were used in the mating tests (Table 2). All of these isolates formed protoperithecia readily within two weeks, and perithecia with viable ascospores were produced within four weeks. This was irrespective of whether they were crossed with each other or with themselves. The species was thus shown to be homothallic.

### 3.7. Morphology and Taxonomy

Based on multi-gene phylogenetic analyses (Figure 3, Appendix B Figures A1–A6) and morphological characteristics, seven *Calonectria* species were identified in this study, including six described species, i.e., *Ca. aconidialis*, *Ca. kyotensis*, *Ca. hongkongensis*, *Ca. pacifica*, *Ca. ilicicola*, *Ca. pseudoreteaudii* and one novel species. To facilitate future studies, complete morphological descriptions and illustrations have been made for the known species and these are presented in Appendix C (Figures A7–A12). The novel species can be distinguished from the phylogenetically most closely related species (*Ca. aciculata*, *Ca. colhounii*, *Ca. eucalypti* and *Ca. honghensis*) by the dimensions of its macroconidia and ascospores (Table 5). This species is described as follows:
Table 5. Morphological comparisons of *Calonectria* species obtained in this study and other phylogenetically closely related species.

| Species         | References or Source of Data | Ascospores (L × W) ab,c | Ascospores Average (L × W) ab | Ascospores Septation | Macroconidia (L × W) ab,c | Macroconidia Average (L × W) ab | Macroconidia Septation | Vesicle (Min.–Max.) a |
|-----------------|-------------------------------|-------------------------|-------------------------------|----------------------|-------------------------|-------------------------------|-------------------------|-----------------------|
| *Calonectria minensis* | this study                   | (38.5–)46.5–64.5(–80.5) | 55.5 × 7                      | 3                    | (51–)55–66(–79)         | (4.5–)5–(–5.5)               | (1–)3                   | 3–5                   |
| *Ca. aciculata*   | [4]                          | N/A d                   | N/A                           | N/A                  | (53–)62–76(–86)           | (4.5–)5–(–5.5)               | 69 × 5                  | 3                     |
| *Ca. colhounii*   | [17]                         | (30–)30–6(–75) × (4–)5–(–6) | 55 × 6                       | (1–)3                | (45–)60–70(–80)          | (4–)5–(–6)                  | 65 × 5                  | (1–)3                 |
| *Ca. eucalypti*   | [37]                         | (25–)30–6(–56) × (3–)5–(–6) | 33 × 6                       | (1–)3                | (66–)69–75(–80)          | (5–)6                      | 72 × 6                  | 3                     |
| *Ca. honghensis*  | [4]                          | (35–)43–55(–65) × (4.5–)5.5–(–7.5) | 49 × 6                      | 3                    | (43–)49–59(–66)          | (4–)5–(–5.5)               | 54 × 5                  | 3                     |

a All measurements are in μm. b L × W = length × width. c Measurements are presented in the format [(minimum–) (average–standard deviation)–(average + standard deviation) (–maximum)]. d N/A represents data that is not available.

**Taxonomy**

*Calonectria minensis* Q.L. Liu and S.F. Chen, sp. nov.

Mycobank MB841412. (Figure 4).

Etymology: Name refers to the short name of Fujian Province in Chinese “Min”, where this fungus was isolated.

Description: *Calonectria minensis* can be distinguished from the phylogenetically closely related species *Ca. aciculata*, *Ca. colhounii*, *Ca. eucalypti* and *Ca. honghensis* by its distinct ascospore and macroconidia dimensions.

Type: China: Fujian Province, Longyan Region, Xinluo District (25°07′08.597″ N, 116°44′42.257″ E), from soil collected in a *Eucalyptus* plantation, 6 November 2016, S.F. Chen, Q.L. Liu and F.F. Liu (HMAS249935—holotype, CSF9941 = CGMCC3.18877—ex-type culture).

Ascomata perithecial, solitary or in groups of four, bright yellow, becoming orange with age; in section, apex and body yellow, base red-brown, sub-globose to ovoid, 258–395 μm high, 227–330 μm diam, body turning dark yellow, and base dark red-brown in 3% KOH+. Ascomata wall rough, consisting of two thick-walled layers; outermost cells 16–31 × 8–16 μm wide, consisting of dark red, angular cells, merging with an inner layer of textura angularis, 22–66 μm thick, cells becoming more compressed towards the inner layer of textura angularis, 9–21 μm thick, cells becoming thin-walled and hyaline towards the centre; outermost cells 16–31 × 8–16 μm, cells of inner layer 8–33 × 2–8 μm; ascomatal base up to 196 μm wide, consisting of dark red, angular cells, merging with an erumpent stroma; cells of the outer wall layer continuous with the pseudoparenchymatous cells of the erumpent stroma. Ascii 4-spored, clavate, 80–163 × 11–27 μm, tapering into a long thin stalk. Ascospores aggregated in the upper third of the ascus, periclinal wall thick, fusoid with rounded ends, straight to slightly curved, (1–)3-septate, constricted at the septum, (38.5–)46.5–64.5(–80.5) × (6–)6.5–8(–8.5) μm (av. = 55.5 × 7 μm). Macroconidiophores consisting of a stipe, a suite of penicillately arranged fertile branches, a stipe extension, and a terminal vesicle; stipe septate, hyaline, smooth, 33–144 × 4–9 μm, stipe extension septate, straight to flexuous 63–240 μm long, 2–3 μm wide at the apical septum, terminating in a clavate vesicle, 3–5 μm diam; lateral stipe extensions (90° to main axis) absent. Conidiogenous apparatus 28–97 μm wide, and 35–83 μm long; primary branches aseptate, 13–40 × 3–7 μm; secondary branches aseptate, 9–31 × 3–6 μm; tertiary branches aseptate, 8–14 × 3–5 μm, quaternary branches aseptate, 7–12 × 3–5 μm, each terminal branch producing 2–4 phialides; phialides allantoid to elongate doliiform to reniform, hyaline, aseptate, 4–14 × 2–7 μm, apex with minute periclinal thickening and inconspicuous collarette. Macroc- onidia cylindrical, rounded at both ends, straight, (51–)55–66(–79) × (4.5–)5–6(–7.5) μm (av. = 60.5 × 5.5 μm), (1–)3-septate, lacking a visible abscission scar, held in parallel cylindrical clusters by colourless slime. Mega- and microconidia not observed.
**Figure 4.** *Calonectria minensis.* (a) Perithecium; (b) vertical section through a perithecium; (c) cells around ostiolar region of perithecium; (d) section through lateral perithecial wall; (e,f) asci; (g,h) ascospores; (i,j) macroconidiophore; (k,m) clavate vesicles; (n,o) conidiogenous apparatus with conidiophore branches and elongate doliiform to reniform phialides; (p,q) macroconidia.—Scale bars: a = 200 µm; b = 100 µm; c, d and f = 20 µm; e and i, j = 50 µm; g, h and n–q = 10 µm; k, m = 5 µm.

Culture characteristics: Colonies forming abundant woolly white to sienna (8) aerial mycelium at 25 °C on MEA, profuse sporulation; surface rust-coloured (39); reverse sienna (8) to rust-coloured (39) after 7 d. Chlamydospores extensive throughout the medium forming microsclerotia. Optimal growth temperature 25 °C, no growth at 5 °C and 35 °C, after 7 d, colonies at 10 °C, 15 °C, 20 °C, 25 °C and 30 °C reached 18.1 mm, 27.0 mm, 58.2 mm, 69.5 mm and 42.4 mm, respectively.

Additional specimens examined: China: Fujian Province, Longyan Region, Xinluo District (25°07′08.597″ N, 116°44′22.257″ E), from soil collected in a *Eucalyptus* plantation, 6 November 2016, S.F. Chen, Q.L. Liu and F.F. Liu (HMAS249936, culture CSF9933 = CGMCC3.18875); Fujian Province, Longyan Region, Liancheng County (25°26′14.348″ N, 116°38′42.400″ E), from soil under a natural forest, 6 November 2016, S.F. Chen, Q.L. Liu and F.F. Liu (HMAS249937, culture CSF9975 = CGMCC3.18881).

Notes: *Calonectria minensis* is a new species in the *Ca. colhounii* species complex. It is closely related to *Ca. aciculata, Ca. colhounii, Ca. eucalypti,* and *Ca. honghensis,* and can be
distinguished from those species by the dimensions of its ascospores and macroconidia. The ascospores of *Ca. minensis* (av. = 55.5 × 7 µm) are larger than those of *Ca. eucalypti* (av. = 33 × 6 µm) [37] and *Ca. honghensis* (av. = 49 × 6 µm) [4]. The macroconidia of *Ca. minensis* (av. = 60.5 × 5.5 µm) are shorter than those of *Ca. aciculata* (av. = 69 × 5.5 µm) [4], *Ca. colhounii* (av. = 65 × 5 µm) [17] and *Ca. eucalypti* (av. = 72 × 6 µm) [37], but longer than those of *Ca. honghensis* (av. = 54 × 5.5 µm) [4]. The total number of SNP differences between the ex-type isolate of *Ca. minensis* (CSF9941), and the ex-type isolates of *Ca. aciculata* (CERC 5342), *Ca. colhounii* (CBS 293.79), *Ca. eucalypti* (CMW 18444) and *Ca. honghensis* (CERC 5572) for six gene regions combined, varied between 13 and 31.

3.8. Distribution of Calonectria Species in Fujian Province

Of the seven *Calonectria* species identified, *Ca. aconidialis* accounted for 50.4% of all the isolates. This was followed in order of occurrence by *Ca. kyotensis* (29.2%), *Ca. hongkongensis* (10.5%), *Ca. pacifica* (4.8%), *Ca. minensis* (2.3%), *Ca. ilicicola* (1.4%) and *Ca. pseudoreteaudii* (1.4%) (Figure 5). *Calonectria aconidialis* and *Ca. kyotensis* can be regarded as the most prevalent species (Figure 5).

![Figure 5](image-url)

**Figure 5.** *Calonectria* species collected from soils of five different types of forests in Fujian Province. (a) the percentage of each *Calonectria* species accounted for all of the species isolated in this study. Different species are indicated by numbers with different colours; (b–f). the percentage of each *Calonectria* species obtained from five different types of forests.

Between two and four *Calonectria* species were isolated from soils sampled at each of the nine Counties or Districts (Figure 2). *Calonectria aconidialis* was found at all sites other than Cangshan District, *Ca. kyotensis* was found at all sites other than Yanping District and Zhangping County, and the remaining five species were found at between one and three sampling sites (Figure 2).

All seven species were isolated from soils collected in *Eucalyptus* plantations. Five of the species were isolated from soils in natural forests, the exception being *Ca. ilicicola* and *Ca. pseudoreteaudii*. Only *Ca. aconidialis* and *Ca. kyotensis* were isolated from soils in *P. heterocycle* and *C. lanceolata* plantations, and only *Ca. kyotensis* was collected from soils in the *P. massoniana* plantation (Figure 5). Based on the percentage of soil samples that
obtained Calonectria from each of the five forest types, the results showed that Calonectria was widely distributed in Eucalyptus plantation soils (47.1%, 57 of 121 sampled soils), followed by P. heterocycle (35.7%, 5 of 14 sampled soils) and natural forests (32.6%, 14 of 43 sampled soils), only 10% of soil samples obtained Calonectria from C. lanceolata (2 of 21 sampled soils) or Pi. massoniana (1 of 10 sampled soils).

Calonectria kyotensis was detected in soils in all of the soil types sampled, while Ca. aconidialis was isolated from soils in all forest types other than Pi. massoniana. Calonectria hongkongensis, Ca. pacifica and Ca. minensis were found both in Eucalyptus plantations and natural forests and the remaining two species were found only in Eucalyptus plantations (Figure 5).

4. Discussion

A total of 353 Calonectria isolates were collected from soils in Eucalyptus plantations and adjacent plantations of other species or natural forests in Fujian Province. Multilocus phylogenetic inference and morphological characteristics revealed seven Calonectria species including Ca. aconidialis, Ca. hongkongensis, Ca. ilicicola, Ca. kyotensis, Ca. pacifica and Ca. pseudoreteaudii, and a novel species described here as Ca. minensis.

Results in this study showed that Ca. aconidialis and Ca. kyotensis were the most prevalent species in the soils sampled. Calonectria aconidialis accounted for 50.4% of all the isolates, which was found in eight of the nine sampled sites and soils of all forest types other than those of Pi. massoniana. The next most common species was Ca. kyotensis, accounting for 29.2% of the isolates, which was isolated from seven sites and soils of all five different forest types. The remaining five species were less common, and isolated only from one to three sites, either from Eucalyptus plantations or natural forests, or from both of these forest types.

Among the identified species, Ca. aconidialis is newly reported in Fujian Province and Ca. pacifica represents a first record for China. Eight Calonectria species were previously known in Fujian Province. These include Ca. crousiana, Ca. eucalypti, Ca. fujianensis, Ca. pauciramosa and Ca. pseudoreteaudii collected from diseased Eucalyptus leaves [7,8], Ca. hongkongensis and Ca. kyotensis isolated from soils in unknown forest types [4,18] and Ca. ilicicola collected from diseased peanuts (Arachis hypogaea) in Longyan Region [58].

The Calonectria species diversity in soils was clearly dependent on the forest types sampled. Of the seven species detected, all were obtained from Eucalyptus plantations, five were obtained from natural forests and only one or two species were from other forest types. While these observations are convincing in terms of broad patterns, they must be tempered by the fact that the greatest number of soil samples were from Eucalyptus plantations and natural forests, which could have influenced the results.

The newly described Ca. minensis isolated from soils both in Eucalyptus plantations and natural forest, adds a new species to the Ca. colhounii species complex. As a consequence, 13 species are now accommodated in this complex [4,7,17,18,21,25,37,39,46,49]. With the exception of Ca. macroconidialis [46], Ca. madagascariensis [17] and Ca. paracolhounii [39], all of the other 10 species have been recorded in southeastern Asia [4,7,17,21,25]. Species in this complex include some important causal agents of CLB on Eucalyptus spp. including Ca. aciculata, Ca. eucalypti and Ca. fujianensis, which have all been reported from diseased Eucalyptus trees in China plantations [4,7].

Five species residing in the Ca. kyotensis species complex were identified in the present study. Of these, Ca. aconidialis accounted for more than half of all the isolates collected, and has previously been shown to be widely distributed in soils of Eucalyptus plantation in many regions of southern China, including Guangdong [11,18], Guangxi [4,10,11] and Hainan Provinces [11]. In the present study, Ca. aconidialis was collected from soils of four types of forests and in eight of the nine sampling sites in Fujian Province (Figure 2), providing new geographic records for this pathogen in China. This species has previously been shown to infect inoculated Eucalyptus seedlings [10] and could pose a threat to Eucalyptus plantation forestry. Calonectria pacifica was isolated from soils both in the Eucalyptus plantations
(Minhou and Yongan Counties) and natural forests (Yanping District) in this study. This species was originally described on *Araucaria heterophylla* from Hawaii, USA [40], and this is the first report of the fungus in China.

This study elucidated the diversity and distribution characteristics of *Calonectria* species in soils collected from plantations and natural forests in Fujian Province. Broad patterns of occurrence were clear with *Eucalyptus* soils yielding the largest number of species. The conifer forests had the lowest number of species, which is consistent with the fact that most *Calonectria* spp. are known from Angiosperm hosts or from soils associated with these plants. The results of the present study bring the number of *Calonectria* species recorded in Fujian to 11. Most of these species have also been shown to be pathogenic to *Eucalyptus* in previous studies [7,9,10]. The surprisingly high species diversity in this region suggests that *Calonectria* species will pose long-term challenges for the development of *Eucalyptus* forestry in southern China.

**Author Contributions:** Conceptualization, Q.L. and S.C.; methodology, Q.L. and S.C.; software, Q.L.; validation, Q.L., M.J.W., T.A.D., B.D.W. and S.C.; formal analysis, Q.L.; investigation, Q.L. and S.C.; resources, Q.L. and S.C.; data curation, Q.L. and S.C.; writing—original draft preparation, Q.L.; writing—review and editing, Q.L., M.J.W., T.A.D., B.D.W. and S.C.; visualization, Q.L.; supervision, M.J.W., T.A.D., B.D.W. and S.C.; project administration, S.C.; funding acquisition, S.C. All authors have read and agreed to the published version of the manuscript.

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**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** The sequences from the current study were submitted to the NCBI database (https://www.ncbi.nlm.nih.gov/, accessed on 24 July 2022) and the accession numbers were listed in Table 2.

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**Conflicts of Interest:** The authors declare no conflict of interest.
Appendix A. Species of *Calonectria* Collected in This Study

Table A1. Species of *Calonectria* collected in this study.

| Species  | Isolate No.  | Genotype | Substrate | Sampling Site | GPS Coordinate                  | Collector               | GenBank Accession No. |
|----------|--------------|----------|-----------|---------------|---------------------------------|-------------------------|-----------------------|
| **Calonectria aconidialis** | CSP9779 | AAA- AA  | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53’49.369” N, 117°32’45.070” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253064 OK253135 OK253279 N/A OK253491 OK253844 |
|          | CSP9857 | AA AAAA  | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17’10.882” N, 117°27’33.635” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253065 OK253136 OK253280 OK253423 OK253492 OK253845 |
|          | CSP9937 | AAAABA  | Soil (Eucalyptus plantation) | Xinluo, Longyan, Fujian, China | 25°07’08.597” N, 116°44’42.257” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253066 OK253137 OK253281 OK253424 OK253493 OK253846 |
|          | CSP9938 | AAAABA  | Soil (Eucalyptus plantation) | Xinluo, Longyan, Fujian, China | 25°07’08.597” N, 116°44’42.257” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253067 OK253138 OK253282 OK253425 OK253494 OK253847 |
|          | CSP9939 | AAAABA  | Soil (Eucalyptus plantation) | Xinluo, Longyan, Fujian, China | 25°07’08.597” N, 116°44’42.257” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253068 OK253139 OK253283 OK253426 OK253495 OK253848 |
|          | CSP9809 | ABAAAA  | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53’49.369” N, 117°32’45.070” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253069 OK253140 OK253284 OK253427 OK253496 OK253849 |
|          | CS10105 | ABAAAA  | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15’04.285” N, 119°02’38.917” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253070 OK253141 OK253285 OK253428 OK253497 OK253850 |
|          | CSP9789 | ABAAAB  | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53’49.369” N, 117°32’45.070” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253071 OK253142 OK253286 OK253429 OK253498 OK253851 |
|          | CSP9839 | ABAAAC  | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17’10.882” N, 117°27’33.635” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253072 OK253143 OK253287 OK253430 OK253499 OK253852 |
|          | CSP9844 | ABAAAC  | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17’10.882” N, 117°27’33.635” E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253073 OK253144 OK253288 OK253431 OK253500 OK253853 |
| Species  | Isolate No. | Genotype | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. |
|----------|-------------|----------|-----------|---------------|----------------|----------|-----------------------|
|          |             |          |           |               |                |          | act  cmdA  his3  rpb2  tef1  tub2 |
| CSP9882  | ABAAAD      |          | Soil      | Zhangping, Longyan, Fujian, China Liancheng, Longyan, Fujian, China Hua’an, Zhangzhou, Fujian, China | 25°17’10.882“ N, 117°27’33.635“ E | S.F. Chen, Q.L. Liu and F.F. Liu S.F. Chen, Q.L. Liu and F.F. Liu S.F. Chen, Q.L. Liu and F.F. Liu | OK253074 OK253145 OK253289 OK253432 OK253501 OK253854 |
| CSP9987  | ABAAAD      |          | Soil (natural forest area) | Soil (Eucalyptus plantation) | 25°26’14.348“ N, 116°38’42.400“ E | OK253075 OK253146 OK253290 OK253433 OK253502 OK253855 |
| CSP9813  | ABAACA      |          | Soil      | Zhangping, Longyan, Fujian, China Hua’an, Zhangzhou, Fujian, China | 24°53’49.369“ N, 117°32’45.070“ E | S.F. Chen, Q.L. Liu and F.F. Liu S.F. Chen, Q.L. Liu and F.F. Liu S.F. Chen, Q.L. Liu and F.F. Liu | OK253076 OK253147 OK253291 OK253434 OK253503 OK253856 |
| CSP9841  | ABAACA      |          | Soil      | Zhangping, Longyan, Fujian, China Hua’an, Zhangzhou, Fujian, China | 25°17’10.882“ N, 117°27’33.635“ E | OK253077 OK253148 OK253292 OK253435 OK253504 OK253857 |
| CSP9870  | ABAAAA      |          | Soil      | Zhangping, Longyan, Fujian, China Hua’an, Zhangzhou, Fujian, China | 25°17’10.882“ N, 117°27’33.635“ E | OK253078 OK253149 OK253293 OK253436 OK253505 OK253858 |
| CSP9875  | ABB-AA      |          | Soil      | Zhangping, Longyan, Fujian, China Hua’an, Zhangzhou, Fujian, China | 25°17’10.882“ N, 117°27’33.635“ E | OK253079 OK253150 OK253294 N/A OK253506 OK253859 |
| CSP9957  | ACBAAA      |          | Soil (natural forest area) | Soil (Eucalyptus plantation) | 25°26’14.348“ N, 116°38’42.400“ E | OK253080 OK253151 OK253295 OK253437 OK253507 OK253860 |
| CSP9851  | -AA-AA      |          | Soil      | Zhangping, Longyan, Fujian, China | 25°17’10.882“ N, 117°27’33.635“ E | – 8 OK253152 OK253296 – OK253508 OK253861 |
| CSP9943  | -AA-AA      |          | Soil      | Zhangping, Longyan, Fujian, China Hua’an, Zhangzhou, Fujian, China | 25°07’08.597“ N, 116°44’42.257“ E | – OK253153 OK253297 – OK253509 OK253862 |
| CSP9812  | -BA-AA      |          | Soil      | Zhangping, Longyan, Fujian, China Hua’an, Zhangzhou, Fujian, China | 24°53’49.369“ N, 117°32’45.070“ E | – OK253154 OK253298 – OK253510 OK253863 |
| CSP9831  | -BA-AA      |          | Soil      | Zhangping, Longyan, Fujian, China | 24°58’22.263“ N, 117°31’09.708“ E | – OK253155 OK253299 – OK253511 OK253864 |
| Species | Isolate No. | Genotype | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. |
|---------|------------|----------|-----------|---------------|---------------|----------|---------------------|
|         |            |          |           |               |               |          | act | cmdA | his3 | rpb2 | tef1 | tub2 |
| CSP9846 | -BA-AA     |          | Soil      | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | – | OK253156 | OK253300 | – | OK253512 | OK253865 |
| CSP9880 | -BA-AA     |          | Soil      | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | – | OK253157 | OK253301 | – | OK253513 | OK253866 |
| CSP9895 | -BA-AA     |          | Soil      | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | – | OK253158 | OK253302 | – | OK253514 | OK253867 |
| CSP9905 | -BA-AA     |          | Soil      | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | – | OK253159 | OK253303 | – | OK253515 | OK253868 |
| CSP9930 | -BA-AA     |          | Soil      | Xinluo, Longyan, Fujian, China   | 25°07'31.133" N, 116°51'37.485" E | S.F. Chen, Q.L. Liu and F.F. Liu | – | OK253160 | OK253304 | – | OK253516 | OK253869 |
| CSP9964 | -BA-AA     |          | Soil      | Liancheng, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | – | OK253161 | OK253305 | – | OK253517 | OK253870 |
| CSP9970 | -BA-AA     |          | Soil      | Liancheng, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | – | OK253162 | OK253306 | – | OK253518 | OK253871 |
| CSP9982 | -BA-AA     |          | Soil      | Liancheng, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | – | OK253163 | OK253307 | – | OK253519 | OK253872 |
| CSP9989 | -BA-AA     |          | Soil      | Liancheng, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | – | OK253164 | OK253308 | – | OK253520 | OK253873 |
| CSF10032 | -BA-AA    |          | Soil      | Yongan, Sanming, Fujian, China   | 25°55'10.860" N, 117°16'39.591" E | S.F. Chen, Q.L. Liu and F.F. Liu | – | OK253165 | OK253309 | – | OK253521 | OK253874 |
| CSF10034 | -BA-AA    |          | Soil      | Yongan, Sanming, Fujian, China   | 25°55'10.860" N, 117°16'39.591" E | S.F. Chen, Q.L. Liu and F.F. Liu | – | OK253166 | OK253310 | – | OK253522 | OK253875 |
| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|-----------|---------------|------------|-----------|---------------|---------------|----------|------------------------|
|           |               |            | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55′10.860″ N, 117°16′39.591″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253167 OK253311 – OK253523 OK253876 |
| CSF10041  | -BA-AA        |            | Soil (Cunninghamia lanceolata) | Qingliu, Sanming, Fujian, China | 26°07′23.497″ N, 116°53′00.762″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253168 OK253312 – OK253524 OK253877 |
| CSF10050  | -BA-AA        |            | Soil (Eucalyptus plantation) | Yanping, Nanping, Fujian, China | 26°46′19.651″ N, 117°57′37.233″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253169 OK253313 – OK253525 OK253878 |
| CSF10064  | -BA-AA        |            | Soil (Eucalyptus plantation) | Yanping, Nanping, Fujian, China | 26°46′19.651″ N, 117°57′37.233″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253170 OK253314 – OK253526 OK253879 |
| CSF10068  | -BA-AA        |            | Soil (Eucalyptus plantation) | Yanping, Nanping, Fujian, China | 26°42′26.672″ N, 118°07′58.317″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253171 OK253315 – OK253527 OK253880 |
| CSF10073  | -BA-AA        |            | Soil (natural forest area) | Yanping, Nanping, Fujian, China | 26°42′26.672″ N, 118°07′58.317″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253172 OK253316 – OK253528 OK253881 |
| CSF10075  | -BA-AA        |            | Soil (natural forest area) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253173 OK253317 – OK253529 OK253882 |
| CSF10081  | -BA-AA        |            | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253174 OK253318 – OK253530 OK253883 |
| CSF10082  | -BA-AA        |            | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253175 OK253319 – OK253531 OK253884 |
| CSF10097  | -BA-AA        |            | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253176 OK253320 – OK253532 OK253885 |
| CSF10098  | -BA-AA        |            | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253177 OK253321 – OK253533 N/A |
| CSF10110  | -BA-A-        |            | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253177 OK253321 – OK253533 N/A |

Table A1. Cont.
Table A1. Cont.

| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|-----------|--------------|------------|-----------|---------------|---------------|----------|------------------------|
|           |              |            | Soil (Eucalyptus plantation) | Minhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253178 OK253322 – OK253544 OK253886 |
| CSF10112  | -BA-AA       |            | Soil (Eucalyptus plantation) | Minhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253179 OK253323 – OK253535 OK253887 |
| CSF10119  | -BA-AA       |            | Soil (Eucalyptus plantation) | Minhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253180 OK253324 – OK253536 OK253888 |
| CSF10125  | -BA-AA       |            | Soil (Eucalyptus plantation) | Minhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253181 OK253325 – OK253537 OK253889 |
| CSF9856   | -BA-AC       |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17′10.882″ N, 117°27′33.635″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253182 OK253326 – OK253538 OK253890 |
| CSP9897   | -BA-AC       |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17′10.882″ N, 117°27′33.635″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253183 OK253327 – OK253539 OK253891 |
| CSP9814   | -BA-CA       |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17′10.882″ N, 117°27′33.635″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253184 OK253328 – OK253540 OK253892 |
| CSP9815   | -BA-CA       |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17′10.882″ N, 117°27′33.635″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253185 OK253329 – OK253541 OK253893 |
| CSP9842   | -BA-CA       |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17′10.882″ N, 117°27′33.635″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253186 OK253330 – OK253542 OK253894 |
| CSP9843   | -BA-CA       |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17′10.882″ N, 117°27′33.635″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253187 OK253331 – OK253543 OK253895 |
| CSP9887   | -BA-CA       |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17′10.882″ N, 117°27′33.635″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253188 OK253332 – OK253544 OK253896 |
Table A1. Cont.

| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|------------|---------------|------------|-----------|---------------|---------------|----------|------------------------|
|            |               |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253189 OK253333 – OK253545 OK253897 |
| CSP9890    | -BA-CA        |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253190 OK253334 – OK253546 OK253898 |
| CSP9891    | -BA-CA        |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253191 OK253335 – OK253547 OK253899 |
| CSP9776    | —-A-          |            | Soil (Eucalyptus plantation) | Zhangzhou, Fujian, China Hua’an, | 24°53'49.369" N, 117°32'45.070" E | – – – – | OK253548 – |
| CSP9777    | —-A-          |            | Soil (Eucalyptus plantation) | Zhangzhou, Fujian, China Hua’an, | 24°53'49.369" N, 117°32'45.070" E | – – – – | OK253549 – |
| CSP9778    | —-A-          |            | Soil (Eucalyptus plantation) | Zhangzhou, Fujian, China Hua’an, | 24°53'49.369" N, 117°32'45.070" E | – – – – | OK253550 – |
| CSP9780    | —-A-          |            | Soil (Eucalyptus plantation) | Zhangzhou, Fujian, China Hua’an, | 24°53'49.369" N, 117°32'45.070" E | – – – – | OK253551 – |
| CSP9787    | —-A-          |            | Soil (Eucalyptus plantation) | Zhangzhou, Fujian, China Hua’an, | 24°53'49.369" N, 117°32'45.070" E | – – – – | OK253552 – |
| CSP9788    | —-A-          |            | Soil (Eucalyptus plantation) | Zhangzhou, Fujian, China Hua’an, | 24°53'49.369" N, 117°32'45.070" E | – – – – | OK253553 – |
| CSP9790    | —-A-          |            | Soil (Eucalyptus plantation) | Zhangzhou, Fujian, China Hua’an, | 24°53'49.369" N, 117°32'45.070" E | – – – – | OK253554 – |
| CSP9806    | —-A-          |            | Soil (Eucalyptus plantation) | Zhangzhou, Fujian, China Hua’an, | 24°53'49.369" N, 117°32'45.070" E | – – – – | OK253555 – |
| Species         | Isolate No. | Genotype | Substrate                  | Sampling Site                  | GPS Coordinate            | Collector                       | GenBank Accession No. | act | cmdA | his3 | rpb2 | tef1 | tub2 |
|-----------------|-------------|----------|----------------------------|--------------------------------|---------------------------|--------------------------------|-----------------------|-----|------|------|------|------|------|
| CSP9807         | —-A-        | Soil     | (Eucalyptus plantation)    | Soil                           | Hua’an, Zhangzhou, Fujian, China | S.F. Chen, Q.L. Liu and F.F. Liu | OK253556             |     |      |      |      |      |      |
| CSP9808         | —-A-        | Soil     | (Eucalyptus plantation)    | Soil                           | Hua’an, Zhangzhou, Fujian, China | S.F. Chen, Q.L. Liu and F.F. Liu | OK253557             |     |      |      |      |      |      |
| CSP9810         | —-A-        | Soil     | (Eucalyptus plantation)    | Soil                           | Fujian, China Zhangping, Longyan | S.F. Chen, Q.L. Liu and F.F. Liu | OK253558             |     |      |      |      |      |      |
| CSP9836         | —-A-        | Soil     | (Eucalyptus plantation)    | Soil                           | Fujian, China Zhangping, Longyan | S.F. Chen, Q.L. Liu and F.F. Liu | OK253559             |     |      |      |      |      |      |
| CSP9837         | —-A-        | Soil     | (Eucalyptus plantation)    | Soil                           | Fujian, China Zhangping, Longyan | S.F. Chen, Q.L. Liu and F.F. Liu | OK253560             |     |      |      |      |      |      |
| CSP9838         | —-A-        | Soil     | (Eucalyptus plantation)    | Soil                           | Fujian, China Zhangping, Longyan | S.F. Chen, Q.L. Liu and F.F. Liu | OK253561             |     |      |      |      |      |      |
| CSP9840         | —-A-        | Soil     | (Eucalyptus plantation)    | Soil                           | Fujian, China Zhangping, Longyan | S.F. Chen, Q.L. Liu and F.F. Liu | OK253562             |     |      |      |      |      |      |
| CSP9845         | —-A-        | Soil     | (Eucalyptus plantation)    | Soil                           | Fujian, China Zhangping, Longyan | S.F. Chen, Q.L. Liu and F.F. Liu | OK253563             |     |      |      |      |      |      |
| CSP9847         | —-A-        | Soil     | (Eucalyptus plantation)    | Soil                           | Fujian, China Zhangping, Longyan | S.F. Chen, Q.L. Liu and F.F. Liu | OK253564             |     |      |      |      |      |      |
| CSP9848         | —-A-        | Soil     | (Eucalyptus plantation)    | Soil                           | Fujian, China Zhangping, Longyan | S.F. Chen, Q.L. Liu and F.F. Liu | OK253565             |     |      |      |      |      |      |
| CSP9849         | —-A-        | Soil     | (Eucalyptus plantation)    | Soil                           | Fujian, China Zhangping, Longyan | S.F. Chen, Q.L. Liu and F.F. Liu | OK253566             |     |      |      |      |      |      |
### Table A1. Cont.

| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|-----------|---------------|------------|-----------|---------------|----------------|----------|------------------------|
|           |               |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253567 – | |
| CSP9850   | —A-           |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253568 – | |
| CSP9852   | —A-           |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253569 – | |
| CSP9853   | —A-           |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253570 – | |
| CSP9854   | —A-           |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253571 – | |
| CSP9855   | —A-           |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253572 – | |
| CSP9858   | —A-           |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253573 – | |
| CSP9859   | —A-           |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253574 – | |
| CSP9860   | —A-           |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253575 – | |
| CSP9861   | —A-           |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253576 – | |
| CSP9867   | —A-           |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253577 – | |
| CSP9868   | —A-           |            | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253578 – | |
Table A1. Cont.

| Species | Isolate No. | Genotype | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. |
|---------|-------------|----------|-----------|---------------|----------------|----------|----------------------|
|         |             |          | (Eucalyptus plantation) |                     |                |          | act cmdA his3 rpb2 tef1 tub2 |
| CSP9869 | A           | Soil     | Zhangping, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu |       | OK253578 – |
| CSP9871 | A           | Soil     | Zhangping, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu |       | OK253579 – |
| CSP9872 | A           | Soil     | Zhangping, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu |       | OK253580 – |
| CSP9873 | A           | Soil     | Zhangping, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu |       | OK253581 – |
| CSP9874 | A           | Soil     | Zhangping, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu |       | OK253582 – |
| CSP9876 | A           | Soil     | Zhangping, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu |       | OK253583 – |
| CSP9877 | A           | Soil     | Zhangping, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu |       | OK253584 – |
| CSP9878 | A           | Soil     | Zhangping, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu |       | OK253585 – |
| CSP9879 | A           | Soil     | Zhangping, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu |       | OK253586 – |
| CSP9881 | A           | Soil     | Zhangping, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu |       | OK253587 – |
| CSP9883 | A           | Soil     | Zhangping, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu |       | OK253588 – |
| Species      | Isolate No. | Genotype | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. |
|--------------|-------------|----------|-----------|---------------|----------------|-----------|----------------------|
|             |             |          |           |               |                |           |                      |
| CSP9884     | —A-         | Soil     | (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253589 |
| CSP9885     | —A-         | Soil     | (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253590 |
| CSP9886     | —A-         | Soil     | (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253591 |
| CSP9892     | —A-         | Soil     | (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253592 |
| CSP9893     | —A-         | Soil     | (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253593 |
| CSP9894     | —A-         | Soil     | (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253594 |
| CSP9896     | —A-         | Soil     | (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253595 |
| CSP9898     | —A-         | Soil     | (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253596 |
| CSP9899     | —A-         | Soil     | (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253597 |
| CSP9900     | —A-         | Soil     | (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253598 |
| CSP9901     | —A-         | Soil     | (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253599 |
Table A1. Cont.

| Species | Isolate No. | Genotype | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. |
|---------|-------------|----------|-----------|---------------|----------------|-----------|---------------------|
|         |             |          |           |               |                |           | act cmdA his3 rpb2 tef1 tub2 |
| J. Fungi | 2022, 8 | 39 of 80 | CSF9902   | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17′10.882″ N, 117°27′33.635″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253600 – |
|         |              |          | CSF9903   | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17′10.882″ N, 117°27′33.635″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253601 – |
|         |              |          | CSF9904   | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17′10.882″ N, 117°27′33.635″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253602 – |
|         |              |          | CSF9906   | Soil (Eucalyptus plantation) | Zhangping, Longyan, Fujian, China | 25°17′10.882″ N, 117°27′33.635″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253603 – |
|         |              |          | CSF9927   | Soil (Phyllostachys heterocycla) | Xinluo, Longyan, Fujian, China | 25°07′31.133″ N, 116°51′37.485″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253604 – |
|         |              |          | CSF9928   | Soil (Phyllostachys heterocycla) | Xinluo, Longyan, Fujian, China | 25°07′31.133″ N, 116°51′37.485″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253605 – |
|         |              |          | CSF9929   | Soil (Phyllostachys heterocycla) | Xinluo, Longyan, Fujian, China | 25°07′31.133″ N, 116°51′37.485″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253606 – |
|         |              |          | CSF9931   | Soil (Phyllostachys heterocycla) | Xinluo, Longyan, Fujian, China | 25°07′31.133″ N, 116°51′37.485″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253607 – |
|         |              |          | CSF9940   | Soil (Eucalyptus plantation) | Xinluo, Longyan, Fujian, China | 25°07′08.597″ N, 116°44′22.257″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253608 – |
|         |              |          | CSF9944   | Soil (Eucalyptus plantation) | Xinluo, Longyan, Fujian, China | 25°07′08.597″ N, 116°44′22.257″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253609 – |
|         |              |          | CSF9954   | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26′14.348″ N, 116°38′42.400″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253610 – |
### Table A1. Cont.

| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|-----------|---------------|------------|-----------|---------------|---------------|-----------|------------------------|
| CSP9955   | ——A—         | ——         | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26′14.348″ N, 116°38′42.400″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253611 |
| CSP9956   | ——A—         | ——         | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26′14.348″ N, 116°38′42.400″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253612 |
| CSP9958   | ——A—         | ——         | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26′14.348″ N, 116°38′42.400″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253613 |
| CSP9965   | ——A—         | ——         | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26′14.348″ N, 116°38′42.400″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253614 |
| CSP9966   | ——A—         | ——         | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26′14.348″ N, 116°38′42.400″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253615 |
| CSP9967   | ——A—         | ——         | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26′14.348″ N, 116°38′42.400″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253616 |
| CSP9968   | ——A—         | ——         | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26′14.348″ N, 116°38′42.400″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253617 |
| CSP9971   | ——A—         | ——         | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26′14.348″ N, 116°38′42.400″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253618 |
| CSP9979   | ——A—         | ——         | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26′14.348″ N, 116°38′42.400″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253619 |
| CSP9980   | ——A—         | ——         | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26′14.348″ N, 116°38′42.400″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253620 |
| CSP9981   | ——A—         | ——         | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26′14.348″ N, 116°38′42.400″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253621 |
| Species | Isolate No. | Genotype | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. |
|---------|-------------|----------|-----------|---------------|----------------|----------|----------------------|
|         |             |          | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26'14.348'' N, 116°38'42.400'' E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253622 |
| CSP9983 | —-A-        |          | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26'14.348'' N, 116°38'42.400'' E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253623 |
|         |             |          | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26'14.348'' N, 116°38'42.400'' E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253624 |
|         |             |          | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26'14.348'' N, 116°38'42.400'' E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253625 |
|         |             |          | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26'14.348'' N, 116°38'42.400'' E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253626 |
|         |             |          | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26'14.348'' N, 116°38'42.400'' E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253627 |
|         |             |          | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26'14.348'' N, 116°38'42.400'' E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253628 |
|         |             |          | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26'14.348'' N, 116°38'42.400'' E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253630 |
|         |             |          | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55'10.860'' N, 117°16'39.591'' E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253631 |
|         |             |          | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55'10.860'' N, 117°16'39.591'' E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253632 |
Table A1. Cont.

| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|-----------|---------------|------------|-----------|---------------|---------------|----------|------------------------|
| CSF10031  | —-A-          | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253633 – |
| CSF10033  | —-A-          | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253634 – |
| CSF10035  | —-A-          | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253635 – |
| CSF10036  | —-A-          | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253636 – |
| CSF10037  | —-A-          | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253637 – |
| CSF10042  | —-A-          | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253638 – |
| CSF10043  | —-A-          | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253639 – |
| CSF10048  | —-A-          | Soil (Cunninghamia lanceolata) | Yongan, Sanming, Fujian, China | 26°07'23.497" N, 116°53'00.762" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253640 – |
| CSF10049  | —-A-          | Soil (Cunninghamia lanceolata) | Yongan, Sanming, Fujian, China | 26°07'23.497" N, 116°53'00.762" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253641 – |
| CSF10051  | —-A-          | Soil (Cunninghamia lanceolata) | Yongan, Sanming, Fujian, China | 26°07'23.497" N, 116°53'00.762" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253642 – |
| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|-----------|---------------|------------|-----------|--------------|---------------|----------|------------------------|
| CSF10052  | —-A-          | Soil (Cunninghamia lanceolata) | Qingliu, Sanming, Fujian, China | 26°07'23.497" N, 116°53'00.762" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253643 – |
| CSF10063  | —-A-          | Soil (Eucalyptus plantation) | Yanping, Nanping, Fujian, China | 26°46'19.651" N, 117°57'37.233" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253644 – |
| CSF10065  | —-A-          | Soil (Eucalyptus plantation) | Yanping, Nanping, Fujian, China | 26°46'19.651" N, 117°57'37.233" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253645 – |
| CSF10066  | —-A-          | Soil (Eucalyptus plantation) | Yanping, Nanping, Fujian, China | 26°46'19.651" N, 117°57'37.233" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253646 – |
| CSF10067  | —-A-          | Soil (Eucalyptus plantation) | Yanping, Nanping, Fujian, China | 26°46'19.651" N, 117°57'37.233" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253647 – |
| CSF10069  | —-A-          | Soil (Eucalyptus plantation) | Yanping, Nanping, Fujian, China | 26°46'19.651" N, 117°57'37.233" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253648 – |
| CSF10074  | —-A-          | Soil (natural forest area) | Yanping, Nanping, Fujian, China | 26°42'26.672" N, 118°07'58.317" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253649 – |
| CSF10083  | —-A-          | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15'04.285" N, 119°02'38.917" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253650 – |
| CSF10099  | —-A-          | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15'04.285" N, 119°02'38.917" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253651 – |
| CSF10100  | —-A-          | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15'04.285" N, 119°02'38.917" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253652 – |
| CSF10101  | —-A-          | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15'04.285" N, 119°02'38.917" E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253653 – |
Table A1. Cont.

| Species | Isolate No. | Genotype | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. |
|---------|-------------|----------|-----------|---------------|----------------|----------|----------------------|
|         |             |          |           |               |                |          | act  | cmdA | his3 | rpb2 | tef1 | tub2 |
| CSF10102 | —A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15’04.285” N, 119°02’38.917” E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – | OK253654 |
| CSF10103 | —A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15’04.285” N, 119°02’38.917” E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – | OK253655 |
| CSF10104 | —A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15’04.285” N, 119°02’38.917” E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – | OK253656 |
| CSF10106 | —A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15’04.285” N, 119°02’38.917” E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – | OK253657 |
| CSF10107 | —A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15’04.285” N, 119°02’38.917” E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – | OK253658 |
| CSF10108 | —A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15’04.285” N, 119°02’38.917” E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – | OK253659 |
| CSF10109 | —A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15’04.285” N, 119°02’38.917” E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – | OK253660 |
| CSF10111 | —A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15’04.285” N, 119°02’38.917” E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – | OK253661 |
| CSF10113 | —A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15’04.285” N, 119°02’38.917” E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – | OK253662 |
| CSF10114 | —A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15’04.285” N, 119°02’38.917” E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – | OK253663 |
| CSF10115 | —A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15’04.285” N, 119°02’38.917” E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – | OK253664 |
Table A1. Cont.

| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|-----------|---------------|------------|-----------|---------------|----------------|----------|------------------------|
|           |               |            |           |               |                |          | act | cmdA | his3 | rpb2 | tef1 | tub2 |
| CSF10116  | —A-           | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – | – | – | – | – | OK253665 |
| CSF10117  | —A-           | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – | – | – | – | – | OK253666 |
| CSF10118  | —A-           | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – | – | – | – | – | OK253667 |
| CSF10120  | —A-           | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – | – | – | – | – | OK253668 |
| CSF7124 c | AAAAA | Soil (natural forest area) | Cangshan, Fuzhou, Fujian, China | 26°5′16.2″ N, 119°14′19.8″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253081 | OK253192 | OK253336 | OK253438 | OK253669 | OK253900 |
| CSF9784 e | AAAAA | Soil (Eucalyptus plantation) | Zhangzhou, Fujian, China | 24°53′49.369″ N, 117°32′45.070″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253082 | OK253193 | OK253337 | OK253439 | OK253670 | OK253901 |
| CSF9794 e | AAAAAA | Soil (Eucalyptus plantation) | Zhangzhou, Fujian, China | 24°53′49.369″ N, 117°32′45.070″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253083 | OK253194 | OK253338 | OK253440 | OK253671 | OK253902 |
| CSF9799 e | AAAAAA | Soil (Eucalyptus plantation) | Zhangzhou, Fujian, China | 24°53′49.369″ N, 117°32′45.070″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253084 | OK253195 | OK253339 | OK253441 | OK253672 | OK253903 |
| CSF7139  | -AA-AA        | Soil (natural forest area) | Cangshan, Fuzhou, Fujian, China | 26°5′16.2″ N, 119°14′19.8″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – | – | – | – | – | OK253196 |
| CSF9804  | -AA-AA        | Soil (Eucalyptus plantation) | Zhangzhou, Fujian, China | 24°53′49.369″ N, 117°32′45.070″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – | – | – | – | – | OK253197 |
| CSF9819  | -AA-AA        | Soil (Eucalyptus plantation) | Zhangzhou, Fujian, China | 24°53′49.369″ N, 117°32′45.070″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – | – | – | – | – | OK253198 |
Table A1. Cont.

| Species  | Isolate No. | Genotype | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. |
|----------|-------------|----------|-----------|---------------|----------------|----------|---------------------|
|          |             |          |           |               | S.F. Chen, Q.L. Liu and F.F. Liu |          | act.cmdA.his3.rpb2.tef1.tub2 |
| CSF10093 | -AA-AA      |          | Soil      | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | – | OK253199 OK253343 – OK253676 OK253907 |
| CSF10096 | -AA-AA      |          | Soil      | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | – | OK253200 OK253344 – OK253677 OK253908 |
| CSF9829  | -BA-AA      |          | Soil      | Hua’an, Zhangzhou, Fujian, China Cangshan, | 24°58′22.263″ N, 117°31′09.708″ E | – | OK253201 OK253345 – OK253678 OK253909 |
| CSF7134  | —-A—       |          | Soil      | Fuzhou, Fujian, China Cangshan, | 26°5′16.2″ N, 119°14′19.8″ E | – | – – – – OK253679 – |
| CSF7135  | —-A—       |          | Soil      | Fuzhou, Fujian, China Cangshan, | 26°5′16.2″ N, 119°14′19.8″ E | – | – – – – OK253680 – |
| CSF7136  | —-A—       |          | Soil      | Fuzhou, Fujian, China Cangshan, | 26°5′16.2″ N, 119°14′19.8″ E | – | – – – – OK253681 – |
| CSF7138  | —-A—       |          | Soil      | Fuzhou, Fujian, China Cangshan, | 26°5′16.2″ N, 119°14′19.8″ E | – | – – – – OK253682 – |
| CSF9781  | —-A—       |          | Soil      | Hua’an, Zhangzhou, Fujian, China | 24°53′49.369″ N, 117°32′45.070″ E | – | – – – – OK253683 – |
| CSF9782  | —-A—       |          | Soil      | Hua’an, Zhangzhou, Fujian, China | 24°53′49.369″ N, 117°32′45.070″ E | – | – – – – OK253684 – |
| CSF9783  | —-A—       |          | Soil      | Hua’an, Zhangzhou, Fujian, China | 24°53′49.369″ N, 117°32′45.070″ E | – | – – – – OK253685 – |
| CSF9785  | —-A—       |          | (Eucalyptus | Hua’an, Zhangzhou, Fujian, China | 24°53′49.369″ N, 117°32′45.070″ E | – | – – – – OK253686 – |
| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|-----------|---------------|------------|-----------|---------------|---------------|----------|----------------------|
|           |               |            |           |               |               |          | act      | cmdA | his3 | rpb2 | tef1 | tub2 |
| CSP9791   | —-A-          | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53'49.369” N, 117°32'45.070” E | S.F. Chen, Q.L. Liu and F.F. Liu | – | – | – | – | OK253687 |
| CSP9792   | —-A-          | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53'49.369” N, 117°32'45.070” E | S.F. Chen, Q.L. Liu and F.F. Liu | – | – | – | – | OK253688 |
| CSP9793   | —-A-          | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53'49.369” N, 117°32'45.070” E | S.F. Chen, Q.L. Liu and F.F. Liu | – | – | – | – | OK253689 |
| CSP9795   | —-A-          | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53'49.369” N, 117°32'45.070” E | S.F. Chen, Q.L. Liu and F.F. Liu | – | – | – | – | OK253690 |
| CSP9796   | —-A-          | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53'49.369” N, 117°32'45.070” E | S.F. Chen, Q.L. Liu and F.F. Liu | – | – | – | – | OK253691 |
| CSP9800   | —-A-          | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53'49.369” N, 117°32'45.070” E | S.F. Chen, Q.L. Liu and F.F. Liu | – | – | – | – | OK253692 |
| CSP9801   | —-A-          | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53'49.369” N, 117°32'45.070” E | S.F. Chen, Q.L. Liu and F.F. Liu | – | – | – | – | OK253693 |
| CSP9802   | —-A-          | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53'49.369” N, 117°32'45.070” E | S.F. Chen, Q.L. Liu and F.F. Liu | – | – | – | – | OK253694 |
| CSP9803   | —-A-          | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53'49.369” N, 117°32'45.070” E | S.F. Chen, Q.L. Liu and F.F. Liu | – | – | – | – | OK253695 |
| CSP9816   | —-A-          | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53'49.369” N, 117°32'45.070” E | S.F. Chen, Q.L. Liu and F.F. Liu | – | – | – | – | OK253696 |
| CSP9817   | —-A-          | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53'49.369” N, 117°32'45.070” E | S.F. Chen, Q.L. Liu and F.F. Liu | – | – | – | – | OK253697 |
| Species       | Isolate No. | Genotype | Substrate                | Sampling Site                                      | GPS Coordinate                  | Collector                              | GenBank Accession No. |
|--------------|-------------|----------|--------------------------|----------------------------------------------------|----------------------------------|----------------------------------------|---------------------|
|              |             |          |                          |                                                    |                                  |                                        | act                 |
|              |             |          |                          |                                                    |                                  |                                        | cmdA                |
|              |             |          |                          |                                                    |                                  |                                        | his3                |
|              |             |          |                          |                                                    |                                  |                                        | rpb2                |
|              |             |          |                          |                                                    |                                  |                                        | tef1                |
|              |             |          |                          |                                                    |                                  |                                        | tub2                |
| Ca. ilicicola |             |          |                          |                                                    |                                  |                                        |                     |
| CSP9862      | AAAA AAAAA  | -A-      | Soil (Eucalyptus plantation) | Zhangping, Fujian, China                          | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu        | OK253085 OK253202 OK253346 OK253442 OK253706 OK253910 |
| CSP9863      | AAAA AAAAA  | -A-      | Soil (Eucalyptus plantation) | Zhangping, Fujian, China                          | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu        | OK253086 OK253203 OK253347 OK253443 OK253707 OK253911 |
| CSP9864      | -AA AA-     |          | Soil (Eucalyptus plantation) | Zhangping, Fujian, China                          | 25°17'10.882" N, 117°27'33.635" E | S.F. Chen, Q.L. Liu and F.F. Liu        | OK253204 OK253348 – OK253708 OK253912 |
| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|-----------|--------------|------------|-----------|---------------|---------------|----------|------------------------|
|           |              |            | (isolates) |               |               |          | act cmdB his3 rpb2 tef1 tub2 |
| CSF9865   | -AA-AA       | AAAA       | Soil      | Zhangping, Longyan, Fujian, China | 25°17′10.882″ N, 117°27′33.635″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253205 OK253349 – OK253709 OK253913 |
| CSF9866   | -AA-AA       | AAAA       | Soil      | Zhangping, Longyan, Fujian, China | 25°17′10.882″ N, 117°27′33.635″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – OK253206 OK253350 – OK253710 OK253914 |
| Ca. kyotensis | CSF7130 e  | AAAAA     | Soil (natural forest area) | Cangshan, Fuzhou, Fujian, China | 26°5′16.2″ N, 119°14′19.8″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253087 OK253207 OK253351 OK253444 OK253711 OK253915 |
| CSF10088 e | AAAAAA      | AAAA       | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253088 OK253208 OK253352 OK253445 OK253712 OK253916 |
| CSF9834 c | AAA-AB      | AAAA      | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°58′22.263″ N, 117°31′09.708″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253089 OK253209 OK253353 N/A OK253713 OK253917 |
| CSF9910 c | AAAAAAB    | AAAAAB   | Soil (Phyllostachys reticulata) | Xinhua, Longyan, Fujian, China | 25°07′31.133″ N, 116°51′37.485″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253090 OK253210 OK253354 OK253446 OK253714 OK253918 |
| CSF10014 e | AAAAAC    | AAAA      | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55′10.860″ N, 117°16′39.591″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253091 OK253211 OK253355 OK253447 OK253715 OK253919 |
| CSF10080 e | AAAAAD    | AAAA      | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253092 OK253212 OK253356 OK253448 OK253716 OK253920 |
| CSF10086 e | AAAAEE   | AAAA      | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253093 OK253213 OK253357 OK253449 OK253717 OK253921 |
| CSF10053 e | AAAABB    | AAAA      | Soil (Pinus massoniana) | Qingliu, Sanming, Fujian, China | 26°10′54.311″ N, 116°52′50.901″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253094 OK253214 OK253358 OK253450 OK253718 OK253922 |
| CSF10054 e | AAAABB    | AAAA      | Soil (Pinus massoniana) | Qingliu, Sanming, Fujian, China | 26°10′54.311″ N, 116°52′50.901″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253095 OK253215 OK253359 OK253451 OK253719 OK253923 |
### Table A1. Cont.

| Species | Isolate No. | Genotype | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. | act | cmdA | his3 | rpb2 | tef1 | tub2 |
|---------|-------------|----------|-----------|---------------|----------------|-----------|-----------------------|-----|------|------|------|------|------|
| CSP9922 | AAAABF      | Soil     | Xinluo, Longyan, Fujian, China | 25°07'31.133" N, 116°51'37.485" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253096 OK253216 OK253360 OK253452 OK253720 OK253924 |
| CSP9923 | AAAABF      | Soil     | Xinluo, Longyan, Fujian, China | 25°07'31.133" N, 116°51'37.485" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253097 OK253217 OK253361 OK253453 OK253721 OK253925 |
| CSP9949 | AAAADB      | Soil     | Xinluo, Longyan, Fujian, China | 25°07'08.597" N, 116°44'42.257" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253098 OK253218 OK253362 OK253454 OK253722 OK253926 |
| CSP9951 | AAAADB      | Soil     | Xinluo, Longyan, Fujian, China | 25°07'08.597" N, 116°44'42.257" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253099 OK253219 OK253363 OK253455 OK253723 OK253927 |
| CSP9932 | AAAADG      | Soil     | Xinluo, Longyan, Fujian, China | 25°07'08.597" N, 116°44'42.257" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253100 OK253220 OK253364 OK253456 OK253724 OK253928 |
| CSP9935 | AAAADG      | Soil     | Xinluo, Longyan, Fujian, China | 25°07'08.597" N, 116°44'42.257" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253101 OK253221 OK253365 OK253457 OK253725 OK253929 |
| CSP9936 | AAAADG      | Soil     | Xinluo, Longyan, Fujian, China | 25°07'08.597" N, 116°44'42.257" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253102 OK253222 OK253366 OK253458 OK253726 OK253930 |
| CSF10020| AAAAEA      | Soil     | Yongan, Sanming, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253103 OK253223 OK253367 OK253459 OK253727 OK253931 |
| CSF10021| AAAAEA      | Soil     | Yongan, Sanming, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253104 OK253224 OK253368 OK253460 OK253728 OK253932 |
| CSF10009| AAABBH      | Soil     | Yongan, Fujian, China Liancheng, Longyan, Fujian, China | 25°33'06.994" N, 116°41'42.328" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253105 OK253225 OK253369 OK253461 OK253729 OK253933 |
| CSF10010| AAABBH      | Soil     | Yongan, Fujian, China Liancheng, Longyan, Fujian, China | 25°33'06.994" N, 116°41'42.328" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253106 OK253226 OK253370 OK253462 OK253730 OK253934 |
| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|-----------|--------------|------------|-----------|---------------|---------------|----------|-----------------------|
| CSP9997 e | AABAAB       | Soil       | Liancheng, Longyan, Fujian, China | 25°33'06.994" N, 116°41'42.328" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253107 OK253227 OK253371 OK253463 OK253731 OK253935 |
| CSP9969 e | AABACB       | Soil       | Liancheng, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253108 OK253228 OK253372 OK253464 OK253732 OK253936 |
| CSP9972 e | AABACB       | Soil       | Liancheng, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253109 OK253229 OK253373 OK253465 OK253733 OK253937 |
| CSP9973 e | AABACB       | Soil       | Liancheng, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253110 OK253230 OK253374 OK253466 OK253734 OK253938 |
| CSF10126 e | AACAAA      | Soil       | Minhou, Fuzhou, Fujian, China | 26°15'04.285" N, 119°02'38.917" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253111 OK253231 OK253375 OK253467 OK253735 OK253939 |
| CSP9962 e | AACAAD       | Soil       | Liancheng, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253112 OK253232 OK253376 OK253468 OK253736 OK253940 |
| CSF10019 e | AADABB       | Soil       | Minhou, Fuzhou, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253113 OK253233 OK253377 OK253469 OK253737 OK253941 |
| CSF10022 e | AADABB       | Soil       | Minhou, Fuzhou, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253114 OK253234 OK253378 OK253470 OK253738 OK253942 |
| CSF10023 e | AADABB       | Soil       | Minhou, Fuzhou, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253115 OK253235 OK253379 OK253471 OK253739 OK253943 |
| CSF10045 e | ABAAAB       | Soil       | Qingliu, Sanming, Fujian, China | 26°07'23.497" N, 116°53'00.762" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253116 OK253236 OK253380 OK253472 OK253740 OK253944 |
| CSF10047 e | ABAAAB       | Soil       | Qingliu, Sanming, Fujian, China | 26°07'23.497" N, 116°53'00.762" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253117 OK253237 OK253381 OK253473 OK253741 OK253945 |
Table A1. Cont.

| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|------------|---------------|------------|-----------|---------------|---------------|----------|------------------------|
|            |               |            |           |               |               |          | act        | cmdA       | his3       | rpb2       | tef1       | tub2       |
| CSP9824    | ACBAAC        | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53'49.369″ N, 117°32'45.070″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253118 OK253238 OK253382 OK253474 OK253742 OK253946 |
| CSF10004   | ADAACB        | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 25°33'06.994″ N, 116°41'42.328″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253119 OK253239 OK253383 OK253475 OK253743 OK253947 |
| CSF10005   | ADAACB        | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 25°33'06.994″ N, 116°41'42.328″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253120 OK253240 OK253384 OK253476 OK253744 OK253948 |
| CSF7123    | -AA-AB        | Soil (natural forest area) | Hua’an, Zhangzhou, Fujian, China | 25°33'06.994″ N, 116°41'42.328″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253120 OK253240 OK253384 OK253476 OK253744 OK253948 |
| CSP9915    | -AA-AB        | Soil (Phyllostachys heterocycla) | Xinluo, Longyan, Fujian, China | 25°07'31.133″ N, 116°51'37.485″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253120 OK253240 OK253384 OK253476 OK253744 OK253948 |
| CSP9999    | -AA-AB        | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 25°33'06.994″ N, 116°41'42.328″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253120 OK253240 OK253384 OK253476 OK253744 OK253948 |
| CSF10124   | -AA-AB        | Soil (Eucalyptus plantation) | Xinluo, Longyan, Fujian, China | 25°33'06.994″ N, 116°41'42.328″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253120 OK253240 OK253384 OK253476 OK253744 OK253948 |
| CSF10055   | -AA-BB        | Soil (Pinus massoniana) | Xinluo, Longyan, Fujian, China | 25°07'31.133″ N, 116°51'37.485″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253120 OK253240 OK253384 OK253476 OK253744 OK253948 |
| CSF10056   | -AA-BB        | Soil (Pinus massoniana) | Xinluo, Longyan, Fujian, China | 25°07'31.133″ N, 116°51'37.485″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253120 OK253240 OK253384 OK253476 OK253744 OK253948 |
| CSF10057   | -AA-BB        | Soil (Pinus massoniana) | Xinluo, Longyan, Fujian, China | 25°07'31.133″ N, 116°51'37.485″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253120 OK253240 OK253384 OK253476 OK253744 OK253948 |
| CSP9952    | -AA-DB        | Soil (Eucalyptus plantation) | Xinluo, Longyan, Fujian, China | 25°07'31.133″ N, 116°51'37.485″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253120 OK253240 OK253384 OK253476 OK253744 OK253948 |
Table A1. Cont.

| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|-----------|---------------|------------|-----------|---------------|---------------|----------|-----------------------|
|           |               |            | Soil (Eucalyptus plantation) | Xinluo, Longyan, Fujian, China | 25°07'08.597″ N, 116°44'42.257″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – | OK253249 OK253393 – OK253753 OK253957 |
| CSP9924   | -AA-BF        | Soil (Phyllostachys heterocycla) | Xinluo, Longyan, Fujian, China | 25°07'31.133″ N, 116°51'37.485″ E | – | OK253250 OK253394 – OK253754 OK253958 |
| CSP9925   | -AA-BF        | Soil (Phyllostachys heterocycla) | Xinluo, Longyan, Fujian, China | 25°07'31.133″ N, 116°51'37.485″ E | – | OK253251 OK253395 – OK253755 OK253959 |
| CSP9926   | -AA-BF        | Soil (Phyllostachys heterocycla) | Xinluo, Longyan, Fujian, China | 25°07'31.133″ N, 116°51'37.485″ E | – | OK253252 OK253396 – OK253756 OK253960 |
| CSF10011  | -AA-BH        | Soil (Eucalyptus plantation) | Liancheng, Longyan, Fujian, China | 25°33'06.994″ N, 116°41'42.328″ E | – | OK253253 OK253397 – OK253757 OK253961 |
| CSF10012  | -AA-BH        | Soil (Eucalyptus plantation) | Liancheng, Longyan, Fujian, China | 25°33'06.994″ N, 116°41'42.328″ E | – | OK253254 OK253398 – OK253758 OK253962 |
| CSF10013  | -AA-BH        | Soil (Eucalyptus plantation) | Liancheng, Longyan, Fujian, China | 25°33'06.994″ N, 116°41'42.328″ E | – | OK253255 OK253399 – OK253759 OK253963 |
| CSF10006  | -DA-CB        | Soil (Eucalyptus plantation) | Liancheng, Longyan, Fujian, China | 25°33'06.994″ N, 116°41'42.328″ E | – | OK253256 OK253400 – OK253760 OK253964 |
| CSF10007  | -DA-CB        | Soil (Eucalyptus plantation) | Liancheng, Longyan, Fujian, China | 25°33'06.994″ N, 116°41'42.328″ E | – | OK253257 OK253401 – OK253761 OK253965 |
| CSF10008  | -DA-CB        | Soil (Eucalyptus plantation) | Liancheng, Longyan, Fujian, China | 25°33'06.994″ N, 116°41'42.328″ E | – | OK253258 OK253402 – OK253762 OK253966 |
| CSP9821   | —-A-          | Soil (Eucalyptus plantation) | Zhangzhou, Fujian, China | 24°53'49.369″ N, 117°32'45.070″ E | – | – – – – OK253763 – |
| Species  | Isolate No. | Genotype | Substrate | Sampling Site | GPS Coordinate | Collector         | GenBank Accession No. |
|----------|-------------|----------|-----------|---------------|----------------|-------------------|----------------------|
|          |             |          | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53'49.369' N, 117°32'45.070' E | S.F. Chen, Q.L. Liu and F.F. Liu | -- -- -- -- OK253764 -- |
| CSP9822  | —-A-        |          | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53'49.369' N, 117°32'45.070' E | S.F. Chen, Q.L. Liu and F.F. Liu | -- -- -- -- OK253765 -- |
| CSP9823  | —-A-        |          | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°53'49.369' N, 117°32'45.070' E | S.F. Chen, Q.L. Liu and F.F. Liu | -- -- -- -- OK253766 -- |
| CSP9825  | —-A-        |          | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°58'22.263' N, 117°31'09.708' E | S.F. Chen, Q.L. Liu and F.F. Liu | -- -- -- -- OK253767 -- |
| CSP9832  | —-A-        |          | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°58'22.263' N, 117°31'09.708' E | S.F. Chen, Q.L. Liu and F.F. Liu | -- -- -- -- OK253768 -- |
| CSP9833  | —-A-        |          | Soil (Eucalyptus plantation) | Hua’an, Zhangzhou, Fujian, China | 24°58'22.263' N, 117°31'09.708' E | S.F. Chen, Q.L. Liu and F.F. Liu | -- -- -- -- OK253769 -- |
| CSP9835  | —-A-        |          | Soil (Eucalyptus plantation) | Xiu Luo, Longyan, Fujian, China | 25°07'31.133' N, 116°51'37.485' E | S.F. Chen, Q.L. Liu and F.F. Liu | -- -- -- -- OK253770 -- |
| CSP9907  | —-A-        |          | Soil (Phyllostachys heterocycla) | Xiu Luo, Longyan, Fujian, China | 25°07'31.133' N, 116°51'37.485' E | S.F. Chen, Q.L. Liu and F.F. Liu | -- -- -- -- OK253771 -- |
| CSP9908  | —-A-        |          | Soil (Phyllostachys heterocycla) | Xiu Luo, Longyan, Fujian, China | 25°07'31.133' N, 116°51'37.485' E | S.F. Chen, Q.L. Liu and F.F. Liu | -- -- -- -- OK253772 -- |
| CSP9909  | —-A-        |          | Soil (Phyllostachys heterocycla) | Xiu Luo, Longyan, Fujian, China | 25°07'31.133' N, 116°51'37.485' E | S.F. Chen, Q.L. Liu and F.F. Liu | -- -- -- -- OK253773 -- |
| CSP9911  | —-A-        |          | Soil (Phyllostachys heterocycla) | Xiu Luo, Longyan, Fujian, China | 25°07'31.133' N, 116°51'37.485' E | S.F. Chen, Q.L. Liu and F.F. Liu | -- -- -- -- OK253774 -- |
| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|-----------|--------------|------------|-----------|---------------|---------------|----------|-----------------------|
| CSP9913   | —A-          | Soil (Phyllostachys heterocycla) | Xinluo, Longyan, Fujian, China | 25°07'31.133" N, 116°51'37.485" E | S.F. Chen, Q.L. Liu and F.F. Liu | —        | OK253775              |
| CSP9914   | —A-          | Soil (Phyllostachys heterocycla) | Xinluo, Longyan, Fujian, China | 25°07'31.133" N, 116°51'37.485" E | S.F. Chen, Q.L. Liu and F.F. Liu | —        | OK253776              |
| CSP9916   | —A-          | Soil (Phyllostachys heterocycla) | Xinluo, Longyan, Fujian, China | 25°07'31.133" N, 116°51'37.485" E | S.F. Chen, Q.L. Liu and F.F. Liu | —        | OK253777              |
| CSP9917   | —A-          | Soil (Phyllostachys heterocycla) | Xinluo, Longyan, Fujian, China | 25°07'31.133" N, 116°51'37.485" E | S.F. Chen, Q.L. Liu and F.F. Liu | —        | OK253778              |
| CSP9918   | —A-          | Soil (Phyllostachys heterocycla) | Xinluo, Longyan, Fujian, China | 25°07'31.133" N, 116°51'37.485" E | S.F. Chen, Q.L. Liu and F.F. Liu | —        | OK253779              |
| CSP9919   | —A-          | Soil (Phyllostachys heterocycla) | Xinluo, Longyan, Fujian, China | 25°07'31.133" N, 116°51'37.485" E | S.F. Chen, Q.L. Liu and F.F. Liu | —        | OK253780              |
| CSP9920   | —A-          | Soil (Phyllostachys heterocycla) | Xinluo, Longyan, Fujian, China | 25°07'31.133" N, 116°51'37.485" E | S.F. Chen, Q.L. Liu and F.F. Liu | —        | OK253781              |
| CSP9921   | —A-          | Soil (Phyllostachys heterocycla) | Xinluo, Longyan, Fujian, China | 25°07'31.133" N, 116°51'37.485" E | S.F. Chen, Q.L. Liu and F.F. Liu | —        | OK253782              |
| CSP9959   | —A-          | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | —        | OK253783              |
| CSP9960   | —A-          | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | —        | OK253784              |
| CSP9961   | —A-          | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | —        | OK253785              |
| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|-----------|--------------|------------|-----------|---------------|---------------|----------|------------------------|
|           |              |            | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253786 |
| CSP9963   | ——A—        |            | Soil (Eucalyptus plantation) | Liancheng, Longyan, Fujian, China | 25°33'06.994" N, 116°41'42.328" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253787 |
| CSP9994   | ——A—        |            | Soil (Eucalyptus plantation) | Liancheng, Longyan, Fujian, China | 25°33'06.994" N, 116°41'42.328" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253788 |
| CSP9995   | ——A—        |            | Soil (Eucalyptus plantation) | Liancheng, Longyan, Fujian, China | 25°33'06.994" N, 116°41'42.328" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253789 |
| CSP9996   | ——A—        |            | Soil (Eucalyptus plantation) | Liancheng, Longyan, Fujian, China | 25°33'06.994" N, 116°41'42.328" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253790 |
| CSP9998   | ——A—        |            | Soil (Eucalyptus plantation) | Liancheng, Longyan, Fujian, China | 25°33'06.994" N, 116°41'42.328" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253791 |
| CSF10000  | ——A—        |            | Soil (Eucalyptus plantation) | Liancheng, Longyan, Fujian, China | 25°33'06.994" N, 116°41'42.328" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253792 |
| CSF10001  | ——A—        |            | Soil (Eucalyptus plantation) | Liancheng, Longyan, Fujian, China | 25°33'06.994" N, 116°41'42.328" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253793 |
| CSF10002  | ——A—        |            | Soil (Eucalyptus plantation) | Liancheng, Longyan, Fujian, China | 25°33'06.994" N, 116°41'42.328" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253794 |
| CSF10003  | ——A—        |            | Soil (Eucalyptus plantation) | Liancheng, Longyan, Fujian, China | 25°33'06.994" N, 116°41'42.328" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253795 |
| CSF10015  | ——A—        |            | Soil (Eucalyptus plantation) | Liancheng, Longyan, Fujian, China | 25°33'06.994" N, 116°41'42.328" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253796 |
| CSF10016  | ——A—        |            | Soil (Eucalyptus plantation) | Liancheng, Longyan, Fujian, China | 25°33'06.994" N, 116°41'42.328" E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253797 |

Notes: a: Species; b: Isolate No.; c: Genotype; d: GenBank Accession No.
Table A1. Cont.

| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|-----------|--------------|------------|-----------|---------------|---------------|----------|------------------------|
| CSF10044  | —-A-         | Soil (Cunninghamia lanceolata) | Qingliu, Sanming, Fujian, China | 26°07′23.497″ N, 116°53′00.762″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253797 – |
| CSF10046  | —-A-         | Soil (Cunninghamia lanceolata) | Qingliu, Sanming, Fujian, China | 26°07′23.497″ N, 116°53′00.762″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253798 – |
| CSF10084  | —-A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253799 – |
| CSF10085  | —-A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253800 – |
| CSF10087  | —-A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253801 – |
| CSF10089  | —-A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253802 – |
| CSF10090  | —-A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253803 – |
| CSF10091  | —-A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253804 – |
| CSF10092  | —-A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253805 – |
| CSF10121  | —-A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253806 – |
| CSF10122  | —-A-         | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253807 – |
Table A1. Cont.

| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|-----------|---------------|------------|-----------|--------------|---------------|----------|------------------------|
|           |               |            |           |              |               |          | act cmdA his3 rpb2 tef1 tub2 |
| CSF10123  | —-A-          | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253808 – |
| CSF10127  | —-A-          | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253809 – |
| CSF10128  | —-A-          | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15′04.285″ N, 119°02′38.917″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253810 – |
| CSF7122   | —-A-          | Soil (natural forest area) | Cangshan, Fuzhou, Fujian, China | 26°5′16.2″ N, 119°14′19.8″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253811 – |
| CSF7128   | —-A-          | Soil (natural forest area) | Cangshan, Fuzhou, Fujian, China | 26°5′16.2″ N, 119°14′19.8″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253812 – |
| CSF7129   | —-A-          | Soil (natural forest area) | Cangshan, Fuzhou, Fujian, China | 26°5′16.2″ N, 119°14′19.8″ E | S.F. Chen, Q.L. Liu and F.F. Liu | – – – – OK253813 – |
| CSF9941   | c,h-j; CGMCC3.18877 | AAAAA | Soil (Eucalyptus plantation) | Xinhuo, Longyan, Fujian, China | 25°07′08.597″ N, 116°44′22.57″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253121 OK253259 OK253403 OK253477 OK253814 OK253967 |
| CSF9974   | e            | AAAAAA | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26′14.348″ N, 116°38′42.400″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253122 OK253260 OK253404 OK253478 OK253815 OK253968 |
| CSF9975   | c,h-i; CGMCC3.18881 | AAAAAA | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26′14.348″ N, 116°38′42.400″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253123 OK253261 OK253405 OK253479 OK253816 OK253969 |
| CSF9976   | e            | AAAAAA | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26′14.348″ N, 116°38′42.400″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253124 OK253262 OK253406 OK253480 OK253817 OK253970 |
| CSF9977   | e            | AAAAAA | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26′14.348″ N, 116°38′42.400″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253125 OK253263 OK253407 OK253481 OK253818 OK253971 |

Ca. minensis sp. nov.
| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d | act | cmdA | his3 | rph2 | tef1 | tub2 |
|-----------|---------------|------------|-----------|--------------|----------------|----------|------------------------|-----|------|------|------|------|------|
| CSP9978 e | AAAAAA        | Soil (natural forest area) | Liancheng, Longyan, Fujian, China | 25°26'14.348" N, 116°38'42.400" E | S.F. Chen, Q.L. Liu and F.F. Liu S.F. Chen, Q.L. Liu and F.F. Liu S.F. Chen, Q.L. Liu and F.F. Liu S.F. Chen, Q.L. Liu and F.F. Liu S.F. Chen, Q.L. Liu and F.F. Liu S.F. Chen, Q.L. Liu and F.F. Liu | OK253126 OK253264 OK253408 OK253482 OK253819 OK253972 |
| CSP993 e | ABBABB        | Soil (Eucalyptus plantation) | Xinluo, Longyan, Fujian, China | 25°07'08.597" N, 116°44'22.257" E | OK253127 OK253265 OK253409 OK253483 OK253820 OK253973 |
| CSP9934 e | ABBABB        | Soil (Eucalyptus plantation) | Xinluo, Longyan, Fujian, China | 25°07'08.597" N, 116°44'22.257" E | OK253128 OK253266 OK253410 OK253484 OK253821 OK253974 |
| Ca. pacifica | CSF10024 e | AAAAAA | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | OK253129 OK253267 OK253411 OK253485 OK253822 OK253975 |
| CSF10129 e | BAAAAA        | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15'04.285" N, 119°02'38.917" E | OK253130 OK253268 OK253412 OK253486 OK253823 OK253976 |
| CSF10070 e | CABAAA        | Soil (Eucalyptus plantation) | Yanping, Nanping, Fujian, China | 26°42'26.672" N, 118°07'58.317" E | OK253131 OK253269 OK253413 OK253487 OK253824 OK253977 |
| CSF10077 e | CABAAA        | Soil (natural forest area) | Yanping, Nanping, Fujian, China | 26°42'26.672" N, 118°07'58.317" E | OK253132 OK253270 OK253414 OK253488 OK253825 OK253978 |
| CSF10027 -AA-AA | - | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | – OK253271 OK253415 – OK253826 OK253979 |
| CSF10039 -AA-AA | - | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | – OK253272 OK253416 – OK253827 OK253980 |
| CSF10130 -AA-AA | - | Soil (Eucalyptus plantation) | Minhou, Fuzhou, Fujian, China | 26°15'04.285" N, 119°02'38.917" E | – OK253273 OK253417 – OK253828 OK253981 |
| CSF10025 —-A- | —- | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55'10.860" N, 117°16'39.591" E | – – – – – OK253829 – |
Table A1. Cont.

| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|-----------|---------------|------------|-----------|---------------|---------------|-----------|------------------------|
|           |               |            |           |               |               |           | act cmdA his3 rpb2 tef1 tub2 |
| CSF10026  | —A-           |            | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55′10.860″ N, 117°16′39.591″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253830 |
| CSF10028  | —A-           |            | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55′10.860″ N, 117°16′39.591″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253831 |
| CSF10038  | —A-           |            | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55′10.860″ N, 117°16′39.591″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253832 |
| CSF10040  | —A-           |            | Soil (Eucalyptus plantation) | Yongan, Sanming, Fujian, China | 25°55′10.860″ N, 117°16′39.591″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253833 |
| CSF10071  | —A-           |            | Soil (natural forest area) | Yanping, Fujian, China | 26°42′26.672″ N, 118°07′58.317″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253834 |
| CSF10072  | —A-           |            | Soil (natural forest area) | Yanping, Fujian, China | 26°42′26.672″ N, 118°07′58.317″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253835 |
| CSF10076  | —A-           |            | Soil (natural forest area) | Yanping, Fujian, China | 26°42′26.672″ N, 118°07′58.317″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253836 |
| CSF10078  | —A-           |            | Soil (natural forest area) | Yanping, Fujian, China | 26°42′26.672″ N, 118°07′58.317″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253837 |
| CSF10079  | —A-           |            | Soil (natural forest area) | Yanping, Fujian, China | 26°42′26.672″ N, 118°07′58.317″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253838 |
| Ca. pseu- | CSF10059 e    | AAAAA      | Soil (Eucalyptus plantation) | Yanping, Nanping, Fujian, China | 26°46′19.651″ N, 117°57′37.233″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253133 OK253274 OK253418 OK253489 OK253839 OK253982 |
| doreteaudii | CSF10060 e    | AAAAA      | Soil (Eucalyptus plantation) | Yanping, Nanping, Fujian, China | 26°46′19.651″ N, 117°57′37.233″ E | S.F. Chen, Q.L. Liu and F.F. Liu | OK253134 OK253275 OK253419 OK253490 OK253840 OK253983 |
Table A1. Cont.

| Species a | Isolate No. b | Genotype c | Substrate | Sampling Site | GPS Coordinate | Collector | GenBank Accession No. d |
|-----------|---------------|------------|-----------|---------------|----------------|----------|------------------------|
|           |               |            |           |               |                |          | act cmdA his3 rpb2 tef1 tub2 |
| CSF10058  | -AA-AA        | Soil (Eucalyptus plantation) | Yanping, Nanping, Fujian, China | 26°46'19.651” N, 117°57'37.233” E | S.F. Chen, Q.L. Liu and F.F. Liu | – | OK253276 OK253420 – OK253841 OK253984 |
| CSF10061  | -AA-AA        | Soil (Eucalyptus plantation) | Yanping, Nanping, Fujian, China | 26°46'19.651” N, 117°57'37.233” E | S.F. Chen, Q.L. Liu and F.F. Liu | – | OK253277 OK253421 – OK253842 OK253985 |
| CSF10062  | -AA-AA        | Soil (Eucalyptus plantation) | Yanping, Nanping, Fujian, China | 26°46'19.651” N, 117°57'37.233” E | S.F. Chen, Q.L. Liu and F.F. Liu | – | OK253278 OK253422 – OK253843 OK253986 |

a New species described in this study are indicated in bold. b CSF = Culture Collection at the Research Institute of Fast-growing Trees (RIFT)/China Eucalypt Research Centre (CERC), Chinese Academy of Forestry (CAF), ZhanJiang, Guangdong Province, China; CGMCC = China General Microbiological Culture Collection Center, Beijing, China. c Genotype within each identified species, determined by sequences of act, cmdA, his3, rpb2, tef1 and tub2 regions; '-' means not available. d act = actin; cmdA = calmodulin; his3 = histone H3; rpb2 = the second largest subunit of RNA polymerase; tef1 = translation elongation factor 1-alpha; tub2 = β-tubulin. e Isolates used in phylogenetic analyses. f N/A represents the relative locus was not successfully amplified in the current study. g '-' represents the relative locus was not amplified in the current study. h Isolates used in morphological and culture growth studies. i Isolates used for mating studies. j Isolates that represent ex-type cultures are indicated in bold.
Appendix B. Phylogenetic Tree of *Calonectria* Species Based on Maximum Likelihood (ML) Analyses of *act*, *cmdA*, *his3*, *rpb2*, *tef1* and *tub2* Gene Sequences

![Phylogenetic tree of Calonectria species](image)

**Figure A1.** Phylogenetic tree of *Calonectria* species based on maximum likelihood (ML) analyses of *act* gene sequences. Bootstrap value \( \geq 70\% \) for ML and MP analyses are presented at the branches. Bootstrap values lower than 70\% are marked with “*”, and absent analyses values are marked with “-”. Ex-type isolates are marked with “T”. Isolates sequenced in this study are highlighted in blue and bold type. The “B” species codes are consistent with the recently published results in Liu and co-authors [18]. The tree was rooted to *Curvicladiella cignea* (CBS 109167 and CBS 109168).
**Figure A2.** Phylogenetic tree of *Calonectria* species based on maximum likelihood (ML) analyses of *cmdA* gene sequences. Bootstrap value \( \geq 70\% \) for ML and MP analyses are presented at the branches. Bootstrap values lower than 70\% are marked with "*", and absent analyses values are marked with "-". Ex-type isolates are marked with "T". Isolates sequenced in this study are highlighted in blue and bold type. The "B" species codes are consistent with the recently published results in Liu and co-authors [18]. The tree was rooted to *Curvicladiella cignea* (CBS 109167 and CBS 109168).
Figure A3. Phylogenetic tree of Calonectria species based on maximum likelihood (ML) analyses of his3 gene sequences. Bootstrap value $\geq 70\%$ for ML and MP analyses are presented at the branches. Bootstrap values lower than 70% are marked with "*", and absent analyses values are marked with "-". Ex-type isolates are marked with "T". Isolates sequenced in this study are highlighted in blue and bold type. The "B" species codes are consistent with the recently published results in Liu and co-authors [18]. The tree was rooted to Curvicladiella cignea (CBS 109167 and CBS 109168).
Figure A4. Phylogenetic tree of _Calonectria_ species based on maximum likelihood (ML) analyses of _rpb2_ gene sequences. Bootstrap value $\geq$70% for ML and MP analyses are presented at the branches. Bootstrap values lower than 70% are marked with “*”, and absent analyses values are marked with “-”. Ex-type isolates are marked with “T”. Isolates sequenced in this study are highlighted in blue and bold type. The “B” species codes are consistent with the recently published results in Liu and co-authors [18]. The tree was rooted to _Curvicladiella cignea_ (CBS 109167 and CBS 109168).
Figure A5. Phylogenetic tree of *Calonectria* species based on maximum likelihood (ML) analyses of *tef1* gene sequences. Bootstrap value $\geq 70\%$ for ML and MP analyses are presented at the branches. Bootstrap values lower than 70\% are marked with “*” , and absent analyses values are marked with “-”. Ex-type isolates are marked with “T”. Isolates sequenced in this study are highlighted in blue and bold type. The “B” species codes are consistent with the recently published results in Liu and co-authors [18]. The tree was rooted to *Curvicladiella cignea* (CBS 109167 and CBS 109168).
Figure A6. Phylogenetic tree of *Calonectria* species based on maximum likelihood (ML) analyses of *tub2* gene sequences. Bootstrap value ≥70% for ML and MP analyses are presented at the branches. Bootstrap values lower than 70% are marked with “*”, and absent analyses values are marked with “-”. Ex-type isolates are marked with “T”. Isolates sequenced in this study are highlighted in blue and bold type. The “B” species codes are consistent with the recently published results in Liu and co-authors [18]. The tree was rooted to *Curvicladiella cignea* (CBS 109167 and CBS 109168).
Appendix C. Morphology of Six Previously Described *Calonectria* Species Collected in This Study

*Calonectria aconidialis*

Figure A7. *Calonectria aconidialis*. (a). Perithecium; (b). vertical section through a perithecium; (c). cells around ostiolar region of perithecium; (d). section through lateral perithecial wall; (e,f). asci; (g). ascospores; (h–j). macroconidiophore; (k–m). obpyriform to sphaeropedunculate vesicles; (n,o). conidiogenous apparatus with conidiophore branches and elongate doliiform to reniform phialides; (p,q). macroconidia.—Scale bars: a = 200 µm; b = 100 µm; c, d, f and h–j = 20 µm; e = 50 µm; g and n–q = 10 µm; k–m = 5 µm.
Description: *Ascomata* perithecial, solitary or in groups of two, orange, becoming orange-brown with age; in section, apex and body orange, base red-brown, subglobose to ovoid, 368–491 µm high, 335–455 µm diam, body turning dark orange to red, and base dark red-brown in 3% KOH+; ascomatal wall rough, consisting of two thick-walled layers; outer layer of *textura globulosa*, 23–82 µm thick, cells becoming more compressed towards the inner layer of *textura angularis*, 8–21 µm thick, cells becoming thin-walled and hyaline towards the centre; outermost cells 21–35 × 7–21 µm, cells of inner layer 9–34 × 2–9 µm; ascomatal base up to 201 µm wide, consisting of dark red, angular cells, merging with an erumpent stroma; cells of the outer wall layer continuous with the pseudoparenchymatous cells of the erumpent stroma.

*Asci* 8-spored, clavate, 68–143 × 10–22 µm, tapering into a long thin stalk.

*Ascospores* aggregated in the upper third of the ascus, hyaline, guttulate, fusoid with rounded ends, straight to slightly curved, 1-septate, constricted at the septum, (24.5–)30.5–37.5(–42.5) × (4–)4.5–5.5(–7) µm (av. = 34 × 5 µm).

*Macroconidiophores* consisting of a stipe, a suite of penicillate arranged fertile branches, a stipe extension, and a terminal vesicle; stipe septate, hyaline, smooth, 27–134 × 4–6 µm, stipe extension septate, straight to flexuous 64–129 µm long, 2–4 µm wide at the apical septum, terminating in a obpyriform to sphaeropedunculate vesicle, 3–7 µm diam; lateral stipe extensions (90° to main axis) moderate, 31–88 µm long, 1.5–3 µm wide at the apical septum, terminating in obpyriform vesicles, 2–5 µm. *Conidiogenous apparatus* 37–134 µm wide, and 41–128 µm long; primary branches aseptate, 15–27 × 3–5 µm; secondary branches aseptate, 12–20 × 3–4.5 µm; tertiary branches aseptate, 11–15 × 3–4 µm; quaternary branches aseptate, 8–16 × 3–5 µm, each terminal branch producing 2–6 phialides; phialides elongate doliiform to reniform, hyaline, aseptate, 9–18 × 2–5 µm, apex with minute periclinal thickening and inconspicuous collarette. *Macroconidia* cylindrical, rounded at both ends, straight, (40–)46–54.5(–63.5) × (3.5–)4.5–5(–6) µm (av. = 50 × 5 µm), 1-septate, lacking a visible abscission scar, held in parallel cylindrical clusters by colourless slime. Mega- and microconidia not observed.

Culture characteristics: Colonies producing abundant white to cinnamon (62) aerial mycelium at 25 °C on MEA, moderate sporulation on the medium surface; reverse sienna (8) to umber (9) after 7 d; chlamydoconidia extensive throughout the medium forming microsclerotia. Optimal growth temperature 25 °C, no growth at 5 °C and 35 °C, after 7 d, colonies at 10 °C, 15 °C, 20 °C, 25 °C and 30 °C reached 21.5 mm, 31.2 mm, 57.1 mm, 81.3 mm and 55.2 mm, respectively.

Specimens examined: China: Fujian Province, Longyan Region, Xinluo District (25°07′08.597″ N, 116°44′42.257″ E), from soil collected in a *Eucalyptus* plantation, 6 November 2016, S.F. Chen, Q.L. Liu and F.F. Liu (HMAS249929, culture CSF9937); Fujian Province, Longyan Region, Liancheng County (25°26′14.348″ N, 116°38′42.400″ E), from soil under a natural forest, 6 November 2016, S.F. Chen, Q.L. Liu and F.F. Liu (HMAS249930, culture CSF9957).

Notes: Isolates CSF9937, CSF9938 and CSF9957 were crossed with each other in all possible combinations on MSA to which autoclaved toothpicks had been placed, randomly distributed on the agar surface. Isolates CSF9937 and CSF9938 readily formed protoperithecia within two weeks, and perithecia with viable ascospores were produced within four weeks, when they crossed with themselves. After eight weeks of incubation, isolate CSF9957 failed to form sexual structures in any combination. *Calonectria aconidialis* is a species in the *Ca. kyotensis* species complex. The ascospores of *Ca. aconidialis* obtained in this study (av. = 34 × 5 µm) were smaller than those of the originally described *Ca. aconidialis* (av. = 36 × 6 µm) [11].
Calonectria hongkongensis

**Figure A8.** Calonectria hongkongensis. (a). Peritheium; (b). vertical section through a perithecium; (c). cells around ostiolar region of perithecium; (d). section through lateral perithecial wall; (e,f). asci; (g,h). ascospores; (i,j). macroconidiophore; (k–m). sphaeropedunculate vesicles; (n,o). conidiogenous apparatus with conidiophore branches and elongate doliiform to reniform phialides; (p,q). macroconidia.—Scale bars: a = 200 µm; b = 100 µm; c–f and i,j = 20 µm; g,h and n–q = 10 µm; k–m = 5 µm.

Description: Ascomata perithecial, solitary or in groups of up to three, orange, becoming red-brown with age; in section, apex and body orange, base dark red-brown, subglobose to ovoid, 243–376 µm high, 219–355 µm diam, body turning red, and base dark red-brown in 3% KOH+; ascomatal wall rough, consisting of two thick-walled layers; outer layer of textura globulosa, 31–54 µm thick, cells becoming more compressed towards the inner layer of textura angularis, 10–28 µm thick, cells becoming thin-walled and hyaline towards the centre; outermost cells 10–25 × 9–23 µm, cells of inner layer 6–24 × 2–6 µm; ascomatal
base up to 168 \( \mu m \) wide, consisting of dark red, angular cells, merging with an erumpent stroma; cells of the outer wall layer continuous with the pseudoparenchymatous cells of the erumpent stroma. *Asci* 8-spored, clavate, 82–148 \( \times \) 12–32 \( \mu m \), tapering into a long thin stalk. *Ascospores* aggregated in the upper third of the ascus, hyaline, guttulate, fusoid with rounded ends, straight to slightly curved, 1-septate, constricted at the septum, \( (23-)25–30(-34) \times (4-)5–7(-8) \mu m \) (av. = 28 \( \times \) 6 \( \mu m \)). *Macroconidiophores* consisting of a stipe, a suite of penicillate arranged fertile branches, a stipe extension, and a terminal vesicle; stipe septate, hyaline, smooth, 47–117 \( \times \) 4–8 \( \mu m \), stipe extension septate, straight to flexuous 68–198 \( \mu m \) long, 1–4 \( \mu m \) wide at the apical septum, terminating in a sphaeropedunculate vesicle, 4–10 \( \mu m \) diam; lateral stipe extensions (90° to main axis) abundant, 42–111 \( \mu m \) long, 1–3 \( \mu m \) wide at the apical septum, terminating in obpyriform vesicles, 2–6 \( \mu m \). *Conidiogenous apparatus* 37–146 \( \mu m \) wide, and 41–111 \( \mu m \) long; primary branches aseptate, 12–28 \( \times \) 3–5.5 \( \mu m \); secondary branches aseptate, 9.5–19 \( \times \) 3–6 \( \mu m \); tertiary branches aseptate, 9–13 \( \times \) 3–5 \( \mu m \), additional branches –5, aseptate, 8–15 \( \times \) 2–4.5 \( \mu m \), each terminal branch producing 2–4 phialides; phialides elongate doliiform to reniform, hyaline, aseptate, 8–14 \( \times \) 2–5 \( \mu m \), apex with minute periclinal thickening and inconspicuous collarette. *Macroconidia* cylindrical, rounded at both ends, straight, \( (34-)37–41(-44) \times (3-)3.5–4(-5) \mu m \) (av. = 39 \( \times \) 4 \( \mu m \)), 1-septate, lacking a visible abscission scar, held in parallel cylindrical clusters by colourless slime. Mega- and microconidia not observed.

Culture characteristics: Colonies forming abundant white to sienna (8) aerial mycelium at 25°C on MEA, with irregular margins, abundant sporulation; surface rust-coloured (39); reverse sienna (8) to umber (9) after 7 d. Chlamydospores extensive throughout the medium forming microsclerotia. Optimal growth temperature 25°C, no growth at 5°C and 35°C, after 7 d, colonies at 10°C, 15°C, 20°C, 25°C and 30°C reached 21.2 mm, 26.1 mm, 46.3 mm, 69.1 mm and 64.1 mm, respectively.

Specimens examined: China: Fujian Province, Zhangzhou Region, Hua’an county (24°53′49.369″ N, 117°32′45.070″ E), from soil collected in a Eucalyptus plantation, 5 November 2016, S.F. Chen, Q.L. Liu and F.F. Liu (HAMAS249931, culture CSF9784).

Notes: Isolates CSF7124, CSF9784 and CSF9794 were crossed with each other in all possible combinations on MSA. Isolates CSF7124 and CSF9784 readily formed protoperithecia within two weeks, and perithecia with viable ascospores were produced within four weeks, when they crossed with themselves. After eight weeks of incubation, isolate CSF9794 failed to form sexual structures in any combination. *Calonectria hongkongensis* is a species in the *Ca. kyotensis* species complex. The ascospores and macroconidia of *Ca. hongkongensis* obtained in this study (ascospores: av. = 28 \( \times \) 6 \( \mu m \); macroconidia: av. = 39 \( \times \) 4 \( \mu m \)) were shorter than those of the originally described *Ca. hongkongensis* (ascospores: av. = 31 \( \times \) 6 \( \mu m \); macroconidia: av. = 46.5 \( \times \) 4 \( \mu m \)) [23]. The vesicle of *Ca. hongkongensis* obtained in this study (4–10 \( \mu m \)) was narrower than those of the originally described *Ca. hongkongensis* (8–14 \( \mu m \)) [23].
*Calonectria ilicicola*

Figure A9. *Calonectria ilicicola*. (a). Perithecium; (b). vertical section through a perithecium; (c). cells around ostiolar region of perithecium; (d). section through lateral perithecial wall; (e,f). asci; (g). ascospores; (h,i). macroconidiophore; (j,k). ovoid to sphaeropedunculate vesicles; (l,m). conidiogenous apparatus with conidiophore branches and elongate doliiform to reniform phialides; (n,o). macroconidia.—Scale bars: a = 200 µm; b = 100 µm; c, d, f and i = 20 µm; e and h = 50 µm; g and l–o = 10 µm; j, k = 5 µm.
Description: Ascomata perithecial, solitary or in groups of two, orange to red, becoming red-brown with age; in section, apex and body red-brown, base dark red-brown, subglobose to ovoid, 375–509 µm high, 363–474 µm diam, body turning dark red, and base dark red-brown in 3% KOH+; ascomatal wall rough, consisting of two thick-walled layers; outer layer of textura globulosa, 47–75 µm thick, cells becoming more compressed towards the inner layer of textura angularis, 14–30 µm thick, cells becoming thin-walled and hyaline towards the centre; outermost cells 9–40 × 8–36 µm, cells of inner layer 10–23 × 2–7 µm; ascomatal base up to 208 µm wide, consisting of dark red, angular cells, merging with an erumpent stroma; cells of the outer wall layer continuous with the pseudoparenchymatous cells of the erumpent stroma. Asci 8-spored, clavate, 70–137 × 12–34 µm, tapering into a long thin stalk.

Ascospores aggregated in the upper third of the ascus, hyaline, guttulate, fusoid with rounded ends, straight to slightly curved, 1-septate, not or slightly constricted at the septum, (30–)37–46.5(–58) × (4–)5–6(–8) µm (av. = 42 × 5 µm). Macroconidiophores consisting of a stipe, a suite of penicillate arranged fertile branches, a stipe extension, and a terminal vesicle; stipe septate, hyaline, smooth, 12–98 × 4–7 µm, stipe extension septate, straight to flexuous 111–216 µm long, 2–4.5 µm wide at the apical septum, terminating in an ovoid to sphaeropedunculate vesicle, 6–13 µm diam; lateral stipe extensions (90° to main axis) absent. Conidiogenous apparatus 32–94 µm wide, and 49–106 µm long; primary branches aseptate, 12–34 × 4–6 µm; secondary branches aseptate, 4–21 × 3.5–6 µm; tertiary branches aseptate, 9–17 × 4–6 µm, each terminal branch producing 2–4 phialides; phialides elongate doliform to reniform, hyaline, aseptate, 8–15 × 3–5 µm, apex with minute periclinal thickening and inconspicuous collarette.

Macroconidia cylindrical, rounded at both ends, straight, (58–)63–70(–76) × 6–7(–8) µm (av. = 67 × 7 µm), (1–)3-septate, lacking a visible abscission scar, held in parallel cylindrical clusters by colourless slime. Mega- and microconidia not observed.

Culture characteristics: Colonies forming abundant white to cinnamon (62) aerial mycelium at 25 °C on MEA, with irregular margins, profuse sporulation; reverse with cinnamon (62) outer margin, and rust (39) inner region after 7 d. Chlamydospores extensive throughout the medium forming microsclerotia. Optimal growth temperature 25 °C, no growth at 5 °C and 35 °C, after 7 d, colonies at 10 °C, 15 °C, 20 °C, 25 °C and 30 °C reached 16.1 mm, 24.9 mm, 54.8 mm, 74.3 mm and 66.4 mm, respectively.

Specimens examined: China: Fujian Province, Longyan Region, Zhangping County (25°17′10.882″ N, 117°27′33.635″ E), from soil collected in a Eucalyptus plantation, 6 November 2016, S.F. Chen, Q.L. Liu and F.F. Liu (HMAS249932, culture CSF9862).

Notes: Isolates CSF9862 and CSF9863 were crossed with each other on MSA and they were readily formed protoperithecia within two weeks, and perithecia with viable ascospores were produced within four weeks, when they crossed with themselves. Calonectria ilicicola is a species in the Ca. kyotensis species. The ascospores of Ca. ilicicola (av. = 42 × 5.5 µm) obtained in this study were smaller than those of the originally described Ca. ilicicola (av. = 45 × 6 µm) [17], and the macroconidia of Ca. ilicicola (av. = 67 × 7 µm) were larger than those of the originally described Ca. ilicicola (av. = 62 × 6 µm) [17], and they share similar vesicle dimensions.
**Calonectria kyotensis**

*Figure A10*. *Calonectria kyotensis*. (a). Perithecium; (b). vertical section through a perithecium; (c). cells around ostiolar region of perithecium; (d). section through lateral perithecial wall; (e,f). asci; (g,h). ascospores; (i–k). macroconidiophore; (l–n). sphaeropedunculate vesicles; (o,p). conidiogenous apparatus with conidiophore branches and elongate doliform to reniform phialides; (q). macroconidia.—Scale bars: a = 200 µm; b = 100 µm; c, d, f, j and k = 20 µm; e and i = 50 µm; g, h and o–q = 10 µm; l–n = 5 µm.
After eight weeks of incubation, isolates CSF7130 and CSF10004 failed to form sexual (8) to umber (9) after 7 d. Chlamydospores extensive throughout the medium forming (28–)32–35.5(–39.5) × microsclerotia. Optimal growth temperature 25 °C, 10 °C, colonies at 10 °C, 15 °C, 20 °C, 25 °C and 30 °C reached 16.2 mm, 23.2 mm, 52.1 mm, 66.3 mm and 61.5 mm, respectively.

Specimens examined: China: Fujian Province, Zhangzhou Region, Hu’a’an county (24°53′49.369″N, 117°32′45.070″E), from soil collected in a Eucalyptus plantation, 5 November 2016, S.F. Chen, Q.L. Liu and F.F. Liu (HMAS249933, culture CSF9824); Fujian Province, Longyan Region, Liancheng county (25°33′06.994″N, 116°41′42.328″E), from soil collected in a Eucalyptus plantation, 6 November 2016, S.F. Chen, Q.L. Liu and F.F. Liu (HMAS249934, culture CSF10004).

Notes: Isolates CSF7130, CSF9824 and CSF10004 were crossed with each other in all possible combinations on MSA. Isolates CSF9824 readily formed protoperithecia within two weeks. After eight weeks of incubation, isolates CSF7130 and CSF10004 failed to form sexual structures in any combination. Calonectria kyotensis is a species in the Ca. kyotensis species. The ascospores of Ca. kyotensis (av. = 34.5 × 6.5 μm) obtained in this study were longer than those of the originally described Ca. kyotensis (av. = 29 × 6 μm) [47], while the macroconidia of Ca. kyotensis (av. = 33.5 × 3.5 μm) in this study were shorter than those of the originally described Ca. kyotensis (av. = 41 × 4 μm) [47], and the vesicle in this study (4–10 μm) was narrower than those of originally described Ca. kyotensis (8.8–19 μm) [47].
**Calonectria pacifica**

**Figure A11.** *Calonectria pacifica*. (a–c). Macroconidiophore; (d–g). ovoid to sphaeropedunculate vesicles; (h–j). conidiogenous apparatus with conidiophore branches and doliiform to reniform phialides; (k,l). macroconidia.—Scale bars: a–c = 20 µm; d–g = 5 µm; h–l = 10 µm.

Description: Sexual morph unknown. Macroconidiophores consisting of a stipe, a suite of penicillate arranged fertile branches, a stipe extension, and a terminal vesicle; stipe septate, hyaline, smooth, 44–115 × 4–7 µm; stipe extensions septate, straight to flexuous 73.5–171 µm long, 2–3.5 µm wide, at the apical septum, terminating in an ovoid to sphaeropedunculate vesicle, 4–10 µm diam; lateral stipe extensions (90° to main axis) abundant, 36–98 µm long, 1.5–2.5 µm wide at the apical septum, terminating in an ovoid vesicles, 3–5 µm diam. Conidiogenous apparatus 45–105 µm wide, and 35–81 µm long; primary branches aseptate, 12.5–23 × 4–6 µm; secondary branches aseptate, 10–20 × 3–6 µm; tertiary branches aseptate, 10–15 × 3–5 µm, each terminal branch producing 2–4 phialides; phialides doliiform to reniform, hyaline, aseptate, 6–15 × 3–5 µm, apex with minute periclinal thickening and inconspicuous collarette. Macroconidia cylindrical, rounded at both ends, straight, (36–)40–46(–48) × (3.5–)4–5(–6) µm, (av. = 43 × 5 µm), 1-septate, lacking a visible abscission scar, held in parallel cylindrical clusters by colourless slime. Mega- and microconidia not observed.

Culture characteristics: Colonies forming sparse white to sienna (8) aerial mycelium at 25 °C on MEA, with feathery, irregular margins at the edges, abundant sporulation; reverse sienna (8) to umber (9) after 7 d. Optimal growth temperature 25 °C, no growth at 5 °C and
35 °C, after 7 d, colonies at 10 °C, 15 °C, 20 °C, 25 °C and 30 °C reached 15.1 mm, 21.4 mm, 45.1 mm, 58.2 mm and 42.1 mm, respectively.

Specimens examined: China: Fujian Province, Nanping Region, Yanping District (26°42′26.672″ N, 118°07′58.317″ E), from soil under a natural forest, 08 November 2016, S.F. Chen, Q.L. Liu and F.F. Liu (HMAS249938, culture CSF10070); Fujian Province: Nanping Region, Yanping District (26°42′26.672″ N, 118°07′58.317″ E), from soil under a natural forest, 08 November 2016, S.F. Chen, Q.L. Liu and F.F. Liu (HMAS249939, culture CSF10077).

Notes: Isolates CSF10024, CSF10070 and CSF10077 were crossed with each other in all possible combinations on MSA and failed to form sexual structures in any combination. *Calonectria pacifica* is a species in the *Ca. kyotensis* species complex. The macroconidia of *Ca. pacifica* (av. = 43 × 5 µm) obtained in this study were shorter than those of the originally described *Ca. pacifica* (av. = 55 × 4.5 µm) [17], and the vesicles were narrower than those of originally described strains of *Ca. pacifica* (7–15 µm) [17].

*Calonectria pseudoreteaudii*

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*Figure A12. Calonectria pseudoreteaudii.* (a–c). Macroconidiophore; (d–f). clavate to narrowly clavate vesicle; (g–i) conidiogenous apparatus with conidiophore branches and cylindrical to allantoid phialides; (j–l). macroconidia.—Scale bars: a–c = 20 µm; d–f = 5 µm; g–l = 10 µm.
Description: Sexual morph unknown. Macroconidiophores consisting of a stipe, a suite of penicillate arranged fertile branches, a stipe extension, and a terminal vesicle; stipe septate, hyaline, smooth, 81–145 × 3–8 µm; stipe extensions septate, straight to flexuous 150–268 µm long, 5–7 µm wide, at the apical septum, terminating in a narrowly clavate vesicle, 3–5 µm diam. Conidiogenous apparatus 68–140 µm long, and 30–92 µm wide; primary branches aseptate or 1-septate, 19–34 × 4–6 µm; secondary branches aseptate, 16–25 × 4–5 µm; tertiary branches aseptate, 13–22 × 3–5 µm, each terminal branch producing 1–3 phialides; phialides cylindrical to allantoid, hyaline, aseptate, 10–18 × 3–5 µm, apex with minute periclinal thickening and inconspicuous collarette. Macroconidia cylindrical, rounded at the apex, flattened at the base, straight, (54.5–)73–88.5(–96) × (6–)6.5–8(–9) µm, (av. = 81 × 7.5 µm), 5-septate, lacking a visible abscission scar, held in parallel cylindrical clusters by colourless slime. Mega- and microconidia not observed.

Culture characteristics: Colonies forming white to sienna (8) aerial mycelium at 25 °C on MEA, with feathery, regular margins at the edges, abundant sporulation; reverse sienna (8) to chestnut (40) after 7 d; chlamydospores extensive throughout the medium, forming microsclerotia. Optimal growth temperature 25 °C, no growth at 5 °C and 35 °C, after 7 d, colonies at 10 °C, 15 °C, 20 °C, 25 °C and 30 °C reached 19.3 mm, 25.1 mm, 49.2 mm, 59.1 mm and 47.1 mm, respectively.

Specimens examined: China: Fujian Province, Nanping Region, Yanping District (26°46′19.651″N, 117°57′37.233″E), from soil collected in a Eucalyptus plantation, 08 November 2016, S.F. Chen, Q.L. Liu and F.F. Liu (HMAS249940, culture CSF10059); Fujian Province: Nanping Region, Yanping District (26°46′19.651″N, 117°57′37.233″E), from soil collected in a Eucalyptus plantation, 08 November 2016, S.F. Chen, Q.L. Liu and F.F. Liu (HMAS249941, culture CSF10060).

Notes: Isolates CSF10059 and CSF10060 were crossed with each other on MSA and failed to form sexual structures in any combination. Calonectria pseudoreteaudii is a species in the Ca. reteaudii species complex. The macroconidia of isolates obtained in this study (av. = 81 × 7.5 µm) were much shorter than those of the originally described strains of Ca. pseudoreteaudii (av. = 104 × 8 µm) [24].

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