The Genera of Fungi - fixing the application of the type species of generic names – G 2: Allantophomopsis, Latorua, Macrodiplodiopsis, Macrohiilum, Milospium, Protostegia, Pyricularia, Robillarda, Rotula, Septoriella, Torula, and Wojnowiczia

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Abstract: The present paper represents the second contribution in the Genera of Fungi series, linking type species of fungal genera to their morphology and DNA sequence data, and where possible, ecology. This paper focuses on 12 genera of microfungi, 11 of which the type species are neo- or epitypified here: Allantophomopsis (A. cytispora, Phacidiaceae, Phacidiaceae, Lecythidiaceae), Latorua gen. nov. (Latorua caligans, Lactoraceae, Pleosporales, Dothideomycetes), Macrodiplodiopsis (M. desmazeri, Macrodiplodiaceae, Pleosporales, Dothideomycetes), Macrohiilum (M. eucalypti, Macrohiilaceae, Diaporthales, Sordariomycetes), Milospium (M. graphisorum, incertae sedis, Paezizomycotina), Protostegia (P. eucleae, Mycosphaerellaceae, Capnodiales, Dothideomycetes), Pycnularia (P. grisea, Pycnulariaceae, Magnaporthales, Sordariomycetes), Rotula (R. sessilis, Robillardaceae, Xylariaceae, Sordariomycetes), Robillardaceae, Rotulae (R. graminis, incertae sedis, Pleosporales, Dothideomycetes), Septoria (S. phragmitis, Phaeosphaeriaceae, Pleosporales, Dothideomycetes), Torula (T. herbarum, Torulaceae, Pleosporales, Dothideomycetes), and Wojnowiczia (syn. of Septoria, S. hirta, Phaeosphaeriaceae, Pleosporales, Dothideomycetes). Novel species include Latorua grootfonteineensis, Robillarda africana, R. roystoneae, R. terrae, Torula ficus, T. hollandica, and T. masonii spp. nov., and three new families: Macrodiplodiaceae, Macrohiilaceae, and Robillardaceae. Authors interested in contributing accounts of individual genera to larger multi-authored papers to be published in IMA Fungus, should contact the associate editors listed for the major groups of fungi on the List of Protected Generic Names for Fungi (www.generaoffungi.org).

Key words: DNA Barcodes
epitype
fungal systematics
ITS
LSU
typification
www.GeneraOfFungi.org

INTRODUCTION

The present research series was launched in 2014 (www.GeneraOfFungi.org, Crous et al. 2014) with the specific aim of contributing to a revision of The Genera of Fungi (Clements & Shear 1931). The focus of this set of papers is on a subset of names that are currently accepted (Kirk et al. 2013), which it is anticipated will in due course obtain...
“protected status”, subject to changes in the rules governing the naming of fungi being proposed to the next International Botanical Congress (IBCXIX) in China in 2017) (Hawksworth et al. 2013, Hawksworth 2015).

The present endeavour is complicated by the fact that for many genera of Fungi no type was designated, and the vast majority were described before the DNA era (Hibbett et al. 2011), meaning that they lack DNA barcodes (Schloch et al. 2012). Many genera of Ascomycetes are also poly- or paraphyletic, meaning that their type species need to be recollected and sequenced to resolve their true higher order phylogeny. Other aspects that affect this process include the end of dual nomenclature (Hawksworth et al. 2011, Wingfield et al. 2012), and that many sexual-asexual links reported in literature were never confirmed in culture. To address these issues, several studies have recently been published revising major groups of fungi, to reach community consensus (Rossman et al. 2013, 2015, Johnston et al. 2014, Wijayawardene et al. 2014) about which names would eventually be taken up in the lists of protected names (Kirk et al. 2013). The present contribution represents the second paper in this series.

Stabilising the application of generic names

An important aim of the present series of papers is to fix the application of names by generating DNA barcodes of type species of genera. In cases where no cultures are available, and DNA cannot be isolated from type material (depauperate or missing specimens), this aim is achieved by means of epi- or neotypification. A classic example of where this approach has been successfully used was the neotypification of Botryosphaeria dothidea (Slippers et al. 2004), which eventually paved the way for others to revise the family, including all related genera (Crous et al. 2006, Phillips et al. 2013). An important hurdle for such typification events is to ensure that the epi- or neotype specimen is derived from the same host and location (e.g. country or region), and is morphologically identical to that of the holotype or lectotype specimen (Cannon et al. 2012). In fungi, many species and genera appear to represent complexes (Crous & Groenewald 2005), and thus the application of names not linked to definitive DNA barcodes remains ambiguous. This situation has serious consequences for trade, health and industry, stressing the need to fix the application of names via DNA data.

The current rules regarding epitypification (McNeill et al. 2012), require that the existing type must be “demonstrably ambiguous”. It has been suggested that this means that every effort should be made to recover DNA for sequencing from the existing type before designation of an epitype can be justified (Jørgensen 2014). In practice it is extremely difficult to recover the actual DNA of a species of microfungi from old type material, and 19th century types in particular are frequently small, fragmentary, and co-colonised by several taxa. We consider it irresponsible to deplete or damage historic collections through repeated attempts to recover DNA just to demonstrate that this could not be done. Following extensive discussions, mycologists have consequently made a proposal to remove “demonstrably ambiguous” from the rules so that epitypification will be allowed when the existing type “cannot, in the opinion of the author making the typification, be critically identified for purposes of the precise application of the name to a taxon” (Hawksworth 2015).

In the case of many microfungi, particularly those growing on plants, as it has become increasingly clear that many are complexes of cryptic species, especially where several hosts are involved (see above) we consider that sequences are essential for a confident application of names. The epitypifications made here are on the assumption that the words “demonstrably ambiguous” will be deleted from the rules in 2017, and the revised provision which places the responsibility on the persons making the epitypification will remain. For the moment, we in any case consider the epitypifications made here are justified because, in our opinion, where there is no sequence data from the existing types the names are indeed ambiguous as regards generic placement and/or application of the species name.

The lack of sequenced types is a problem even for fungi currently being described. In 2013, approximately 65 % of the names published that year still lacked a DNA barcode (Crous et al. 2015), suggesting that a different approach is called for in the future. In the interim, in the case of previously published names, where the interpretation of a specimen is considered in the opinion of a later author to be ambiguous without molecular data, this can be rectified by designating an epitype, preferably linked to a culture, and DNA barcode. Such typification events can now also be registered in MycoBank and assigned a MBT number to ensure traceability of the nomenclatural act (Robert et al. 2013). This approach is followed here.

MATERIALS AND METHODS

Isolates

Descriptions are based on cultures obtained from the CBS-KNAW Fungal Biodiversity Centre in Utrecht, The Netherlands (CBS-KNAW) and the working collection of P.W. Crous (CPC), housed at CBS. For fresh collections, leaves and twigs were placed in damp chambers, and incubated at room temperature for 1–2 d. Single conidial colonies were established from sporulating conidiomata in Petri dishes containing 2 % malt extract agar (MEA) as described earlier (Crous et al. 1991). Colonies were sub-cultured onto MEA, 2 % potato-dextrose agar (PDA), oatmeal agar (OA), MEA (Crous et al. 2009b), autoclaved pine needles on 2 % tap water agar (PNA) (Smith et al. 1996), and incubated at 25 °C under continuous near-ultraviolet light to promote sporulation. Reference strains and specimens are maintained at the CBS.

DNA isolation, amplification and analyses

Genomic DNA was extracted from fungal colonies growing on MEA using the UltraClean™ Microbial DNA Isolation Kit (MoBio Laboratories, Inc., Solana Beach, CA, USA) according to the manufacturer’s protocol. The primers V9G (de Hoog & Gerrits van den Ende 1998) and LR5 (Vilgalys & Hester 1990) were used to amplify part of (ITS) of the nuclear rDNA operon spanning the 3’ end of the 18S nrRNA gene, the first internal transcribed spacer (ITS1), the 5.8S nrRNA gene, the second ITS region (ITS2) and approximately 900 bp of the 5’ end of
the 28S nrRNA gene (LSU). The primers ITS4 (White et al. 1990) and LSU1Fd (Crous et al. 2009) were used as internal sequence primers to ensure good quality sequences over the entire length of the amplicon. Part of the histone H3 gene (HIS) was amplified with primers CyH3F and CyH3R (Crous et al. 2004b). Amplification conditions for ITS and LSU followed Cheewangkoon et al. (2008), and for HIS Groenewald et al. (2013). SeqMan v. 7.0.0 (DNASTAR, Madison, WI) was used to compute consensus sequences. Blast searches using ITS and LSU sequences were performed for each strain and the closest matches were retrieved and included in the phylogenetic analyses. An overview LSU tree was inferred to determine the higher order phylogenetic placement and ITS phylogenies for selected species to determine higher resolution placement at the species level; for Robillarda, the ITS data was supplemented with HIS sequences. The sequence alignment and subsequent phylogenetic analyses of the alignments were carried out using methods described by Crous et al. (2006) for parsimony and Groenewald et al. (2013) for Bayesian analyses. Gaps were treated as “fifth state” data in the parsimony analysis. Novel sequence data were deposited in GenBank (Table 1) and the alignments and trees in TreeBASE (ID 17674; http://www.treebase.org).

**Morphology**

Slide preparations were mounted in clear lactic acid either directly from specimens or from colonies sporulating on MEA, PDA, PNA, or OA. Sections of conidiomata were made by hand for examination purposes. Observations were made with a Zeiss V20 Discovery stereo-microscope (Zeiss, Oberkochen, Germany), and with a Zeiss Axio Imager 2 light microscope using differential interference contrast (DIC) illumination and an AxioCam MRc5 camera and ZEN software. Additional photomicrographs were done using a Nikon Eclipse Ni-U microscope (Nikon, Tokyo), a Nikon SMZ1500 stereo-microscope, Nikon DS-U3 digital camera and Nis Elements imaging software. Colony characters and pigment production were noted after 2–4 wk of growth on MEA and OA (Crous et al. 2009b) incubated at 25 ºC. Colony colours (surface and reverse) were rated according to the colour charts of Rayner (1970). Taxonomic novelties and new typifications were deposited in MycoBank (www.MycoBank.org; Crous et al. 2004a).

**RESULTS**

**Phylogeny**

For the species treated here, amplicons of approximately 1700 bases were obtained of ITS and LSU, and approximately 400 bases for HIS, of the isolates listed in Table 1. The LSU alignment was used to resolve the generic placement of strains (Fig. 1) and the remaining alignments (see below) for species identification. The manually adjusted LSU alignment contained 140 sequences (including the outgroup sequence) and 745 characters including alignment gaps were used in the phylogenetic analysis; 296 of these were parsimony informative, 68 were variable and parsimony-uninformative, and 381 were constant. The parsimony analysis yielded the maximum setting of 1000 equally most parsimonious trees (TL = 1268 steps; CI = 0.476; RI = 0.937; RC = 0.446), which made it possible to evaluate the higher order classification of the species treated here (Fig. 1; discussed below in the Taxonomy section). A Bayesian analysis (337 unique site patterns, tree based on consensus of 80328 trees) on the sequence alignment yielded a tree topology delimiting the same lineages to those of the parsimony analysis (posterior probability values plotted on Fig. 1, tree available in TreeBASE), but with some rearrangements at the terminal (for example the order of Melanconia, Macrothrium and Diaporthe within Diaporthales) and the deeper nodes (for example the placement of Capnodiales compared to Phacidiales). The genus Robillarda represented a lineage distinct from Amphishphaeraceae and therefore a novel family is introduced below to accommodate it in Xylariaceae. Likewise, new familial names are introduced below for Latorula, Macrodiploidiopsis, and Torula in Pleosporales and for Macrothrium in Diaporthales.

The LSU phylogeny could not discriminate the relationship of species included in Phacidiales, therefore a focussed ITS phylogeny was constructed (Fig. 2). The manually adjusted ITS alignment contained 46 sequences (including the outgroup sequence) and 533 characters including alignment gaps were used in the phylogenetic analysis; 36 of these were parsimony informative, 91 were variable and parsimony-uninformative, and 406 were constant. The parsimony analysis yielded 62 equally most parsimonious trees (TL = 160 steps; CI = 0.887; RI = 0.933; RC = 0.828), the first of which is shown in Fig. 2. Overall, the phylogeny was poorly supported, with many nodes having no or low bootstrap support values. Species of Phacidium clustered in the same clade (no bootstrap support), with species representing Allantophomopsis, Bulgari, Phacidioyniopsis, Potbeniamyces and Pseudophacidium being distinct. The allantophomopsis-like species turned out to be non-monophyletic in this phylogeny and formed predominantly more basal, separate lineages. It is possible that the addition of extra loci to the dataset might increase the backbone support and resolution of the phylogeny.

The LSU phylogeny could not discriminate the relationship of species included in Robillarda, therefore a focussed combined ITS and HIS phylogeny was constructed (Fig. 3). The manually adjusted combined alignment contained nine sequences (including the outgroup sequence) and 935 characters including alignment gaps (ITS: 573; HIS: 362) were used in the phylogenetic analysis; 61 (ITS: 7; HIS: 54) of these were parsimony informative, 75 (ITS: 54; HIS: 21) were variable and parsimony-uninformative, and 799 (ITS: 512; HIS: 287) were constant. The parsimony analysis yielded two equally most parsimonious trees (TL = 182 steps; CI = 0.912; RI = 0.833; RC = 0.760), the first if which is shown in Fig. 3. All species were supported in this phylogeny, while the HIS sequences contributed some intra-specific variation to the clade. The HIS sequences of CBS 101440, CBS 276.78 and CBS 173.65 differ with 1, 4 and 8 bases respectively from the HIS sequence of the ex-epitype culture CBS 114312.

The LSU phylogeny could not discriminate the relationship of species included in Phaeosphaeraceae, therefore a focussed combined LSU and ITS phylogeny was constructed...
Fig. 1. The first of 1000 equally most parsimonious trees obtained from a heuristic search with 100 random taxon additions of the LSU sequence alignment. Parsimony bootstrap support values >74 % and Bayesian posterior probabilities >0.79 are plotted at the nodes, strict consensus branches from the parsimony analysis are thickened, and the scale bar represents the number of changes. An asterisk (*) denotes a node with 100 % parsimony bootstrap support and 1.00 Bayesian posterior probability. Families and orders are indicated in different colours to the right of the tree and classes at the nodes to the left of the tree. Species treated here for which LSU sequences were available are shown in bold face. The tree was rooted to *Saccharomyces cerevisiae* (GenBank Z73326).
Fig. 1. (Continued).
Fig. 2. The first of 62 equally most parsimonious trees obtained from a heuristic search with 100 random taxon additions of the ITS sequence alignment. The scale bar shows the number of changes, and bootstrap support values from 1 000 replicates are shown at the nodes. Thickened lines indicate the strict consensus branches and the species treated here are printed in bold face. The species boundaries are delimited with coloured blocks. The tree was rooted to *Gremmenia infestans* (GenBank accession KM216393).
The genera of Fungi 2

Fig. 3. The first of two equally most parsimonious trees obtained from a heuristic search with 100 random taxon additions of the combined ITS and HIS sequence alignment. The scale bar shows the number of changes, and bootstrap support values from 1 000 replicates are shown at the nodes. Thickened lines indicate the strict consensus branches and the species treated here are printed in bold face. The species boundaries are delimited with coloured blocks. The tree was rooted to Pestalotiopsis sp. (culture CPC 17179).

(Fig. 4). The manually adjusted combined alignment contained 52 sequences (including the outgroup sequence) and 1283 including alignment gaps characters (LSU: 779; ITS: 504) were used in the phylogenetic analysis; 274 (LSU: 62; ITS: 212) of these were parsimony informative, 126 (LSU: 38; ITS: 88) were variable and parsimony-uninformative, and 883 (LSU: 679; ITS: 204) were constant. The parsimony analysis yielded 148 equally most parsimonious trees (TL = 1564 steps; CI = 0.458; RI = 0.693; RC = 0.318), the first of which is shown in Fig. 4. Overall, the backbone of the phylogeny was poorly supported, with many nodes having no or low bootstrap support values. Species previously belonging to Wojnowicia, as well as "Ophiophysaerial herdorica and several "Phaeosphaeria" species clustered with Septoria phragmitis. Phaeosphaeria is non-monophyletic in this phylogeny and several lineages distinct from Phaeosphaeria s.str. are present and these might need to be accommodated in novel genera.

THE GENERA


Classification: Phacidiaceae, Phacidiaceae, Leotiomycetes.

Current generic circumscription: Conidiomata stromatic, pycnidial to pycnidial, immersed, semi-immersed or erumpent, unilocular, often irregularly multilocular with the locules convoluted or irregularly divided, glabrous, brown to dark brown or black, ostiolate; wall of textura angularis, globulosa, epidermoidea or intricata, cells dark brown and thick-walled in the outer layers, paler and thin-walled in the inner layers; interlocular tissue of hyaline to subhyaline, of thin-walled textura prismatica. Conidiophores arising all around the cavity of the conidiomata, often reduced to conidigenous cells, sometimes septate and branched, invested in mucus. Conidiogenous cells discrete or integrated, ampulliform, conical, lageniform or subcylindrical, hyaline, smooth, proliferating percurrently at apex, with visible annellations. Conidia conical, symmetrically or asymmetrically ellipsoidal, fusoid, lunate, naviculate, obovate, reniform, or irregular with narrowly truncate base, aseptate, hyaline, smooth, guttulate, bearing mucoid appendages of type C at one or both ends; subapical appendage conspicuous, conical, flabelliform or irregular in shape; basal appendage often small and inconspicuous.

Type species: Allantophomopsis cytisporea (Fr.) Petr. 1925.

Allantophomopsis cytisporea (Fr.) Petr., Annls mycol. 23: 104 (1925).


Description based on CPC 24977: Conidiomata pycnidoid, scattered, globose, to 600 µm diam (becoming loose with age on the surface of PDA plates), unilocular but convoluted or irregularly divided, glabrous, brown to black, ostiolate, wall up to 40 µm thick, of textura angularis, cells of outer layers brown, thick-walled; inner layers hyaline to subhyaline, thin-walled. Conidiophores lining the cavity of the conidiomata, reduced to conidiogenous cells or sparsely septe and branched. Conidiogenous cells discrete, occasionally integrated, ampulliform hyaline, thin-walled, smooth, 7–12 × 2.5–4 µm with several annellations, invested in mucus. Conidia naviculate with a broad rounded apex and narrow truncate base, hyaline, thin-walled, smooth, 5–6.5(–7) × 2(–2.5) µm, bearing a conical or irregular, mucoid, apical appendage.
Fig. 4. The first of 148 equally most parsimonious trees obtained from a heuristic search with 100 random taxon additions of the combined LSU and ITS sequence alignment. The scale bar shows the number of changes, and bootstrap support values from 1000 replicates are shown at the nodes (Parsimony bootstrap support / Distance bootstrap support). An asterisk (*) identifies those branches with both 100 % parsimony and distance bootstrap support. Thickened lines indicate the strict consensus branches and the species treated here are printed in bold face. The genus boundaries are delimited with coloured blocks and genus names are printed to the right of the tree in bold face – genus names with inverted commas refer to those genera which do have the generic type species included in the clade whereas those without inverted commas have their generic type species included. The tree was rooted to Didymella exigua (culture CBS 183.55).

Notes: Allantophomopsis was introduced by Petrak (1925) based on a species previously described by Fries (1823) as Sphaeria cytisporea, isolated from Vaccinium vitis-idaea leaves, and considered by the same author as a synonym of Cytospora vaccinii and C. endophylla. Clements & Shear (1931) considered Allantophomopsis a synonym of Phoma. Based on their conidial morphology, Sutton (1977) regarded Allantophomopsis to be synonymous with Ceuthospora. However, Carris (1990) regarded the morphology of the conidionata, conidiophores and conidia as valuable characters to distinguish Allantophomopsis from both Phoma and Ceuthospora, but not from Apostrasseria. The latter genus was proposed by Nag Raj (1983) to accommodate Ceuthospora lunata (syn. Strasseria lycopodina) the causal agent of black rot of cranberry. After examination of the type specimens of Allantophomopsis cytisporea and Apostrasseria lunata, Carris (1990) concluded that the degree of locular partitioning does not seem to be adequate justification for retaining them as separate genera, and reduced them to synonymy. Carris (1990) also reviewed the type material of Strasseria lycopodina and proposed the new combination Allantophomopsis lycopodina. The last revision of Allantophomopsis was made by Nag Raj (1993) and included two new species, A. abietina and A. pusilla from needles of Abies pectinata and stems of Rubus fruticosus, respectively. Nag Raj (1993) also transferred species from Apostrasseria and Phomopsis to Allantophomopsis, and proposed the new combinations A. fusiformis, A. pseudotsugae and A. robusta.

In his treatment of A. cytisporea, Nag Raj (1993) regarded this as a wide host range taxon, occurring on Andromeda catesbae, Azalea sp., Gaultheria procumbens, Gaylussacia brachyspera, Kalmia latifolia, Pinus sp., Pyrola secunda, Rhododendron maximum, R. praecox, Vaccinium macrocarpum, and V. vitis-idaea in Europe and North America. Although the asexual morph was clearly not congeneric with Ceuthospora, the sexual morph was treated as Phacidium lunatum (DiCosmo et al. 1983), although Phacidium s. str. should be confined to taxa with Ceuthospora asexual morphs (Crous et al. 2014, Johnston et al. 2014). The type of Ceuthospora lunata on V. macrocarpon has conidia 6–9 × 2–3.5 µm (Nag Raj 1983), while those of Sphaeria cytisporea on V. vitis-idaea are 6–8 × 2–2.5 µm (Carris 1990), closely matching those in the epitype. Nag Raj (1993) regarded A. cytisporea as having several synonyms, and conidia to fall in the range 5–13 × 2–3(–3.5) µm (av. 8.2 × 2.5 µm) (Nag Raj 1993). We are of the opinion, however, that this is a species complex, and that as isolates of “cytisporea” are recollected from different hosts and sequenced, they will be revealed to be phylogenetically distinct. For this reason, we prefer to retain A. lunata as separate from A. cytisporea.

Carris (1990) considered another specimen of Fries’ in UPS from Femsjö to be the holotype, but the only collection actually mentioned in the protologue is Scleromyces Svecici no. 290, issued in 1822 (Pfister 1985: 108) and there appears to be no evidence that the Femsjö specimen was collected before Systema Mycologicum vol. 2 was issued. The example of this exsiccate in UPS illustrated by Carris (1990) is therefore selected as lectotype here as there is no doubt that
**Table 1.** Details of sequences and/or strains included in the molecular and/or morphological analyses.

<table>
<thead>
<tr>
<th>Species name</th>
<th>Strain accession number</th>
<th>Locality</th>
<th>Substrate</th>
<th>Collector(s)</th>
<th>GenBank accession numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Allantophomopsis cytisporea</em></td>
<td>CBS 109.22</td>
<td>USA</td>
<td>Oxycoccus macrocarpos, leaf</td>
<td>C.L. Shear</td>
<td>KJ663822 KJ663861</td>
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<td>CBS 140061, CPC 24977,</td>
<td>Latvia: Alusne</td>
<td>Oxycoccus macrocarpus, berry</td>
<td>L. Vilka</td>
<td>KR873228 KR873262</td>
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<td><em>Allantophomopsis lunata</em></td>
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<td>USA: New Jersey</td>
<td>Vaccinium macrocarpon, fruit exhibiting symptoms of black rot</td>
<td>C. Constantelos</td>
<td>KR873229 KR873263</td>
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<tr>
<td></td>
<td>ATCC 66956, ex-epitype</td>
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<td>USA: New Jersey</td>
<td>Vaccinium macrocarpon, fruit exhibiting symptoms of black rot</td>
<td>C. Constantelos</td>
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<td>ATCC 66958</td>
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<td></td>
<td>CBS 262.85, CPC 24515,</td>
<td>Germany</td>
<td>From roots of conifers</td>
<td>H. Courtois</td>
<td>KJ663830 KJ663869</td>
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<td>IFO 32643</td>
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<td>KJ663839 KJ663880</td>
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<td>Crataegus laevigata</td>
<td>R.K. Schumacher</td>
<td>KR873231 KR873265</td>
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<td>Canarau</td>
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<td>MUCL 7922, ex-type</td>
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<td>Brown sandy soil</td>
<td>G. Franz</td>
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<td>East of Grootfontein</td>
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<td>Bez., Botanischer</td>
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**Allantophomopsis lunata** (Shear) Crous & Carris, **comb. nov.**

*Mycobank MB812789* (Fig. 6)


*Phacidium lunatum* DiCosmo et al., *Canad. J. Bot.* 61: 38 (1983); as “*lunatus*”.

**Description and Illustration:** Nag Raj (1983).

**Culture characteristics:** Colonies covering the dish in 2 wk, lacking aerial mycelium, with even, smooth margins. On OA surface olivaceous grey. On PDA surface and reverse olivaceous grey.


**Notes:** DiCosmo et al. (1983) linked *Apostrasseria lunata* to a sexual morph occurring on *Gaultheria procumbens*, which they described as *Phacidium lunatum*. No reason was, however, provided for this association, or conidial dimensions given to support this link. In a separate study, Nag Raj (1983) treated the type specimen of *A. lunata*, and gave the conidia as 6–9 × 2–3.5 µm, though he later (Nag Raj 1993) treated *A. lunata* as a synonym of *A. cytisporea*, choosing a wider circumscription of the species, with conidia 5–13 × (2.5–)3 µm. Conidia of CBS 137781 are (7–)8–9(–10) × (2.5–)3 µm, thus closely fitting that of the authentic specimen. Furthermore, as it also has the same location and host as the original type collection, we regard CBS 137781 as a suitable epitype for this species.


**Description** based on CBS 262.85: Caulicolous, fuscous or fructicolous. *Conidiomata* pycnidial to pycnidoid, scattered to gregarious, subepidermal, globose to depressed globose, 170–500 µm diam, 130–300 µm tall, often with a distinct conical or subconical neck, 20–40 µm long and 30 µm wide, unilocular but convoluted or irregularly divided, glabrous, dark brown to black, ostiolate, wall to 40 µm thick, of *textura angularis*, cells of outer layers brown, thick-walled; inner was “orginal material”. This choice also has the advantage that it means that other collections with this exsiccatum have isolecotypes (including BPI, C, K, FH).
layers hyaline to subhyaline, thin-walled; ostiole papillate, circular or oval, 15–40 µm diam. Conidiophores lining the cavity of the conidiomata, reduced to conidiogenous cells or sparsely septate and branched. Conidiogenous cells discrete, occasionally integrated, ampulliform to lageniform or conical, hyaline, thin-walled, smooth, (5–)6–8(–9) × 3–4 µm with several annellations, invested in mucus. Conidia naviculate with a broad rounded apex and narrow truncate base, hyaline, thin-walled, smooth, (8–)9–11(–12) × (2–)2.5–3(–3.5) µm, bearing a conical or irregular, mucoid, apical appendage.

Culture characteristics: Colonies reaching 85 mm diam in 2 wk, lacking aerial mycelium, with even, smooth margins. On OA surface olivaceous grey. On PDA surface and reverse iron-grey.


Culture characteristics: Colonies as for CBS 262.85, but only reaching 70 mm diam after 2 wk.

Notes: Although these two isolates cluster together, conidia of CBS 262.85 are smaller (8–)9–11(–12) × (2–)2.5–3(–3.5) µm than those reported for CBS 137782 (7–)8–15(–17) × 2–3.5 µm (Carris 1990), but as this culture failed to sporulate, conidial measurements could not be compared under the conditions used in this study. The original description by Höhnel (1909) cites the conidia as 8–12 × 2–2.5 µm, thus corresponding with that observed in CBS 262.85. In spite of their similar morphology, we decided to not designate CBS 262.85 as epitype for A. lycopodina, as the host differs

Fig. 6. Allantophomopsis lunata (CBS 137781). A, B. Conidiomata on PNA. C. Conidiomata forming on PDA. D. Conidia. Bars: A–C = 250 µm, C = 10 µm.

Fig. 7. Allantophomopsis lycopodina (CBS 262.85). A. Conidioma on PNA. B–D. Conidiogenous cells. E. Conidia (arrows denote mucoid caps). Bars: A = 600 µm, all others = 10 µm.
from that of the holotype specimen, which is on Lycopodium complanatum.

Authors: L.M. Carris, J. Vličāne, and P.W. Crous

Latoruaceae Crous, fam. nov.
MycoBank MB812790

Description: Colonies discrete, dark brown to black, effuse, dry. Mycelium immersed to superficial, hyaline to brown, branched, septate. Conidiophores reduced to conidiogenous cells, or erect, moniliform, brown. Conidiogenous cells solitary on mycelium, or terminal on conidiophores, erect, brown, smooth to verruculose, polyblastic, or reduced to inconspicuous loci on hyphae. Conidia brown, solitary or in acrogenously branched chains, smooth or with warts, septate, fusoid-ellipsoidal, clavate or ovoid; frequently in acrogenously branched chains, dry, with spikey warts, septate, fusoid-ellipsoidal, with obtusely rounded basal cell, and small, globose apical cell; constricted at septa; conidia giving rise to secondary conidia, becoming cupulate, with second and third cell from base being more swollen and darker brown than the rest of conidium; conidium pale brown, dry, with spikey warts (1 µm long), (3–)4-septate, fusoid-ellipsoidal, with obtusely rounded basal cell, and small, globose apical cell; constricted at the septa, with second and third cell from base being more swollen and darker brown than the rest of conidium; conidia giving rise to 1–3 secondary conidia via apical cell, which subsequently collapses after conidiogenesis, becoming cupulate, secondary conidia again forming 1–2 additional conidia; basal cell 5–6 µm diam, second and third cells from base 5–7 µm diam, subapical cell 5–6 µm diam, apical cell 4–5 µm diam; conidia (18–)22–25(–27) × (6–)7–8(–9) µm.

Culture characteristics: Colonies spreading, reaching 65 mm diam after 2 wk at 25 ºC, with moderate aerial mycelium, flat, spreading, with smooth, even margins. On OA surface greenish grey, on MEA surface pale olivaceous-grey, sectored, reverse olivaceous grey.


Notes: Latorua caligans was originally described in the genus Bahusandhika. However, the latter does not have cupulate apical cells, and conidia are not prominently constricted at septa, and do not have the same spikey ornamentation as in Bahusandhika. The single LSU sequence of Bahusandhika in GenBank (Accession KF460274 Bahusandhika indica) allies the genus to Sporormiaceae (Pratibha et al. 2014).

Latorua caligans (Bat. & H.P. Upadhyay) Crous, comb. nov.
MycoBank MB812792
(Fig. 8)

Description: Mycelium immersed to superficial, hyaline, branched, septate, 3–4 µm diam. Conidiophores reduced to conidiogenous cells. Conidiogenous cells solitary on mycelium, erect, clavate, pale brown, smooth, polyblastic, 5–10 × 4–5 µm, or reduced to inconspicuous loci on hyphae. Conidia acrogenous, brown, in branched chains, apical conidium pale brown, dry, with spikey warts (1 µm long), (3–)4-septate, fusoid-ellipsoidal, with obtusely rounded basal cell, and small, globose apical cell; constricted at the septa, with second and third cell from base being more swollen and darker brown than the rest of conidium; conidia giving rise to 1–3 secondary conidia via apical cell, which subsequently collapses after conidiogenesis, becoming cupulate, secondary conidia again forming 1–2 additional conidia; basal cell 5–6 µm diam, second and third cells from base 5–7 µm diam, subapical cell 5–6 µm diam, apical cell 4–5 µm diam; conidia (18–)22–25(–27) × (6–)7–8(–9) µm.

Etymology: An anagram of Torula, as was the case in Rutula.

Type genus: Latorua Crous 2015.

Genera included: Latorua, Polyschema.

Latorua Crous, gen. nov.
MycoBank MB812791

Classification: Latoruaceae, Pleosporales, Dothideomycetes.

Diagnosis: Conidiogenous cells solitary, erect, clavate, pale brown, polyblastic. Conidia acrogenous, brown, in branched chains, dry, with spikey warts, septate, fusoid-ellipsoidal, with obtusely rounded basal cell, and small, globose apical cell; constricted at septa; conidia giving rise to secondary conidia via apical cell.

Description: Mycelium immersed to superficial, hyaline, branched, septate. Conidiophores reduced to conidiogenous cells. Conidiogenous cells solitary on mycelium, erect, clavate, pale brown, smooth to verruculose, polyblastic, or reduced to inconspicuous loci on hyphae. Conidia acrogenous, brown, in branched chains, apical conidium pale brown, dry, with spikey warts, septate, fusoid-ellipsoidal, with obtusely rounded basal cell, and small, globose apical cell; constricted at septa; conidia giving rise to secondary conidia via apical cell, which subsequently collapses after conidiogenesis, becoming cupulate; secondary conidia again forming additional conidia.

Type species: Latorua caligans (Bat. & H.P. Upadhyay) Crous 2015.

Latorua grootfonteinensis Crous, sp. nov.
MycoBank MB812793
(Fig. 9)

Etymology: Named after the region in South Africa where it was collected, Grootfontein.

Diagnosis: Conidiophores pale brown, smooth to finely verruculose, 1–3-septate, to 20 µm long, 3–4 µm diam. Conidiogenous cells integrated, clavate, solitary, pale brown, finely verruculose, polyblastic, 4–10 × 4–5 µm. Conidia acrogenous, brown, in short branched chains, with spikey warts (1.5 µm long), fusoid-ellipsoidal with obtusely rounded basal cell and small apical cell (5–6 µm diam) that collapses
The genera of Fungi 2

ARTICLE

during conidiogenesis, becoming cupulate; conidia 3-septate, constricted at the septa, (18–)20–22(–25) × (8–9) µm.


Description: Mycelium immersed to superficial, pale brown, finely verruculose, branched, septate, 2–3 µm diam. Conidiophores pale brown, smooth to finely verruculose, erect, flexuous, 1–3-septate, to 20 µm long, 3–4 µm diam. Conidiogenous cells integrated, clavate, solitary on mycelium, erect, pale brown, finely verruculose, polyblastic, 4–10 × 4–5 µm. Conidia acrogenous, brown, in short branched chains, apical conidium pale brown, dry, with spikey warts (1.5 µm long), fusoid-ellipsoidal with obtusely rounded basal cell and small apical cell (5–6 µm diam) that collapses during conidiogenesis, becoming cupulate; conidia 3-septate, constricted at the septa, widest in second cell from base, which is darker brown than other cells, conidia (18–)20–22(–25) × (8–9) µm.

Fig. 8. Latorua caligans (CBS 576.65). A. Sporulation on SNA. B–F. Conidiogenous cells giving rise to conidial chains. Bars = 10 µm.

Fig. 9. Latorua grootfonteinensis (CBS 369.72). A. Sporulation on SNA. B–G. Conidiogenous cells giving rise to conidial chains. Bars = 10 µm.
Crous et al.  

**Macrodiplodiopsis desmaziieri** Voglmayr, Jaklitsch & Crous, fam. nov.  

MycoBank MB812794

**Description:** Mycelium immersed, branched, septate, brown. Conidiomata single or gregarious, globose to collarette, papillate or not, dark brown to black, unilocular; wall thick, of **textura porrecta** to **textura angularis**. Ostiole single, circular, papillate. Conidiophores reduced to conidiogenous cells. Conidiogenous cells discrete, indeterminate, cylindrical, hyaline, smooth, with percurrent proliferations. Conidia ellipsoid to obovoid or clavate, distoseptate, occasionally with a longitudinal septum, pale brown, thick-walled, base truncate, apex obtuse, surrounded by a large gelatinous sheath. Ascomata black, immersed, solitary or aggregated, globose. Asci cylindric-clavate to broadly clavate. Ascospores dark brown, obvoid with obtuse to subacute ends, straight to inequilateral, distinctly asymmetric, distoseptate, with an excentric primary distoseptum and secondary distosepta, constricted at septa, surrounded by a mucoid sheath.

**Type species:** *Macrodiplodiopsis desmaziieri* (Mont.) Petr. 1922

**Macrodiplodiopsis desmaziieri** (Mont.) Petr., **Annls mycol.** 20: 343 (1922).

**Classification:** Macrodiplodiopsidaceae, Pleosporales, Dothideomycetes.

**Current generic circumscription:** Mycelium immersed, branched, septate, brown. Conidiomata single or gregarious, immersed, peridermal, globose to collarette, papillate, dark brown to black, unilocular, thick-walled; outer walls of thick-walled **textura porrecta**, except at the base where they are of **textura angularis**, becoming progressively pale and more hyaline towards the conidiogenous region. Ostiole single, circular, papillate. Conidiophores reduced to conidiogenous cells. Conidiogenous cells discrete, indeterminate, cylindrical, hyaline, smooth, thick-walled, with 1–2 percurrent proliferations, formed from the inner cells of the pycnidial wall. Conidia ellipsoid to obovoid or clavate, 3-distoseptate, occasionally with a longitudinal septum, lumina very much reduced and often surrounded by dark brown wall deposits, continuous, pale brown, thick-walled, base truncate, apex obtuse, surrounded by a large gelatinous sheath. Ascomata black, immersed, solitary or aggregated, globose. Asci cylindric-clavate to broadly clavate. Ascospores dark brown, obvoid with obtuse to subacute ends, straight to inequilateral, distinctly asymmetric, distoseptate, with an excentric primary distoseptum and secondary distosepta, constricted at septa, surrounded by a mucoid sheath.

**Type species:** *Macrodiplodiopsis desmaziieri* (Mont.) Petr. 1922

**Macrodiplodiopsis desmaziieri** (Mont.) Petr., **Annls mycol.** 20: 343 (1922).

**Description:** Mycelium immersed, branched, septate, brown. Conidiomata single or aggregated, 500–1000 µm diam, separate or gregarious, immersed, subepidermal, globose to collarette, papillate, dark brown to black, unilocular, thick-walled; outer wall layers of thick-walled **textura porrecta**, base of **textura angularis**, becoming progressively pale and more hyaline towards the conidiogenous region. Ostiole single, circular, papillate. Paraphyses not observed. Conidiophores reduced to conidiogenous cells. Conidiogenous cells hyaline, smooth, discrete, indeterminate, doliiform to subcylindrical, thick-walled, with several percurrent proliferations at apex, formed from the inner cells of the pycnidial wall, 7–15 × 4–8 µm. Conidia (28–)35–44(–50) × (14–)18–20(–22) µm, ellipsoid to obovoid, or clavate, (1–)3(–4)-distoseptate, occasionally with a longitudinal septum, lumina very much reduced and often surrounded by dark brown wall deposits, continuous, pale brown, thick-walled (2–4 µm diam), finely verruculose, base truncate (4–8 µm diam), with minute marginal frill, apex obtuse, surrounded by a large gelatinous sheath (4–10 µm diam). Ascomata black, immersed, solitary or aggregated, globose, to 1 mm diam. Asci 110–250 × 27–35 µm, cylindric-clavate to broadly clavate. Ascospores 40–66 × 10–17.5 µm, dark brown, obvoid with obtuse to subacute ends, straight to inequilateral, strongly asymmetric, 3–5(–6) distoseptate, with an excentric primary distoseptum and 1–3 distosepta in the upper, 1 distoseptum in the lower part of the spore, strongly constricted at the primary septum and weakly to not constricted at secondary septa, surrounded by a mucoid sheath, 2–6.5 µm diam (sexual morph adapted from Barr 1982).

Specimens examined:** Austria:** Wien, 3. Bez., Botanischer Garten (HBV), on branches of *Platanus* ×hispanica, 12 Feb. 2006, H. Voglmayr (WU 35926, cultures L1 = CBS 123812, sexual morph; L2 = CBS 123811, asexual morph). – **France:** bark of *P. orientalis*, R.K. Schumacher (CBS H-5/5/14-86, **lectotype designated here**. ex-herb. Montagne, MBT201549). – **Germany:** Dortmund, on *P. orientalis*, Germany: Dortmund, on *P. orientalis*. – **Notes:** This isolate was originally identified as *Torula caligans* (i.e. *Latorula caligans*) (see notes on *Torula* below). It differs from the latter in having more prominent ornamentation, being predominantly 3-septate, and on having shorter conidia on average.
culture CPC 24648, asexual morph); on branches of *P. orientalis*, 3 Mar. 2013, R.K. Schumacher (culture CPC 22645, sexual morph).


**Notes**: We examined several original specimens deposited in PC under the name *Hendersonia desmazieri* (PC 0142156–PC 0142160), and choose one (PC 0142158) as lectotype, enabling us to designate fresh material as epitype. Single conidial isolates of *M. desmazieri* were identical in sequence.

**Fig. 10.** *Macrodiplodiopsis desmazieri* (CPC 24971). **A.** Conidioma on host tissue. **B–E.** Conidiogenous cells. **F, G.** Conidia (arrows denote mucoid sheaths). **H.** Asci. **I.** Ascospores (arrows denote mucoid sheaths). **J.** Colony on PDA. **K.** Conidiogenous cells in vitro. **L, M.** Conidia in vitro (arrows denote mucoid sheaths). Bars: A = 600 µm, J = 10 mm, all others = 10 µm.
to that of ascospore isolates of *Splanchnonema platani*, confirming the observations of Shear & Davidson (1936), who obtained single conidial and ascospore cultures which were morphologically identical, and after 5–7 wk colonies of both collections produced similar conidia. The name to use for this genus is *Macrodiplodiopsis*, as the genus *Splanchnonema* is based on *S. pustulatum*, which clusters remotely from *Macrodiplodiopsis*. *Macrodiplodiopsis desmazieri* causes an economically important disease that infects branches of plane trees, commonly known as Massaria disease.

The recent treatment of the genus *Macrodiplodiopsis* by Wijayawardene et al. (2013b) is incorrect. That study was based on the culture MFLUCC 12-0088 (incorrectly cited as ex-type), which led to the introduction of numerous new combinations from *Misturatosphaeria* (Mugambi & Huhndorf 2009) to *Macrodiplodiopsis*. Culture MFLUCC 12-0088 does not, however, represent *Macrodiplodiopsis desmazieri* so their conclusion over the generic name to use was erroneous.

**Authors**: H. Voglmayr, W.M. Jaklitsch, R.K. Schumacher, and P.W. Crous

**Macrohilaceae** Crous, fam. nov.

**Mycobank** MB812795

**Description**: *Conidiomata* pycnidial, immersed, becoming erumpent, medium brown, globose. *Conidiogenous cells* lining the inner cavity, pale brown, cylindrical, proliferating percurrently near the apex. *Conidia* solitary, medium to dark brown, ovoid, smooth, guttulate, developing a single, dark brown, supra-median septum, thick-walled, frequently constricted at the septum, apex obtuse, base truncate and protruding, with a visible scar, 2–3 μm wide, (15–)17–19(–20) × (8–)10–12(–13) μm.

**Culture characteristics**: Colonies fast growing, reaching 60 mm diam after 2 wk at 25 °C, with moderate, fluffy aerial mycelium, zonate growth rings, and even, lobate margins. On MEA, OA and PDA surface cream to dirty white; buff in reverse.


**Notes**: The description provided by Swart (1988) for this genus is accurate. Of interest is the major difference in growth observed between the New Zealand isolate (CPC 10945; sterile) and that of the Australian epitype (CPC 19421). Based on their ITS sequences, these two isolates differ in four base pairs, and it seems probable that the New Zealand isolates represents a new species of *Macrohilum*. Phylogenetically *Macrohilum* appears to be allied to *Diaporthales*.

**Author**: P.W. Crous


**Classification**: incertae sedis, Pezizomycotina.

**Current generic circumscription**: Lichenicolous genus of hyphomycetes. *Colonies* effuse, dark brown to black. *Mycelium* superficial to somewhat immersed; stroma, setate and hyphopodia absent. *Conidiophores* micromonotropic to semi-macronematous, mononematous, simple to rarely branched, flexuous, hyaline to pale brown. *Conidiogenous cells* monoblastic, integrated, terminal, determinate, hyaline to pale brown, cylindrical to ellipsoid. *Conidia* solitary, dry, acropleurogenous, irregularly subglobose to ellipsoid, but with rounded, plicate lobes, thick-walled, smooth, olivaceous-brown to dark brown.

**Type species**: *Milospium graphideorum* (Nyl.) D. Hawksw. 1975.
The genera of Fungi 2

(Fig. 12)

Description: Colonies effuse, dark brown to black, forming thin, extensive, irregular patches on the thallus of the host lichen stroma, setae and hyphopodia absent. Conidiophores micronematous to semi-macronematous, mononematous, simple or irregularly and sparsely branched, flexuous, hyaline but sometimes with slightly brownish walls, septate, often slightly inflated, 2–4 µm diam. Conidiogenous cells monoblastic, integrated, terminal, determinate, hyaline to pale brown, cylindrical to ellipsoid, sometimes inflated, walls occasionally unevenly thickened, variable in size, 5–10(–15) × 3–4.5 µm. Conidia arising singly at the apices of conidiogenous cells, dry, acrogenous, irregularly subglobose to ellipsoid, with 0–8 or more unevenly thickened plicate, rounded lobes, variable in shape and size, smooth-walled, simple, but often appearing muriform superficially in heavily lobed conidia, olivaceous brown to dark brown, almost black in mass, variable in size, 6–17(–20) × 5–10 µm.


Fig. 11. Macrohilum eucalypti (CPC 19421). A. Conidiomata on PNA. B. Conidiomata on OA. C–E. Conidiogenous cells. F. Conidia. Bars: A = 200 µm, B = 300 µm, all others = 10 µm.

Fig. 12. Milospium graphideorum (CBS H-22271). A, B. Dark brown, lichenicolous colonies. C, D. Conidiogenous cells giving rise to lobed conidia. Bars: A, B = 5 mm, C, D = 10 µm.
Notes: Milospium is restricted to lichen thalli, and is distinguished from superficially similar genera of hyphomycetes (e.g. Glarea) by lobate, unevenly thickened, brown, asceptate conidia. Conidia of M. graphideorum were induced to germinate after 2–4 wk on PDA at room temperature (unsuccessful on MEA and OA). Small colonies were harvested after 2–3 mo, and subjected to DNA isolation and ITS sequencing. However, the ITS sequence was so divergent from all ITS sequences available in GenBank that it is not possible to unequivocally assign it even to a class.

The nomenclature of this species is complex, as this fungus had been given names inclusive of the host as a lichen by several authors, as far back as 1806. When the generic name was introduced for the fungus by Hawksworth (1975), such names based on the fungus and the host could be rejected as based on discordant elements, but after that provision was deleted from the Leningrad Code (Staffeu et al. 1978) lectotypification of the earlier names (Hawksworth 1984) and then conservation (Hawksworth 2006) became necessary to fix the generic name and also safeguard the generic name of the commonest host lichen of this fungus. The fungus is also reported from other lichens in Opegraphaceae: Opegrapha atra on trees (Hawksworth 1975), Dirina massiliensis f. soredata on limestone rocks (Hawksworth & Diederich 1991), and cf. Lecanactis dilleniana on rocks (Hawksworth 1984). We consequently consider epitypification by sequenced material from the type host necessary to precisely fix the application of the name as it is conceivable that material from different hosts may prove not to be conspecific at the molecular level.

Several other lichenicolous fungi have been placed in Milospium by several authors, but most of these have spores with septae and differently thickened walls and are unlikely to be revealed as congeneric by molecular data.

Authors: D.L. Hawksworth, B. Stielow, and P.W. Crous

Protostegia Cooke, Grevillea 9: 19 (1880).

Classification: Mycosphaerellaceae, Capnodiales, Dothideomycetes.

Current generic circumscription: Conidiomata immersed, becoming somewhat erumpent, solitary, exuding a mucoid conidial cirrhus, pale brown, splitting the leaf surface, with central ostiole; wall of brown textura intricata. Conidiophores reduced to conidiogenous cells. Conidiogenous cells hyaline, smooth, lining the inner cavity, lageniform to subcylindrical, proliferating percurrently at apex. Conidia hyaline, smooth, saccate and euseptate.

Type species: Protostegia eucleae Kalchhr. & Cooke 1880.


Notes: Protostegia eucleae has been reported from Euclea divinorum, E. lanceolata, E. natalensis, E. racemosa, and E. undulata, and thus far is only known from South Africa. However this plant genus is widespread throughout Africa and the fungus may be more widespread than currently known. Distinguishing characters for the genus include having immersed conidiomata with walls of textura intricata, splitting the epidermis and appearing acervular, but having a well developed ostiole (see Dyko et al. 1979; fig. 2). Protostegia clusters close to Cystostagonospora martiniana, which is characterised by having both percurrent and polyphalid conidiogenous cells, and solitary to aggregated conidiomata embedded in stromatic tissue (Quaedvlieg et al. 2013). Furthermore, Protostegia also appears related to Phaeophleospora, though the latter genus has pigmented conidia and conidiogenous cells, and proliferates percurrently (Crous et al. 2009), being quite distinct from Cystostagonospora. Plidiurn, to which genus this fungus was assigned by Saccardo, is a member of Helotiales.

Authors: E.J. van der Linde, A.R. Wood, and P.W. Crous

Classification: Pyriculariaceae, Magnaporthales, Sordariomycetes.

Current generic circumscription: Conidiophores solitary or in fascicles, subcylindrical, erect, brown, smooth, rarely branched, with sympodial growth. Conidiogenous cells terminal and intercalary, pale brown, with phialidic, denticulate conidiogenous loci. Conidia single, formed sympodially, pyriform to obclavate, narrowed toward tip, rounded at the base, 2-septate, hyaline to pale brown, with a distinct protruding basal hilum. Ascomata perithecial, solitary to gregarious, sub spherical, brown to black, base immersed in host tissue, with long neck protruding above plant tissue; wall of several layers of brown textura angularis. Asci 8-spored, hyaline, subcylindrical to clavate, unitunicate, short-stipitate, with prominent apical ring. Paraphyses intermingled among asci, unbranched, septate. Ascospores bi- to multiseriate in asci, hyaline, guttulate, smooth-walled, fusiform, curved with rounded ends, transversely 3-septate, slightly constricted at septa.

Type species: *Pyricularia grisea* Sacc. 1880.

**Pyricularia grisea** Sacc., *Michelia* 2: 20 (1880); as "(Cooke sub Trichothecio) Sacc." (Fig. 14)

Synonyms: Trichothecium griseum Cooke, *Grevillea* 8: 12 (1879); nom. inval. (Art. 38.1).

Trichothecium griseum (Sacc.) Cooke, in Ravenel, *Fungi Amer. Exs.* no. 580 (1881).


Description and illustration: Ellis (1971).

Crous et al.


Note: Although *Pyricularia* has until recently been treated as a member of the *Magnaporthales*, Klaubauf et al. (2014) revealed pyricularia-like species to represent a generic complex in the newly introduced family *Pyriculariaceae*. To fix the application of the name *Pyricularia* s. str., we herewith designate an epitype for *P. grisea* based on material occurring on *Digitaria* from the USA.

Authors: M.-H. Lebrun and P.W. Crous

**Robillardaceae** Crous, fam. nov.
MycoBank MB812796

Description: *Conidiomata* stromatic, pycnidial to pycnidioid or indeterminate, immersed to partly erumpent, unilocular to variably loculate with the locale often convoluted, glabrous, dehiscing by an ostiole or by an irregular split in the apical wall and overlying host tissue; wall thick of *textura angularis* to *textura prismatica*. *Conidiophores* reduced to conidiogenous cells or with 1–2 supporting cells lining the cavity of the locale, invested in mucus. *Conidiogenous cells* discrete, ampulliform to lageniform, hyaline, smooth; proliferating sympodially or percurrently near apex. *Conidia* composed of a conidium body and a separate apical cell modified into a branched appendage; conidium body ellipsoid or fusiform, 1-euseptate, wall smooth and occasionally constricted at the septum, hyaline to pale brown, often guttulate; apical cell short-cylindrical at base, then dividing into 2–5 branches, branches thin-walled, tubular, ends pointed or swollen, flexuous, divergent, smooth, hyaline, devoid of contents.

Type species: *Robillarda sessilis* (Sacc.) Sacc. 1880.

**Robillarda africana** Crous & Giraldo, sp. nov.
MycoBank MB812797 (Fig. 15)

Etymology: Named after the continent in which it was collected, Africa.

Diagnosis: *Conidia* fusiform, straight or slightly curved, wall smooth, often slightly constricted at the median septum, hyaline to pale brown, (10–)11–12(–13) × 2.5–3(–3.5) µm.


Description: *Conidiomata* stromatic, pycnidial, scattered, immersed to partly erumpent, unilocular, ovoid, globose, 100–200 µm diam, glabrous, dark brown to black, ostiolate; ostiole papillate or not, circular or oval, 10–20 µm diam; wall to 30 µm thick, of an outer *textura angularis*, cells thick-walled, dark brown to brown in the outer layers, becoming progressively

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thin-walled and paler toward an inner, thin-walled, hyaline, textura prismatica. Conidiophores reduced to conidiogenous cells lining the cavity of the conidioma, invested in mucus. Conidiogenous cells ampulliform to subcylindrical, hyaline, thin-walled, smooth, guttulate, 3–10 × 2–4 µm, proliferating sympodially at apex. Conidia composed of a 1-septate conidium body and a separate apical cell modified into a branched appendage; conidium body fusiform, straight or slightly curved, wall smooth and often slightly constricted at the median septum, hyaline to pale brown, (10–)11–12(–13) × 2.5–3(–3.5) µm; apical cell cylindrical for 1–2.5 µm then dividing into 2–3 divergent branches, devoid of cell contents; attenuated toward the apex, flexuous, 15–18 µm long and less than 1.5 µm wide at the broadest point.

**Culture characteristics:** Colonies flat, spreading, with even, smooth margins, and sparse aerial mycelium. On OA surface ochreous, reverse salmon. On PDA surface ochreous, reverse ochreous in centre, saffron in outer region.

**Notes:** The genus Robillarda currently contains around 38 species names, four of which were treated by Nag Raj (1993), and 12 considered to belong to other genera, including Hyalotiella, Pseudorobillarda, Neottiospora, Chaetoconis, and Pestalotiopsi. The generic name is conserved over Robillarda Castaing 1845, a synonym of Pestalotiopsis according to Nag Raj et al. (1972). Although Nag Raj (1993) regarded Pseudorobillarda a synonym of Robillarda, Rungjindamai et al. (2012) showed that they clustered distant from each other, with three species of Pseudorobillarda forming a separate clade in Dothideomycetes. Crous et al. (2014) also confirmed the relationship of several species of Pseudorobillarda with Pleosporales. Based on a lack of molecular and cultural data at the time, Nag Raj (1993) was forced to accept a wider circumscription of *R. sessilis*, and hence several new species need to be introduced to circumscribe the various cryptic species.

Based on conidial dimensions, Robillarda africana (10–13 × 2.5–3.5 µm) is very similar to *R. sessilis* (9–13 × 2.5–3.5 µm), but can be distinguished by the small, unicellular conidiomata in culture. In contrast, conidiomata of *R. sessilis* tend to be aggregated and multicellular.

**Robillarda roystoneae** Crous & Giraldo, sp. nov. MycoBank MB812798 (Fig. 16)

**Etymology:** Named after the host genus from which it was collected, *Roystonea*.

**Diagnosis:** Conidia fusiform, straight or slightly curved, wall smooth and often slightly constricted at the median septum, hyaline to pale brown, (13–)14–15(–16) × 2.5–3(–3.5) µm.

**Type:** Hong Kong: Pokfulam road, on leaf of *Roystonea regia* (Arecaceae), 5 Nov. 2003, D. Vijaykrishna (CBS H-22274 – holotype; CBS 115445 = HKUCC 10134 – culture ex-type).

**Description:** Conidiomata stromatic, pycnidioïd, scattered to gregarious, occasionally confluent, immersed to partly erumpent, uni- to plurilocular, ovoid, globose, or depressed globose, usually 100–200 µm diam, but to 400 µm diam when plurilocular, and to 200 µm high, glabrous, dark brown to black, ostiolar; ostiole papillate or not, circular or oval, 10–20 µm diam; wall to 30 µm thick, of an outer textura angularis, cells thick-walled, dark brown to brown in the outer layers, becoming progressively thin-walled and paler toward an inner, thin-walled, hyaline, textura prismatica. Conidiophores reduced to conidiogenous cells or with a supporting cell, 12–17 × 2.5–4 µm, lining the cavity of the conidioma, invested in mucus. Conidiogenous cells ampulliform to subcylindrical, hyaline, thin-walled, smooth, guttulate, 7–12 × 2–3 µm, proliferating sympodially at apex. Conidia composed of a 1-septate conidium body and a separate apical cell modified into a branched appendage; conidium body fusiform, straight or slightly curved, wall smooth and often slightly constricted at the median septum, hyaline to pale brown, (13–)14–15(–16) × 2.5–3(–3.5) µm; apical cell cylindrical for 1–2.5 µm then dividing into 2–3 divergent branches, devoid of cell contents; attenuated toward the apex, flexuous, 15–20 µm long and less than 1.5 µm wide at the broadest point.

**Culture characteristics:** Colonies flat, spreading, with even margins and moderate aerial mycelium. On MEA surface pale
olivaceous grey, reverse sienna. On PDA surface olivaceous grey, reverse iron grey.

Note: Robillarda roystoneae can be distinguished from R. sessilis (conidia 9–13 × 2.5–3.5 µm) by its slightly longer conidia (13–16 × 2.5–3.5 µm).

Robillarda sessilis (Sacc.) Sacc., *Michelia* 2: 8 (1880).


(Fig. 17)

Description: Conidiomata stromatic, pycnidial, scattered to gregarious, occasionally confluent, immersed to partly erumpent, uni- to plurilocular, ovoid, globose, or depressed globose, usually 110–210 µm diam but to 500 µm diam when plurilocular, and to 200 µm high, glabrous, dark brown to black, ostiolate; ostiole papillate or not, circular or oval, 10–20 µm diam; wall to 30 µm thick, of an outer textura angularis, cells thick-walled, dark brown to brown in the outer layers, becoming progressively thin-walled and paler toward an inner, thin-walled, hyaline, textura prismatica; when present, interlocular tissue hyaline, thin-walled textura prismatica. Conidiophores reduced to conidiogenous cells, lining the cavity of the conidioma, invested in mucus. Conidiogenous cells ampulliform to subcylindrical, hyaline, thin-walled, smooth, guttulate, 5–8 × 2–4 µm, proliferating sympodially at apex. Conidia composed of a 1-septate conidium body and a separate apical cell modified into a branched appendage; conidium body fusiform, straight or slightly curved, wall smooth and often slightly constricted at the median septum, hyaline to pale brown, (9–)11–12(–13) × (2.5–)3(–3.5) µm; apical cell cylindrical for 1–2.5 µm then dividing into 2–3

Fig. 16. Robillarda roystoneae (CBS 115445). A. Conidiomata on PNA. B, C. Conidiogenous cells. D. Conidia. Bars: A = 200 µm, all others = 10 µm.

Fig. 17. Robillarda sessilis (CBS 114312). A. Conidiomata on PNA. B–E. Conidiogenous cells. F. Conidia. Bars: A = 200 µm, all others = 10 µm.
divergent branches, devoid of cell contents; attenuated toward the apex, flexuous, 18–22 µm long and less than 1.5 µm wide at the broadest point.

Culture characteristics: Colonies flat, spreading, with even, smooth margins and moderate aerial mycelium. On MEA surface pale olivaceous grey, reverse sienna. On PDA surface pale olivaceous grey in centre, olivaceous grey in outer region, reverse iron grey. On OA surface smoke grey to dirty white in outer region, reverse sienna.


Notes: Robillarda sessilis has been reported mostly from India (Nag Raj 1993) and also from Angola, Caribbean, Hungary, Italy, and the USA, growing on different hosts, including Eryngium, Pinus, Ficus, Fragaria, Fumana, Ludwigia, Magnolia, Paonia, Quercus, Randia, Rosa, Rubus, and Vitis (Yurchenko & Belomesyatseva 2010). Occasionally R. sessilis has been isolated from soil samples collected in Australia and Pakistan (Matsushima 1989, 1993).

Robillarda terrae Crous & Giraldo, sp. nov.
MycoBank MB812799 (Fig. 18)

Etymology: Named after the substrate from which it was isolated, soil.

Diagnosis: Conidia fusiform, straight or slightly curved, wall smooth and often slightly constricted at the median septum, almost hyaline to pale brown, (11.5–)12–15(–19) × 2.5–3.5 µm.

Description: Conidiomata stromatic, pycnidioïd, scattered to gregarious, occasionally confluent, immersed to partly erumpent, uni- or plurilocular with as many as six locules when caulicolous or seminicolous, ovoid, globose, or depressed globose, usually 110–210 µm diam but to 600 µm diam when plurilocular, 90–180 µm high, glabrous, dark brown to black, ostiolate; ostiole papillate or not, circular or oval, 10–20 µm diam.; wall to 30 µm thick, an outer textura angularis, cells thick-walled, dark brown to brown in the outer layers, becoming progressively thin-walled and paler toward an inner, thin-walled, hyaline, textura prismatica; when present, interlocular tissue hyaline, thin-walled textura prismatica. Conidiophores reduced to coniodegenous cells, lining the cavity of the conidioma, invested in mucus. Conidiogenous cells ampulliform to subcylindrical, colourless, thin-walled, smooth, guttulate, (3.5–)4.5–7.5(–8) × 2–4 µm, proliferating sympodially at apex. Conidia composed of a 1-septate conidium body and a separate apical cell modified into a branched appendage; conidium body fusiform, straight or slightly curved, wall smooth and often slightly constricted at the median septum, almost hyaline to pale brown, (11.5–)12–15(–19) × 2.4–3.5 µm; apical cell cylindrical for 1–2.5 µm then dividing into 2–4 divergent branches, devoid of cell contents; appendage branches unbranched, attenuated toward the apex, flexuous, 14.5–22 µm long and less than 1.5 µm wide at the broadest point.

Culture characteristics: Colonies flat, spreading, reaching up to 40 mm diam after 2 wk at 25 °C, with moderate, fluffy aerial mycelium, and smooth, lobate margins. On MEA surface dirty white in outer region, olivaceous grey in centre, reverse iron grey in middle, buff in outer region. On OA surface iron-grey in middle, dirty white in outer region.

Notes: Nag Raj (1993) regarded two species described from India to be synonyms of R. sessilis, R. matheranensis (conidia 8.5–10.5 × 2.5–3 µm), and R. indica (conidia 10.5–13 × 2.5–3.5 µm). Both species, however, differ in their conidial dimensions from R. terrae.

Authors: P.W. Crous and D.A. Giraldo López


Classification: incertae sedis, Pleosporales, Dothideomycetes.

Current generic circumscription: Colonies oval, powdery, dry, black. Conidiophores appressed to substrate, micronematous, branched, septate, pale brown. Conidiogenous cells integrated, terminal or intercalary, monoblastic, pale brown. Conidia phragmosporous, composed on long, simple to branched chains of brown, verruculose acrogenous cells, constricted at septa, fragmenting into segments, 0–multiseptate.

Type species: Rutola graminis (Desm.) J.L. Crane & Schokn. 1977.


Description: See Crane & Schoknecht (1977).

Notes: The description provided by Crane & Schoknecht (1977) is accurate, with the conidiogenous cells being integrated in the superficial hyphae, terminal or intercalary, brown, monoblastic. Conidia are phragmosporous, occurring in simple or branched chains, with darker conidiogenous cells as observed in Torula bring absent. They are also 0–10-septate, with individual cells measuring (3–)4–5(–6) × (4–)5–6 µm. Presently no cultures or DNA sequence data are available for this species, and it will have to be recollected to resolve its phylogenetic relationships. Rotula is included here to simplify comparison with Torula. Presently the genus is not known from culture or DNA sequence, and needs to be recollected.

Author: P.W. Crous


Synonym: Unconfirmed generic synonyms include Septosporiella Sacc. 1892 and Naemostroma Höhn. 1919 (Nag Raj 1993).


Classification: Phaeosphaeriaceae, Pleosporales, Dothideomycetes.

Generic circumscription: Conidiomata pycnidial, immersed, globose to subglobose, unilocular, dark brown, with central, circular ostiole; wall of brown textura angularis, inner layers becoming hyaline. Conidiophores lining the inner cavity, reduced to conidiogenous cells, invested in mucus. Conidiogenous cells ampulliform to lageniform, hyaline, smooth, proliferating via inconspicuous percurrent proliferations near apex. Conidia fusiform to subcylindrical, apex obtuse to subobtuse, base truncate, straight or curved, euseptate, pale brown, thin-walled, smooth or minutely verruculose, bearing mucoid appendages at both ends (type H sensu Nag Raj 1993).

Type species: Septoriella phragmitis Oudem. 1889.


(Fig. 20) Synonym: Stagonospora phragmitis (Oudem.) Leuchtm., Sydowia 37: 139 (1984).

Description: Conidiomata pycnidial, immersed, globose to subglobose, unilocular, dark brown, to 350 µm diam, with central, circular ostiole, 20–40 µm diam; wall brown textura angularis, inner layers becoming hyaline. Conidiophores lining the inner cavity, reduced to conidiogenous cells, invested in mucus. Conidiogenous cells ampulliform to lageniform, hyaline, smooth, 4–8 × 4–5 µm, proliferating via inconspicuous percurrent proliferations near apex. Conidia fusiform to subcylindrical, apex subobtuse, base truncate, straight or curved, (3–)5(–7)-septate, (29–)32–40(–46) × 3(–3.5) µm, pale brown, thin-walled, smooth, not constricted at septa, bearing mucoid appendages at both ends (type H sensu Nag Raj 1993).

Synonymy: Unconfirmed generic synonyms include Adella Petrik 1936 and Guvecievica Glezer 1959 (Sutton 1980).

Generic circumscription: Conidiomata pycnidial, at first immersed, later appearing superficial due to decay of host tissue, separate, globose, often markedly papillate, dark brown; walls thick, composed of dark brown, thick-walled textura angularis becoming hyaline and thin-walled toward the inner conidiogenous region. Ostiole central or displaced to one side, ± papillate, circular. Setae formed around the ostiole or from the lateral pycnidial walls, straight or flexuous, unbranched, brown, septate, smooth. Conidiophores reduced to conidiogenous cells. Conidiogenous cells enteroblastic, phialidic, determinate, discrete, doliform to ampulliform, hyaline, smooth, channel and colliarette minute. Conidia pale brown, with several transverse eusepta, continuous, straight or curved, fusiform or cylindrical, apex and base obtuse, thin-walled, smooth, ± guttulate.

Type species: Wojnowicia hirta Sacc. 1892.

Notes: Species of Wojnowicia are found as saprobes on different substrates (Sutton 1975, Farr & Bills 1995) or as pathogens on cereals crops and grasses. Wojnowicia was established by Saccardo (1892) with W. hirta as type species, based on Hendersonia hirta (Schroeter 1890). However, the nomenclature of W. hirta is confused since Saccardo in the protologue of this species cited no binomial for the new combination, although it is clear that W. hirta is based on the specimen of Schroeter. Nevertheless, the binomial H. hirta Schroet. is an illegitimate name being a later homonym of H. hirta (Fr.) Curr. 1859 (syn. Sphaeria hirta Fr.). In addition, Zerova & Morockovskij (1971) published another illegitimate binomial Wojnowicia hirta (Fr. ex Curr.) Zerova & Morockovskij referring to a species on Sambucus racemosa, not congeneric with Wojnowicia (Sutton 1975). The holotype of W. hirta Sacc. was described from old stems of Setaria verticillata, in Belgrade (Serbia). This specimen was deposited in WRSCL (Wrocław University, Museum of Natural History). Unfortunately, this material could not be located in the herbarium, since some of this collection was destroyed in World War II. Sutton (1975) provided a taxonomic review of the genus Wojnowicia. He examined the holotypes of H. graminis (syn. Wojnowicia graminis) and W. tenella, but unfortunately could not study the holotypes of H. crastophila or H. hirta.

Wojnowicia is characterised by taxa with setose pycnidia, with ampulliform, enteroblastic, phialidic conidiogenous cells and septate, pale brown conidia. Sutton (1975) accepted two species, W. hirta and W. ephedrae. Since then two other species have been introduced in the genus, W. viburni and W. colluvium (Farr & Bills 1995, Wijayawardene et al. 2013a). Nevertheless, W. viburni was recently transferred to Wojnowiciella, which is distinguished by having non-papillate conidiomata lacking setae, dark brown conidia, and also being phylogenetically distinct (Crous et al. 2015).

Septoriella hirta (Sacc.) M. Hern.-Restr & Crous, comb. nov.

Sporulation on CMA. Conidiomata pycnidial, superficial, solitary, dark brown to black, subglobose to obpyriform, 353–502 × 272–290 µm, with one or two papillate to rostrate necks opening to the exterior by rounded central or lateral ostiole; walls 31–69 µm thick, textura angularis, composed of several cell layers, towards the periphery brown to dark brown, thick-walled, pigment accumulating in irregular deposits along cell wall, the inner layers hyaline to yellowish brown, thin-walled; setae abundant, formed from the outer cells of the conidiomata, brown to dark brown, septate, 2–5 µm wide. Conidiogenous cells formed from the inner cells of the pycnidial wall, hyaline, smooth, enteroblastic, phialidic, ampulliform to doliform, 5.4–8.5 × 2.5–4.5 µm. Conidia cylindrical to fusiform, straight or falcate often flattened on one side, yellowish brown to pale brown, smooth, guttulate, tapering towards the apex, 32–39.5 × 3–4 µm, (4–)7-septate, apical cell acute to rounded, basal cell mostly truncate, 1–2.5 µm, with a mucilaginous sheath at the apex.

Culture characteristics: Colonies with abundant aerial mycelium, variable in colour, reaching 70–80 mm after 14 d at 25 °C. On OA surface usually greyish green, becoming greyish sepia to dark mouse grey; reverse colourless. On CMA smoke-grey to olivaceous grey; reverse with ochreous diffusible pigment.


Type species: Wojnowicia hirta Sacc. 1892.

Notes: Species of Wojnowicia are found as saprobes on different substrates (Sutton 1975, Farr & Bills 1995) or as pathogens on cereals crops and grasses. Wojnowicia was established by Saccardo (1892) with W. hirta as type species, based on Hendersonia hirta (Schroeter 1890). However, the nomenclature of W. hirta is confused since Saccardo in the protologue of this species cited no binomial for the new combination, although it is clear that W. hirta is based on the specimen of Schroeter. Nevertheless, the binomial H. hirta Schroet. is an illegitimate name being a later homonym of H. hirta (Fr.) Curr. 1859 (syn. Sphaeria hirta Fr.). In addition, Zerova & Morockovskij (1971) published another illegitimate binomial Wojnowicia hirta (Fr. ex Curr.) Zerova & Morockovskij referring to a species on Sambucus racemosa, not congeneric with Wojnowicia (Sutton 1975). The holotype of W. hirta Sacc. was described from old stems of Setaria verticillata, in Belgrade (Serbia). This specimen was deposited in WRSCL (Wrocław University, Museum of Natural History). Unfortunately, this material could not be located in the herbarium, since some of this collection was destroyed in World War II. Sutton (1975) provided a taxonomic review of the genus Wojnowicia. He examined the holotypes of H. graminis (syn. Wojnowicia graminis) and W. tenella, but unfortunately could not study the holotypes of H. crastophila or H. hirta.

Wojnowicia is characterised by taxa with setose pycnidia, with ampulliform, enteroblastic, phialidic conidiogenous cells and septate, pale brown conidia. Sutton (1975) accepted two species, W. hirta and W. ephedrae. Since then two other species have been introduced in the genus, W. viburni and W. colluvium (Farr & Bills 1995, Wijayawardene et al. 2013a). Nevertheless, W. viburni was recently transferred to Wojnowiciella, which is distinguished by having non-papillate conidiomata lacking setae, dark brown conidia, and also being phylogenetically distinct (Crous et al. 2015).

Septoriella hirta (Sacc.) M. Hern.-Restr & Crous, comb. nov.

MycoBank MB812800 (Fig. 21)
Synonyms: Hendersonia hirta J. Schröt., Hedwigia 29: 61 (1890); nom. illegit. (Art. 53.1).
Hendersonia crasphalosa Sacc., Michelia 1: 211 (1878).
Non Wojnowicia hirta (Fr.) Zerova & Morockovskij, Vyzn. grybiv Ukrajiny 3: 593 (1971); nom. illegit. (Art. 53.1).

Notes: Septoriella hirta is considered an economically important secondary pathogen (Sprague 1950). This fungus is often found in association with other strawbreaker (foot rot) fungi such as Gaeumannomyces graminis and Oculimacula yullandae (Johnston et al. 2014). Invasion of S. hirta occurs in the lumen of the culms through the crown, spreading upwards to 15 cm above the soil line. Symptoms are discoloured culms, leaden on the outside. Plants affected by S. hirta are...
predisposed to premature collapse, especially in rainy and windy seasons, since this fungus produces a weakness in the culms of plants with ripe grains. These conditions increase the cost of harvesting and lower the quality of the grain (Sprague 1950).

Ex-type strains of other species that cluster in Septoriella are treated below:

**Septoriella hubertusii** M. Hern.-Restr., J.Z. Groenew. & Crous, nom. nov. MycoBank MB812801

*Etymology:* Named after Hubertus Antonius van der Aa, who collected this specimen.

*Replaced name:* Sclerostagonospora phragmiticola Quaedvl.


**Septoriella leuchtmannii** M. Hern.-Restr., J.Z. Groenew. & Crous, nom. nov.
MycoBank MB812802

*Etymology:* Named after A. Leuchtmann, who collected this specimen.


*Notes:* Conidia of *S. leuchtmannii* have mucoid caps at the ends of its conidia, as in the type species, *S. phragmitis*. Nevertheless, *S. leuchtmannii* has shorter conidia (18–25 × 3.5–4 µm) and less septa (3–4), than in *S. phragmitis* (conidia (29–)32–40(–46) × 3(–3.5) µm, (3–)5(–7)-septate).

**Septoriella poae** (Crous & Quaedvl.) M. Hern.-Restr., J.Z. Groenew. & Crous, comb. nov.
MycoBank MB812803


*Authors:* M. Hernández-Restrepo and P.W. Crous

**Torulaceae** Corda, Deutschlands Flora, Abt. 3. Die Pilze Deutschlands 3(2): 71 (1829)

*Description:* Colonies discrete, dark brown to black, effuse, dry, velvety. *Mycelium* mostly immersed. *Conidiophores* erect, or reduced to conidiogenous cells, brown, subcylindrical, with or without apical branches. *Conidiogenous cells* doliiform to ellipsoid or clavate, brown, smooth to verruculose, mono- to polyblastic. *Conidia* chiefly subcylindrical, phragmosporous, in branched chains, acrogenous, brown, dry, septate, smooth to verrucose.

*Type genus:* Torula Pers. 1794.

Genera included: Dendryphion, Torula.


*Classification:* Torulaceae, Pleosporales, Dothideomycetes.

*Current generic circumscription:* Colonies discrete, dark brown to black, effuse, dry, velvety. *Mycelium* mostly immersed. *Conidiophores* reduced to conidiogenous cells, or with one brown supporting cell. *Conidiogenous cells* solitary on mycelium, erect, doliiform to ellipsoid or clavate, brown, smooth to verruculose, mono- to polyblastic. *Conidia* phragmosporous, in branched chains, acrogenous, brown, apex pale brown, dry, constricted at septa, smooth to verrucose, fragmenting into segments, conidiogenous cell and fertile cell in conidial chain (where branching occurs) darker brown than other cells; cells subglobose, conidia strongly constricted at the septa.

*Type species:* Torula herbarum (Pers.) Link 1809.

**Torula ficus** Crous, sp. nov.
MycoBank MB812804
(Fig. 22)

*Etymology:* Named after the host genus from which it was collected, *Ficus*.

*Diagnosis:* Conidia predominantly 2–3-septate, cells subglobose, 2-septate conidia 12–13-14(-15) × 5(-6) µm, 3-septate conidia 17–19 × 5(-6) µm.


*Description:* Mycelium immersed to superficial, hyaline, branched, septate, 3–4 µm diam. *Conidiophores* reduced to conidiogenous cells, or with one supporting cell, to 13 µm tall. *Conidiogenous cells* solitary on mycelium, erect, doliiform to clavate, brown, (5–)6–8 × 5(–7) µm, smooth, becoming verruculose at apex, mono- to polyblastic. *Conidia* phragmosporous, in branched chains, acrogenous, brown, apex pale brown, dry, constricted at septa, verrucose, fragmenting into segments, conidiogenous cell and fertile cell in conidial chain (where branching occurs) darker brown than other cells; conidia predominately 2–3-septate, cells subglobose, 2-septate conidia 12–13-14(-15) × 5(-6) µm, 3-septate conidia 17–19 × 5(-6) µm.

*Culture characteristics:* Colonies spreading, covering dish after 2 wk at 25 ºC, with sparse aerial mycelium, flat, spreading, with smooth, even margins. On OA surface olivaceous-grey, with diffuse buff pigment, on MEA buff on surface and in reverse.

*Note:* *Torula ficus* is distinct from the other species treated here, in that conidiogenous cells are frequently clavate, and 2-septate conidia are also rather common.

(Figs 23, 24)
Fig. 22. *Torula ficus* (CBS 595.96). A–E. Conidiogenous cells giving rise to conidia. F. Conidia. Bars = 10 µm.

Fig. 23. *Torula herbarum* (L0118919). A. Colony *in vivo*. B–D. Conidia. Bars = 10 µm.

Fig. 24. *Torula herbarum* (CPC 24114). A–D. Conidiogenous cells and conidia. Bars = 10 µm.

Description: Mycelium immersed to superficial, hyaline, branched, septate, 2–4 µm diam. Conidiophores reduced to conidiogenous cells, or with one brown supporting cell, to 13 µm tall. Conidiogenous cells solitary on mycelium, erect, doliiform to ellipsoid, brown, 5–8 × 6–8 µm, verruculose at apex, mono- to polyblastic. Conidia phragmosporous, in branched chains, acrogenous, brown, apex pale brown, dry, constricted at septa, verrucose, fragmenting into segments, conidiogenous cell and fertile cell in conidial chain (where branching occurs) darker brown than other cells; cells subglobose, conidia predominantly 3-septate, (15–)16–18(–20) × (5–)6(–7) µm, 4-septate conidia 22–24 × 6–7 µm.


Culture characteristics: Colonies spreading, covering dish after 2 wk at 25 ºC, with moderate aerial mycelium, flat, spreading, with smooth, even margins. On PDA surface pale olivaceous-grey, on MEA surface pale olivaceous-grey, reverse olivaceous-grey.

Notes: Torula herbarum is morphologically closest to T. ficus [2-septate conidia (12–)13–14(–15) × (5–)6 µm, 3-septate conidia 17–19 × 5(–6) µm], but is distinct in that it has longer and wider conidia. Torula hollandica is distinguished in that it predominantly forms 4-septate conidia.

Torula hollandica Crous, sp. nov.
MycoBank MB812805
(Fig. 25)

Etymology: Named after The Netherlands (Holland), the country where the fungus was collected.

Diagnosis: Conidia predominantly 4-septate, cells subglobose, 2-septate conidia 13–14 × 6–7 µm, 3-septate conidia 16–20 × 6–7 µm, 4-septate conidia 21–26 × 6–7 µm.


Description: Sporodochial conidiomata forming on agar surface, or sporulating in aerial mycelium. Mycelium immersed to superficial, hyaline, becoming brown closer to fertile region, branched, septate, 3–4 µm diam. Conidiophores reduced to conidiogenous cells. Conidiogenous cells solitary on mycelium, erect, doliiform, brown, 6–7 × 6–7 µm, verruculose, monoblastic. Conidia phragmosporous, in branched chains, acrogenous, brown, apex pale brown, dry, constricted at septa, verrucose, fragmenting into segments, branching cell in conidial chain darker brown than other cells, predominantly 4-septate, cells subglobose, 2-septate conidia 13–14 × 6–7 µm, 3-septate conidia 16–20 × 6–7 µm, 4-septate conidia 21–26 × 6–7 µm.

Culture characteristics: Colonies spreading, covering dish after 2 wk at 25 ºC, with moderate aerial mycelium, flat, spreading, with smooth, even margins. On MEA surface olivaceous-grey, reverse sienna.
Note: *Torula hollandica* is distinct from the other species treated here, in that 4-septate conidia proved to be more prominent than either the 2- or 3-septate conidia.

**Torula masonii** Crous, sp. nov.
MycoBank MB812806
(Fig. 26)

*Etymology:* Named after Edmund W. Mason, first mycologist at the Imperial Bureau of Mycology at Kew, and a President of the British Mycological Society, who collected this species.

*Diagnosis:* Conidia predominantly 6-septate, but to 12-septate conidia present; 2-septate conidia 14–16 × 6–7 µm, 3-septate conidia 19–30 × 6–7 µm, 4-septate conidia 23–35 × 6–7 µm, 5-septate conidia 32–40 × 6–7 µm, 6-septate conidia 36–45 × 6–7 µm, 12-septate conidia 70–75 × 7–8 µm.

*Type:* United Kingdom: Surrey: Haslemere, on *Brassica* sp., 1945, E.W. Mason (CBS H-22278 – holotype; CBS 245.57 – culture ex-type).

*Description:* Mycelium immersed to superficial, hyaline, becoming brown closer to fertile region, branched, septate, 2–3 µm diam. *Conidiophores* straight to flexuous, subcylindrical, 2-septate, 10–25 × 4–5 µm, or reduced to conidiogenous cells, solitary on mycelium, erect, doliform, brown, 6–7 × 5–6 µm, verruculose, monoblastic. Conidia phragmosporous, in branched chains, acrogenous, brown, apex pale brown, dry, constricted at septa, verrucose, fragmenting into segments, branching cell in conidial chain darker brown than other cells, predominantly 6-septate, but up to 12-septate conidia present; cells subglobose, 2-septate conidia 14–16 × 6–7 µm, 3-septate conidia 19–30 × 6–7 µm, 4-septate conidia 23–35 × 6–7 µm, 5-septate conidia 32–40 × 6–7 µm, 6-septate conidia 36–45 × 6–7 µm, 12-septate conidia 70–75 × 7–8 µm.

*Culture characteristics:* Colonies spreading, covering dish after 2 wk at 25 ºC, with sparse aerial mycelium, flat, spreading, with smooth, even margins. On OA surface olivaceous-grey, on MEA surface pale olivaceous-grey, dirty white in centre, reverse olivaceous-grey.

Note: *Torula masonii* is distinct from the other species treated here in that in culture 6-septate conidia tended to be more prominent, while the 12-septate conidia were widest in their middle region.

(Fig. 27)

*Description:* Mycelium immersed to superficial, hyaline, branched, septate, 2–4 µm diam. *Conidiophores* reduced to conidiogenous cells, or with one brown supporting cell, up to 14 µm tall. *Conidiogenous cells* solitary on mycelium, erect, doliform to ellipsoid, brown, 5–8 × 6–8 µm, verruculose at apex, mono- to polyblastic. Conidia phragmosporous, in branched chains, acrogenous, brown, apex pale brown, dry, constricted at septa, verrucose, fragmenting into segments, conidiogenous cell and fertile cell in conidial chain (where branching occurs) darker brown than other cells; conidia up to 9-septate, cells subglobose, conidia predominantly 3-septate, but at times also muriformly septate in the lower part of conidial chains, (15–)17–18(–20) × (6–)7(–8) µm.

*Specimen examined:* Country unknown: (on litter) (L910.267-995 = L0118923 – authentic specimen).
Notes: The present specimen is annotated by Persoon as *Torula monilis*. *Torula monilis*, as understood here, is distinguished from *T. herbarum* by having up to 9-septate conidia, and smaller conidia that are also frequently muriformly septate, features not observed in *T. herbarum*. Currently the species is not known from DNA sequence data.

Author: P.W. Crous

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