Article

Multi-Gene Phylogeny and Morphology Reveal
Haplohelminthosporium gen. nov. and Helminthosporiella gen. nov. Associated with Palms in Thailand and A Checklist for Helminthosporium Reported Worldwide

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Citation: Konta, S.; Hyde, K.D.; Karunarathna, S.C.; Mapook, A.; Senwanna, C.; Dauner, L.A.P.; Nanayakkara, C.M.; Xu, J.; Tibpromma, S.; Lumyong, S. Multi-Gene Phylogeny and Morphology Reveal Haplohelminthosporium gen. nov. and Helminthosporiella gen. nov. Associated with Palms in Thailand and A Checklist for Helminthosporium Reported Worldwide. *Life* 2021, 11, 454. https://doi.org/10.3390/life11050454

Abstract: Palms (Arecaceae) are substrates for a highly diverse range of fungi. Many species are known as saprobes and many are important plant pathogens. Over the course of our studies of microfungi from palms in Thailand, two new taxa were discovered. Morphological characteristics and phylogenetic analyses of combined ITS, LSU, SSU, and tef1-α sequence data revealed their taxonomic positions within Massarinaceae. There are currently ten genera identified and accepted in Massarinaceae, with the addition of the two new genera of *Haplohelminthosporium* and *Helminthosporiella*, that are introduced in this paper. Each new genus is provided with a full description and notes, and each new taxon is provided with an illustration for the holotype. A list of identified and accepted species of *Helminthosporium* with morphology, host information, locality, sequence data, and related references of *Helminthosporium* reported worldwide is provided based on records in Species Fungorum 2021. This work provides a micro-fungi database of *Haplohelminthosporium*, *Helminthosporiella*, and *Helminthosporium* which can be modified and validated as new data come to light.

Keywords: 4 new taxa; Massarinaceae; morphology; multi-genes; palm fungi; Thailand

1. Introduction

In Thailand, a large number of novel fungi from a variety of hosts have been recently described, adding to the region’s highly known fungal diversity [1,2]. This diversity is supported by various factors, including host–plant species relationships, geography, seasons, air humidity, and temperature. Many interesting fungi from Thai monocotyledons such as bamboo (Poaceae) and Pandanaceae have been described in previous studies, and some new taxa and records of microfungi on palms have been published, especially from the southern region of Thailand [3–11]. However, more research on fungal diversity on palms in Thailand is needed.
Pleosporales is the largest order in Dothideomycetes [12] with 566 genera in 91 families accepted, while 48 genera have been placed in Pleosporales genera incertae sedis with an estimated stem age of 205 MYA [12,13]. Massarinaceae is a family within Pleosporales introduced by Munk [14] to accommodate the genus Massarina, with M. eburnea being designated as the type species and described based on the sexual morph [15]. Hongsanan et al. [12] and Wijayawardene et al. [13] accepted nine genera in Massarinaceae (Byssothecium, Helminthosporiella, Helminthosporium, Massarina, Pseudodidymosphaeria, Pseudoplanchnonema, Semifissispora, Stagonospora, and Suttonomyces).

Helminthosporium has the asexual morph of H. velutinum as the type species. It is characterized by terminal and intercalary conidiogenous cells as well as solitary conidia with distosepta [16]. The members of this genus are commonly found as saprobics and endophytes, but they are often isolated from dead corticated twigs or wood, living leaves, and soils [17–23]. Most Helminthosporium species have been described based on their asexual morph, and only a few species have been described based on both morphs viz., H. massarinum, H. microsorum, H. oligosporum, H. quercicola, H. quercinum, and H. tiliae [19,21,24]. Several species in the Helminthosporium complex are polyphyletic and have been placed in other genera viz. Bipolaris, Curvularia, and Exserohilum within Pleosporales, other families viz. Corynesporaceae, Massarinaceae, and Mycosphaerellaceae within Dothideomycetes, or other unrelated Ascomycetes groups that were initially based on morphological characteristics and later on molecular data, although some species still remain unresolved [20,25–37]. Wijayawardene et al. [13] approximated the number of taxa in Helminthosporium at 416 species. However, this genus was not updated with the DNA sequences in the most recent monograph.

Few previous studies have investigated the Helminthosporium-like taxa from plants, particularly palms, in Thailand. In this study, we were able to isolate Helminthosporium-like taxa from palms collected in Thailand. Morphology and multi-gene phylogenetic analyses showed two Helminthosporium-like taxa are novel in Massarinaceae. In addition, we provide a checklist of Helminthosporium and the name for Helminthosporiella stilbacea is also validated.

2. Materials and Methods

2.1. Collection, Isolation, and Identification

The plant materials containing the fungal structures were collected from Krabi and Prachuap Khiri Khan Provinces, Thailand, from living and dead parts of palm trees (Calamus sp. and Cocos nucifera). Samples were taken to the laboratory for morphological study following the methods provided by Konta et al. [9]. Single spore isolates were obtained following the method of Senanayake et al. [38]. Measurements were taken using an Image Framework program. Illustrations were made in Adobe Photoshop CS6. Specimens and cultures were deposited in the herbarium of Mae Fah Luang University (MFLU) and Mae Fah Luang Culture Collection (MFLUCC). Faces of Fungi and Index Fungorum numbers were registered as outlined in Jayasiri et al. [39] and Index Fungorum [40], respectively.

2.2. DNA Extraction and Amplification (PCR)

DNA extraction was performed using the Biospin Fungus genomic DNA extraction kit-BSC14S1 (Bioflux, P.R. China) according to Dissanayake et al. [41]. Partial nucleotide genes were subjected to PCR amplification and sequencing of the large subunit (28S, LSU) [42], the internal transcribed spacer (ITS) [43], the small subunit (18S, SSU) [43], and the translation elongation factor 1-alpha (tef1-α) was performed [44,45]. For primers and conditions, see Table 1. PCR amplification and sequencing were carried out following Konta et al. [9]. The resulting fragments were sequenced in both forward and reverse directions, the generated DNA sequences were analysed, and the consensus sequences were computed using SeqMan software. New sequences generated in this study were deposited in GenBank (Table 2).
Table 1. Details of genes/loci with PCR primers and PCR conditions.

| Genes/loci | PCR Primer (Forward/Reverse) | PCR Conditions |
|------------|-----------------------------|----------------|
| LSU        | LR0R/LR5                    | a; 95 °C: 30 s, 55 °C: 50 s, 72 °C: 30 s (35 cycles); b |
| ITS        | ITS5/ITS4                   |               |
| SSU        | NS1/NS4                     |               |
| tef1-α     | 983F/2218R                  |               |

a Initiation step of 95 °C: 3 min; b Final elongation step of 72 °C: 10 min and final hold at 4 °C.

2.3. Phylogenetic Analyses

The sequences generated in this study were subjected to a BLAST search in GenBank to identify closely related sequences. Sequence data retrieved from GenBank and recent publications were used as references [24]. Sequence data for the ITS, LSU, SSU, and tef1-α regions were analysed both individually and in combination. A total of 93 taxa were used for the combined phylogenetic analyses (ITS, LSU, SSU, and tef1-α) in order to find a natural classification placement. In addition, 103 taxa of ITS and 113 taxa of LSU were used for phylogenetic analyses. For both the individual and combined phylogenetic analyses, *Cyclothyriella rubronotata* (Cyclothyriellaceae) was selected as the outgroup taxon. Absent sequence data (i.e., ITS, LSU, SSU, tef1-α sequence data) in the alignments were treated with gaps as missing data. Sequence alignments were carried out with MAFFT v.6.864b [46] and were manually improved where necessary. The single gene datasets were combined using Mega7 [47]. Data were converted from fasta to nexus and PHYLIP format with Alignment Transformation Environment online, https://sing.eu.uvigo.es/ALTER/ (accessed on 15 July 2020) [48]. The tree topologies obtained from single gene sequence data were compared prior to the combined gene analysis in order to check for incongruence in the overall topology of the phylogenetic tree. Maximum likelihood (ML) analysis was accomplished using RAxML-HPC2 (v.8.2.12) on XSEDE in the CIPRES Science Gateway platform (http://www.phylo.org) (accessed on 12 May 2020) [49] with GTR+GAMMA model and set as 1000 bootstrap replicates. Bayesian analysis was performed at CIPRES using Bayesian analysis on XSEDE (v.3.2.7) as part of the “MrBayes on XSEDE” tool [49–51]. GTR+I+G model was selected by using MrModelTest 2.2 [52] under the Akaike information criterion (AIC) as the best-fit models of the combined dataset for maximum likelihood and Bayesian analysis [52]. Bayesian posterior probabilities (BYPP) were determined by Markov Chain Monte Carlo sampling (MCMC) in MrBayes on XSEDE v.3.2.7. Six simultaneous Markov chains were run for 5,000,000 generations and trees were sampled every 1000th generation. An MCMC heated chain was set with a “temperature” value of 0.20. All sampled topologies beneath the asymptote (25%) were discarded as part of a burn-in procedure; the remaining trees (7502) were used for calculating posterior probabilities in the majority rule consensus tree. Bootstrap support values for ML and BYPP are given near to each node (Figures 1 and 2). The phylogenetic trees were configured in FigTree v1.4.0 [53] and edited using Microsoft Office PowerPoint 2016 and Adobe Photoshop CS6 (Adobe Systems, San Jose, CA, USA).
Figure 1. Comparison of the topology of Maximum likelihood majority rule consensus tree for the analyses of some selected Corynesporaceae, Massarinaceae, and Perioconiaceae isolates. (A) Phylogenetic tree of the dataset for ITS sequence data. (B) Phylogenetic tree of the dataset for LSU sequence data. Bootstrap support values for maximum likelihood (ML) equal to or higher than 50%, and Bayesian Posterior Probabilities (BYPP) equal to or greater than 0.90 are given above each branch. Novel taxa are in blue. Ex-type strains are in bold. The tree is rooted to *Cyclothyriella rubronotata* strains TR, TR9 (*Cyclothyriellaceae*).
Figure 2. Maximum likelihood majority rule consensus tree for the analyses of Massarinaceae and sister family Perioconiaceae isolates based on a dataset of combined ITS, LSU, SSU, and tef1-α sequence data. Bootstrap support values for maximum likelihood (ML) equal to or higher than 50%, and Bayesian posterior probabilities (BYPP) equal to or greater than 0.90 are given above each branch. Novel taxa are in blue. Ex-type strains are in bold. The tree is rooted to *Cyclothyriella rubronotata* strains TR, TR9 (Cyclothyriellaceae).
| Family              | Species                  | Strain No. | ITS  | LSU Accession No. | SSU  | tef1-α | References |
|---------------------|--------------------------|------------|------|-------------------|------|--------|------------|
| Corynesporaceae     | *Corynespora cassiicola* | CBS 100,822| -    | GU301808          | GU296144 | GU349052 | [54]       |
| Corynesporaceae     | *Corynespora cassiicola* | CCP        | KF810854 | -                 | GU296145 | -        |            |
| Corynesporaceae     | *Corynespora smithii*    | CBS 139,925| KY984299 | KY984299          | -    | -      | [54,55]    |
| Corynesporaceae     | *Corynespora smithii*    | L120       | KY984297 | KY984297          | -    | KY984435 | [21]       |
| Corynesporaceae     | *Corynespora smithii*    | L130       | KY984298 | KY984298          | KY984419 | KY984436 | [21]       |
| Corynesporaceae     | *Corynespora smithii*    | L139       | KY984300 | KY984300          | -    | -      | [21]       |
| Cyclothyriellaceae  | *Cyclothyriella rubronotata* | TR         | KX650541 | KX650541          | KX650507 | KX650516 | [56]       |
| Massarinaceae       | *Byssothecium circinans*| CBS 675.92 | -    | GU205217          | GU205235 | GU349061 | [54]       |
| Massarinaceae       | *Byssothecium circinans*| CBS 675.92 | -    | AY016357          | AY016339 | -        |            |
| Massarinaceae       | *Haplohelmintosporium calami* | MFLUCC 18-0074 | MT928158 | MT928156          | MT928160 | -        | [57,58]    |
| Massarinaceae       | *Helmintosporium aquaticum* | MFLUCC 15-0357 | KU697302 | KU697306          | KU697310 | -        | [20]       |
| Massarinaceae       | *Helmintosporium aquaticum* | DLUCC 0758 | MG098779 | MG098786          | MG098795 | MG98585  | [24]       |
| Massarinaceae       | *Helmintosporium austriacum* | L132 *   | KY984301 | KY984301          | KY984420 | KY984437 | [21]       |
| Massarinaceae       | *Helmintosporium austriacum* | L169     | KY984303 | KY984303          | -     | KY984439 | [21]       |
| Massarinaceae       | *Helmintosporium austriacum* | L137     | KY984302 | KY984302          | -     | KY984438 | [21]       |
| Massarinaceae       | *Helmintosporium caespitosum* | L99 *    | JQ044429 | JQ044448          | KY984421 | KY984440 | [21]       |
| Massarinaceae       | *Helmintosporium caespitosum* | L141    | KY984305 | KY984305          | -     | -       | [21]       |
| Massarinaceae       | *Helmintosporium caespitosum* | L151    | KY984306 | KY984306          | -     | -       | [21]       |
| Massarinaceae       | *Helmintosporium dalbergiae* | H 4628   | LC014555 | AB807521          | AB797231 | AB808497 | [19]       |
| Massarinaceae       | *Helmintosporium endiandrae* | CBS 138902 | KP004450 | KP004478          | -     | -       | [59]       |
| Massarinaceae       | *Helmintosporium endiandrae* | CBS 138,902 | -    | MH878637          | -     | -       | [60]       |
| Family               | Species                      | Strain No. | ITS       | LSU       | SSU       | tef1-α    | References |
|---------------------|------------------------------|------------|-----------|-----------|-----------|-----------|------------|
| Massarinaceae       | Helminthosporium endiandrae | SM64       | MT279335  | -         | -         | -         | Unpublished|
| Massarinaceae       | Helminthosporium endiandrae | SM61       | MT279339  | -         | -         | -         | Unpublished|
| Massarinaceae       | Helminthosporium endiandrae | SM64       | MT279340  | -         | -         | -         | Unpublished|
| Massarinaceae       | Helminthosporium endiandrae | SM61       | MT279336  | -         | -         | -         | Unpublished|
| Massarinaceae       | Helminthosporium endiandrae | AKRM1      | MN880136  | -         | -         | -         | Unpublished|
| Massarinaceae       | Helminthosporium erythrinicola | CBS 145,569 | MK876391  | MK876432  | -         | -         | [22]       |
| Massarinaceae       | Helminthosporium genistae   | L128       | KY984308  | KY984308  | KY984422  | -         | [21]       |
| Massarinaceae       | Helminthosporium genistae   | L129       | KY984309  | KY984309  | KY984423  | -         | [21]       |
| Massarinaceae       | Helminthosporium genistae   | L142 *     | KY984310  | KY984310  | -         | -         | [21]       |
| Massarinaceae       | Helminthosporium hispanicum | L109 *     | KY984318  | KY984318  | KY984424  | KY984441  | [21]       |
| Massarinaceae       | Helminthosporium italicum   | MFLUCC 17-0241 | KY977638  | KY984308  | KY984422  | -         | [21]       |
| Massarinaceae       | Helminthosporium juglandinum | L97        | KY984322  | KY984322  | KY984425  | KY984445  | [21]       |
| Massarinaceae       | Helminthosporium juglandinum | L118 *     | KY984321  | KY984321  | -         | KY984444  | [21]       |
| Massarinaceae       | Helminthosporium leucadendri | CBS 135133 *  | KF251150  | KF251654  | -         | KF253110  | [62]       |
| Massarinaceae       | Helminthosporium magnisporum | H 4627 *  | AB811452  | AB807522  | AB979232  | AB808498  | [19]       |
| Massarinaceae       | Helminthosporium massarinum | KT 1564 *  | AB809629  | AB807524  | AB979234  | AB808500  | [19]       |
| Massarinaceae       | Helminthosporium massarinum | KT 838     | AB809628  | AB807523  | AB979233  | AB808499  | [19]       |
| Massarinaceae       | Helminthosporium microsorum | L94        | KY984327  | KY984327  | KY984426  | KY984446  | [21]       |
| Massarinaceae       | Helminthosporium microsorum | L95        | KY984328  | KY984328  | -         | KY984447  | [21]       |
| Massarinaceae       | Helminthosporium microsorum | L96 *      | KY984329  | KY984329  | KY984427  | KY984448  | [21]       |
| Massarinaceae       | Helminthosporium oligosporum | L92        | KY984332  | KY984332  | KY984428  | KY984450  | [21]       |
| Massarinaceae       | Helminthosporium oligosporum | L93 *      | KY984333  | KY984333  | -         | KY984451  | [21]       |
| Family       | Species                          | Strain No. | GenBank Accession No. | References |
|--------------|----------------------------------|------------|-----------------------|------------|
| Massarinaceae| *Helminthosporium* oligosporum  | L106       | KY984330 KY984330 -  | KY984449 [21] |
| Massarinaceae| *H. quercinum*                   | L90 *      | KY984339 KY984339 KY984429 KY984453 [21] |
| Massarinaceae| *H. quercinum*                   | L91        | KY984340 KY984340 -  | KY984454 [21] |
| Massarinaceae| *H. solani*                      | CBS 365.75 | KY984341 KY984341 KY984430 KY984455 [21] |
| Massarinaceae| *H. solani*                      | CBS 640.85 | KY984342 KY984342 -  | - [21] |
| Massarinaceae| *Helminthosporiella stilbacea*  | CPHmZC-01  | KX228298 KX228355 -  | - [63] |
| Massarinaceae| *H. stilbacea*                   | COAD 2126  | MG668862 - - -       | - [64] |
| Massarinaceae| *H. stilbacea*                   | MFLUCC 15-0813 * | MT928159 MT928157 MT928161 MT928151 | This study |
| Massarinaceae| *H. submersum*                   | MFLUCC 16-1360 * | - MG098787 MG098796 MG098586 | [24] |
| Massarinaceae| *H. submersum*                   | MFLUCC 16-1290 | MG098780 MG098788 MG098797 MG098587 | [24] |
| Massarinaceae| *H. submersum*                   | DLUCC 0805  | MG098781 MG098789 MG098798 - | - [24] |
| Massarinaceae| *Helminthosporium syzygii*       | CBS 145,570 * | MK876392 MK876433 -  | - [22] |
| Massarinaceae| *Helminthosporium tiliae*        | L88 *      | KY984345 KY984345 KY984431 KY984457 | [21] |
| Massarinaceae| *H. tiliae*                      | L89        | KY984346 KY984346 -  | - [21] |
| Massarinaceae| *H. tiliae*                      | L171       | KY984343 KY984343 -  | KY984456 [21] |
| Massarinaceae| *Helminthosporium velutinum*     | yone 38    | - AB807527 AB797237 AB808502 | [19] |
| Massarinaceae| *H. velutinum*                   | yone 63    | - AB807528 AB797238 AB808503 | [19] |
| Massarinaceae| *H. velutinum*                   | MFLUCC 15-0423 | KU697300 KU697304 KU697308 - | [20] |
| Massarinaceae| *H. velutinum*                   | MFLUCC 15-0428 | KU697299 KU697303 KU697307 - | [20] |
| Massarinaceae| *H. velutinum*                   | H 4626     | LCC014556 AB807530 AB797240 AB808505 | [19] |
| Massarinaceae| *H. velutinum*                   | L117       | KY984349 KY984349 -  | KY984460 [21] |
| Massarinaceae| *H. velutinum*                   | L126       | KY984350 KY984350 -  | KY984461 [21] |
| Massarinaceae| *H. velutinum*                   | L131 *     | KY984352 KY984352 KY984432 KY984463 | [21] |
| Family                  | Species                     | Strain No.          | GenBank Accession No.       | References |
|------------------------|-----------------------------|---------------------|-----------------------------|------------|
|                        |                             |                     | ITS | LSU | SSU | tef1-α |                      |
| Massarinaceae          | *Helminthosporium velutinum*| CPC 26297 = CBS 141,504 | KX306757 | KX306785 | - | - | [65]   |
| Massarinaceae          | *Helminthosporium velutinum*| yone 96            | LC014558 | AB807529 | AB797239 | AB808504 | [19]   |
| Massarinaceae          | *Helminthosporium velutinum*| H 4739             | LC014557 | AB807525 | AB797235 | AB808501 | [19]   |
| Massarinaceae          | *Helminthosporium velutinum*| L115               | KY984347 | KY984347 | - | KY984458 | [21]   |
| Massarinaceae          | *Helminthosporium velutinum*| L116               | KY984348 | KY984348 | - | KY984459 | [21]   |
| Massarinaceae          | *Helminthosporium velutinum*| L127               | KY984351 | KY984351 | - | KY984462 | [21]   |
| Massarinaceae          | *Helminthosporium velutinum*| L98                | KY984359 | KY984359 | KY984433 | KY984466 | [21]   |
| Massarinaceae          | *Helminthosporium velutinum*| H 4743             | -       | AB807526 | AB797236 | - | [19]   |
| Massarinaceae          | *Helminthosporium velutinum*| MFLUCC 16-1096     | MG098783 | MG098791 | MG098799 | MG098588 | [24]   |
| Massarinaceae          | *Helminthosporium velutinum*| MFLUCC 16-1282     | MG098784 | MG098792 | MG098800 | MG098589 | [24]   |
| Massarinaceae          | *Helminthosporium velutinum*| MFLUCC 17-1707     | MG098785 | MG098793 | MG098801 | MG098590 | [24]   |
| Massarinaceae          | *Helminthosporium velutinum*| MFLUCC 17-1321     | -       | MG098794 | MG098802 | MG098591 | [24]   |
| Massarinaceae          | *Helminthosporium velutinum*| S-076              | KU697301 | KU697305 | KU697305 | - | [20]   |
| Massarinaceae          | *Helminthosporium velutinum*| MFLUCC 15-0243     | KU697301 | KU697305 | KU697305 | - | [20]   |
| Massarinaceae          | *Helminthosporium velutinum*| MFLUCC 16-1300     | MG098782 | MG098790 | - | - | [24]   |
| Massarinaceae          | Massarina albocarnis        | CBS119345          | LC194503 | LC194379 | LC194337 | LC194416 | [66]   |
| Massarinaceae          | Massarina cisti             | CBS 266.62 *       | LC014568 | AB807539 | AB797249 | AB808514 | [19]   |
| Massarinaceae          | Massarina cisti             | CBS 266.62         | -       | FJ795447 | FJ795490 | - | [67]   |
| Massarinaceae          | Massarina eburnea           | CBS 473.64         | AF383959 | GU301840 | AF164367 | - | [60,68] |
| Massarinaceae          | Massarina eburnea           | JCM 14422          | LC014569 | AB521735 | AB521718 | AB808517 | [19]   |
| Massarinaceae          | Massarina igniaria          | CBS 845.96         | -       | FJ795452 | FJ795494 | - | [67]   |
| Massarinaceae          | Massarina pandanicola       | MFLUCC 17-0596     | MG646958 | MG646947 | MG646979 | MG646986 | [4]     |
| Massarinaceae          | Massarina phragmiticola     | CBS 110,446        | -       | DQ813510 | DQ813512 | - | [69]   |
| Family          | Species                      | Strain No. | GenBank Accession No. | References |
|-----------------|------------------------------|------------|-----------------------|------------|
|                 |                              |            | **ITS**               | **LSU**    | **SSU**   | **tef1-α** | **References** |
| Massarinaceae   | Neottiiosporina paspali      | CBS 331.37 | -                     | EU754172  | EU754073  | -          | [70]          |
| Massarinaceae   | Pseudodidymosphaeria spartii | CBS 183.58 | -                     | GU205225  | GU205250  | -          | [71]          |
| Massarinaceae   | Pseudodidymosphaeria spartii | MFLUCC 13-0273 | KP325434  | KP325436  | KP325438  | -          | [72]          |
| Massarinaceae   | Pseudodidymosphaeria spartii | MFLUCC 14-1212 | KP325435  | KP325437  | KP325439  | -          | [72]          |
| Massarinaceae   | Pseudosplanchnonema phorcioides | MFLUCC 14-0618 | KP683372  | KP683373  | KP683374  | -          | [72]          |
| Massarinaceae   | Pseudosplanchnonema phorcioides | MFLUCC 13-0533 | -          | KM875454  | KM875455  | -          | [73]          |
| Massarinaceae   | Pseudosplanchnonema phorcioides | L16        | KY984360  | -          | KY984434  | KY984467  | [21]          |
| Massarinaceae   | Pseudosplanchnonema phorcioides | MFLUCC 13-0611 | KP683375  | KP683376  | KP683377  | -          | [21]          |
| Massarinaceae   | Senfissispora natalis       | CPC 25383  | KT950846  | KT950858  | -          | KT950878  | [21]          |
| Massarinaceae   | Senfissispora natalis       | CBS 140659 | -          | MH878157  | -          | -          | [21]          |
| Massarinaceae   | Senfissispora rotundata     | CPC 549    | KT950847  | KT950859  | -          | -          | [21]          |
| Massarinaceae   | Senfissispora tooloomensis  | CBS143431  | MG38607   | MG386124  | -          | -          | [21]          |
| Massarinaceae   | Stagonospora perfecta       | KT 1726A   | AB809642  | AB807579  | AB797289  | AB808555  | [19]          |
| Massarinaceae   | Stagonospora cf. paludosa   | CBS 130,005 | KF251254  | KF251757  | -          | -          | [62]          |
| Massarinaceae   | Stagonospora duoseptata     | CBS 135,093 | KF251255  | KF251758  | -          | -          | [62]          |
| Massarinaceae   | Stagonospora imperaticola   | MFLUCC 15-0026 | KY706143  | KY706133  | KY706138  | KY706146  | [74]          |
| Massarinaceae   | Stagonospora multiseptata   | MFLUCC 15-0449 | KX956735  | KX954404  | -          | -          | [74]          |
| Massarinaceae   | Stagonospora paludosa       | CBS 135088 * | KF251257  | KF251760  | -          | KF253207  | [62]          |
| Massarinaceae   | Stagonospora perfecta       | CBS 135,099 | KF251258  | KF251761  | -          | -          | [62]          |
| Massarinaceae   | Stagonospora perfecta       | KT 1726A   | AB809642  | AB807579  | AB797289  | AB808555  | [19]          |
| Massarinaceae   | Stagonospora pseudocaricis  | CBS 135,132 | KF251259  | KF251763  | -          | -          | [62]          |
| Massarinaceae   | Stagonospora pseudopaludosa | CPC 22,654  | KF777188  | KF777239  | -          | -          | [62]          |
| Massarinaceae   | Stagonospora pseudoperfecta | KT 889 *   | AB809641  | AB807577  | AB797287  | AB808553  | [19]          |
| Massarinaceae   | Stagonospora sp.            | CBS 135,096 | KF251263  | KF251766  | -          | -          | [62]          |
Table 2. Cont.

| Family           | Species                      | Strain No. | GenBank Accession No. | References |
|------------------|------------------------------|------------|-----------------------|------------|
|                  |                              |            | ITS                   | LSU        | SSU       | tef1-α    |            |
| Massarinaceae    | *Stagonospora tainanensis*   | KT 1866    | AB809643              | AB807580   | AB797290  | AB808556  | [19]       |
| Massarinaceae    | *Stagonospora trichophoricola* | CBS 136,764 | KJ869110          | KJ869168   | -         | -         | [75]       |
| Massarinaceae    | *Stagonospora uniseptata*    | CPC 22,150 | KF251266             | KF251769   | -         | -         | [62]       |
| Massarinaceae    | *Stagonospora uniseptata*    | CBS 135,090| KF251264             | KF251767   | -         | -         | [62]       |
| Massarinaceae    | *Suttonomyces clematidis*    | MFLUCC 14-0240 | -              | KP842917   | KP842920  | -         | [76]       |
| Massarinaceae    | *Suttonomyces rosae*         | MFLUCC 15-0051 | MG828973         | MG829085   | MG829185  | -         | [77]       |
| Periconiaceae    | *Periconia byssoides*        | H 4600     | LC014581             | AB807570   | AB797280  | AB808546  | [19]       |
| Periconiaceae    | *Periconia digitata*         | CBS 510.77 | LC014584             | AB807561   | AB797271  | AB808537  | [19]       |
| Periconiaceae    | *Periconia macrospinosa*     | CBS 135,663| KP183999             | KP184038   | KP184080  | -         | [78]       |
| Periconiaceae    | *Periconia pseudodigitata*   | KT 1395 *  | LC014591             | AB807564   | AB797274  | AB808540  | [19]       |

* = The asterisks after the strain number represent the ex-type strains from the holotype specimens.
3. Results and Discussion

3.1. Phylogenetic Analyses

The individual datasets for ITS and LSU regions comprised selected isolates from closely related families (Figure 1). The RAxML analyses of the ITS dataset yielded the best-scoring trees with a final ML optimization likelihood value of -9830.778478 (Figure 1A). The matrix had 531 distinct alignment patterns with 51.80% undetermined characters or gaps. Estimated base frequencies were as follows: A = 0.227770, C = 0.273565, G = 0.243931, T = 0.254733; substitution rates AC = 2.172295, AG = 3.427213, AT = 2.029849, CG = 0.957843, CT = 5.859679, GT = 1.000000; and gamma distribution shape parameter \( \alpha = 0.350193 \). In Figure 1A, the novel taxon *Haplohelminthosporium calami* grouped within Massarinaceae and was well separated from other genera but without good bootstrap support.

The RAxML analyses of the LSU dataset yielded the best-scoring trees with a final ML optimization likelihood value of -4283.882978 (Figure 1B). The matrix had 307 distinct alignment patterns with 12.16% undetermined characters or gaps. Estimated base frequencies were as follows: A = 0.246483, C = 0.214075, G = 0.309890, T = 0.229553; substitution rates AC = 1.828869, AG = 4.019496, AT = 3.119987, CG = 0.662100, CT = 12.098644, GT = 1.000000; and gamma distribution shape parameter \( \alpha = 0.159335 \). In Figure 1B, the novel taxon *Haplohelminthosporium calami* was also well separated within Massarinaceae and clustered with *Helminthosporium* and *Helminthosporiella*. *Helminthosporiella stilbacea* (MFLUCC 15-0813) is closely related to *Hel. stilbacea* (strains CPHmZC-01 and COAD 2126) with 100% ML/1.00 BYPP.

The RAxML analysis of the combined (ITS, LSU, SSU, and tef1-\( \alpha \)) dataset yielded a best scoring tree with a final ML optimization likelihood value of -22122.846454 (Figure 2). The matrix had 1363 distinct alignment patterns, with 41.38% undetermined characters or gaps. Estimated base frequencies were as follows: A = 0.241467, C = 0.241603, G = 0.271551, T = 0.245380; substitution rates AC = 1.860804, AG = 3.064520, AT = 1.916442, CG = 1.009390, CT = 7.530432, GT = 1.000000; and gamma distribution shape parameter \( \alpha = 0.183588 \). In the phylogenetic analyses (Figure 2), twelve genera are included in the tree. The novel taxon of *Haplohelminthosporium calami* grouped within Massarinaceae without strong bootstrap support. *Haplohelminthosporium calami* is closely related to *H. endiandrae* (CBS 138902, MH878637), but this is statistically unsupported. *Helminthosporiella stilbacea* (MFLUCC 15-0813) is closely related to *Hel. stilbacea* (strain CPHmZC-01) with 100% ML/1.00 BYPP.

The RAxML analysis of the combined (ITS, LSU, SSU, and tef1-\( \alpha \)) dataset yielded a best scoring tree with a final ML optimization likelihood value of -22122.846454 (Figure 2). The matrix had 1363 distinct alignment patterns, with 41.38% undetermined characters or gaps. Estimated base frequencies were as follows: A = 0.241467, C = 0.241603, G = 0.271551, T = 0.245380; substitution rates AC = 1.860804, AG = 3.064520, AT = 1.916442, CG = 1.009390, CT = 7.530432, GT = 1.000000; and gamma distribution shape parameter \( \alpha = 0.183588 \). In the phylogenetic analyses (Figure 2), twelve genera are included in the tree. The novel taxon of *Haplohelminthosporium calami* grouped within Massarinaceae without strong bootstrap support. *Haplohelminthosporium calami* is closely related to *H. endiandrae* (CBS 138902, MH878637), but this is statistically unsupported. *Helminthosporiella stilbacea* (MFLUCC 15-0813) is closely related to *Hel. stilbacea* (strains CPHmZC-01 and COAD 2126) with 100% ML/1.00 BYPP.

The RAxML analysis of the combined (ITS, LSU, SSU, and tef1-\( \alpha \)) dataset yielded a best scoring tree with a final ML optimization likelihood value of -22122.846454 (Figure 2). The matrix had 1363 distinct alignment patterns, with 41.38% undetermined characters or gaps. Estimated base frequencies were as follows: A = 0.241467, C = 0.241603, G = 0.271551, T = 0.245380; substitution rates AC = 1.860804, AG = 3.064520, AT = 1.916442, CG = 1.009390, CT = 7.530432, GT = 1.000000; and gamma distribution shape parameter \( \alpha = 0.183588 \). In the phylogenetic analyses (Figure 2), twelve genera are included in the tree. The novel taxon of *Haplohelminthosporium calami* grouped within Massarinaceae without strong bootstrap support. *Haplohelminthosporium calami* is closely related to *H. endiandrae* (CBS 138902, MH878637), but this is statistically unsupported. *Helminthosporiella stilbacea* (MFLUCC 15-0813) is closely related to *Hel. stilbacea* (strains CPHmZC-01 and COAD 2126) with 100% ML/1.00 BYPP.

The phylogenetic analyses (Figures 1 and 2) showed several topologies of the tree had generally rather low support (ML \( \leq 50\% \) and BYPP \( \leq 0.90 \)). This reflects the relatively high amount of homoplasy in the data. Most *Helminthosporium*-like taxa did not have SSU and tef1-\( \alpha \) sequence data for the phylogenetic analyses. In the future, divergent time estimations will be needed for *Helminthosporium*-like taxa to resolve taxonomic confusion and placement.

3.2. Taxonomy

3.2.1. *Haplohelminthosporium* Konta & K.D. Hyde, gen. nov

Index Fungorum number: IF557873; Facesoffungi number: FoF09169

Etymology—Haplo in Greek means single, which refers to the single conidium in each conidiophore. It is a close relative of *Helminthosporium*.

Saprobic on living leaves and petioles of *Calamus* sp. On living leaves, small spots, circular to irregular, yellow in the beginning, later becoming red brown surrounded by yellow. Colonies on natural substrate forming black patches on the upper leaf, petiole surfaces. Sexual morph: Undetermined. Asexual morph: Hyphomycetous. Colonies on natural substrate forming black patches on the upper leaf, petiole surfaces. Mycelium mostly immersed, partly on the surface forming small stroma-like aggregations of red brown pseudoparenchymatous cells. Conidiophores arising singly or fasciculate from stroma.
cells, erect, simple, unbranched, straight, curved and swollen at apex, septate, thick-walled, cylindrical, smooth, bulbous at base, hyaline in the middle, brown to yellow-brown at 1–2-cells above the base, pale brown to yellow-brown at apical cell. **Conidiogenous cells** monotretic, terminal, determinate, cylindrical, wide and yellow-brown with a well-defined, small, noncicatrized pore at the apex. **Conidia** one for each conidiophore, obpyriform to lageniform, straight or curved, smooth, olive-brown, distoseptate, with a dark scar at the base.

**Type species**—*Haplohelminthosporium calami* Konta & K.D. Hyde

**Notes:** *Haplohelminthosporium* is established as a monotypic genus with *Hap. calami* as the type species. ITS phylogenetic analyses separated this genus from other genera, while in the LSU and multigene analyses it clustered with *Helminthosporium* and *Helminthosporiella*, but both without good statistical support (Figures 1 and 2). *Haplohelminthosporium* is presented herein as an asexual morph (hyphomycete) similar to *Helminthosporium* and *Helminthosporiella* in that it is hyphomycete with an erect conidiophore, monotretic conidiogenous cell and distoseptate conidia [19,22,63]. The type species of *Helminthosporium* has pale to dark brown, septate conidiophores, with terminal and intercalar polytretic conidiogenous cells, noncicatrized pores at the apex and upper 3–4 cells, solitary or short catenate conidia that are subhyaline to brown, distoseptate, and is dark brown to black scar at the base [19]. *Helminthosporiella* has brown to red-brown conidiophores with terminal, polytretic conidiogenous cells, with cenate and easily disarticulating chains of conidia that are medium brown, striated at surface and distoseptate [63]. However, *Haplohelminthosporium* is distinguished by its unbranched conidiophores arising solitary or fasciculate from the stroma-like bulbous basal cells that are hyaline in the middle, brown to red-brown at 1–2-cells above the base, pale brown to red-brown and curved at the apical cell with well-defined non-cicatrized small pores and with a single olive-brown conidium arising from each conidiophore (Figure 3). In the BLAST search of GenBank, the closest match of the LSU, ITS, and SSU sequence data were identical to *Helminthosporium* spp. Based on distinguishing morphological characteristics together with single/multigene phylogenetic analyses we introduce the newly described strain as a new genus *Haplohelminthosporium* in Massarinaceae.

*Haplohelminthosporium calami* Konta & K.D. Hyde, sp. nov.

**Index Fungorum number:** IF557874, **Facesoffungi number:** FoF09170, **Figure 3**

**Etymology:** Referring to the genus of palm trees *Calamus* L.

**Holotype:** MFLU 20-0520.

**Saprobic** on living leaves and petioles of *Calamus* sp. On living leaves, small spots, circular to irregular, yellow in the beginning, later becoming red-brown surrounded by yellow. **Colonies** on natural substrate forming black patches on the upper leaf, petiole surfaces. **Sexual morph:** Undetermined. **Asexual morph:** *Mycelium* mostly immersed, on the surface forming small stroma-like aggregations of red brown pseudoparenchymatous stromal cells (7–)10–14(–20) μm (μ = 12 μm). **Conidiophores** (110–)140–175(–215) × (4–)5–7(–8) μm (μ = 160 × 6 μm, n = 50), wide at the base and apex, macronematous, mononematous, arising singly or fasciculate from the stroma cells, erect, simple, unbranched, straight, curved and swollen at the apex, thick-walled, cylindrical, smooth, bulbous at base, hyaline in the middle, brown to red-brown at 1–2-cells above the base, pale brown to red-brown at the last cell of the apex, (3–)4–5(–6) septa. **Conidiogenous cells** monotretic, terminal, determinate, cylindrical, with well-defined small noncicatrized pores at the apex, wide and yellow-brown at the apex. **Conidia** (55–)70–100(–120) × (13–)17–20(–23) μm (μ = 80 × 20 μm, n = 60), one on each conidiophore, obpyriform to lageniform, straight or curved, smooth, olive-brown, (3–)4–6(–7)-distoseptate, with a dark scar at the base.
Figure 3. *Haplohelminthosporium calami* (MFLU 20-0520, holotype) (A) The forest in Krabi Province. (B–E) Fresh and herbarium palm samples. (F,G) Colonies on living leaf. (H–L) Conidiophores. (M–U) Conidia. (V,W) Germinated conidia. (X) Culture on PDA. (Y) Conidiophore and conidia on culture. (Z) Conidiogenesis. (AA) Conidiophores. (AB,AC) Conidia. Scale bars: C, E =2 cm, H–W, Y–AC = 50 μm.
Culture characteristics: Culture on PDA, colony yellow-gray-brown at the center, turning dull creamy white toward to margin, smooth, dense, zonate at the margin (Figure 3X).

Material examined: THAILAND, Krabi Province, on living leaves and petioles of Calamus sp. (Arecales), 14 December 2015, Sirinapa Konta, KHNPR-2 (MFLU 20-0520, holotype); ex-type living culture, MFLUCC 18-0074.

Notes: BLAST search of the ITS sequence of the newly described strain (Haplohelminthosporium calami) shows 88.89% similarity with Helminthosporium juglandinum (L118), the LSU sequence shows 98.75% similarity with H. aquaticum (MFLUCC 15-0357), and the SSU sequence shows 99.52% similarity with H. quercinum (L90). Based on ITS phylogenetic analysis, Haplohelminthosporium calami formed a single branch at the basal clades of Helminthosporiella and Helminthosporium (Figure 1A), while based on LSU analysis, Hap. calami clustered together with H. juglandinum (L97), H. endiandrae (CBS 138902, MH878637), and Hel. stilbacea with no strong statistical support for both analyses. The phylogenetic results of the combined dataset indicated that Hap. calami clustered with H. endiandrae (CBS 138902, MH878637) without strong bootstrap support (Figure 2). Comparison of base pair differences between LSU loci for isolates of Hap. calami strains MFLUCC 18-0074 and H. endiandrae strains CBS 138,902 (KP004478; Ex-type from the holotype, and MH878637; sister strain) including gaps showed 1.74% (15/861 bp) differences, and the position of each base pair difference is shown in Table 3. Other H. endiandrae strains (AKMR1, CBS 138902; ex-type from the holotype, and SM61) grouped together in Helminthosporium, as the other strains have an ITS region, but the H. endiandrae (CBS 138902, MH878637) strain that grouped with our new collection lacks the ITS region. Therefore, we compared the morphology of these two species and found that Hap. calami differs from H. endiandrae with respect to its smaller conidiophores ((110–)140–175(–215) × (4–)5–7(–8) vs. 200–300 × 5–7 µm), number of conidiophore septa ((3–)4–5(–6) vs. 8–16 septa), larger conidia ((55–)70–100(–120) × (13–)17–20(–23) vs. (35–)37–45(–57) × (7–)8(–9) µm), solitary conidium per conidiophore, and higher number of distoseptate ((3–)4–6(–7)-distoseptate vs. 3(–4)-distoseptate). The results show the placement of Haplohelminthosporium calami within Massarinaceae, and that this species is distinct from other known species. Therefore, we introduce Hap. Calami as a new species based on both morphological and phylogenetic data.

Table 3. Polymorphic nucleotides from sequence data of the LSU loci for isolates of Haplohelminthosporium calami MFLUCC 18-0074 and Helminthosporium endiandrae CBS 138,902 (KP004478, MH878637).

| Species               | Strain                | LSU          |
|-----------------------|-----------------------|--------------|
| Haplohelminthosporium calami (this study) | MFLUCC 18-0074         | - A A T T T T C C A C A T T T T G |
| Helminthosporium endiandrae (Ex-type from the holotype) | CBS 138,902 (KP004478) | - C C C C C C T T C C T C T T G G G G |
| H. endiandrae (sister strain in Figures 1B and 2) | CBS 138,902 (MH878637) | C A C C C C C C T T C C T C T T G G G G |

3.2.2. Helminthosporiella Konta & K.D. Hyde, gen. nov.

Index Fungorum number: IF558311, Facesoffungi number: FoF09171

Helminthosporiella Hern.-Restr., Sarria & Crous, in Crous et al., Persoonia 36: 437 (2016), MycoBank MB816988, Nom. inval., Art. 40.3 (Shenzhen)

Saprobic on dead petiole of Cocos nucifera. Sexual morph: Undetermined. Asexual morph: Colony on natural substrate black, hairy. Mycelium mostly immersed, at the surface forming small stroma-like aggregations of dark brown pseudoparenchymatous cells. Conidiophores macronematous, wide at the apex and base, arising singly from the stroma cells, erect, simple, unbranched, straight or flexuous, thick-walled, cylindrical, smooth-walled, dark brown, becoming pale brown at the apex, septate. Conidiogenous cells terminal and intercalary, polytretic, with well-defined thick, pale brown pores. Conidia obpyriform to
lageniform, straight or curved, smooth-walled, subhyaline to light brown, distoseptate, with a thick scar at the base.

Type species—*Helminthosporiella stilbacea* Konta & K.D. Hyde

Notes: *Helminthosporiella* was introduced by Crous et al. [63] to accommodate a new combination of *Hel. stilbacea* Hern.-Restr., Sarria & Crous, in Massarinaceae, the basionym of the type species was not provided a Latin diagnosis [63]. In this paper we accept *Helminthosporiella* as a distinct genus, presently with a single species *Helminthosporiella stilbacea*. Since a Latin diagnosis is no longer required, we provide an English diagnosis and priority was given to the previous genus and species names. Furthermore, this study provides the holotype to validate the genus and species, and reports the first host record of *Hel. stilbacea* associated with coconut tree (Areceaeae) in Thailand. In particular, based on the present morphology and DNA sequence data, *Helminthosporiella* is identified as a monotypic genus, with *Hel. stilbacea* as the type species. The members of *Helminthosporiella* were found associated with leaf spots on oil palm (Areceaeae) [64].

*Helminthosporiella stilbacea* Konta & K.D. Hyde, sp. nov.

Index Fungorum number: IF558312, Facesoffungi number: FoF09172, Figure 4. = *Cercospora palmicola f. stilbacea* Moreau, Rev. Mycol. 12: 38. 1947 Nom. inval., Art. 39.1 (Shenzhen)
≡ *Helminthosporiella stilbacea* Hern.-Restr., Sarria & Crous, in Crous et al., Persoonia 36: 437. 2016; Nom. inval., Art. 39.1 (Shenzhen)

*Helminthosporium stilbaceum* Moreau ex S. Hughes, Mycol. Pap. 48: 38. 1952; Nom. inval., Art. 39.1 (Shenzhen).
≡ *Exosporium stilbaceum* Moreau ex M.B. Ellis, Mycol. Pap. 82: 38. 1961; Nom. inval., Art. 39.1 (Shenzhen).
≡ *Exosporium stilbacum var. macrosporum* Subramon. & V.G. Rao, Journal of the Annamalai University, part B, Sciences 29: 404. 1971; Nom. inval., Art. 35.1 (Shenzhen).

*Saprobic* on dead petiole of *Cocos nucifera*. Sexual morph: Colony on natural substrate black, hairy. *Mycelium* mostly immersed, at the surface forming small stroma-like aggregations of dark brown pseudoparenchymatous cells (6–)11–15(–25) μm diam (μ = 14 μm). *Conidiophores* (60–)165–270(–310) × (5–)7–9(–12) μm (μ = 200 × 8 μm, n = 30), macronematous, wide at the apex and base, arising singly from the stroma cells, erect, simple, unbranched, straight or flexuous, thick-walled, cylindrical, smooth-walled, dark brown, becoming pale brown at the apex, (4–)12–15-septate. *Conidiogenous cells* terminal and intercalary, polytretic, with well-defined thick, pale brown pores. *Conidia* (30–)45–60(–70) × 6–9 μm (μ = 50 × 7 μm, n = 30), obpyriform to lageniform, straight or curved, smooth-walled, subhyaline to light brown, 5–8-distoseptate, with a thick scar at the base.

Culture characteristics: Culture on MEA, colony yellow-green at the center, turning dull green, pale yellow next, becoming dull green again, pale yellow, and white toward the margin. Colony smooth, dense at the middle, zonate, fluffy at the margin (Figure 4P).

Material examined: THAILAND, Prachuap Khiri Khan Province, on dead petiole of *Cocos nucifera* L. (Areceaeae), 30 July 2015, Sirinapa Konta PJK04gHB (MFLU 20-0521, holotype); ex-type living culture, MFLUCC 15-0813.
Figure 4. Helminthosporiella stilbacea (MFLU 20-0521, holotype) (A) A coconut plantation in Prachuap Khiri Khan Province. (B) Palm samples. (C–E) Conidiogenesis. (F–H) Conidiophores (at red arrow are pores). (I–M) Conidia. (N,O) Germinated conidia. (P) Culture on MEA. Scale bars: B = 2 cm, C, I–O = 20 μm, D–H = 50 μm.
Notes: Crous et al. [63] introduced a new genus *Helminthosporiella* with a new combination of *Hel. stilbacea* based on fresh collections from oil palm (*Elaeis oleifera*) in Colombia and the second collection of *Hel. stilbacea* was also collected from oil palm (*Elaeis guineensis*) in Brazil by Rosado et al. [64]. The full descriptions, illustrations, and sequence data are provided with interesting information as this species causes elliptical necrotic spots with a yellowish halo on living leaves of commercial oil palm plantations [63,64]. However, the type species was invalid because of the basionym lacked a Latin diagnosis [63]. From these, our fresh collection was collected from dead petiole of coconut (*Cocos nucifera*) and in phylogenetic analysis (Figures 1 and 2), three strains of *Hel. stilbacea*, including our strain, are grouped together with high bootstrap support. In this study, we therefore provide a holotype from our specimen, and introduce a new species *Helminthosporiella stilbacea*, complete with an English diagnosis, and validated by using the same name while linking to the valuable information provided from the previous publication of this species.

A BLAST search of the ITS sequence of our isolate showed 90.19% similarity with *H. velutinum* (L131), the LSU sequence showed 97.05% similarity with *H. aquaticum* (MFLUCC 15-0357), the SSU sequence showed 99.15% similarity with *H. quercinum* (L90), and the tef1-α sequence showed 92.61% similarity with *H. tiliae* (L88). These blast results do not match the results of the phylogenetic analyses.

The comparison between three strains of *Hel.stilbacea* (see Table 4) from three collections showed that our collection MFLU 20-0521 has several differences when compared with the other two strains CPHmZC-01 and COAD 2126. Our collection was obtained from a dead petiole, while the two other strains were isolated from living leaves [63,64]. Therefore, our new collection has been provided as a holotype for *Hel. Stilbacea*. It is also the first geographical record from Thailand, and is a new record of the species from a coconut host (*Cocos nucifera*).
Table 4. Comparison of three strains of *Helminthosporiella stilbacea*.

| No. | Herbarium/ 
| Culture No. | Host (Genus/Family) | Locality | Mycelia (µm Wide) | Conidiophores (µm) | Conidiogenous Cells (µm) | Conidia (µm) | References |
|-----|------------------|---------------------|----------|-------------------|---------------------|--------------------------|--------------|------------|
| 1.  | Herbarium: - 
Cultured no.: 
CPHmZC-01 | On leaves of *Elaeis oleifera* /Arecaceae | Colombia | Hyaline to pale brown, smooth, branched, septate | Erect, brown to red-brown, synnematous, septate, compacted, 620–1400 × 19–54, individual hyphae 3–4 wide | Mono- or polytretic, integrated, determinate, terminal, cylindrical, 31–67 × 4.5–7 | Catenate, obclavate, subcylindrical, occasionally bifurcate, medium brown, 26–83 × 7–10, (1–)3–5(–6)-distoseptate | [63] |
| 2.  | Herbarium: - 
Cultured no.: 
COAD 2126 | On old leaves of *Elaeis guineensis* /Arecaceae | Brazil | Hyaline to pale brown, 2–4 | Erect, brown, septate, synnematous, 66–201(–770) × 2.5–6(–18) | Mono or polytretic, cylindrical, terminal, 18–59 × 4–7 | Catenate, subcylindrical, obclavate, brown, 32–83 × 4–11, 2–7-distoseptate | [64] |
| 3.  | Herbarium: MFLU 
20-0521 
Culture no.: 
MFLUCC 15-0813 | On dead petiole of *Cocos nucifera* /Arecaceae | Thailand | Mostly immersed, dark brown | Solitarily, erect, unbranched, straight or flexuous, cylindrical, bulbous at base, dark brown, becoming pale brown at the apex, (60–)165–270(–310), (5–)7–9(–12) at the base, 5–8 µm wide at the apex, (4–)12–15 septate | Terminal and intercalary with well-defined pores, pale brown | Obpyriform to lageniform, straight or curved, light brown, (30–)45–60(–70) × 6–9, 5–8-distoseptate | This study |
4. Conclusions

In this study, we introduce the new genus *Haplohelminthosporium*, with *Hap. calami* as the type species. In multigene phylogenetic analyses, *Hap. calami* clustered together with *Helminthosporium endiandrae* (CBS 138902) without strong good bootstrap support (other *H. endiandrae* (AKRM1, CBS 138902 (ex-type), SM61) groups together in *Helminthosporium*). Moreover, we were unable to synonymize *H. endiandrae* (CBS 138902) under *Haplohelminthosporium* because *H. endiandrae* has only LSU sequence data available [60]. In the future, *H. endiandrae* needs more collections and sequence data to confirm taxonomic placement.

Another newly described isolate clusters together with *Helminthosporiella stilbacea*. *Helminthosporiella* was introduced by Crous et al. [63] but was invalidated as the type species was not provided with a Latin diagnosis. In this study, we validate *Helminthosporiella* with *Hel. stilbacea* as the type species. Moreover, the newly described strain from this study is the first saprobic report of *Hel. stilbacea*, as this was reported in previous studies as a pathogenic fungus on leaves [63,64]. Moreover, topological nodes in phylogenetic analyses showed conflicting results (Figures 1 and 2). Probably, using only single gene ITS or LSU analyses will preclude the establishment of taxonomic placements, while combined gene analyses (including protein coding genes) provide sufficient molecular data to determine the placements.

*Helminthosporium* is generally described as a common saprobe found on leaf or twig litter, and it appears to have a diverse distribution. Occasionally, members of this genus are also described as pathogens, occurring on a wide range of hosts. Comparison of morphology is important for fungal identification [79]. In this study, we provide a checklist for *Helminthosporium* species reported worldwide including details of each species based on records from Species Fungorum [80] (Table 5). We noted that ten *Helminthosporium* species have been found on palm substrates (Arecaceae). Although *Helminthosporium* conidia superficially resemble many genera, such as *Drechslera*, *Bipolaris*, and *Exserohilum*, phylogenetic analyses have provided different results [19,33,81–83]. Furthermore, we recommend revision of the genus *Helminthosporium* with fresh collections and DNA sequence data (specifically the ITS region and protein coding genes).
Table 5. Morphology, host information, locality, sequence data, and related references of *Helminthosporium* reported worldwide based on the record of Species Fungorum 2021 (bold text present *Helminthosporium* reported from Arecaceae).

| No. | Taxa         | Host(Genus/Family)                  | Locality       | Morphology                                                                 | Sequence Data | References |
|-----|--------------|-------------------------------------|----------------|---------------------------------------------------------------------------|---------------|------------|
| 1   | *H. abietis* | *Abies* sp./Pinaceae                | U.S.A./Washington | Conidiophores irregularly branched; Conidia 126–150 × 12–16 μm, fusiform, pointed at both ends, olive-green, 12–15-distoseptate | Absent        | [84]       |
| 2   | *H. acaciae* | On dead branches of *Acacia farnesiana* /Fabaceae | Sierra Leone | Conidiophores 140–280 × 7–11 μm, dense, fasiculate, simple, straight or flexuous, sometimes swollen at the tip, septate, smooth, thick-walled, brown, with well-difinded small pores at the apex; Conidia 31–(44–)49 × 10–(12–)14 μm in widest part, narrowing towards the apex to 3–5 μm, obclavate, straight or flexuous, smooth-walled subhyaline to pale brown, 3–6-distoseptate, with a small dark blackish-brown to black scar at the base | Absent        | [85]       |
| 3   | *H. acalyphae* | On leaves of *Acalypha angustifolia* /Euphorbiaceae | Dominican Republic | Conidiophores 2.5–4 μm thick, erect, simple, superficial, brown-blackish, septate; Conidia 9–16 × 4–6 μm, one for each conidiophore, ovate-ellipsoid, olivaceous-brown or dull-brown, 2–3-distoseptate | Absent        | [86]       |
| 4   | *H. accedens* | On living leaves of *Dolichos baumii* /Fabaceae | Namibia         | Conidiophores 250–300 × 5–9 μm, erect, olive-brown; Conidia 35–57 × 6.5–9 μm, solitary, oblong-fusoid, olive, 3–6-distoseptate | Absent        | [87]       |
| 5   | *H. ahmadii* | On dead branches of *Quercus* sp./Fagaceae    | Pakistan       | Conidiophores 220–650 × 12–15 μm, dense, fasiculate, simple, straight or flexuous, smooth, thick-walled, brown to dark brown, with small pores at the apex, septate; Conidia 95–(110–)150 × 25–30(–38) μm wide infield, broadest part, tapering towards the apex to 5–9 μm, obclavate, sometimes rostrate, straight or flexuous, smooth-walled, brown or dark brown, 5–15-distoseptate, with a dark blackish-brown to black scar at base | Absent        | [85]       |
| 6   | *H. aichrysonis* | On leaves of *Aichryson dichotomum* /Crassulaceae | Spain          | No information available                                                 | Absent        | [88]       |
| 7   | *H. alatum*  | On dying leaves of *Dioscorea alata* /Dioscoreaceae | Dominican Republic | No information available                                                 | Absent        | [89]       |
| No. | Taxa            | Host(Genus/Family)                        | Locality         | Morphology                                                                 | Sequence Data | References |
|-----|-----------------|------------------------------------------|-------------------|---------------------------------------------------------------------------|---------------|------------|
| 8   | *H. albiziae*    | On leaves of *Albizia lebbeck* /Fabaceae | Sri Lanka         | Conidiophores 70 ×7 μm; Conidia 42–56 × 12 μm, tapering to 4 μm diam. clavate, ends rounded, at the lower end, rough with minute warts, fuliginous, terminal cell paler, stright or curved below, 3–4-distoseptate | Absent        | [90]       |
| 9   | *H. albiziicola* | *Albizzia lebbeck* /Fabaceae              | India             | Conidiophores 28–44 × 4.5–6 μm, straight or slightly curved, one-septate at the base; Conidia 23.5–34 × 8–9 μm, pyriform, prolongate at the apex, rounded at the base, pale, cinnamon-brown, 3-distoseptate | Absent        | [91]       |
| 10  | *H. allamandae*  | On living leaves of *Allamanda cathartica* /Apocynaceae | Dominican Republic | Conidiophores 100–180 × 8–10 μm, solitary or aggregate, curved, simple, dark-brown; Conidia 66–110 × 17–20 μm, clavate, elongate-ellipsoid or subfusoid, erect or curved, gray-brown, 7–10-distoseptate | Absent        | [92]       |
| 11  | *H. alphitoniae* | On living leaves of *Alphitonia* sp./Rhamnaceae | Malaysia/Mount Kinabalu | Conidiophores 250–500 ×5–8 μm, erect, dark-brown; Conidia 25–66 × 8–13 μm, obclavate, erect or curved, yellow-brown or pale olive, 1–6-distoseptate | Absent        | [93]       |
| 12  | *H. aneurolepidii* | On leaves of *Aneurolepidium ramosum* /Poaceae | Russia/West Siberia | No information available | Absent        | [94]       |
| 13  | *H. anomalum*    | From soil                                 | U.S.A./Iowa, Utah | No information available | Present       | [17,63]    |
| 14  | *H. anonomyicum* | In culture: former Soviet Union           | Russia            | No information available | Absent        | [95]       |
| 15  | *H. apiculatum*  | On dry tree of *Betula sp.* (Betulinum) /Betulaceae | Czech Republic    | Conidiophores fasculate, flexuous, simple, hyaline; Conidia long, 37 μm, elliptical-fusiform, with color, multi-septate | Absent        | [96]       |
| 16  | *H. appatternae* | From leaves of *Cynodon dactylon* /Poaceae; from culture | India/Maharashtra | Conidiophores unbranched, of two types; determinate conidiophores uniform, 182 × 5.2 μm, single, olivaceous, 1–3 septate; indeterminante conidiophores narrower, 208–520 × 7.8 μm, paler and distantly septate at base, gradually broadened into a darker, close septate; Conidia 20.8–152.0 × 7.8 μm, 6–18-distoseptate | Absent        | [18]       |
| 17  | *H. appendiculatum* | On branches of the trees                  | Czechia           | Conidiophores simple, fasciculate; Conidia 65 × 11 μm, clavate, curved, blunted, whitish, multi-septate | Absent        | [96]       |
Table 5. Cont.

| No. | Taxa       | Host(Genus/Family)                          | Locality          | Morphology                                                                 | Sequence Data | References |
|-----|------------|--------------------------------------------|-------------------|---------------------------------------------------------------------------|---------------|------------|
| 18  | H. aquaticum | On submerged decaying wood                 | China/Yunnan      | Conidiophores 410–580 × 13–17 µm, solitary or in groups of 2–4, erect, flexuous, unbranched, smooth, dark brown paler towards the apex, bulbous at base, 14–23 septate; Conidia 70–80 × 16–18 µm, single, obclavate, straight or curved, pale brown to brown, truncate and cicatized at base, wider than apex, guttulate, 8–10-distoseptate | Present       | [20]       |
| 19  | H. arcautei | On living leaves Scorpiurus subvillosa/Fabaceae | Spain             | Conidiophores 35–50 × 7–8 µm, erect, simple, cylindrical, brownish-purple, 2–3 septate; Conidia 48–86 × 10.5–11 µm, cylindrical-fusoid, straight or slightly curved, light-brown chestnut, 3–8-distoseptate | Absent        | [95,97]    |
| 20  | H. asterinoides | On living leaves of Eugenia sp./Myrtaceae | Brazil            | Conidiophores 5–7 µm thick, fasciculate, rhizoid; Conidia 22–24 × 5–6 µm, fusoid, curved, colorless at each bottom, 3-distoseptate | Absent        | [98]       |
| 21  | H. asterinum | On Liquidambar sp./Altingiaceae            | U.S.A./Florida    | Conidiophores erect, simple, septate; Conidia 500–600 × 80 µm, clavate, 3–4-distoseptate | Present       | [99]       |
| 22  | H. astragali | On leaves of Astragalus siversianus/Fabaceae | Kyrgyzstan        | No information available                                                  | Absent        | [100]      |
| 23  | H. atypicum | On leaves of Triticum sp./Poaceae          | India/Maharashtra | Conidiophores 3–7 septate, unbranched, and of two types; shorter conidiophore uniformly wide, 62.4–72.8 × 7.8 µm, brown; longer ones narrow at the base and paler, gradually broadening and darkening towards the apex, 440–680 × 5.2–10 µm; Conidia yellow to brown, darkening at maturity, of two kinds; normal ones 23–93.6 × 26 µm, elliptical with hemispherical edges, widest at the middle, 0–10-distoseptate; a typical conidia abundant, forked or geniculate, septation forked, brown to dark brown, 5–8-distoseptate | Absent        | [101]      |
| No. | Taxa                          | Host (Genus/Family)                      | Locality                        | Morphology                                                                                                                                                                                                                                                                                                                                 | Sequence Data | References |
|-----|-------------------------------|-----------------------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|
| 24  | *H. austriacum*               | On dead corticated twigs of *Fagus sylvatica* / Fagaceae | Austria / Döbling, Kahlenberg, Wien | Conidiophores 275–700(–920) µm long, 11.5–19 µm wide at the base, tapering to 7–11 µm near the apex, solitarily or fasciculate, erect, simple, sub-cylindrical, straight or flexuous, thick-walled, smooth, brown to dark brown, paler near the apex, with well-defined small pores at the apex, 1–12 septate; Conidia (30–)35–48(–97) × (10.0–)13.7–16.5(–19.8) µm, tapering to 4.5–6.0 µm at the distal end, obpyriform to lageniform, straight or curved, smooth, pale brown, (4–)5–7(–10)-distoseptate, with a blackish-brown 3–6 µm wide scar at the base | Present       | [21]       |
| 25  | *H. avenae-pratensis*         | On sheaths of *Avena pratensis* / Poaceae | Germany                          | Conidiophores 300 × 8–11 µm, solitary or fasciculate, dark-chestnut, septate; Conidia 70–107 × 16–21 µm, cylindrical or obclavate, light brown, on both sides paler, 5–11-distoseptate                                                                                              | Absent        | [102]      |
| 26  | *H. bactridis*                | On sheaths of *Bactris* sp. / Arecaceae | Brazil / Pará                    | Conidiophores 200 × 3–4.5 µm, septate; Conidia 20–30 × 6–8 µm, fusoid, 6–7-distoseptate                                                                                                                                                                                                                                                           | Absent        | [103]      |
| 27  | *H. bakeri*                   | On dead stems of *Premnavestita* sp. / Lamiaceae | Philippines                      | Conidiophores 500–800 × 12 µm wide at base to below, 10 µm wide, erect, unbranched, dark; Conidia 80–150 × 17–22 µm, solitary, oblong, obclavate, 3–6-distoseptate                                                                                                                                                  | Absent        | [104]      |
| 28  | *H. bambusicola*              | On dead culm of *Bambusa* sp. / Poaceae  | China / Sichuan                  | Conidiophores 55–247 × 4–6 µm, fasciculate or solitary, simple, cylindrical, straight or flexuous, thick walled, smooth, brown, paler towards the apex, with well-defined small pores, 1–2 septate; Conidia 36–66 × 6–11 µm narrowing towards the apex to 2–4.5 µm wide, obclavate, straight or slightly flexuous, thin-walled 1–1.5 µm thick, smooth, pale brown, paler towards the apex, 5–8-distoseptate, scar not distinct at the base | Absent        | [105]      |
| 29  | *H. bataticola*               | On living leaves of *Ipomoea batatas* / Convolvulaceae | Caucasus                         | No information available                                                                                                                                                                                                                                                                                                                                                                         | Absent        | [106]      |
| No. | Taxa            | Host(Genus/Family)                      | Locality         | Morphology                                                                                                                   | Sequence Data | References |
|-----|----------------|----------------------------------------|------------------|-----------------------------------------------------------------------------------------------------------------------------|---------------|------------|
| 30  | *H. bauhiniae*  | On dead twigs of *Bauhinia tomentosa* Fabaceae | Sierra Leone     | Conidiophores 350–110 × 10–15 μm thick at the apex, 15–20 μm thick at the base, dense, fasciculate, simple, straight or flexuous, smooth-walled, dark brown, sometimes paler towards the apex, with well defined, small pores septate; Conidia 55–(86–)145 × 16–(17.2–)18 μm thick in broadest part, tapering to 3–4 μm the apex, obclavate, straight or flexuous, rostrate, smooth-walled, subhyaline to brown, 7–18-distoseptate, with a dark blackish brown to black scar at the base | Absent        | [85]       |
| 31  | *H. belgaumense* | On litter, *Calamus thwaitesii* Areaceae | India/Karnataka  | Conidiophores 140–250 × 6–9 μm, erect, straight to flexuous, unbranched, smooth, brown; Conidia 10–15 × 6–11 μm, solitary, dry, sub-spherical, dark brown, truncate at base, roundea at the apex, 1-distoseptate | Absent        | [107]      |
| 32  | *H. bhawanii*   | On leaves of *Eragrostis japonica* Poaceae | India/Bihar      | No information available                                                                                                        | Absent        | [108]      |
| 33  | *H. bigenum*    | Palmæ rotten petiole Areaceae            | Peru             | No information available                                                                                                        | Absent        | [109]      |
| 34  | *H. bondarzewii*| From grains of *Triticum* sp. and *Secale* Poaceae | Russia, Ukraine | No information available                                                                                                        | Present       | [60,110]  |
| 35  | *H. cacaliae*   | *Cacalia sonchifolia* Asteraceae         | Brazil           | No information available                                                                                                        | Absent        | [111]      |
| 36  | *H. cacaophillum*| From unfermented Cacao beans, *Theobroma cacao* Malvaceae | Dominican Republic/Santo Domingo | No information available                                                                                                        | Absent        | [112]      |
| 37  | *H. cactacearum* | In young plants of *Cereus* species Cactaceae | Italy            | No information available                                                                                                        | Absent        | [113]      |
| 38  | *H. caespitiferum* | Meliola spec. in leaf spots of living leaves of *Omphalea pasciflora* Euphorbiaceae | Dominican Republic/Santo Domingo | Conidiophores 150–300 × 6.5–8 μm, simple, dark-brown, septate; Conidia 18–42 × 8–11 μm, oblong to fusoid, dark-brown, constrict at septum, (3–)6–7-distoseptate | Absent        | [92]       |
Table 5. Cont.

| No. | Taxa               | Host(Genus/Family)                  | Locality                                      | Morphology                                                                 | Sequence Data | References |
|-----|--------------------|------------------------------------|-----------------------------------------------|----------------------------------------------------------------------------|---------------|------------|
| 39  | H. canephorae      | Coffea canephora/Rubiaceae         | Democratic Republic of the Congo/Zaire       | No information available                                                   | Absent        | [114]      |
| 40  | H. cantareirense   | On dead stems                      | Brazil/São Paulo                             | Conidiophores 7–12 µm thick, erect, fasciculate; Conidia 50–60 × 8–12 µm; Clavate, brown, constrict at septum, 6–8-distoseptate | Absent        | [115]      |
| 41  | H. cantonense      | On decaying culms of Bambusa vulgaris/Poaceae | China                                          | Conidiophores 80–95 × 6 µm; Conidia 50–62 × 8 µm, obclavate, 7–9-distoseptate | Absent        | [116]      |
| 42  | H. caperoniae      | On living leaves of Caperonia palustris/Euphorbiaceae | Dominican Republic                           | Conidiophores 100–300 × 3.5–5 µm, 2–5 fasciculate, simple, olive-brown; Conidia 22–55 × 4–6 µm, oblong-fusoid or subclavate, rarely cylindrical, yellow or gray-brown | Absent        | [92]       |
| 43  | H. carpocrinum     | Parasite on perithecia of Meliola funebris on leaves of Omphalea sp./Euphorbiaceae (O. pauciflora) | Dominican Republic/D Santo Domingo           | Conidiophores 1–4 articulate, 200–350 µm long, very densely fasciculate, erect to sub-erect, straight or slightly irregularly curved, almost straight or curved, dark-brown to blackish, tip light-colored; Conidia 22–25 ×8–10 µm, 1–4 to each conidiopore, easily falling, ellipsoid to ovoid, with narrowed ends, or basal end narrowed-truncate, apical end rounded to acute, not caudate, central cells from dark-brown to brownish, and cells light brown to yellowish, 2–5-distoseptate | Absent        | [117]      |
| 44  | H. carposaprum     | On Lycopersicon esculentum/Solanaceae | British Guiana, Haiti, Mexico                 | No information available                                                  | Absent        | [118]      |
| 45  | H. ceibae          | On leaves of Ceiba pentandra/Malvaceae | Philippines                                    | No information available                                                  | Absent        | [119]      |
| 46  | H. chlorophorae    | On dead twigs of Chlorophora regia/Moraceae | Sierra Leone                                   | Conidiophores 120–270 × 7–10 µm thick at the base, often swollen towards the tip up to 12 µm, single or fasciculate, simple, straight or flexuous, smooth-walled, brown to dark brown, with 1–3 well-definded, small pores, septate; Conidia 52–(73–)102 × 8–(9.5–)11 µm, thick in the widest part narrowing gradually towards the apex to 3–5 µm, obclavate, straight or flexuous, smooth-walled, subhyaline to pale brown, 6–9-distoseptate, with a tather large dark blackish-brown to black scar at the base | Present       | [85,120]   |
| 47  | H. chrysobalani    | On dry leaves of Chrysobalanus ico/Chrysobalanaceae | Dominican Republic/Bonao                      | Conidiophores up to 6 µm, fasciculate, erect, 2–3 septate; Conidia 25–50 × 3–4 µm, fusoid, 2–4-distoseptate | Absent        | [121]      |
Table 5. Cont.

| No. | Taxa            | Host(Genus/Family)                                      | Locality              | Morphology                                                                                                           | Sequence Data | References   |
|-----|-----------------|--------------------------------------------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------|---------------|--------------|
| 48  | *H. chusqueae*   | On living and dying leaves of *Chusquea serrulata/Poaceae* | Ecuador/Tungurahua    | Conidiophores 200–350 × 4–6 μm, dense, erect, fasciculate, simple, straight or slightly curved, dark-brown or olive, septate; Conidia 32–50 × 9–11 μm, elongate-fusiform, blunt at both ends, curved, rarely straight, gray or olive-brown, 3–4-distoseptate | Absent        | [122]        |
| 49  | *H. cibotii*     | On leaves of *Cibotium sp./Cibotiaceae*                 | U.S.A./Hawaii Islands | No information available                                                                                           | Absent        | [123]        |
| 50  | *H. ciliare*     | -                                                      | -                     | No information available                                                                                           | Absent        | [124]        |
| 51  | *H. citri*       | On leaves of *Citrus poonensis*, *Citrus tankart*, *Citrus ponki*, and of *Citrus sinensis* var. brasiliensis/Rutaceae | China/Taiwan          | No information available                                                                                           | Absent        | [125]        |
| 52  | *H. claviphorum* | Rotten branch                                          | Peru                  | No information available                                                                                           | Absent        | [109]        |
| 53  | *H. cleosmatis*  | On living leaves of *Clematis sp./Ranunculaceae* (in foliis vivis *Cleosmati sectandri*) | Dominican Republic    | Conidiophores 140–250(−300) μm long, 4–5 μm wide, solitary, erect, simple, dark-brown, often becoming paler; *Conidia* 28–52 × 6.5–9 μm, clavate or fusoid, yellow or pale olive-brownish, (3–)4–5-distoseptate | Absent        | [92]         |
| 54  | *H. clusiae*     | On leaves of *Clusiarosa sp./Clusiaceae*               | Dominican Republic    | Conidiophores 108–128 × 12–16.5 μm effuse, brown-black, irregular at based, or subbulbos, septate; *Conidia* 26–32 × 10–11.5 μm, fusoid, subfusoid or cylindrical, 4–8-distoseptate | Absent        | [126]        |
| 55  | *H. coffeae*     | On leaves of *Coffea liberica/Rubiaceae*               | Ghana                 | Conidiophores 300–400 × 7–8 μm, effuse, nigro-olivaceas, aggregate, erect, cylindrical, rect or flexuous, olives-brown, septate; *Conidia* 45–55 × 8–10 μm, obovate, 3–5-distoseptate | Absent        | [127]        |
| 56  | *H. conidiophorellum* | On dead branches of tree                      | China/Guangxi         | Conidiophores 60–280 × 7.0–8.5 μm, fasciculate, simple, subcylindrical, straight or flexuous, thick-walled, smooth, dark brown, paler towards the apex, with 1–3 well-defined small pores at the apex, 1–2 septate; *Conidia* 100–147.5 μm long, 9.5–11 μm diam in the widest part, narrowing towards the apex to 3–4 μm diam, straight or slightly flexuous, smooth-walled, pale brown, sometimes verruculose at apex, 11–17-distoseptate, with a large dark blackish-brown scar at the base, 2–3 μm thick | Absent        | [128]        |
| No. | Taxa       | Host(Genus/Family)                  | Locality               | Morphology                                                                 | Sequence Data | References |
|-----|------------|------------------------------------|------------------------|-----------------------------------------------------------------------------|---------------|------------|
| 57  | H. constrictum | On dead branches of *Trachycarpus fortunei* / Arecaceae | China/Guangdong        | Conidiophores single, simple, subcylindrical, straight or slightly flexuous, brown to dark brown, paler towards the apex, 1–3 septate; Conidia 57–120 × 9–12 µm, thick in the widest part, narrowing toward the apex to 2.5–5 µm, abruptly tapered to a truncate base, tentic, obclavate, straight or slightly flexuous, pale brown, paler toward to apex, 9–15-distoseptate, sometimes constricted at one or two septa | Absent        | [129]      |
| 58  | H. conviva  | On *Hyphoderma caliciferum*, the genus of crust fungi in the family Meruliaceae. | Spain/Archipelago/Balearic/Baleares Islands | No information available                                                      | Absent        | [130]      |
| 59  | H. corchori | On leaves of *Corchorus capsularis* / Malvaceae | China/Taiwan            | No information available                                                    | Absent        | [131]      |
| 60  | H. crassiseptum | Meliola abrupta                | Dominican Republic      | Conidiophores 30–50 × 2–3 µm, septate; Conidia 45–55(–65) × 12–14 µm, ovoid or elliptical, (2–)3-distoseptate | Absent        | [86]       |
| 61  | H. crotalariae | On leaves of *Crotalaria juncea* / Fabaceae | India/Assam             | No information available                                                    | Absent        | [132]      |
| 62  | H. crus-galli | On living leaves of *Echinochloa crus-galli* (=*Panicum cristata-galli*) / Poaceae | Japan                    | No information available                                                    | Absent        | [133,134] |
| 63  | H. cubense  | On rachis of *Roystonea regia* / Arecaceae | Cuba                    | No information available                                                    | Absent        | [135]      |
| 64  | H. cucumerinum | On living leaves of *Cucumis sativus* / Zingiberaceae | Russia/Krym             | No information available                                                    | Absent        | [136]      |
| 65  | H. curvulum | On decaying leaves of *Zea mays* / Poaceae | Philippines             | Conidiophores 160–180 × 7–7.5 µm, fasciculate, filiform, septate; Conidia 25–35 × 8–9 µm, oblong-fusoid, narrow, 3(–4)-distoseptate | Absent        | [137]      |
| 66  | H. cuspidatum | On decaying branches of *Afzelia rhomboidea* / Fabaceae | Philippines             | Conidiophores 800–900 × 8–9 µm, fasciculate, filiform, multiseptate; Conidia 100–130 × 11–12 µm, obclavate, 8–12-distoseptate | Absent        | [137]      |
| No. | Taxa             | Host(Genus/Family)         | Locality                | Morphology                                                                 | Sequence Data | References |
|-----|------------------|----------------------------|--------------------------|---------------------------------------------------------------------------|---------------|------------|
| 67  | *H. cylindricum*  | On rotten wood             | Czech Republic/Bohemia   | Conidiophores 100–130 × 4–5 µm, subfasciculate, filiform long, simple, fuliginous up paler, septate; Conidia 14–15 × 2.5 µm, cylindrical, apex rounded, base acuted, minute, pale fuliginous, 3-distoseptate | Absent        | [138]      |
| 68  | *H. cymmartinii*  | On leaves of *Cymbopogon*  | India/Uttar Pradesh      | No information available                                                  | Absent        | [108]      |
|     | *martinii* *martinii/Poaceae* |               |                         |                                                                           |               |            |
| 69  | *H. cyperi*      | On *Cyperus* sp./Cyperaceae| Greece                   | Conidiophores straight to subflexuous, greenish, paler at apex; Conidia 78 × 9 µm, fusoid, fuscidull, 5–8-distoseptate | Absent        | [139]      |
| 70  | *H. dactylixis*  | On leaves of *Dactylis*    | U.S.A./Pennsylvania      | No information available                                                  | Absent        | [140]      |
|     | *glomerata*/Poaceae |                   |                         |                                                                           |               |            |
| 71  | *H. dalbergiae*  | On dead branches of *Dalbergia* | Pakistan                | Conidiophores 300–1300 × 10–12(–15) µm, dense, fasciculate, simple, flexuous, smooth-walled, brown to dark brown, sometimes paler towards the apex, with well-definded small pores, septate; Conidia 58–(93–)125 × 12–(13.2–)14 µm thick in broadest part, tapering to gradually towards the apex to 3–5 µm, obclavate, straight or flexuous, smooth-walled, straw-coloured to pale brown with, 5–17-distoseptate, large dark blackish-brown to black scar at the base | Present       | [85]       |
| 72  | *H. daviilla*    | On leaves of *Davilla*     | U.S.A./San Francisco     | Conidiophores 4–6 µm, thick filiform, flexuous, unbranched, elongate, brown, septate; Conidia 40–70 × 4–6 µm, elongate-obclavate, narrower and paler, (1–)2–4-distoseptate | Absent        | [141]      |
| 73  | *H. decacuminatum* | In the dry twigs on *Vitis* | Italy                    | Conidiophores 4 µm thick, extremely short-articulated, irregular, dark reddish-brown; Conidia 40–45 × 10 µm, long clavate, decacumina to tip, or cut down in pedicellum narrowed, pale brown-gray, 4–5-distoseptate | Present       | [60,142]   |
| 74  | *H. delicatulum* | On stems of Umbelliferae or | UK/Great Britain         | Conidiophores slender, subulate, multi-articulate, brown, paler at the tips; Conidia oblong, nearly colourless, with the apices very obtuse, consisting of about five swollen articulations, one or two of which have occasionally a vertical dissepiment | Absent        | [143]      |
|     | *Apiaceae*       |                           |                         |                                                                           |               |            |
| 75  | *H. delphinii*   | On stems of *Delphinium*   | Russia                   | No information available                                                  | Absent        | [144]      |
|     | *brunoniunum*/Ranunculaceae |                   |                         |                                                                           |               |            |
| No. | Taxa              | Host(Genus/Family)            | Locality                  | Morphology                                                                 | Sequence Data | References |
|-----|-------------------|------------------------------|---------------------------|----------------------------------------------------------------------------|---------------|------------|
| 76  | H. dendroideum    | On *Acer* sp./Sapindaceae    | U.S.A./South Carolina     | Conidiophores 1–2 short branchlets terminated, oblong, subfusiform, slightly curved, multiarticulate conidia; Conidia 60 µm long, each joint containing a globose nucleus | Absent        | [145]      |
| 77  | H. densum         | -                            | -                         | No information available                                                   | Absent        | [146]      |
| 78  | H. desmodii       | On *Desmodium buergeri* /Fabaceae | Japan                     | No information available                                                   | Absent        | [147]      |
| 79  | H. diedickei      | No information available     | No information available  | No information available                                                   | Absent        | [148]      |
| 80  | H. dimorphosporum | On decaying rotting stems of unknown liana | Cuba                      | Conidiophores 150–400 µm long, at the apex 9–12 µm, at the base 10–14 µm wide, single or fasciculate 2–10, simple, straight or flexuous, smooth, dark brown, paler towards the apex, septate; Conidia of two different types arising through pores at the apex (1–4 pores) and late rally beneath the upper septa: (a) 19–24 × 8–10.5 µm, broadly ellipsoidal, ovoid or broadly fusiform, thick-walled, smooth, brown to dark brown, 1-distoseptate; (b) 24–65 µm long, 10–15 µm wide in the broadest part, tapering to 3.2–4.8 µm at the apex, obclavate, rostrate, straight or flexuous, pale brown, smooth, 6–9-distoseptate, with a dark brown scar at the base | Absent        | [149]      |
| 81  | H. dolichi        | On living leaves of *Dolichos* sp./Fabaceae | Namibia                   | Conidiophores 250–350 × 4–6 µm, erect, olive-brown; Conidia 27–38 × 5.5–8 µm, solitary, oblong-subfusoid, olive, 2–3-distoseptate | Absent        | [87]       |
| 82  | H. dongxingense   | *Rhododendron* sp.           | China                     | No information available                                                   | Absent        | [150]      |
| 83  | H. elasticae      | -                            | -                         | No information available                                                   | Absent        | [151]      |
| 84  | H. endiandrae     | On leaves of *Endiandra introrsa* /Lauraceae | Australia/New South Wales, Nightcap National Park | Conidiophores 200–300 × 5–7 µm, solitary, erect, subcylindrical, straight to flexuous, unbranched, thick-walled, base bulbous, lacking rhizoids, brown, 8–16 septate; Conidia (35–)37–45(–57) × (7–)8(–9) µm, solitary or in short chains (2–3), obclavate, thick-walled, finely roughened, brown, 3(–4)-distoseptate | Present       | [21,59]    |
| No. | Taxa                  | Host(Genus/Family)                          | Locality               | Morphology                                                                 | Sequence Data          | References |
|-----|----------------------|--------------------------------------------|------------------------|---------------------------------------------------------------------------|------------------------|------------|
| 85  | H. eragrostiellae    | On inflorescence and leaves of Eragrostis bifta/Poaceae | India/Uttar Pradesh   | No information available                                                  | Absent                 | [108]      |
| 86  | H. erythrina         | On leaves of Erythrina suberosa/Leguminosae | India/Karnataka        | Conidiophores 32–42 × 4–5 µm, simple, brownish-yellow; Conidia 39–62 µm at base, straight or vermiciform, rounded at the apex and flat at the base, pale cinnamon-brown, 4–8-distoseptate | Absent                 | [91]       |
| 87  | H. erythrinicola     | On leaves of Erythrina humeana/Fabaceae    | South Africa/Eastern Cape | Conidiophores 500–1200 × 6–10 mm, fasciculate, subcylindrical, unbranched, brown, becoming pale brown at apex, multiseptate; Conidia (70–)80–90(–110) × (9–)10–11(–12) mm, obclavate, straight to curved, apex subobtuse, smooth, medium brown, (6–)7–8(–12)-distoseptate | Present                | [22]       |
| 88  | H. exasperatum       | On Dianthus barbatus/Caryophyllaceae       | UK/Great Britain       | Conidiophores flexuous, knotted above, each knot bearing oblong conidia; Conidia 30–45 × 10–12 µm | Absent                 | [152]      |
| 89  | H. feijoae           | On leaves of Acacia sellowiana/Myrtaceae (syn: Feijoa sellowiana) | North America/Hispaniola island | No information available                                                  | Absent                 | [153]      |
| 90  | H. ferrugineum       | On leaves of Hiraea sp. and Heteropterys sp./Malpighiaceae | U.S.A./San Francisco | Conidiophores 8–9 µm thick, filiform, yellow, septate; Conidia 50–62 × 11–14 µm, obclavate, subhyaline, last 2 septate hyaline-yellow to yellow | Absent                 | [141]      |
| 91  | H. fici              | On leaves of Ficus retusa/Moraceae         | Philippines/Thailand   | Conidiophores fusiform, nodulosis, septate; Conidia 18–20 × 5–6 µm, cylindrical, reddish-brown, 3-distoseptate | Absent                 | [137,154]  |
| 92  | H. ficinum           | On leaves of Ficus ulmifolia/Moraceae      | Philippines            | Conidiophores 250 × 6 µm, filiform, septate; Conidia 50–60 × 6–8 µm, obclavate, 4–5-distoseptate | Absent                 | [137]      |
| 93  | H. filicola          | On leaves of Lygodium sp./Lygodiumaceae and of Selaginella sp./Selaginellaceae | Peru                  | Conidiophores 400 × 3–5 µm thick, erect, simple, filiform, septate; Conidia 30–40 × 6–10 µm, cylindrical-fusoid or clavate, both side blunt, 3–5-distoseptate | Absent                 | [155]      |
| 94  | H. flagellatum       | On mycelium of Meliola, in leaves of Ardisia disticha/Myrsinaceae | Philippines            | Conidiophores 2.5–4 µm thick, erect, sub-hyaline                         | Absent                 | [156]      |
| 95  | H. flumeanum         | On leaves of Bambusa sp./Bambuseae         | Philippines            | Conidiophores 90–100 × 6–7 µm, dense, fusciform, filiform; Conidia 35–40 × 9–12 µm, obclavate, 3-distoseptate | Absent                 | [157]      |
| No. | Taxa                     | Host(Genus/Family)                        | Locality                      | Morphology                                                                 | Sequence Data | References |
|-----|-------------------------|------------------------------------------|-------------------------------|---------------------------------------------------------------------------|---------------|------------|
| 96  | *H. fumagineum*         | On leaves of *ficusulmifolia/ Moraceae*  | Philippines                   | Conidiophores 240–300 × 7 μm, filiform, septate; Conidia 35 × 9–10 μm, oblong-obclavate, 3-distoseptate | Absent        | [137]      |
| 97  | *H. gibbersporum*       | *Musa cavendishii*/*Musaceae*            | Somalia                       | No information available                                                  | Absent Present| [158]      |
| 98  | *H. glabroides*         | On *Meliola glabroides*, on *Piper aduncum/ Piperaceae* | Puerto Rico                   | Conidiophores 100–140 × 7 μm; Conidia 40–81 × 6–7 μm, 3–6-distoseptate | Absent        | [159]      |
| 99  | *H. gleicheniae*        | On leaves of *Dicranopteris linearis (=Gleichenia dichotoma)/* Gleicheniaceae* | U.S.A./Hawaii Islands         | No information available                                                  | Absent        | [123]      |
| 100 | *H. gossypii*           | On living leaves and bracts of *Gossypium sp./* Malvaceae | North America                 | Conidiophores 40–185 × 6.5–8.5 μm, singly or in groups of three to six, straight cylindrical to nodose or bent, brown, 5 septate; Conidia 35–118 × 11.7–18.4 μm, elliptical, curved, rarely straight, light to dark fuliginous, thick walled, rounded at the ends, 1–8-distoseptate | Absent        | [160]      |
| 101 | *H. grewiae*            | On leaves of *Grewia sp./* Malvaceae      | Democratic Republic of the Congo | Conidiophores 80–120 × 5–8 μm, fasciculate, septate; Conidia 35–45 × 8–10 μm, fusoid, 2–4-distoseptate | Absent        | [161]      |
| 102 | *H. guangxiense*        | On dead branches of unidentified tree     | China/Guangxi, Shanglin        | Conidiophores 330–850 μm long, 15–20 μm wide just above the base and 8–13 μm wide toward the apex, fasciculate, simple, straight or flexuous, sub-cylindrical, thick-walled, smooth, brown, with 1–3 well-defined small pores at the apex, 1–4 septate; Conidia 76–110 μm long, 16–22 μm wide in the widest part, narrowing towards the apex to 3–6 μm wide, straight or curved, obclavate, smooth, middle brown, paler towards the apex, 9–17-distoseptate, with a large dark blackish-brown scar at the base, 1.5–3.5 μm thick | Absent        | [128]      |
| 103 | *H. guianense*          | *Meliola guianensis* parasitic on mycelium on living leaves of *Theobroma cacao/ Malvaceae* | Guyana                        | No information available                                                  | Absent        | [162]      |
| No. | Taxa              | Host(Genus/Family)            | Locality                        | Morphology                                                                 | Sequence Data | References |
|-----|-------------------|-------------------------------|---------------------------------|-----------------------------------------------------------------------------|---------------|------------|
| 104 | *H. heringerianum* | *Tipuana speciosa* / Fabaceae | Brazil                          | No information available                                                  | Absent        | [163]      |
| 105 | *H. hispanicum*   | On dead corticated twigs of   | Asturias, Selviella, Spain      | Conidiophores 130–540 µm long, 13–22.5 µm wide at the base, tapering to 8–15 µm near the apex, solitarily or in small groups, erect, simple, straight or flexuous, thick-walled, subcylindrical, smooth, dark to blackish brown, paler near the apex, with well-defined small pores at the apex, 1–2 septate; Conidia 69–99(–130) × (17–)18–21(–24) µm, obclavate, straight or flexuous, thin-walled, smooth, pale brown, (4–)6–11(–14)-distoseptate, with a blackish-brown 4–6 µm wide scar at the base | Present       | [21]       |
| 106 | *H. hispaniolae*  | On living leaves of *Manihot* | Dominican Republic / Haiti      | Conidiophores sub-hyaline to light-grey, when old, with an almost hyaline tip; Conidia 14.8–(53.5–)81.4 × 7.4–(11–)14.8 µm, sub-hyaline to smoky, irregular, cylindric-elongate to ellipsoidal, straight or slightly curved, with the basal end applanate, 1–8-distoseptate | Absent        | [112]      |
| 107 | *H. hunanense*    | On dead branches of          | China / Zhangjiajie, Hunan     | Conidiophores 70–226 × 5–7 above, 8.5–14 µm base, solitary or fasciculate, simple, cylindrical, straight or flexuous, thick-walled, smooth, brown, well-defined small pores at the apex, 1–3 septate; Conidia 56–127 × 10–14 base, apex 2–4 µm, obclavate, straight or curved, smooth, middle brown, paler towards the apex, 4–12-distoseptate, blackish-brown scar at the base, 1.5 µm thick | Absent        | [67]       |
| 108 | *H. hygrophilae*  | On leaves of *Hygrophila*     | Dominican Republic              | No information available                                                  | Absent        | [89]       |
| 109 | *H. insigne*      | On leaves of *Mallotus*       | Philippines                     | Conidiophores 600–800 × 50 µm, fasciculate, filiform, blackish, septate; Conidia 45–55 × 7–8 µm, obclavate, often curved, 4–5-distoseptate | Absent        | [137]      |
| No. | Taxa       | Host(Genus/Family)                    | Locality              | Morphology                                                                 | Sequence Data | References |
|-----|------------|--------------------------------------|-----------------------|---------------------------------------------------------------------------|---------------|------------|
| 110 | *H. insuetum* | On living leaves of *Philodendron sodiroi* (=*Piplocarpha sodiroi*) / Araceae | Ecuador / Pichincha   | Conidiophores 2.5–5 µm thick, olive brown or dark brown; Conidia 17–38 × 7–12 µm, oblong, ellipsoid or oblong-ellipsoid fusiform and often subclavate, rarely cylindrical, often straightly, rarely curved, olive brown or dark-brown, (3–)5–7(–9)-distoseptate, scared or a little more often in the middle constricted | Absent        | [122]      |
| 111 | *H. ipomoeae* | On leaves of *Ipomoea reptans* / Convolvulaceae | China / Taiwan       | No information available                                                   | Absent        | [130]      |
| 112 | *H. iranicum* | On living leaves of *Indigofera sp.* / Fabaceae | Iran / Bandar Abbas  | Conidiophores 40–75 × 6.9 µm, dense, curved, rarely straight, dark-brown, septate; Conidia 36(–42) × 7–11 µm, oblong, narrowly ellipsoid or curved, obtuse at both ends, straight or curved, sometimes irregular, olive, 1–3-distoseptate | Absent        | [164]      |
| 113 | *H. italicum* | On dead branch of *Alnus glutinosa* / Betulaceae | Italy                | Conidiophores (190–)330–600 × (12–)16–18(–20) µm, aggregated, erect, straight or slightly flexuous, unbranched, cylindrical, dark brown, 13–25 septate; Conidia 58–78 × 15–19(–23) µm, obclavate, straight or curved, pale brown to brown, slightly truncate and black at base, rounded, narrowed, 6–11-distoseptate | Absent        | [61]       |
| 114 | *H. juglandinum* | On dead corticated twigs of *Juglans regia* / Juglandaceae | Austria / Niederösterreich / Gießhübl, Italy | Conidiophores (175–)215–325(–455) µm long, 11–23 µm wide at the base, 8.5–14 µm wide near the slightly inflated apex, fasciculate, erect, simple, straight or flexuous, thick-walled, sub-cylindrical, smooth, brown to dark brown, darker to black at the apex, the latter with a well-defined apical pore; Conidia (69–)89–145(–205) × (15.0–)16.5–20.0(–25.0) µm, rostrate, straight or flexuous, thin-walled, smooth, pale brown, (5–)9–17(–20)-distoseptate, blackish-brown scar at the base | Present       | [21]       |
| 115 | *H. juglandis* | *Juglans sp.* / Juglandaceae          | China, Yunnan        | No information available                                                   | Absent        | [165]      |
| No. | Taxa          | Host(Genus/Family)                          | Locality                      | Morphology                                                                 | Sequence Data | References |
|-----|---------------|--------------------------------------------|--------------------------------|---------------------------------------------------------------------------|---------------|------------|
| 116 | H. kakamegense | On dead attached twig of *Uvariopsis congensis* / Annonaceae | Kenya                          | Conidiophores 250–550 × 8–12 µm, solitary, unbranched; Conidia 30–90 × 8–10 µm, in the broadest part, uniformly tapering to 2–4 µm wide at the apex, solitary, simple straight or somewhat curved, obclavate, rostrate, subhyaline, smooth, 4–15-distoseptate | Absent        | [166]      |
| 117 | H. kalakadense | On dead unidentified twig                  | India/Tamil Nadu               | Conidia 13–15 µm                                                          | Absent        | [21]       |
| 118 | H. kalopanacis | On dead wood of *Kalopanax septemlobus* / Araliaceae | Russia/Primorye                | No information available                                                   | Absent        | [167]      |
| 119 | H. kok-saghyz  | In seeds of *Taraxacum kok-saghyz* / Asteraceae | Russia                         | No information available                                                   | Absent        | [168]      |
| 120 | H. kyllingae   | *Kyllinga* sp. / Cyperaceae                | Uganda                         | No information available                                                   | Absent        | [169]      |
| 121 | H. lablab      | On leaves of *Dolichos lablab* / Fabaceae   | China/Taiwan                   | No information available                                                   | Absent        | [130]      |
| 122 | H. leucadendri | On leaves of *Leucadendron* sp. / Proteaceae | South Africa/Western Cape Province, Helderberg Nature Reserve | On MEA and PDA  
Conidiophores 100–300 × 4–6(-7) µm, erect, subcylindrical, thick-walled, medium brown, multiseptate; Conidia (35–)70–110(-170) × (6–)7–8(-11) µm, obclavate to subcylindrical, straight to slightly curved, thick-walled, medium brown, (3–)4–6(-10)-distoseptate | Present       | [21]       |
| 123 | H. leucosykes  | On *Meliola*, on leaves of *Leucosyke capitellata* / Urticaceae | Philippines                    | Conidiophores 300 × 7–8 µm, erect, brown, septate; Conidia 30 × 8 µm, 3-distoseptate | Absent        | [156]      |
| 124 | H. ligustri    | On dead branches of *Ligustrum quihoui* / Oleaceae | China/Guangxi, Nanning         | Conidiophores 127–700 µm long, 9.5–18 µm diam just above the base and 8.5–10 µm diam towards the apex, solitary, simple, straight or flexuous, smooth or verruculose, thickwalled, dark brown, with 1–3 well-defined small pores at the apex, 1–4 septate; Conidia 24–38.5 × 9.5–13 µm, obclavate, straight or slightly curved, rostrate or pseudorostrate, smoothwalled, pale brown, subhyaline towards the apex, 4–6-distoseptate, with a large dark blackish-brown scar at the base, 1–2 µm thick | Absent        | [128]      |
Table 5. Cont.

| No. | Taxa            | Host(Genus/Family)                      | Locality                                | Morphology                                                                 | Sequence Data | References |
|-----|----------------|----------------------------------------|-----------------------------------------|---------------------------------------------------------------------------|---------------|------------|
| 125 | *H. litseae*    | Litsea polyantha/Lauraceae             | India/Assam                             | No information available                                                  | Absent        | [170]      |
|     |                |                                        |                                         | **Conidiophores** 500 × 4–6 µm, erect, flexuous, cylindrical, smooth to rough-walled, medium brown, multiseptate; **Conidia** (25–40–55–65) × (7–)8–9 µm, subcylindrical, straight, smooth, medium brown, apex obtuse, base somewhat obconic, (3–)4–6–(7)–distoseptate | Present       | [171]      |
| 126 | *H. livistona*  | On leaves of *Livistona australis* / Arecales | Australia/New South Wales, Murramarang National Park | **Conidiophores** 20–75 × 3.5–5 µm; **Conidia** 65–220(–1000) × 8–10.5 µm, solitary, long, narrowly obclavate, 9–22-distoseptate | Absent        | [109]      |
| 127 | *H. longisinuatum* | Palmae rotten trunk                     | Peru                                    | **Conidiophores** 20–75 × 3.5–5 µm; **Conidia** 65–220(–1000) × 8–10.5 µm, solitary, long, narrowly obclavate, 9–22-distoseptate | Absent        | [109]      |
| 128 | *H. lonicerae*  | On Lonicera sp./Caprifoliaceae          | Brazil                                  | No information available                                                  | Absent        | [111]      |
| 129 | *H. lophirae*   | On leaves of *Lophiraalata* sp./Ochnaceae | Sierra Leone                           | **Conidiophores** 110–200 × 3–4 µm thick, simple, bluntly rounded ends; **Conidia** solitary 15–29 × 3.5–4.5 µm, oblong or oblong-cylindrical, hook or curved, smooth, olive-brown, 1–2 guttulate, 1–3-distoseptate | Absent        | [172]      |
| 130 | *H. lunzinense* | No information available                | No information available                | No information available                                                  | Absent        | [173]      |
| 131 | *H. lusitanicum*| On Alnus glutinosa/Betulaceae           | Portugal                                | No information available                                                  | Absent        | [174]      |
| 132 | *H. lycopersici*| On *Solanum lycopersicum* / Solanaceae | Guinea                                  | No information available                                                  | Absent        | [175]      |
| 133 | *H. machaerii*  | On Machaerium sp./Fabaceae              | Brazil                                  | No information available                                                  | Absent        | [111]      |
| 134 | *H. macilentum* | On rotten wood                          | UK/Great Britain                        | **Conidiophores** erect, simple, fusiform, 7–10 septate; **Conidia** 0.5–0.65 × 0.1 mm | Absent        | [176]      |
| 135 | *H. magnisporum*| On dead fallen branches of an unknown woody plant | Japan                                  | **Conidiophores** 150–270 µm long, 9.5–13 µm thick at the apex, 8.5–13.5 µm thick at the base, single or fasciculate, straight or flexuous, smooth walled, brown to dark brown, sometimes paler toward the apex, septate; **Conidia** 100–203 × 12.5–22.5 µm tapering gradually to 2.5–5 µm thick near the apex, solitary, obclavate or rostrate, straight or flexuous, pale olive-brown to pale brown, paler toward the apex, 7–18-distoseptate, with a blackish-brown to black scar, 4–7 µm thick | Present       | [177,178] |
| No. | Taxa             | Host(Genus/Family)                          | Locality       | Morphology                                                                 | Sequence Data       | References |
|-----|-----------------|--------------------------------------------|----------------|--------------------------------------------------------------------------|---------------------|------------|
| 136 | *H. makilingense* | On dead branches of *Paramignya monophylla* /Rutaceae | Philippines    | Conidiophores 400–600 × 7–9 µm, dense, erect, curved, brown, septate; Conidia 100–300 × 10–12 µm, obclavate, 12–18-distoseptate | Absent              | [179]      |
| 137 | *H. manihotis*   | on living leaves of *Manihot sp.* /Euphorbiaceae | Brazil         | Conidiophores 50–95 × 4–6 µm, 4–6 septate; Conidia 40–50 × 6–8 µm, vermiform, clavate to subfusoid, olives, 4–7-distoseptate | Absent              | [180]      |
| 138 | *H. marantae*    | On leaves of *Maranta arundinacea*/Marantaceae | China/Taiwan   | No information available                                                  | Absent              | [130]      |
| 139 | *H. massarinum*  | *Berchemia racemose*/Rhamnaceae             | Japan          | Conidiophores 380–810 × 7–9 wide at the apex, 13.5–21 wide at the base µm, 15–25 septate; Conidia 17–56.5 × 5–9 µm, tretic, solitary or in short chains (5–6), obclavate, rostrate, pale brown, smooth, with or without guttules, 1–8-distoseptate | Present             | [19]       |
| 140 | *H. mattiroloi*  | On branches of *Sideroxylon oxycantha*/Sapotaceae | Etiopia        | No information available                                                  | Absent              | [181]      |
| 141 | *H. mayaguezense*| On culms and leaves of *Paspalum conjugatum*/Poaceae | Puerto Rico    | Conidiophores 300–500 × 18–22 µm; Conidia 135–155 × 35–45 µm, fusoid to clavate, 3–4-distoseptate | Absent              | [182]      |
| 142 | *H. melastomacarum* | On *Melolamelastomacearum*, on *Miconiaracemose*/Melastomataceae | Puerto Rico    | Conidiophores 280 × 3 µm; Conidia 14–21 × 3.5–6 µm, ellipsoid, 3-distoseptate | Absent              | [159]      |
| 143 | *H. meliae*      | On leaves of *Melia azedarach*/Meliaceae     | Dominican Republic | Conidiophores 250–350 × 15–22 µm, simple, aggregated, branched, olive-brown to black, septate; Conidia 70–100 × 12–15 µm, elongate, fusoid, or clavate | Absent              | [183]      |
| 144 | *H. melioloides* | On leaves of *Uvaria sp.*/Annonaceae        | Philippines    | Conidiophores 250–300 × 6–8 µm; Conidia 35–45 × 9–10 µm, obclavate, 3-distoseptate | Absent              | [137]      |
| 145 | *H. microsorum*  | On twigs of *Quercus ilex*/Fagaceae         | England, Italy | Conidiophores 100–550 × 8–14 µm, fasciculate, simple, flexuous, cylindrical, smooth-walled, dark brown, with a pore at the apex and often 1–2, septate; Conidia 60–(114–)160 × 12–(17–)22 µm thick in broadest part, tapering to 4–10 µm near the apex, obclavate, smooth-walled, pale to mid golden-brown, 9–17-distoseptate, with 5–7 µm wide at the scar | Present             | [184]      |
Table 5. Cont.

| No. | Taxa              | Host(Genus/Family)     | Locality                  | Morphology                                                                                         | Sequence Data | References |
|-----|-------------------|------------------------|---------------------------|-----------------------------------------------------------------------------------------------------|---------------|------------|
| 146 | *H. microsporum*  | From soil              | India/Maharashtra         | Conidiophores 234–468 × 10.8 µm, pale brown, 10–16 septate; Conidia 26–41 × 22 µm, fusoid, widest at the middle, brown, 2–7-distoseptate | Absent        | [18]       |
| 147 | *H. minimum*     | On dead decorticatd branches | UK/Great Britain/England | Conidiophores erect, simple, septate; Conidia 12–14 × 3–4 µm, fusiform, obtuse at the ends, triseptate, scarcely constricted, hyaline | Absent        | [185]      |
| 148 | *H. multiseptatum* | On dead branches       | China/Guangdong           | Conidiophores 390–650 × 10–14 µm wide at the base, 7–9 µm at apex, simple, subcylindrical, straight or slightly flexuous, smooth-walled, brown to dark brown, paler towards the apex, with 1–3 well defined, small pores, 1–3 septate; Conidia 78–190 µm long, 11–16 µm thick in the widest part, narrowing toward the apex to 3–6 µm, tretic, straight or slightly flexuous, obclavate or whip-like, smooth-walled, pale brown paler toward the apex, 13–25-distoseptate, with a dark blackish-brown scar at the base | Absent        | [129]      |
| 149 | *H. nadsonii*    | On fibers of *Gossypium* sp./Malvaceae | Russia                   | No information available                                                                             | Absent        | [186]      |
| 150 | *H. nanjingense* | On dead branches of an unidentified tree | China/Jiangsu, Nanjing   | Conidiophores 250–470 × 6.9–7.7 µm, solitary or fasciculate, simple, straight or flexuous, thick-walled, sub-cylindrical, smooth, brown to dark brown, with well-defined small pores at the apex,1–4 septate; Conidia 64.5–170.5 µm long, 7.3–10.3 µm wide in the widest part, narrowing towards the apex to 5.0–6.8 µm wide, subulate or nearly whip-like, straight or curved, thin-walled, smooth, pale brown, 6–17-distoseptate, with a blackish-brown scar at the base, 1.4–2.7 µm thick | Present       | [187]      |
| 151 | *H. naviculare*  | On leaves of *Euphorbia* sp./Euphorbiaceae | Brazil/Tubarão            | Conidiophores 6–8 µm thick, branched, often curved, yellow, septate; Conidia 50–84 × 11–16 µm naviculiform, hyaline at length, very pale with brown | Absent        | [188]      |
| 152 | *H. naviculatum* | On dead herbaceous stems of *Solidago* sp./Asteraceae | U.S.A./New York          | No information available                                                                             | Absent        | [189]      |
| 153 | *H. newbouldiae* | On leaves of *Newbouldia laevis*/Bignoniaceae | Guinea                   | No information available                                                                             | Absent        | [190]      |
Table 5. Cont.

| No. | Taxa             | Host(Genus/Family)                  | Locality         | Morphology                                                                 | Sequence Data | References |
|-----|------------------|------------------------------------|------------------|---------------------------------------------------------------------------|---------------|------------|
| 154 | *H. novae-zelandiae* | On dead wood and bark of *Vitex lucens* / Lamiaceae | New Zealand      | Conidiophores 165 μm long, 4.8–7(–9) μm, erect, single or in groups, simple, or once-branched at the base, straight or flexuous, subcylindrical, brown to dark brown below, very pale brown to subhyaline above, 15 septate; Conidia 13.5–16.2 × 7.2–9.0 μm, solitary, obvoid, sometimes slightly, smooth, the 2 lower cells being brown and the distal cell paler with a dark band of wall overlying each septum, 2-distoseptate | Absent        | [191]      |
| 155 | *H. obpyriforme*  | On dead branches of unidentified tree | China/Guangxi    | Conidiophores 225–460 μm long, 9.5–13 μm diam just above the base and 6–8.5 μm diam towards the apex, arising singly from the upper cells of the stromata, simple, subcylindrical, straight or flexuous, dark brown, paler towards the apex, with well-defined small pores at the apex, 1–3 septate; Conidia 47–74 μm long, 14–19 μm diam in the widest part, narrowing in diameter towards the apex to 2.5–5 μm, straight or slightly curved, obpyriform, smooth-walled, middle brown, paler towards the apex, 5–9-distoseptate, with a large dark blackish-brown scar at conidium base, 1–2 μm thick | Absent        | [128]      |
| 156 | *H. ocoteae*     | On *Meliola ocoteae*, on *Guareatrichilioides* | Puerto Rico      | Conidiophores 135–200 × 4 μm, septate; Conidia 20–28 × 4–6 μm, 3-distoseptate | Absent        | [159]      |
| 157 | *H. oligosporum* | Holotype of *Sporidesmium olivaceum*: on rotten branches of *Tilia* sp. Lectotype of *Coryneumoligosporum*, here designated: on rotten branches of *Coriolus* sp. Epitype of *Sporidesmiumolivaceum* and of *Coryneumoligosporum*: on dead corticated twigs of *Tilia cordata* sp. | Austria, Czech Republic, Germany | From Epitype specimen [21] Conidiophores (17–)22–35(–46) × (8.0–)8.5–10.5(–11.5) μm, densely crowded, erect, simple, straight, cylindrical to slightly swollen at the apex, brown to dark brown, darker at the apex, smooth, 0–2 septate; Conidia (37–)39–80(–124) × (14.8–)15.8–18.0(–20.0) μm, tapering to 4–10.5 μm at the distal end, with 4–8 μm wide, dark brown to black scar at the base, obclavate, sometimes rostrate, straight or curved, smooth but occasionally wrinkled with age, pale brown to brown, paler toward the apex, 6–12(–16)-distoseptate | Present       | [21,124]  |
| 158 | *H. olisipponense* | Culture from the perithecia stage of *Pyrenophora polytricha* | -                | No information available | Absent        | [192]      |
| No. | Taxa                  | Host (Genus/Family)                  | Locality       | Morphology                                                                                                                                  | Sequence Data                  | References |
|-----|-----------------------|-------------------------------------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------------|
| 159 | *H. oplismeni*        | On leaves of *Oplismenus compositus* /Poaceae | China / Taiwan | No information available                                                                                                                  | Absent                         | [130]      |
| 160 | *H. orchidacearum*    | On leaves of *Neottia ovata* (=*Listera ovata*) /Orchidaceae | France          | No information available                                                                                                                  | Absent                         | [193]      |
| 161 | *H. orthospermum*     | On rotten wood                      | U.S.A. / New York | Conidiophores 50–60 × 5 µm, erect, simple, fasciculate, straight, dark, 3–4 septate; Conidia 60–80(–110) × 10–12 µm, cylindrical, straight, apex rounded, tuncated at base, 12–14-distoseptate | Absent                         | [194]      |
| 162 | *H. oryzae-microsporae* | On *Oryza sativa* /Poaceae          | Japan           | No information available                                                                                                                  | Absent                         | [195]      |
| 163 | *H. ovoideum*         | On dead branches of tree            | China / Jilin   | Conidiophores 380–510 × 15–25 µm diam just above the base, 7.5–10 µm diam towards the apex, arising singly from the upper cells of thestromata, simple, subcylindrical, straight or flexuou, thick-walled, smooth, brown to dark brown, paler towards the apex, with 1–3 well-defined small pores at the apex, 1–6 septate; Conidia 27–61 × 13–21 µm diam in the widest part, narrowing towards the apex to 4.5–8.5 µm, straight, to ellipsoidal, smooth-walled, moderately brown, paler towards the apex, 3–8-distoseptate, with a large dark blackish-brown scar at the base, 1.5–2.5 µm thick | Absent                         | [128]      |
| 164 | *H. pachystelae*      | On living leaves of *Synsepalum solo* (=*Pachystelam solo*) /Sapotaceae | Tanzania        | Conidiophores 300–350 × 6–8 µm, erect, simple, septate; Conidia 35–50 × 10–13 µm, fusoid or oblong clavate or lanceolate, 3–5-distoseptate | Absent                         | [196]      |
| 165 | *H. palaestinum*      | On stems and flowers of *Dianthus sp.* /Caryophyllaceae | Israel          | Conidiophores 30–160 × 6–8 µm, fasciculate, 8–16 aggregate, simple, bent, thick-walled, coffin terminal obtuse, thin, yellow or colorless, 5–7 septate; Conidia 60–120 × 9–12 µm, solitary, obclavate, rectiusculus or curved, pale-olive, minute-granule, thick-walled, towards colorless above, 5–7-distoseptate | Absent                         | [197]      |
| No. | Taxa               | Host (Genus/Family)                                                                 | Locality                           | Morphology                                                                                                                                                                                                                                                                                                                                 | Sequence Data | References |
|-----|--------------------|-----------------------------------------------------------------------------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|
| 166 | *H. palmigenum*    | On rotten fruit of *Cocos nucifera*/Arecaeeae; On petiole and rachis from reference specimen | Brasil/Pará, Papua New Guinea      | From reference specimen [190]: *Conidiophores* 132.5–195 × 5–6 µm, solitary, erect, simple, cylindrical, straight or flexuous, smooth, brown, light brown at the apex, 7–10 septate; *Conidia* 38–53 × 8–11 base, 3–4 µm apex, solitary, in small chains, obclavate or cylindrical, straight or slightly curved, simple, smooth, brown with light brown at apical cell, 6–10-distoseptate                                                                 | Absent        | [198,199]  |
| 167 | *H. panici*        | On leaves of *Panicum maximum*/Poaceae                                             | Indonesia/Java                     | *Conidiophores* 115–180 × 8–10 µm; *Conidia* (35–)50–75 × (7–)10–13 µm, ellipsoidal-truncate, ellipsoidal-elongate, dull-brown, (1–)3(–4)-distoseptate                                                                                                                                 195            |
| 168 | *H. papulosum*     | On bark of *Malus sylvestris* or *Pyrus communis*/Rosaceae                        | West Virginia                      | No information available                                                                                                                                                                                                                                                                                                                                 195            |
| 169 | *H. parathesicola* | On *Meliola parathesicola*, on *Parathesis serrulate*/Primulaceae                 | Puerto Rico                        | *Conidiophores* 120 × 4 µm, solitary; *Conidia* 17–20 × 4–6 µm, base truncate, apex beaked, beak often 7 µm long, 1–3-distoseptate                                                                                                                                                                                                                   Absent        | [159]         |
| 170 | *H. paulense*      | On leaves of Myrtaceae                                                             | Brazil/São Paulo                   | *Conidiophores* 3–4.5 µm thick, brown, septate; *Conidia* 15–24 × 4 µm, fusoid, brown, 3-distoseptate                                                                                                                                                                                                                                           Absent        | [115]         |
| 171 | *H. penniseti*     | On leaves of *Pennisetum glaucum* (= *Pennisetum typhoides*)/Poaceae              | India/Uttar Pradesh                | No information available                                                                                                                                                                                                                                                                                                                                 Absent        | [108]         |
| 172 | *H. philippinum*   | On decaying leaves of *Arenga mindorensis*/Arecaeeae                              | Philippines                        | *Conidiophores* 300–400 × 6–7 µm, fasciculate, filiform, curved, septate; *Conidia* 33–35 × 8–9 µm, obclavate, 4-distoseptate                                                                                                                                                                                                                   Absent        | [137]         |
| 173 | *H. philodendri*   | On *Meliola philodendri*, on *Phylodendron krebii*/Araceae                         | Puerto Rico                        | *Conidiophores* 400 × 3–4 µm; *Conidia* 24–35 × 5–9 µm, clavate, 3-distoseptate                                                                                                                                                                                                                                                           Absent        | [159]         |
| 174 | *H. phomatae*      | On bark of *Acer pennsylvanicum*/Sapindaceae                                      | U.S.A./New York                    | No information available                                                                                                                                                                                                                                                                                                                                 Absent        | [189]         |
| 175 | *H. phyllantheum*  | On dead branches hanging down of *Phyllanthus* sp./Phyllanthaceae                  | Philippines                        | *Conidiophores* 180–200 × 4.7–6 µm, filliform, blackened, septate; *Conidia* 80–90 × 9–10 µm, obclavate, long, 9–11-distoseptate                                                                                                                                                                                                       Absent        | [137]         |
Table 5. Cont.

| No. | Taxa             | Host (Genus/Family)                        | Locality               | Morphology                                                                                                                                  | Sequence Data | References |
|-----|------------------|--------------------------------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------|
| 176 | *H. piperis*     | On leaves of *Piper betle*/Piperaceae      | China/Taiwan           | No information available                                                                                                                  | Absent        | [130]      |
| 177 | *H. portoricense*| On dead branches hanging down of *Phyllanthus sp./Phyllanthaceae* | Philippines           | *Conidiophores* 25–250 × 2–5 μm; *Conidia* 30–60 × 6–10 μm, elongate-fusoid, olive-brown or brown, (2–)4-distoseptate | Absent        | [86,201]   |
| 178 | *H. proliferatum*| On grain of *Triticum sp./Poaceae*         | India/Maharashtra     | Colony on PDA; *Conidiophores* 292–510 × 7–13.8 μm, unbranched, pale, olivaceous, 5–20 septate; *Conidia* 23–126 × 11.5–13.8 μm; cylindrical, olivaceous, 3–13-distoseptate | Absent        | [101]      |
| 179 | *H. pseudomicrosorum* | On dead branches of unidentified tree       | China/Changbaishan, Jilin | *Conidiophores* 155–288 × 11–15 μm, fasciculate, simple, cylindrical, straight or flexuous, smooth, dark brown, paler towards the apex, with 1–3 well-defined small, 1–4-septate; *Conidia* 82–142 × 17–27 μm in the widest part, narrowing towards the apex to 3–6 μm diam, tretic, straight or slightly flexuous, obclavate, smooth-walled, brown, paler towards the apex, 7–16-distoseptate, with a large dark blackish-brown scar at the base, 2–4 μm thick | Absent        | [128]      |
| 180 | *H. pseudotsugae* | On bark and resin exudations of *Pseudotsuga taxifolia var. glauca*/Pinaceae | U.S.A.                | *Conidiophores* scattered on aerial hyphae with usually one at each cell; *Conidia* 65–105 × 14–15 μm, opaque, black or greenish black, smooth walls, with 8–14-distoseptate | Absent        | [202]      |
| 181 | *H. purpurascens* | On leaves of *Panicum purpurascens*/Poaceae | U.S.A./Florida         | No information available                                                                                                                   | Absent        | [203]      |
| 182 | *H. pyracantha*   | *Pyracantha* sp./Rosaceae                  | Portugal               | No information available                                                                                                                   | Absent        | [204]      |
| 183 | *H. quercicola*   | On dead corticated branches of *Quercus cf. reticulata*/Fagaceae | U.S.A.                | *Conidiophores* (115–)133–226(–300) μm long, 14–20 μm wide at the base, tapering to 10–15 μm near the apex, solitary or fasciculate, simple, straight or flexuous, cylindrical, thick-walled, smooth, brown to dark brown, with well-defined small pores at the apex; *Conidia* 60–100 × 15–22 μm, straight or flexuous, obclavate, smooth-walled, brown, 8–10-distoseptate, with blackish-brown to black scar at the base | Absent        | [21]       |
| No. | Taxa          | Host(Genus/Family)                | Locality                           | Morphology                                                                 | Sequence Data | References |
|-----|---------------|----------------------------------|------------------------------------|---------------------------------------------------------------------------|---------------|------------|
| 184 | *H. quercinum*| On dead corticated twigs of      | Austria/Niederösterreich,          | Conidiophores (40–)74–199(–332) µm long, 11–18 µm wide at the base,       | Present       | [21]       |
|     |               | *Quercus petraea*/Fagaceae       | Spitzerberg                        | tapering to 8.5–13.5 µm near the apex, solitarily or fasciculate, simple, |               |            |
|     |               |                                  |                                    | straight or flexuous, cylindrical, smooth, brown to dark brown, with       |               |            |
|     |               |                                  |                                    | well-defined small pores at the apex, 1–5 septa; *Conidia* (47–)78–130(–201) |               |            |
|     |               |                                  |                                    | × (13.2–)15.3–18.0(–20.5) µm, straight or flexuous, rostrate, smooth-walled, |               |            |
|     |               |                                  |                                    | brown, 8–13(–20)-distoseptate, with blackish-brown to black scar at the   |               |            |
|     |               |                                  |                                    | base                                                                         |               |            |
| 185 | *H. repens*   | On bark of dead *Acer            | U.S.A./Utah, Red Butte            | Conidia 40–45(–60) × 8–9 µm, sub-oblong, 5–12-distosepate                | Absent        | [205]      |
|     |               | *grandidentatum*/Sapindaceae     | Canyon                            |                                                                             |               |            |
| 186 | *H. reyesii*  | On dead branch of *Guioa sp./     | Philippines                        | Conidiophores 130 × 8–10 µm, erect, brown, septate; *Conidia* 34–112 ×    | Absent        | [137]      |
|     |               | Sapindaceae                      |                                    | 8–13 µm, tereti-fusoid, brown, ends hyaline, 5–14-distosepate              |               |            |
| 187 | *H. rhodomyrti*| On leaves of *Rhodomyrtus        | China/Guangdong                    | Conidia 42–60 × 17–20 µm, fusoid, brown, 5–7-distosepate                  | Absent        | [206]      |
|     |               | *tomentosa*/Myrtaceae             |                                    |                                                                             |               |            |
| 188 | *H. rhopaloides*| On decaying stem of *Brassica*     | Britain, France, Germany,          | Conidiophores short, dark brown-black, 12–14 septate; *Conidia* 0.04–    | Absent        | [207,208] |
|     |               | *oleracea*/Brassicaceae           | Italy, Portugal                    | 0.1 mm long, 0.08 mm wide, straight or slightly curved                    |               |            |
| 189 | *H. schelkownikii*| On branches                      | Armenia, Azerbaijan,               | No information available                                                   | Absent        | [209]      |
|     |               |                                  | Georgia, Russia                    |                                                                             |               |            |
| 190 | *H. scolecoides*| On dry wood                     | Germany/Reichenberg               | Conidiophores simple, branched; *Conidia* 80 × 7.5 µm, torulus,          | Absent        | [96]       |
|     |               |                                  |                                    | fusciculate, septate, yellow                                               |               |            |
| 191 | *H. sechicola*| On *Sechium edule*/Cucurbitaceae | Puerto Rico                        | No information available                                                   | Absent        | Present    |
|     |               |                                  |                                    |                                                                             |               | [210]      |
| 192 | *H. sichuanense*| On dead branches of tree         | China/Sichuan                      | No information available                                                   | Absent        | Present    |
|     |               |                                  |                                    |                                                                             |               | [211]      |
| No. | Taxa         | Host(Genus/Family)                          | Locality                               | Morphology                                                                 | Sequence Data | References |
|-----|-------------|--------------------------------------------|-----------------------------------------|----------------------------------------------------------------------------|---------------|------------|
| 193 | *H. solani* | On stem of *Solanum nigrum* / Solanaceae (type); *Citrus linella*; *Leucaena glauca*; *Solanum dulcamara*; *S. nigrum*; *Solanum tuberosum* | England, Guernsey, New Zealand, New Guinea, Sierra Leone, Wales | Conidiophores 120–600 × 9–15 µm thick near base, 6–9 µm thick near the apex, erect, simple, straight or flexuous, smooth or occasionally, brown to very dark brown, paler near apex, septate, with small pores at apex, 1–8 septate; *Conidia* (24–)39–85 × (7–)9–11 µm, straight or curved, obclavate, smooth-walled, subhyaline to brown, 2–8-distosepate, with a well-defined dark brown to black scar at base | Present | [212] |
| 194 | *H. solitarium* | On leaves of *Iris sp.* / Iridaceae | U.S.A./Minnesota | Conidiophores 60–150 × 6 µm, solitary, slightly fasciculate, erect, swollen at the base, lighter colored at the apex, dark brown, septate; *Conidia* 24–30 × 8–9 µm, oblong-elliptical, sometimes slightly curved, dark brown, at first 2–4 guttulate, 3–5-distosepate | Absent | [213] |
| 195 | *H. spirotrichum* | On withered leaves of *Cytophyllum fragrans* / Gentianaceae | Singapore | Conidiophores 190–220 × 6 µm, fasciculate, filiform, brown, septate; *Conidia* 23–25 × 9 µm, oblong-obclavate, gently curving, brown, 3-distosepate | Absent | [214] |
| 196 | *H. spirostrom* | On dead branches of tree | China/Sichuan | No information available | Absent | [211] |
| 197 | *H. subapiculatum* | On dead wood of *Sambucus callicarpa* / Adoxaceae | U.S.A./Washington | Conidiophores 8–10 µm thick; *Conidia* 35–80 × 12–16 µm, oblong or subfusiform, 6–7-distosepate | Absent | [215] |
| 198 | *H. subhyalinum* | On living leaves of *Phoenix hanceana* / Areaceae | China/Guangdong | Conidiophores 120–200 × 10–12 (basal), above 6–8.5 µm thick, simple or fasciculate, erect, subcylindrical, brown, pores 1–3 µm, septate; *Conidia* 72–125 × 9–11.5 µm, obclavate, straight or flexuous, subhyaline, apex 2.5–5 µm, black at tip, 6-9-distosepate, dark blackish-brown scar | Absent | [129] |
| 199 | *H. submersum* | On submerged decaying wood | China/Yunnan | Conidiophores 239–423 × 8.5–15.5 µm, solitary or in group of 2–4, unbranched, straight or curved, smooth, dark brown, paler towards to the apex, bulbous at base 9–14 septate; *Conidia* 41–55 × 14.5–18.5 µm, straight or curved, wider below than apex, truncate and dark at base, apically rostrate and pale, smooth, pale brown to mid-brown, guttulate, 6–10-distosepate | Present | [24] |
Table 5. Cont.

| No.  | Taxa             | Host(Genus/Family)                              | Locality                  | Morphology                                                                 | Sequence Data         | References |
|------|------------------|------------------------------------------------|---------------------------|---------------------------------------------------------------------------|-----------------------|------------|
| 200  | *H. subsimile*   | On withered and dead leaves of *Bruguiera sexangula* (=*Bruguiera eriopetala*)/Rhizophoraceae | Singapore                 | Conidiophores 200–250 × 8–9 µm, filiform-fasciculate, brown, septate; Conidia (38–)45–50 × 11–12–(14) µm, brown, 3-distoseptate | Absent                | [216]      |
| 201  | *H. syzygii*     | On bark canker of *Syzygium* sp./Myrtaceae            | South Africa/Eastern Cape Province | Conidiophores 150–400 × 10–15 mm, fasciculate, unbranched, clavate at apex, dark brown, multiseptate; Conidia (70–)80–100(–150) × (19–)22–23(–25) mm, obclavate, curved, apex subobtuse, warty, inner surface striate, medium brown, (7–)9–12-distoseptate | Present               | [22]       |
| 202  | *H. theobromae*  | On leaves of *Theobroma cacao*/Malvaceae           | Italy                     | Conidiophores 500–1000 µm, erect, 6–10 septate; Conidia 60–160 × 12–20 µm, obclavate to tereti-obclavate | Absent                | [217]      |
| 203  | *H. theobromicola* | On rotten leaves of *Theobroma cacao*/Malvaceae    | Dominican Republic/Moca   | Conidiophores 20–33 × 3.5–5 µm olives-brown, septate; Conidia 46–58 × 10–13.5 µm, elliptic-oblong or subfusoid, irregular, 3–5-distoseptate | Absent                | [218]      |
| 204  | *H. tritici*     | On seedhead of *Triticum vulgare* /Poaceae          | Tanzania                  | Conidiophores 3.5–5 µm, thick fasciculate, erect, sepaete; Conidia 12–25 × 4–7 µm, subcylindrical-oblong, clavate or fusoid, 2–4-distoseptate, constrict at septum | Absent                | [219]      |
| 205  | *H. tritikernelis* | On kernels of *Triticum aestivum* /Poaceae         | India/Bihar               | No information available                                                   | Absent                | [108]      |
| 206  | *H. turbinatum*  | On unidentified wood                                | Great Britain             | Conidiophores simple, slender; Conidia elongated, turbinatis, tuncatus, apiculate, brown, 4–7-distoseptate | Absent                | [220]      |
| 207  | *H. ubangiense*  | On leaves of *Coffea* sp./Rubiaceae                 | Democratic Republic of the Congo/Ubangi River | Conidiophores (2–)3–6 µm, fasciculate; erect, branched, sepaete; Conidia 30–60 × 5–8 µm, fusoid, 3–4-distoseptate | Absent                | [221]      |
| 208  | *H. ustilaginoideum* | On flowers of *Panicum spicatum* /Poaceae         | Democratic Republic of the Congo | Conidiophores 3–3.5 µm thick, fasciculate; Conidia 10–50 × 3.5–4.5 µm, cylindrical or subfusoid, blunted, 1–5-distoseptate | Absent                | [121]      |
| 209  | *H. varium*      | On decaying leaves of unidentified plants           | Brazil/Pernambuco         | Conidiophores 150–200 × 10–14 µm, erect, unbranched, straight or flexuous, cylindrical, slightly inflated at the apex, smooth, brown, 5–7 septate; Conidia 29–58 × 4–7 µm, cylindrical-obclavate, subcylindrical, oblong or navicular, dry, trick-walled, with wall verrucose or verruculose, gray-brown, lumina pale yellow, (0–)1–4-distoseptate | Absent                | [222]      |
Table 5. Cont.

| No. | Taxa | Host(Genus/Family) | Locality | Morphology | Sequence Data | References |
|-----|------|-------------------|----------|------------|---------------|------------|
| 210 | *H. varroniae* | On leaves of *Varronia* sp./Boraginaceae | Puerto Rico | Conidiophores 160–200 × 4 µm; *Conidia* 27–44 × 6–7 µm, 3-distoseptate | Absent | [223] |
| 211 | *H. velutinum* | Fagus sylvatica dead corticated twigs/saprobic on decaying wood submerged in stream | Austria, Wien, Döbling, Kahlenberg/China | From reference specimen [20]; Conidiophores 530–655 × 16–18 µm, erect or flexuous, unbranched, dark brown, 17–23 septate; Conidia 67–79 × 15–19 µm, single, obclavate, straight or curved, smooth, pale brown to brown, 7–9-distoseptate, rounded at apex, guttulate when young, non-guttulate at maturity | Present | [16,20] |
| 212 | *H. viticis* | On leaves of *Vitis* sp./Vitaceae | Brazil/Pará | Conidiophores 80 × 2–3 µm, fasciculate, septate; Conidia 12–20 × 2.5–3.5 µm cylindrical, 1–3-distoseptate | Absent | [223] |
| 213 | *H. wagateae* | On leaves of *Moullava spicata* (=*Wagarea spicata*)/Fabaceae | India/Karnataka | Conidiophores 81–125 × 1.5–2.5 µm, yellowish-brown, multisepate; Conidia 15.5–28 × 3–4 µm, clavate-cylindric, cinnamon-yellow, rounded at both ends, 2–4-distoseptate | Absent | [91] |
| 214 | *H. warpuriae* | On stem of *Warpuria clandestina* /Acanthaceae | Great Britain/England | Conidiophores 300–500 × 6–8 µm; Conidia 115–190 × 12–14 µm, obclavate, 8–11-distoseptate | Absent | [224] |
| 215 | *H. xanthosomatis* | On leaves of *Xanthosoma violaceum* /Araceae | Dominican Republic/Moca | Conidiophores 35–90 µm long, septate; Conidia 185 × 24 µm, fusoid, subfusoid to subclavate, 3–7(-10)-distoseptate | Absent | [225] |
| 216 | *H. xylopiifolii* | On *Asterina*, on *Xylopia sericea* /Annonaceae | Brazil/Pernambuco | Conidiophores 85–305 × 5.5–8 µm, erect, 3–5 septate; Conidia 38–62 × 8–13.5 µm, cylindrical or clavate, 3–6-distoseptate | Absent | [226] |
Author Contributions: Conceptualization, S.K., K.D.H., S.C.K., C.S. and S.T.; Data curation, S.K.; Methodology, S.K., A.M. and S.T.; Resources, K.D.H., S.C.K., J.X. and S.L.; Supervision, K.D.H. and S.T.; Writing—original draft, S.K., K.D.H., S.C.K., A.M., C.S., L.A.P.D., C.M.N., J.X. and S.T.; Writing—review & editing, S.K., K.D.H., S.C.K., S.T. and S.L. All authors have read and agreed to the published version of the manuscript.

Funding: Saowaluck Tibpromma would like to thank the International Postdoctoral Exchange Fellowship Program (number Y918082251), CAS President’s International Fellowship Initiative (PIFI) (number 2020PC0009), China Postdoctoral Science Foundation and the Yunnan Human Resources, and Social Security Department Foundation for funding her postdoctoral research. Kevin D. Hyde thanks the Thailand Research Funds for the grant “Impact of climate change on fungal diversity and biogeography in the Greater Mekong Subregion (RD6130001)”. Samantha Karunarathna thanks CAS President’s International Fellowship Initiative (PIFI) for funding his postdoctoral research (number 2018PC0006) and the National Science Foundation of China (NSFC) for funding this research work under project code 31750110478. This work was partly supported by Chiang Mai University.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: Sirinapa Konta is grateful to Paul Kirk, Shaun Pennycook, Jayarama Bhat, and Sirilak Radbouchoom, for their valuable suggestions and comments.

Conflicts of Interest: The authors declare no conflict of interest.

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