



Trichopeltinaceae* (Dothideomycetes), an earlier name for *Brefeldiellaceae*, with a new species of *Trichopeltina

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Abstract

The family *Trichopeltinaceae* is poorly known. This is due to an unclear history, few modern morphological studies and lack of sequence data in GenBank. The family was introduced in 1914 as *Trichopeltaceae* to accommodate the subfamilies *Trichopeltinae* and *Brefeldiineae*. In 1958 the spelling of the family was corrected to *Trichopeltinaceae*, as it was presumably based on the genus *Trichopeltina*. The family *Brefeldiellaceae* was introduced in 1962. Both *Brefeldiellaceae* and *Trichopeltinaceae* contain morphologically similar epiphytic foliar taxa, the only difference being that the thallus is linear in *Trichopeltinaceae* and rounded in *Brefeldiellaceae*. In both families the thallus forms a neatly arranged, “skin-like”, palisade of cells over the flattened thyriothecia, pseudoparaphyses are mostly lacking, asci are bitunicate and saccate and ascospores are ellipsoidal, muriform of trans-septate and hyaline to brown. *Trichopeltinaceae* is the earliest name for these taxa. The family can be confused with *Trichothyriaceae* and this is discussed. A new species of *Trichopeltina* is also introduced and illustrated.

Key words: foliar epiphytes, *Trichopeltaceae*, *Trichopeltidaceae*

Introduction

The fungal family *Trichopeltinaceae* (Dothideomycetes) comprises foliar epiphytes, which grow on leaves, or less often on stems of host plants (Batista *et al.* 1958). To the unaided eye, colonies usually appear as small to enveloping, black areas on the host surface, and/or as darkened “root”-like structures, and are similar in appearance to the black mildews or members of *Teratosphaeriaceae* (Thimmaiah *et al.* 2013, Hyde *et al.* 2013). In species of *Trichopeltinaceae*, the thallus consists of a neatly arranged, “skin-like”, palisade of cells, which covers the host and is interdispersed with immersed, flattened thyriothecia.

The taxonomic placement of *Trichopeltinaceae* is uncertain because there have been few modern morphological studies, the literature is confused and sequence data is lacking in GenBank. Theissen (1914) introduced the family as *Trichopeltaceae* Theiss., with two subfamilies, *Brefeldiineae* Theiss. and *Trichopeltineae* Theiss. separated on thallus characters. In *Brefeldiineae* the thallus was considered to be rounded, while in *Trichopeltineae* it was linear. Subsequently, the family *Trichopeltaceae* was further elaborated and illustrated by Theissen & Sydow (1917) who characterized the subfamily *Trichopeltineae* with the genus *Trichopeltina* and subfamily *Brefeldiineae* with *Brefeldiella*. Thus, it can be concluded that *Trichopeltina* should be the type genus for *Trichopeltaceae* (as otherwise the family would have been named *Brefeldiellaceae*) and that the family name should have been “*Trichopeltinaceae*”. Indeed, Batista *et al.* (1958) corrected the spelling to *Trichopeltinaceae*. Index Fungorum (2014) and MycoBank (2014) use *Trichopeltidaceae* as the current name for *Trichopeltaceae* with *Trichopeltis reptans* as the generic type. Barr (1987) reported that the name *Trichothyriaceae* Theiss. is predated by *Trichopeltidaceae*. Hyde *et al.* (2013) examined the type genus of *Trichopeltidaceae*, represented by *Trichopeltis*

reptans, which is similar to *Trichothyrium* and belongs in *Trichothyriaceae*; thus it cannot be accommodated in *Trichopeltinaceae*.

Stevens (1925) reviewed the Hawaiian species described in *Trichopeltinaceae* and concluded that *Trichopeltina* was a synonym of *Trichopeltis* based on the fact that the type of *Trichopeltis* Speg. (*Asterina reptans* Berk. & M.A. Curtis) was confused and comprised several distinct species, or even genera. Index Fungorum (2014) and Wu *et al.* (2011) placed *Trichopeltis* in *Trichothyrium* Speg., which is accommodated in the family *Trichothyriaceae* (Hyde *et al.* 2013). Members of *Trichothyriaceae* also have flattened ascostromata but cannot be included in *Trichopeltinaceae* because their ascostromata develop on mycelium rather than under a thallus (Batista *et al.* 1958, Hyde *et al.* 2013). Whether *Trichopeltina* is a synonym of *Trichopeltis* does not affect the family status of *Trichopeltinaceae*, which is based on *Trichopeltina labecula* (Mont.) Theiss. as the type species.

The families *Trichopeltinaceae*, *Microthyriaceae* (Höhnelt 1910, Fraser 1936, Cookson 1947) and *Stephanothecaceae* (Petraik 1947, Luttrell 1951) are somewhat similar in having flattened thyriothecia. Thyriothecia in *Microthyriaceae* and *Stephanothecaceae* do not develop under a spreading thallus (Bessey 1952, Batista *et al.* 1958, Jayawardena *et al.* 2014), unlike in *Trichopeltinaceae*. However, the families need further study.

Materials and methods

Examination of herbarium material

Although Müller & von Arx (1962) could not trace the type specimen of *Trichopeltina labecula*, we were able to obtain two specimens from Museum National d'Histoire Naturelle (PC0084644 and PC0084646). The label on one packet (PC0084644) matched the original description and should be designated the lectotype of *T. labecula*. The second specimen (PC0084646) is a collection of the same species on a different host. Specimen morphology was studied in a free-hand section cut under a stereomicroscope. Due to the extremely thin thallus we could not get a vertical section of the ascostromata. Specimens were mounted in water or in 70% lactic acid, stained by Melzer's reagent and cotton blue reagent, and examined under a Nikon80i compound microscope; measurements were made with Tarosoft (R) Image Frame Work. Herbarium specimens were recorded as photo-plates and are provided with descriptions. The type specimen of the new species is deposited in Mae Fah Luang University Herbarium (MFLU), Chiang Rai, Thailand.

Isolation

Attempts to germinate single spores (Chomnunti *et al.* 2011) on PDA (potato dextrose agar) and MEA (malt extract agar) were unsuccessful. In the future, we plan to extract DNA directly from ascostroma or the thallus in order to obtain sequences.

Results

Key to genera of *Trichopeltinaceae*

1. Thallus often rounded on host surface 2
- Thallus spreading, appearing as "root"-like structures, or linear with branches 4
1. Ascospores muriform, asci globose to ovoid *Saccardinula*
2. Ascospores with only transverse septa..... 3
- 3 Ascospores 1-septate, thallus poorly developed *Brefeldiella*
3. Ascospores 2-septate, thallus well-developed..... *Acrogenotheca*
4. Ascospores muriform, asci clavate or sub cylindrical *Trichopeltithecium*
4. Ascospores with only transverse septa..... 5
5. Only known as asexual state, conidia non septate, 5–8 conidia in chain, hyaline..... *Trichopeltella*
5. Only known as sexual state, ascospores 1–4-septate, hyaline to pale brown *Trichopeltina* (*Trichopeltum*)

Taxonomy

Trichopeltinaceae (Theiss.) Bat., C.A.A. Costa & Cif., Atti dell'Istituto Botanico della Università e Laboratorio Crittogamico di Pavia 15: 37 (1958) MycoBank: MB 81489

Possible synonymy:

Brefeldiellaceae E. Müll. & Arx, in Müller & von Arx, Beitr. Kryptfl. Schweiz 11(no. 2): 148 (1962)

Saccardinulaceae G. Arnaud, Anns Sci. Nat., Bot., sér. 10 7: 647 (1925)

Trichopeltaceae Theiss., Centralbl. Bakteriol. Parasitol., II 39:629 (1914)

Trichopeltidaceae Theiss. [as 'Trichopeltaceae'], Zentbl. Bakt. ParasitKde, Abt. II 39: 629 (1914) [1913]

Epiphytes on leaves, appearing as rounded or linear, or “root”-like darkened areas. *Thallus* very thin on the surface of host plant, superficial, comprising neatly or irregularly arranged, angular or cylindrical to cuboid cells, with brown to dark brown walls. *Sexual state*: *Thyriothecia* developing under thallus tissue, globose to subglobose, flattened, with a porate, central ostiole. *Hamathecium* usually lacking pseudoparaphyses, sometimes comprising hyaline pseudoparaphyses. *Asci* 6–8-spored, bitunicate, fissitunicate, subglobose to clavate, short pedicellate or apedicellate, long pedicellate when immature in some species, apically rounded, sometimes with small ocular chamber or apical ring. *Ascospores* 2–4-seriate, oblong to ellipsoidal, or clavate, 1–3-septate or muriform, constricted at the septa in some species, hyaline to pale brown, smooth-walled. *Asexual state*: Unknown.

Notes:—*Trichopeltinaceae* are epiphytes on leaves of various plants with a worldwide distribution. The name *Trichopeltinaceae* was predated by *Trichopeltaceae* (Theissen 1914). Batista *et al.* (1958) renamed the family *Trichopeltinaceae*, which was based on the genus *Trichopeltina*, and accommodated genera that have flattened thyriothecia developing under a thallus, and included *Brefeldiella*, *Petrakiopeltis*, *Phragmoscutella*, *Trichopeltella*, *Trichopeltthea*, *Trichopeltina*, *Trichopeltospora* and *Trichopeltum*. Hyde *et al.* (2013) used *Brefeldiellaceae* for this group, which contains species of *Brefeldiellaceae* and *Trichopeltineae*. However, the older name *Trichopeltinaceae* should be used to accommodate this group and *Brefeldiellaceae* be considered a synonym. In the following account we accept *Acrogenotheca*, *Brefeldiella*, *Saccardinula*, *Trichopeltella*, *Trichopeltthea* and *Trichopeltina* (*Trichopeltum*) in *Trichopeltinaceae* based on their thyriothecia being covered by a “skin”-like thallus.

The *Trichopeltinaceae* appears to be morphologically similar to the *Microthyriaceae* as both have flattened ascostroma known as thyriothecia (Höhnelt 1910, Fraser 1936, Cookson 1947, Wu *et al.* 2011, Hyde *et al.* 2013). Genera from *Trichopeltinaceae* with thyriothecia were transferred to *Stephanothecaceae* (Petrak 1947, Luttrell 1951). However, *Stephanothecaceae* (type genus *Stephanotheca*) has a hypostroma, and was considered to be distinct from *Trichopeltinaceae* (Bessey 1952, Batista *et al.* 1958). *Stephanotheca* was illustrated by Jayawardena *et al.* (2014), but the thyriothecia are individual and not covered by a thallus, and thus are probably distinct from *Trichopeltina*.

Type genus:—*Trichopeltina* Theiss., Beih. bot. Zbl., Abt. 2 32: 3 (1914) MycoBank: MB 5566

Trichopeltina Theiss., Beih. bot. Zbl., Abt. 2 32: 3 (1914) Mycobank: MB 5566

Epiphytes on leaves, appearing as “root”-like darkened areas. *Thallus* very thin, superficial, comprising neatly or irregularly arranged, angular or cylindrical to cuboid cells, with brown to dark brown walls. *Sexual state*: *Thyriothecia* developing under thallus tissue, globose to subglobose, flattened, with a porate, central ostiole. *Hamathecium* usually lacking pseudoparaphyses. *Asci* 8-spored, bitunicate, fissitunicate, clavate, short pedicellate or apedicellate, long pedicellate when immature in some species, apically rounded, sometimes with small ocular chamber or apical ring. *Ascospores* 2–3-seriate, long clavate, 1–3-septate, constricted at each septa, upper cells wider and shorter than lower cells, hyaline, sometimes pale brown in the lower cells, smooth-walled. *Asexual state*: Unknown.

Notes:—*Trichopeltina* was established by Theissen (1914) based on *Trichopeltina labecula* (basionym, *Asteroma labecula*). Clements & Shear (1931) placed fossil material with a thin thallus and 1-septate ascospores in *Trichopeltina*. However, Dilcher (1965) did not agree that the fossil material cited by Clements & Shear (1931) is *Trichopeltina*.

Type species:—*Trichopeltina labecula* (Mont.) Theiss., Zentbl. Bakt. ParasitKde, Abt. II 39: 630 (1914)
 Mycobank: MB 220570 (Figs 1, 2)

≡ *Asteroma labecula* Mont., Anns Sci. Nat., Bot., sér. 2 14: 328 (1840) MycoBank: MB 231887



FIGURE 1. *Trichopeltina labecula* (lectotype). a. Specimen. b–c. Thallus and thyriothecia a on host substrate. d. Thyriothecia under thallus in 70% lactic acid, showing ostioles. e. Cells of thallus. f. Thyriothecium at maturity composed of darkly pigmented cells. g–h. Asci stained in Melzer's reagent. i. Asci stained in cotton blue reagent. j. Ascospore stained in cotton blue reagent. k. Immature ascospore stained in Melzer's reagent. l. Immature ascospore stained in Melzer's reagent. Scale bars: d, f = 50 µm, e, g–i = 20 µm, j–l = 10 µm.

Epiphytes on leaves, appearing as “root”-like darkened areas. *Thallus* very thin on upper surface of leaves, superficial, comprising neatly or irregularly arranged, angular or cylindrical to cuboid cells, with brown to dark brown walls. *Sexual state*: *Thyriothecia* 65–78 µm diam. × 33–48 µm high (\bar{x} = 74 × 39 µm, n = 10), developing under thallus tissue, globose to subglobose, flattened, with a porate, central ostiole. *Hamathecium* lacking

pseudoparaphyses. *Asci* 20–29 × 14–17 μm (\bar{x} = 26 × 15 μm, n = 10), 8-spored, bitunicate, fissitunicate, clavate, short pedicellate or apedicellate, long pedicellate when immature, apically rounded, usually with a small ocular chamber. *Ascospores* 15–17 × 3–4 μm (\bar{x} = 16 × 3 μm, n = 10), 2–3-seriate, long clavate, 1–3-septate, constricted at each septa, upper cells wider and shorter than lower cells, hyaline, sometimes pale brown in the lower cells, smooth-walled. *Asexual state*: Unknown.

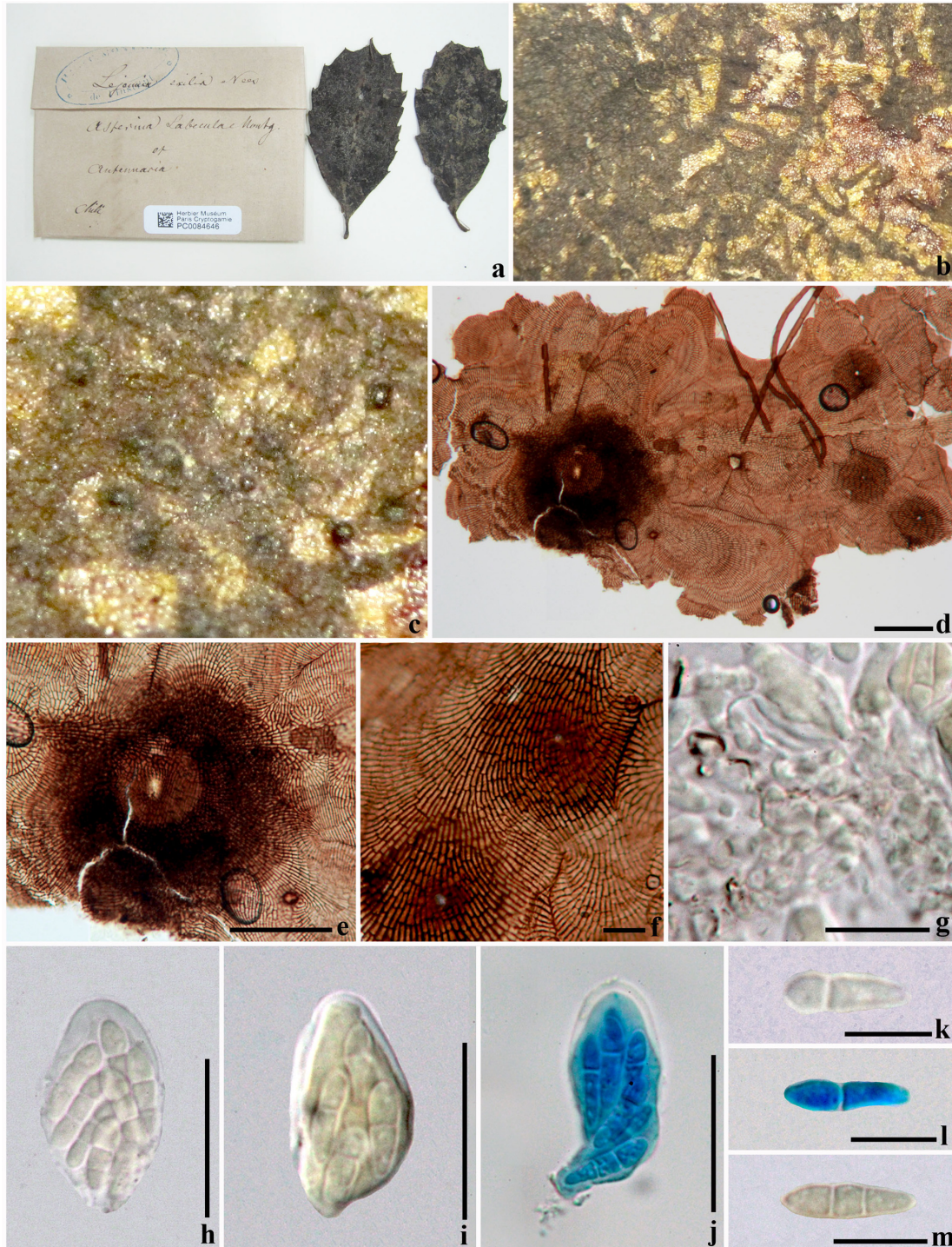


FIGURE 2. *Trichopeltina labecula* (PC 0084646) a. Specimen. b–c. Thallus on host substrate. d. Ascomata and ostiole in 70% lactic acid. e–f. Cells of thallus and ascomata. g. Squash mount of contents of ascoma stained in Melzer's reagent. h. Mature ascus. i. Mature ascus stained in Melzer's reagent. j. Mature ascus stained in cotton blue reagent. k. Immature 1-septate ascospore. l. Immature ascospore stained in cotton blue reagent. m. Ascospore stained in Melzer's reagent. Scale bars: d, e = 100 μm, f, h–j = 20 μm, g, k–m = 10 μm.

Material examined:—FRANCE. Guiana, Gabaret River, on coriaceous leaf, September 1835, Leprieur 664 (PC 0084644! lectotype designated here); *ibid.*—On leaf of chili with *Antennaria* and *Lejeunea exilis* (Reinw., Blume & Nees) Grolle (PC 0084646!).

Notes:—*Trichopeltina* comprises four species: *T. chilensis* (Speg.) Theiss., *T. exorrepta* Dilcher., *T. ixorae* Bat. & Peres. and *T. labecula* (Mont.) Theiss. (Index Fungorum, 2014). Although the type species *T. labecula* was described as having 2-celled ascospores (Batista *et al.* 1958), our examination of the type material indicated that the ascospores can be 2- or occasionally 3-celled.

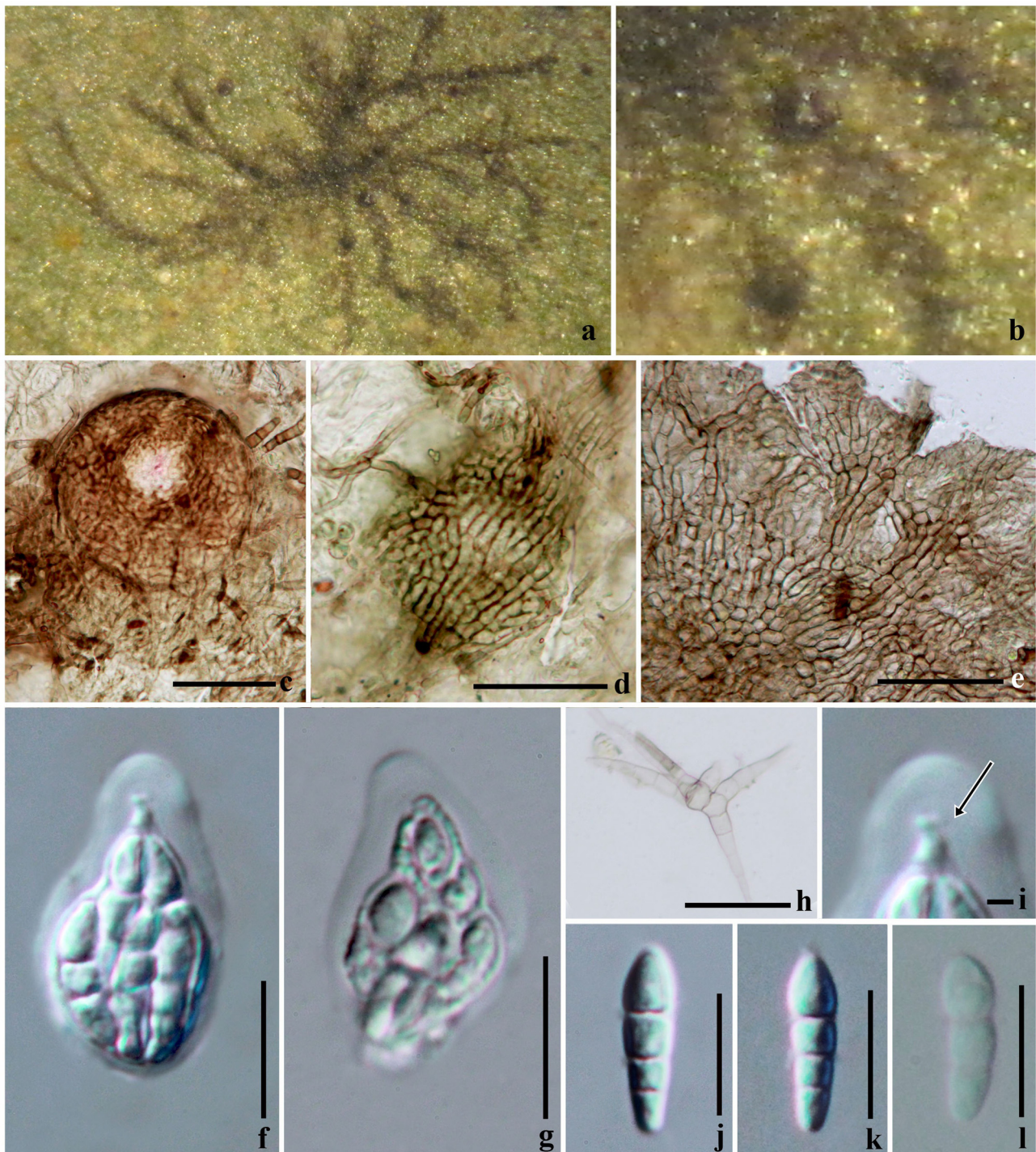


FIGURE 3. *Trichopeltina asiatica* (holotype). a–b. Thallus and thyriothecia on surface of host. c. Thyriothecium with central ostiole. d. Cells of thyriothecia when immature. e. Upper wall cells of thallus. f–g. Asci with apical ring. h. Conidium. i. Apical ring. j–k. Ascospores with 3 septa. l. Immature ascospores in 70% lactic acid. Scale bars: c = 50 μ m, d–h, j–l = 10 μ m, l = 2 μ m.

Trichopeltina asiatica Hongsanan & K.D. Hyde *sp. nov.* MycoBank: MB 807759 (Fig. 3)

Differs from other species in *Trichopeltina* based on asci with an apical ring, and 3-septate ascospores.

Holotype:—MFU13-0507.

Epiphyte on upper surface of *Strobilanthes*, appearing as “root”-like or linear and branched darkened areas on leaves. *Thallus* very thin, superficial, comprising neatly or irregularly arranged, angular to cuboid cells, with brown to dark brown walls. *Sexual state: Thyriothecia* 75c105 μm diam. \times 40–53 μm high (\bar{x} = 81 \times 44 μm , n = 10), developing under thallus tissue, globose to subglobose, flattened, with a porate, central ostiole. *Hamathecium* usually lacking pseudoparaphyses. *Asci* 22–27 \times 14–16 μm (\bar{x} = 24 \times 14 μm , n = 10), 8-spored, bitunicate, fissitunicate, clavate, short pedicellate or apedicellate, with distinct apical ring. *Ascospores* 11–14 \times 4–5 μm (\bar{x} = 12 \times 5 μm , n = 10), 2–3-seriate, oblong to ellipsoidal, usually 3-septate or sometimes 2-septate when immature, constricted at each septa, upper cells wider and shorter than lower cells, hyaline, smooth-walled. *Asexual state:* Unknown.

Material examined:—PHILIPPINES. Laguna Province: Botanic garden at base of Mount Makiling, on living leaves of *Strobilanthes*, October 2012, S. Hongsanan BT01 (MFU 13-0507! **holotype**).

Notes:—*Trichopeltina asiatica* is most similar to *T. labecula*, which also appears “root”-like, with ascospores having only transverse septa. However, it differs in having an apical ring at apex of asci and ascospores being mostly 2–3-septate. We therefore introduce a new species *Trichopeltina asiatica* to accommodate this taxon.

Genera included in *Trichopeltinaceae*

Acrogenotheca Cif. & Bat., in Batista & Ciferri, Saccardo 2: 51 (1963) MycoBank: MB 49

Possible synonymy:

Laterotheca Bat., in Batista & Ciferri, Saccardo 2: 118 (1963)

Epiphytes, appearing as black colonies of rounded darkened areas on leaves. *Thallus* very thin, superficial, comprising neatly or irregularly arranged, cylindrical to cuboid cells, with brown to dark brown walls, mycelium composed of two types, one is stoloniferous, interwoven, brown, thick-walled, giving rise to second kind of upright hyphae which are monopodially branched, brownish-black, without setae, mother hyphae growing up, at an angle with fertile hyphae (see note). *Sexual state: Thyriothecia* developing under thallus tissue, globose to subglobose, flattened, with a porate, central ostiole, peridium very thin. *Hamathecium* lacking pseudoparaphyses. *Asci* 4–8-spored, bitunicate, fissitunicate, clavate, broader at the centre, short pedicellate or apedicellate, apically rounded with ocular chamber. *Ascospores* 2–3-seriate, fusoid to clavate, 1–3-septate, constricted at septa, hyaline to pale brown, smooth-walled. *Asexual state: Pycnidia* intercalary or sometimes on branches, subglobose to ovoid, dark brown, pseudo-ostiolate, with polygonal cells. *Pycnosporos* hyaline, multi-transversely septate, not constricted, brown, connected with the mycelia hyphae through the short peduncle.

Type species:—*Acrogenotheca pulcherrima* Bat. & Cif., Saccardo 2: 52 (1963) MycoBank: MB 325806 (Fig. 4).

Epiphytes, appearing as black colonies or rounded darkened areas on leaves. *Thallus* thin and dense, superficial, having two types of hyphae, one repent irregularly branched, comprising cylindrical cells, other type is built of upright branches, straight at the base, septate, constricted at septa. *Sexual state: Thyriothecia* developing under thallus tissue, globose to subglobose, flattened, with a porate, central ostiole, peridium very thin. *Hamathecium* lacking pseudoparaphyses. *Asci* 30–50 \times 9–15 μm (\bar{x} = 45 \times 12 μm , n = 10), 8-spored, bitunicate, fissitunicate, ellipsoid to obpyriform, short pedicellate, apically rounded, with ocular chamber. *Ascospores* 15–18 \times 4–7 μm (\bar{x} = 16 \times 5 μm , n = 10), 2-seriate, oblong to ellipsoidal, 1-septate when immature, 2–3-septate at maturity, constricted at each septa, upper cells wider and longer than lower cells, hyaline when immature and pale brown when mature, end cells rounded, smooth-walled. *Asexual state: Pycnidia* intercalary or sometime terminal on branches of erect dark brown hyphae, subglobose to ovoidal, dark brown, pseudo-ostiolate, walls having distinct polygonal cells. *Pycnosporos* 150–200 \times 150–185 μm (\bar{x} = 125 \times 175 μm , n = 10), hyaline, 5–13-septate, not constricted, brown, connected with the mycelia hyphae through the short peduncle.

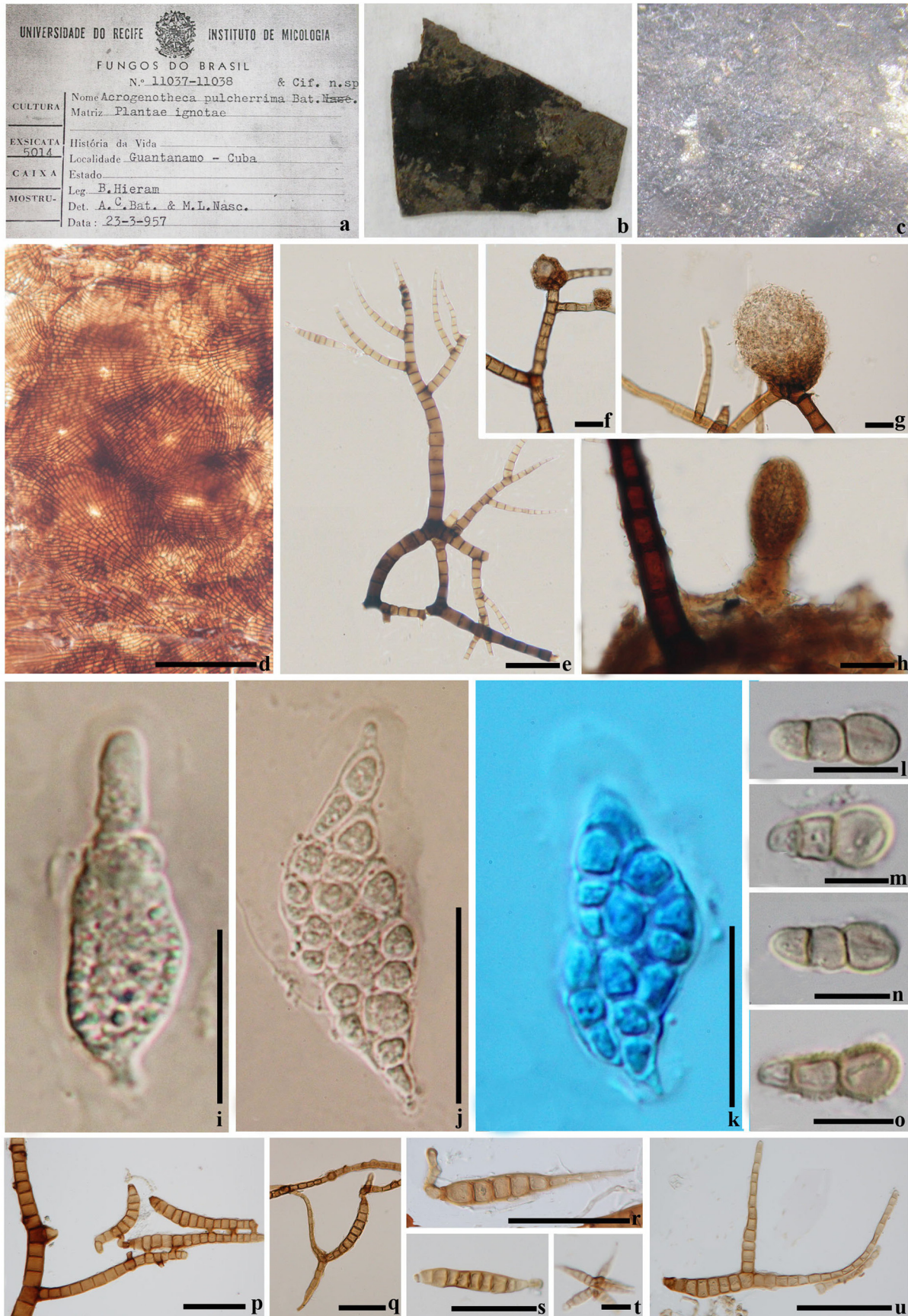


FIGURE 4. *Acrogenotheca pulcherrima*. a–b. Specimen. c. Thallus and thyriothece on surface of host. d. Cells of upper wall of thyriothece. e. Erect mycelia with branches. f–h. Intercalary or sometimes terminal pycnidia. i–j. Asci. k. Ascus stained in cotton blue reagent. l–o. Ascospores with 2-septa. p–u. Conidia. Scale bars: f–k = 20 μ m, l–o = 10 μ m, d–e, p–s = 100 μ m.

Type:—CUBA. Guantánamo, Colegio Sagrado Coraszon, San Juan, on leaves of unknown host, July 1927, *B. Hieram* (URM 11037!).

Notes:—*Acrogenotheca* was introduced by Batista & Ciferri (1963) with *A. pulcherrima* as the type species. The genus presently comprises three species including *A. elegans* (L.R. Fraser) Cif. & Bat., *A. ornata* Deighton & Piroz. and *A. pulcherrima* Bat. & Cif. We examined the type material of *A. pulcherrima*, which is typical of *Trichopeltinaceae*. The ascospores of this species are greyish brown, clavate and 3-celled and asci are clavate, which differ from those of *Trichopeltina*. There is no way of confirming that the asexual fructifications which form on the thallus are linked to the ascomycete state. Although we maintain *Acrogenotheca* as a distinct genus in *Trichopeltinaceae*, we acknowledge that fresh collections and molecular data is needed to confirm that *Trichopeltina* and *Acrogenotheca* are not synonyms.

Acrogenotheca was illustrated with two types of hyphae; one being irregularly branched, composed of cylindrical cells and the other comprising upright monopodially branches, which are straight at the base, septate, constricted at each septum, pale brown to dark brown, with the mother hyphae growing up, at an angle to the fertile hyphae (Batista & Ciferri 1963). There appears to be at least two species in the type specimen.

Brefeldiella Speg., Boln Acad. nac. Cienc. Córdoba 11(4): 558 (1889) MycoBank: MB 648

Epiphytes on surface of host, worldwide distribution, appearing as rounded to circular or irregular colonies. *Thallus* very thin, superficial, comprising radially arranged cylindrical to cuboid cells, with dark brown to black walls. *Sexual state:* *Thyriothecia* developing under thallus tissue, globose to subglobose, flattened, with a porate, central ostiole, peridium very thin. *Hamathecium* pseudoparaphyses, comprised with asci. *Asci* 8-spored, bitunicate, fissitunicate, cylindric or clavate, short pedicellate or apedicellate, usually with a small ocular chamber. *Ascospores* 2–3-seriate, oblong to ellipsoidal, 1-septate, upper cell wider and shorter than lower cell, hyaline, smooth-walled (Hyde *et al.* 2013). *Asexual state:* Unknown.

Type species: *Brefeldiella brasiliensis* Speg., Boln Acad. nac. Cienc. Córdoba 11(4): 558 [no. 344] (1889) MycoBank: MB 230084

Notes:—*Brefeldiella* comprises four species (Index Fungorum 2014). It was introduced and illustrated with measurement by Spegazzini (1889) of $35 \times 12(-14) \mu\text{m}$ for asci and $12 \times 4 \mu\text{m}$ for ascospores. The type collection was examined by Eriksson (1981), but specimens were considered immature (Hyde *et al.* 2013). *Brefeldiella* and *Trichopeltella* need recollecting and study at the molecular level to confirm that *Trichopeltella* is not a synonym of *Brefeldiella*.

Saccardinula Speg., Anal. Soc. cient. argent. 19(6): 257 (1885) MycoBank: MB 4809

Possible synonymy:

Myxomyriangium Theiss., Annls mycol. 11(6): 507 (1913)

Pycnodermella Petr., Sydowia 1(1–3): 111 (1947)

Pycnopeltis Syd. & P. Syd., Annls mycol. 14(5): 365 (1916)

Type Species:—*Saccardinula guaranitica* Sacc., Anal. Soc. Cient. Argent. 19:257 (1885) MycoBank: MB 208526

Notes:—*Saccardinula* comprises 14 species (Index Fungorum 2014) and the type species (*Saccardinula guaranitica*) was illustrated in Li *et al.* (2011). *S. guaranitica* has a less well-developed thallus than *Elsinoaceae* species which covers the thyriothecia. Asci are saccate and typical of *Trichopeltinaceae*, while ascospores differ from *Elsinoaceae* as they are muriform (Hyde *et al.* 2013, Li *et al.* 2011). Li *et al.* (2011) and Jayawardena *et al.* (2014) place *Saccardinula* in *Brefeldiellaceae* and thus the genus should belong in *Trichopeltinaceae*.

Trichopeltica Bat., C.A.A. Costa & Cif., Atti Ist. bot. Univ. Lab. crittog. Pavia, Ser. 5 15: 44 (1958) MycoBank: MB 5565

Type species: *Trichopelthea asiatica* Bat., C.A.A. Costa & Cif., Publicações Inst. Micol. Recife 90: 13 (1958) [1957] MycoBank: MB 307090

Notes:—*Trichopelthea* was introduced by Batista *et al.* (1958) and presently comprises two species (Index Fungorum 2014). This genus resembles *Saccardinula* based on its muriform ascospores, but differs in ascus shape and thallus form. *Saccardinula* has globose to ovoid asci and the thallus is rounded (Spegazzini 1885), while *Trichopelthea* has clavate to sub-cylindrical asci and the thallus appears “root”-like (Batista *et al.* 1958).

Trichopeltella Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 119: 458 [66 repr.] (1910) MycoBank: MB 5564

Possible synonymy:

Raciborskiella Speg., Boln Acad. nac. Cienc. Córdoba 23(3–4): 509 (1919)

Type species:—*Trichopeltella montana* (Racib.) Höhn., Sber. Akad. Wiss. Wien, Math.-naturw. Kl., Abt. 1 119: 458 [66 repr.] (1910) MycoBank: MB 227170

Notes:—*Trichopeltella* was introduced by Raciborski (1909). Wu *et al.* (in prep.) examined the holotype of *T. montana* but the specimen only comprised the asexual state, thus comparison with *Brefeldiella* and *Trichopeltella* is unclear. Although, Hyde *et al.* (2013) mentioned that *Trichopeltella* may be a synonym of *Brefeldiella*, we presently maintain *Trichopeltella* as a distinct genus in *Trichopeltinaceae* based on its asexual state, and having a “root”-like thallus, with non-septate, hyaline conidia.

Excluded and doubtful genera

Phragmoscutella Woron. & Abramov, in Woronichin, Anns mycol. 24(3/4): 231 (1927) [1926] MycoBank: MB 4035

Type species:—*Phragmoscutella abchasica* Woron. & Abramov, Anns mycol. 24(3/4): 231 (1926). MycoBank: MB 255520

Notes:—Following correspondence with Vadim Mel’nik we cannot locate the type of this genus and believe it is lost. Therefore, the genus must be treated as doubtful.

Pycnoderma Syd. & P. Syd., Anns mycol. 12(6): 563 (1914). MycoBank: MB 4565

Possible synonymy:

Calolepis Syd., Anns mycol. 23(3/6): 399 (1925)

Pycnodermina Petr., Sydowia 8(1–6): 31 (1954)

Type species:—*Pycnoderma bambusinum* Syd. & P. Syd., Anns mycol. 12(6): 563 (1914) MycoBank: MB 189375 (Fig. 5)

Epiphytes on leaves. *Sexual state:* *Thyriothezia* 120–150 µm diam (\bar{x} = 145 µm, n = 5) clustering together as rounded or irregular darkened regions, superficial, subglobose or irregular, surface rough, flattened, opening by fracture of the upper wall. *Upper thyriothezial wall* comprising radially arranged, angular or cuboid cells, with brown to dark brown walls. *Hamathecium* lacking pseudoparaphyses. *Asci* 25–30 × 22–28 µm (\bar{x} = 27 × 24 µm, n = 10), 8-spored, bitunicate, fissitunicate, oblong to subglobose, apedicellate, with narrow and wide ocular chamber, or ocular chamber lacking. *Ascospores* 15–20 × 7–10 µm (\bar{x} = 17 × 8 µm, n = 10), 2–3-seriate, ellipsoid, muriform with 3 transverse septa, and 1–2 longitudinal septa, slightly constricted at each septum, upper cells wider and shorter than lower cells, hyaline to pale brown, smooth-walled. *Asexual state:* Unknown.

Syntype:—PHILIPPINES. Rizal, Luzon, on *Schizostachyum* sp. (family *Poaceae*, subfamily *Bambusoideae*), 14 August 1913, M. Ramos (S, F7745!).

Notes:—*Pycnoderma* is presently placed in *Cookellaceae* and comprises four species (Index Fungorum, 2014). Hyde *et al.* (2013) placed *Pycnoderma* in *Brefeldiellaceae* and also placed the genus in *Cookellaceae* in the same publication; we agree to it being placed in *Cookellaceae* based on its thyriothechia clustered together with surface rough, pigmented. *Pycnoderma* is similar to *Saccardinula* based on its muriform ascospores, but the thallus is less well-developed than in *Saccardinula* (Jayawardena *et al.* 2014, Spegazzini 1885), while thyriothechia of *Pycnoderma* cluster together, with globose asci. *Pycnoderma* is also similar to *Elsinoaceae* species based on globose asci, but *Elsinoaceae* species have wart-like ascostromata, or are small, white to pale yellow or brown, soft, and multi-loculate (Hyde *et al.* 2013).

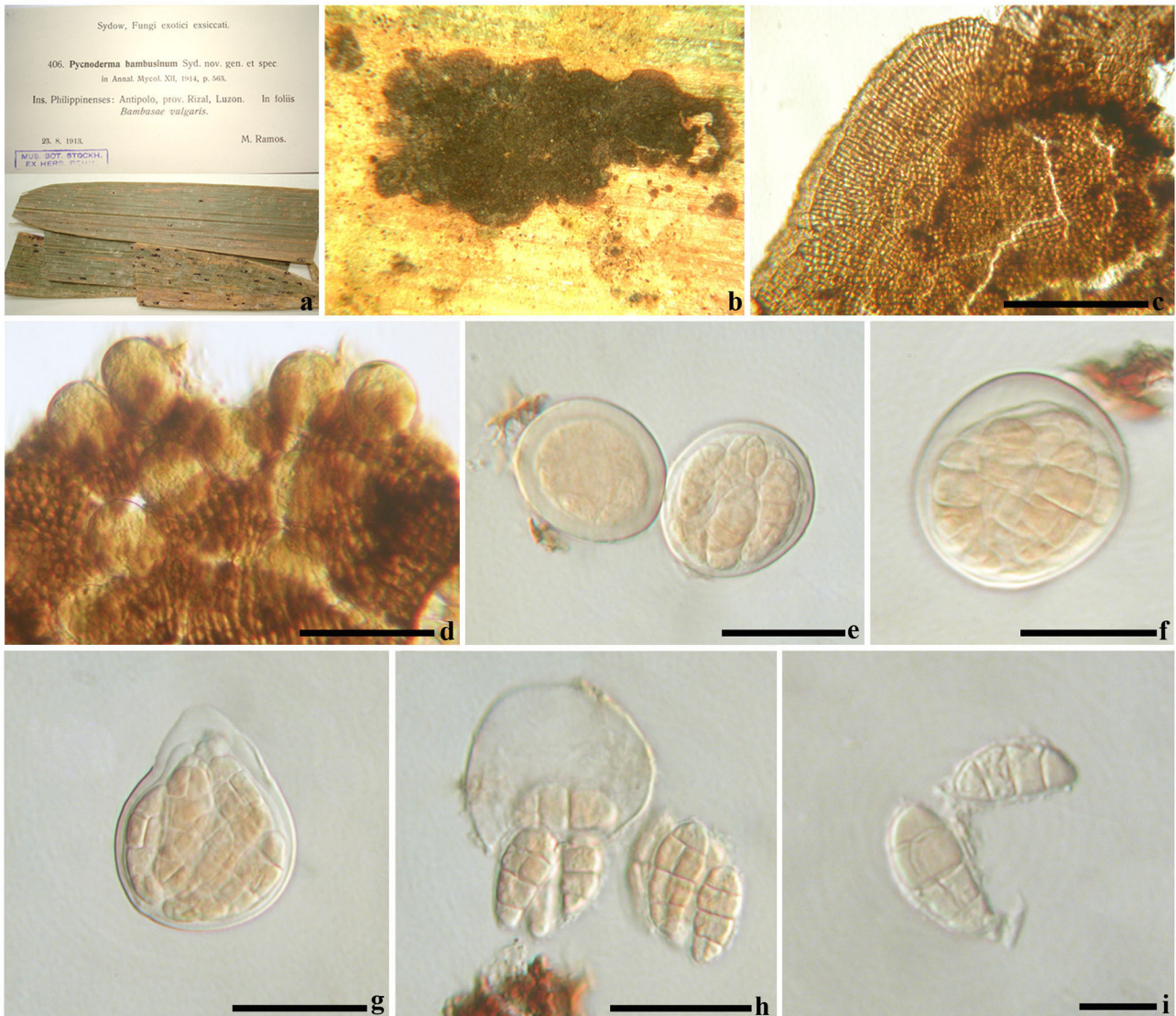


FIGURE 5. *Pycnoderma bambusinum* (syntype). a. Specimen. b. Thyriothechia clustering together on the host surface. c. Cells of upper wall of thyriothecium. d. Arrangement of asci. e. Immature asci. f–g. Mature asci. h–i. Muriform ascospores. Scales bars: c = 50 μ m, d = 100 μ m, e–h = 20 μ m, i = 10 μ m.

Trichopeltospora Bat. & Cif., in Batista *et al.*, Publicações Inst. Micol. Recife 90: 17 (1958) MycoBank: MB 5565

Type species:—*Trichopeltospora pipericola* Bat., Cif. & C.A.A. Costa, in Batista *et al.*, Publicações Inst. Micol. Recife 90: 17 (1958) [1957] MycoBank: MB 307092

Notes:—*Trichopeltospora* was introduced by Batista *et al.* (1958). Wu *et al.* (2011) examined the holotype of *T. pipericola* and concluded that this genus should be placed in *Asterinaceae* as thyriothecia lack a distinct ostiole, upper wall of thyriothecia composed of radially arranged, hyphopodia present (Wu *et al.* 2011). Hyde *et al.* (2013) accommodated *Trichopeltospora* under Microthyriales. Whether those characters support a distinct genus is questionable and we synonymise this under *Asterinales*.

Trichothyrinula Petr., Sydowia 4(1–6): 171 (1950) MycoBank: MB 5595

Type species: *Trichothyrinula sydowii* Petr., Sydowia 4(1–6): 171 (1950) MycoBank: MB 307129

Notes:—Wu *et al.* (in prep.) re-examined the type of *Trichothyrinula* that occurs on *Sechium edule* (*Cucurbitaceae*). The type species is similar to *Rhagadolobium cucurbitacearum* (basionym, *Asterotexis cucurbitacearum*), based on circular thyriothecia with an upper wall comprising radiating cuboid cells, and ellipsoidal to ovoid, 1-septate ascospores, which are slightly constricted at the septum, and have a hyaline, upper cell which is shorter than lower cell. However, in *Trichothyrinula sydowii* the thyriothecia are raised, botryose and clustered in a large darkened area (Wu *et al.* in prep.), while in *Rhagadolobium cucurbitacearum* the thyriothecia are scattered with few in each small darkened colony (personal observation). Wu *et al.* (in prep.) suggest that *Trichothyrinula* should be placed in *Trichopeltinaceae*. *Trichothyrinula sydowii* is typical of other genera in *Trichopeltinaceae*, but differs in the spreading thallus where thyriothecia are raised and botryose and it may be necessary to introduce a new family to accommodate taxa of *Trichothyrinula*.

Discussion

The earliest name for the fungal foliar epiphytes discussed in this paper is *Trichopeltinaceae*. *Trichopeltinaceae* was introduced by Batista *et al.* (1958) based on the type *Trichopeltina labecula*. The thallus consists of a neatly arranged, “skin-like”, palisade of cells, which covers the host and are interdispersed with immersed, flattened thyriothecia. This is similar to *Brefeldiella brasiliensis* (Spegazzini 1889), which is the type species of *Brefeldiellaceae*, a family introduced by Müller & von Arx (1962). We treat *Brefeldiellaceae* as a synonym of *Trichopeltinaceae*. The family differs from *Stephanothecaceae* which has individual thyriothecia with hypostromata (Jayawardena *et al.* 2014). *Stephanothecaceae* may need resurrecting to accommodate *Stephanotheca* and similar genera, as its fruiting structures are quite unusual in Dothideomycetes (Hyde *et al.* 2013). The holotype material of *Trichopeltina labecula* is illustrated in this study, although in most previous studies it had been reported that it could not be found. It is important that further collections should be made to clarify the concept for each genus in the family. Future molecular work is needed to clarify the relationships of *Trichopeltinaceae* and genera therein.

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