Dendrothele griseocana (Corticiaceae) and related taxa with hyphal pegs

by

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With 7 figures


Abstract: Four Dendrothele (Corticiaceae, Polyporales) species with hyphal pegs are described and illustrated. Type specimens of Corticium griseocanum and Dendrothele papillosa were examined and found to be conspecific. Two new taxa, D. americana and D. tanzania, are described and illustrated, and the new combination, Dendrothele andina, is proposed. A key to D. griseocana and similar taxa with hyphal pegs is provided.

Key words: Odontia andina, Dendrothele, hyphal pegs, Tanzania.

Resumen: Cuatro especies del género Dendrothele (Corticiaceae, Poliporales) con papilas o clavijas son desentas e ilustradas. Los especímenes tipo de Corticium griseocanum y Dendrothele papillosa fueron estudiados, y dos nuevos taxones, D. americana y D. tanzania, son descritos e ilustrados. Se propone una nueva combinación para Dendrothele andina. Se incluye una clave para D. griseocana y taxones similares con papilas o clavijas.

Palabras clave: Odontia andina, Dendrothele, papilas o clavijas, Tanzania.

Introduction

Dendrothele Höhn. & Litsch. (1907) was erected nearly 100 years ago for a taxon with crust-like fruiting bodies and sterile papillae (hyphal pegs) composed of finely branched hyphae called dendrohyphidia. Dendrothele papillosa Höhn. & Litsch., the generic type, is a distinctive corticioid species with sterile hyphal pegs, simple septate hyphae, 2-spored basidia, and globose to subglobose basidiospores. Widespread...
in Europe, its preferred habitat is the bark of living hardwood trees. Rogers (1935) and Lemke (1964) applied the name *Dendrothele griseocana* (Bres.) Bourdot & Galzin to a similar taxon in North America with hyphal pegs, clamped hyphae, and 4-spored basidia. Although the discrepancy between the European and North American application of the name *D. griseocana* is widely recognized (Boidin et al. 1996; Ginns & Lefebvre 1993; Nakasone 1990; Thorn 1991), this species-complex remains unresolved.

In this study, the *D. griseocana* species-complex is resolved. The new species *D. americana* is described for the North American taxon with clamped hyphae and 4-spored basidia. The type specimens of *Corticium griseocanum* Bres. and *D. papillosa* were examined and found to be conspecific. Another new taxon, *Dendrothele tanzaniana* from Africa, is described, and a new combination, *Dendrothele andina*, is proposed. All four species of *Dendrothele* with hyphal pegs are described and illustrated. A key to the *Dendrothele* species with hyphal pegs is included.

### Materials and Methods

Thin, freehand sections from each specimen were mounted in aqueous potassium hydroxide (2% weight/volume) and aqueous phloxine (1% w/v) or Melzer’s reagent (Kirk et al. 2001) and examined under an Olympus BH2 compound microscope (Olympus America, Inc., Melville, NY). Line drawings were made with a camera lucida attachment. Cyanophilia of the basidiospore walls was determined with cotton blue (0.1% w/v) in 60% lactic acid. The reaction of the gloeocystidial contents to sulfovanillin (1 g vanillin, 3 mL distilled water, 8 mL concentrated sulfuric acid) was tested. Color names are from Kornerup & Wanscher (1978), and herbarium designations follow those of Holmgren et al. (1990).

### Results

**Key to the *Dendrothele* species with hyphal pegs**

1. Basidia with 2-sterigmata........................................................................................................................................... 2
2. Hyphae nodose-septate............................................................................................................................................. *D. andina*
3. Basidiospores usually > 10 µm long...................................................................................................................... *D. tanzaniana*
4. Basidiospores usually < 10 µm long...................................................................................................................... *D. americana*

**Species descriptions**

**Dendrothele americana** Nakasone, sp. nov.  

Figs. 1-2

Differt a *Dendrothele griscocana* hyphis fibulis, basidiis tetrasporis, basidiosporis minoribus (7.5-)8-9(-10)×(6.5-)7-9 µm.

**Holotype:** U.S.A., Wisconsin, Dane County, Maromanic, Walking Iron County Park, on bark of *Juniperus* sp., 18 Sep 1984, legit K.K. Nakasone, FP101995 (holotype: BPI; isotype: CFMR).

Basidiocarps effuse, adnate, beginning as small circular or irregular patches, confluent, up to 20 × 10 mm, thin, 60-loo(-350) µm thick, subcereaceous, smooth to rugulose with scarce to numerous tiny hyphal pegs, yellowish white (4A2), orange white...
(5A2), greyish yellow to yellowish grey [4B(2-3)], or greyish orange (5B3, 6C3), cracks lacking or scarce to numerous, shallow to deep, sometimes breaking into polygons: hyphal pegs cylindrical to conical, terete, 50-80 × 11-30 µm, hyaline to white, 6-10 pegs per mm; margin abrupt, distinct, concolorous with hymenium, rarely thinning out, with white, fibrillose edges.

Hyphal system monomitic with clamped generative hyphae. Hyphal pegs a dense aggregation of dendrohyphidia with numerous, short, fine branches. Subiculum and subhymenium indistinct, a compact, agglutinated tissue embedded with abundant hyaline crystalline material; hyphae 1.5-3 µm, clamped, moderately branched, walls hyaline, thin to slightly thick, smooth. Catahymenium a dense, partially agglutinated, hyaline to yellowish brown tissue, sometimes obscured by crystalline materials, composed of hyphal pegs, dendrohyphidia, gloeocystidia, and basidia. Dendrohyphidia scarce to abundant, filamentous, simple with short, lateral branches to elaborately branched at apex, 20-50 × 0.5-3 µm, with a basal clamp connection, walls hyaline, thin, smooth, rarely coated with brown, mucilaginous material. Gloeocystidia embedded, cylindrical to constrictions, flexuous, occasionally vesciculose, sometimes with short, lateral knobs at base, 25-70 × 7-10(-15) µm, with a basal clamp connection, sometimes stalked, with dark yellow, resinous or light brown contents, occasionally encrusted with yellowish, mucilaginous material, contents negative in sulfovanillin, walls hyaline, thin to slightly thickened, smooth. Basidia at first obclavate to vesciculose, cylindrical to slight constrictions, 25-55(-75) × 7-12 µm, with a basal clamp connection, with or without a stalk, repetitive, walls hyaline, thin, smooth, 4-sterigmate, sterigmata up to 9 × 2 µm. Basidiospores subglobose to globose, (7.5-)8-9(-10) × (6.5-)7-9 µm, often in clusters of 2-4, walls hyaline, thin to slightly thickened, smooth, cyanophilous, negative in Melzer’s reagent.

HABITAT: bark of living angiosperms and gymnosperms

DISTRIBUTION: widely distributed in Canada (Manitoba, Ontario, Quebec) and the United States, from New York to Florida and westward to Minnesota and Arizona.

The new species *D. americana* is readily distinguished from other *Dendrothele* species by hyphal pegs, clamp connections, 4-sterigmate basidia, and subglobose basidiospores. Specimens lacking hyphal pegs can be mistaken for *D. microspora* (H.S. Jacks. & Lemke) Lemke, which has smaller basidiospores measuring 6-8 × 5.5-7 μm. *Dendrothele americana* has been confused with *D. griseocana*, but this species lacks clamp connections and has 2-sterigmate basidia. *Dendrothele americana* is widely distributed in North America, whereas *D. griseocana* has a more restricted distribution. Both species are known to occur in Manitoba, Ontario, Minnesota, Wisconsin, and Illinois.

The name *D. griseocana* was misapplied to specimens of *D. americana* in North America by Lemke (1964), Rogers (1935), and Gilbertson & Blackwell (1985). Cultural descriptions of *D. americana* are available in Nakasone (1990) as *Dendrothele* sp. and Thorn (1991) as *D. griseocana*.


Basidiocarps effuse, adnate, beginning as small, coalescing, orbicular patches, up to 20 × 7 mm, soft, finely spinose, pale orange (5A3) to greyish orange [5B(3-4)], rimose; hyphal pegs minute, numerous, dense, terete, 90-100 × 35-55 μm, 8-10 pegs per mm; margin abrupt, distinct.

Hyphal system monomitic with clamped generative hyphae. Hyphal pegs composed of hyaline, branched dendrohyphidia enclosing a column of coarse, hyaline crystals. Subiculum and subhymenium not observed. Catahymenium composed of crystals, dendrohyphidia and basidia. Dendrohyphidia numerous, filamentous, knobby or finely branched at apex, 20-35 × 1-2 μm, clamped at base, walls hyaline, thin, smooth. Basidia rare, collapsed at maturity, broadly clavate with a slight median constriction, 25-30 × 7-9 μm, tapering to 2-3.5 μm at base, clamped at base, 2-sterigmate. Basidiospores rare, subglobose to broadly ellipsoid, 9.5-12.5 × 7.5-9 μm, with a distinct apiculus, walls hyaline, thin to slightly thickened, smooth, negative in Melzer’s reagent.

**HABITAT:** bark and wood of angiosperms.

**DISTRIBUTION:** known only from type locality, Ecuador.

**TYPE SPECIMEN EXAMINED:** ECUADOR, Pululahua, (on wood and bark of a small branch), Mars 1892, leg. de Lagerheim, ut *Kneiffia andina* (holotype of *Odontia andina*: FH).

This description is slightly modified from Nakasone (2003). The holotype is a poor specimen with scattered basidia and basidiospores. Because of the rarity of basidiospores, cyanophily of the walls was not determined. The hyphal pegs and 2-sterigmate basidia of *D. andina* are similar to those of *D. griseocana*. *Dendrothele andina*, however, is
distinguished from *D. griseocana* by clamped hyphae and absence of gloeocystidia. A discrepancy was noted in the month as published in the protologue, “Février,” and on the holotype label, “Mars.”

*Fig. 4-6*

=* Corticium griseocanum* Bres., Fungi Tridentini 2: 58. 1898.  
=* Aleurodiscus griseocanum* (Bres.) Höhn. & Litsch., Wiesner-Festschrift p. 76. 1908.  
=* Corticium papillosum* (Höhn. & Litsch.) Sacc. & Trotter, Sylloge fung. 21: 404. 1912

Basidiocarps effuse, adnate, beginning as small patches that coalesce, thin, up to 150 µm thick, subcercaceous to soft, membranous, smooth with tiny sterile hyphal pegs, sometimes hyphal pegs lacking, yellowish white to yellowish grey [4(A-B)2], orange white (5A2), pale orange [5A(2-3)], orange grey (5B2), brownish grey (6C2), pale orange, greyish orange, or brownish orange [5(B-D)3], with a few scattered, sometimes deep, cracks; hyphal pegs absent or numerous, crowded, terete, white, 10-11 pegs per mm; margin distinct, greyish white or concolorous with hymenophore.

Hyphal system monomitic with simple-septate generative hyphae. Hyphal pegs comprised of dendrohyphidia in a compact fascicle. Subiculum indistinct, sometimes partially agglutinated, obscured by abundant, large, coarse hyaline crystals that persist in KOH; subicular hyphae few, 1-2 µm diam., simple septate, sparsely to moderately branched, walls thin, hyaline, smooth. Catahymenium composed of dendrohyphidia, gloeocystidia, and basidium hut obscured by crystals. Dendrohyphidia filiform with simple lateral knobs, sometimes highly branched at apex, 15-50 ×1-3 µm, simple septate at base, walls hyaline, thin, smooth, or lightly encrusted with hyaline crystals. Gloeocystidia cylindrical to clavate, sometimes with lateral lobes near base, with or without median constrictions, 20-50 × 6-10 µm, tapering to a short stalk, up to 2 µm diam., simple septate at base, terminal, often with dark yellow resinous material, rarely entirely brownish yellow, contents not reacting in sulfovanillin, walls hyaline, thin, smooth. Basidia pyriform to cylindrical, sometimes basally inflated or with a median constriction, often with a short stalk, 22-40 × 6-10 µm, simple septate at base, walls hyaline, thin, smooth, with two stout, digitate sterigmata, sterigmata up to 15 × 3 µm. Basidiospores subglobose to globose with a small, rounded apiculus, (8-)10-12 × (7-) 8-10 µm, often filled with resinous materials, adhering in clusters of two, walls hyaline, thin to slightly thickened, smooth, cyanophilous, negative in Melzer’s reagent.

**Habitat:** on bark of various living angiospermm trees and shrubs, occasionally on gymnosperms.

**Distribution:** Denmark (Eriksson & Ryvarden 1975), Czech Republic, Montenegro (Pilát 1926), Austria, France, Italy, Canada, United States.

Figs. 1-6. Microscopic elements of *Dendrothele* species.

Fig. 1. *Dendrothele americana* (FP 101995, holotype): a) gloeocystidia, b) dendrohyphidia, c) basidiospores, d) basidia. Fig 2. *Dendrothele americana* (Wisconsin, IX 4 1953): a) gloeocystidia, b) basidia, c) basidiospores. Fig. 3. *Dendrothele andina* (Mars 1892, Lagerheim, holotype): a) basidia, b) dendrohyphidia, c) basidiospores. Fig. 4. *Dendrothele griseocana* (FP101882): a) gloeocystidia, b) basidia, c) basidiospores. Fig. 5. *Dendrothele griseocana* (April 1896, Bresadola, holotype): a) dendrohyphidia, b) basidia, c) gloeocystidia, d) basidiospores. Fig. 6. *Dendrothele papillosa* (lectotype, FH): a) basidia, b) gloeocystidia, c) dendrohyphidia, d) basidiospores.

Dendrothele griseocana is well characterized by hyphal pegs, simple septate hyphae, and 2-sterigmate basidia. This species occurs exclusively on angiosperms in Europe, especially Salix, whereas in North America it is found on Thuja occidentalis as well as angiosperms. Hyphal pegs are present in most of the specimens examined, especially in the thinner, younger areas of the basidiome. Mature basidia were difficult to find in some specimens, but in all cases they produced 2-sterigmata. Interestingly, Bresadola’s (1898) illustration of C. griseocanum included a basidium with 4 sterigmata. Many of the specimens of D. griseocana from North America cited by Lemke (1964) and Rogers (1935) should be referred to D. americana. For additional descriptions and illustrations, see Boidin et al. (1996), Eriksson & Ryvarden (1975), and Pilát (1926). A report of D. griseocana from Venezuela could not be confirmed (Oberwinkler 1972), whereas the collection from Tanzania (Niemelä et al. 1998) represents a new taxon described below.

Minor differences in basidiospore size and shape were observed between the lectotype of D. papillosa, designated herein, and the holotype of C. griseocanum. Nevertheless, there is no doubt that they are conspecific as first indicated by Bourdot & Galzin (1913). The lectotype specimen of D. papillosa at FH consists of eight irregular pieces of bark bearing numerous small, discreet, white to grayish-orange basidiocarps with tiny hyphal pegs. Microscopically, the lectotype differs from the holotype of C. griseocanum in producing basidiospores slightly smaller than average, measuring 8.5-9.5 × 7-8 µm (Fig. 6). The holotype specimen of C. griseocanum is composed of five large and several smaller pieces of bark with larger, effuse basidiomes, up to 10 × 15 mm, bearing abundant hyphal pegs. The basidiospores in this specimen are typical, measuring (8-)10-12 × (7.5-)8-10 µm (Fig. 5).

Dendrothele tanzaniana Nakasone, sp. nov. (Fig. 7)

Dendrothele americanae affinis sed basidiosporis longioribus, (10.5-)11-12.5 × 7.5-9(-10) µm et gloeocystidiis angustioribus 25-50 × 4-7 µm,

HOLOTYPE: Tanzania, Arusha Province, Arusha District, western side of Mt. Meru, above Laikinoi, alt. 2850-3200 m, on bark of living Hagenia abyssinica J.F. Gmel., 14-15 Dec 1988, legit Pertii Renvall 1619 (KUO no. 018281).
Basidiocarp effuse, adnate, beginning as small, irregular patches, up to 45 × 15 mm, confluent, moderately thin, up to 350 µm thick, subceraceous, felty with tiny sterile hyphal pegs scattered about, yellowish white to pale yellow [4A(2-3)] to pale orange (5A3), moderately rimose, with deep cracks: hyphal pegs numerous, fragile, slender, white, up to 120 × 40 µm, 5-10 pegs per mm; margin distinct, abrupt or rapidly thinning out, concolorous with hymenophore.

Hyphal system monomitic with clamped generative hyphae. Hyphal pegs composed of dendrohyphidia in a compact fascicle. Subiculum obscured by abundant, coarse hyaline to yellow crystals, composed of agglutinated hyphae; subicular hyphae 1.5-2.5 µm diam., clamped, walls hyaline, thin to slightly thickened, smooth. Catahymenium obscured by crystals, composed of dendrohyphidia, gloeocystidia, and basidia. Dendrohyphidia filiform, delicately branched at apex, 25-35 × 1.5-2 µm, clamped at base, walls hyaline, thin, smooth or lightly encrusted with hyaline crystals. Gloeocystidia more or less cylindrical, often tapering slightly toward apex, occasionally with lateral lobes near base, sometimes slightly constricted, 25-50 × 4-7 µm, tapering to 1.5-2 µm diam. at base, clamped at base, contents negative in sulfovanillin, walls hyaline, thin, smooth. Basidia clavate to slightly ventricose, sometimes with a median constriction, 25-40 × 9-12 µm, clamped at base, walls hyaline, thin, smooth, with 4 sterigmata, sterigmata up to 10 × 2.5 µm. Basidiospores broadly ellipsoid, often slightly tapering toward apiculus, (105)11-12.5 × 7.5-9(-10) µm, usually filled with refractive globules. often adhering in groups of four, walls hyaline, thin to slightly thickened, smooth, cyanophilous, negative in Melzer’s reagent.

**Habitat:** on bark of living *Hagenia*.

**Distribution:** known only from type locality, Tanzania.

*Dendrothele tanzaniana*, like *D. americana*, is characterized by hyphal pegs, clamped generative hyphae, and 4-sterigmate basidia. *Dendrothele tanzaniana*, however, has longer basidiospores and narrower gloeocystidia than *D. americana.*
Discussion

Sterile hyphal pegs projecting from the hymenial surface are a distinctive feature that occur in a few, unrelated genera of resupinate basidiomycetes. In Epithele (Pat.) Pat., Epithelopsis Jülich, Pteridomyces Jülich, Skeletohydnum Jülich, Heterochaete Pat., and Mycothele Jülich, hyphal pegs are important traits that are found in all or most species in the genus. In contrast, hyphal pegs occur only in one or a few taxa of Dendrothele, Cerinomyces G.W. Martin, Gloiothele Bres., and Veluticeps (Cooke) Pat. Dendrothele is unique for its hyphal pegs are comprised solely of dendrohyphidia.

Dendrothele griseocana and the other taxa treated herein are morphologically similar and probably closely related; they represent true Dendrothele species. The simple structure and microscopic features of Dendrothele give little clue to its relationships. Recently, Goranova et al. (2003) revealed through molecular phylogenetic studies that Dendrothele is polyphyletic with eleven lineages dispersed in the hymenochaetoid, russuloid, corticioid, and euagaric clades. Dendrothele griseocana, the type of the genus Dendrothele, is embedded in the Agaricales clade and basal to a group of marine and terrestrial cyphelloid species that includes Cyphellopsis, Nia, Lachnellia and Flagelloscypha (Goranova et al. 2003, Bodensteiner et al. 2004). This surprising result suggests that Dendrothele is a reduced form of mushroom-forming fungi. Additional morphological and molecular studies are needed, however, to clearly define Dendrothele sensu stricto and phenotypically similar genera.

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