Abstract — Tubeufiaceae (Pleosporales, Ascomycota) occurring on native trees from the Andean Patagonian forests in Argentina are described and illustrated. Acanthostigma minutum and Tubeufia cerea with its anamorphic state are reported from South America for the first time on Nothofagus dombei and N. antarctica, respectively. Both species were up to now only known from the Northern Hemisphere.

Key words — ascomycetes, Helicosporium, Nothofagaceae

Introduction

Barr (1979) erected the family Tubeufiaceae to accommodate several genera of Pleosporales that are saprobic on wood, hypersaprobic or hyperparasitic on other fungi, or parasitic on scale insects. The ascomata are small, pallid yellowish to brownish, globose, conic, ellipsoid or cylindrical. She included six genera in the family: the type genus Tubeufia, Letendraea Sacc., Melioliphila Sped., Podonectria Petch, Rebentischia P. Karst., and Thaxteriella Petr. Later, Barr (1980) added five more genera — Allonecte Syd., Boerlagiomyces Butzin, Byssocallis Syd., Paranectriella (Henn. ex Sacc. & D. Sacc.) Höhn., and Puttemansia Henn. — and synonymized Thaxteriella with Tubeufia.

The classification of the Tubeufiaceae, mainly based on morphology, has been controversial. Eriksson (2005) placed this family as “Dothideomycetes et Chaetothyriomycetes incertae sedis”. Based on sequence analyses Kodsueb et al. (2006) considered the Tubeufiaceae a distinct monophyletic family that clusters within the Pleosporales as originally proposed by Barr (1980) and excluded Boerlagiomyces and Letendraea as phylogenetically unrelated. At the same time Tsui & Berbee (2006) arrived at similar results analyzing molecular data of several Tubeufia taxa and helicosporous fungi that are considered anamorphic
states of *Acanthostigma* and *Tubeufia*. They indicated that many *Tubeufia* spp. and most species of *Helicoma*, *Helicomycetes*, and *Helicosporium* lay within a strongly supported monophyletic lineage, the *Tubeufiaceae sensu stricto*.

Most species of *Tubeufiaceae* are considered tropical, but there are species that occur primarily in temperate areas (Hughes 1978; Rossman 1979, 1987; Samuels et al. 1978). Additional austral records are known in Argentina, Brazil, Chile, and Paraguay, i.e. four *Acanthostigma* species described by Spegazzini (1884, 1887, 1899, 1909), *Rebentischia costi* in Brazil (Batista et al. 1963), and *Rebentischia massalongoi* recently recorded in Argentina (Bianchinotti & Sánchez 2009).

*Rebentischia* is an accepted member of *Tubeufiaceae* (Kodsueb et al. 2006) but the position of *Acanthostigma* is doubtful. De Notaris established the genus in 1863 with *A. perpusillum* as type. From the beginning its taxonomic status was confused, with the genus referred first to the *Sphaeriaceae* by Saccardo (1883), to the *Trichosphaeriaceae* by Ellis & Everhart (1892), and then synonymized with *Tubeufia* by Arx & Müller (1975). Barr (1980) regarded *Acanthostigma* as a section in *Tubeufia* but later (Barr 1990, 1993) returned it to the *Trichosphaeriaceae* based on its unitunicate asci. Crane et al. (1998) established another genus in the *Tubeufiaceae*, *Acanthostigmina* Höhn. More recently, Réblová & Barr (2000) examined the type material of *Acanthostigma* and confirmed its position in *Tubeufiaceae*, citing *Acanthostigmina* as a synonym. Tsui et al. (2006) found that *A. perpusillum* clusters with *Tubeufia cerea*, and they suggested that *Tubeufia* should be synonymized under *Acanthostigma*.

We have re-examined the specimens representing *Acanthostigma* described by Spegazzini that have not been included in former revisions of the genus. Also, we describe and illustrate other representatives of the *Tubeufiaceae* s.l. collected on native trees from the Andean Patagonian forests. *Acanthostigma* and *Tubeufia* are recorded for the first time in Argentina, with *Acanthostigma minutum* and *Tubeufia cerea* reported for the first time in South America. These new records expand the geographical distribution of the family to the most austral point.

**Materials and methods**

The samples were collected in forests of Los Alerces National Park (Chubut) and Lanín National Park (Neuquén) located in the southern Andes of Patagonia (Argentina). The vegetation is composed mostly of native *Nothofagus* species together with some species of *Cupressaceae*, *Proteaceae*, ferns and mosses. The climate is temperate to cold with high humidity. Leaves, small branches and bark showing fungal growth when observed with a field magnifying glass were placed in paper bags and transported to the laboratory. The samples were dried at room temperature and deposited at Bahía Blanca Biology Herbarium.
(BBB). For microscopic examinations sections were hand-made and mounted in water or 5% KOH with phloxine. At least ten measurements were taken for each structure and all were made in tap water. Calcofluor 1% was used for the examinations made under the fluorescence microscope. The LPS and NYBG Herbaria provided type material. Herbarium abbreviations follow Holmgren et al. (1990). The term “$x_{av}$” represents the average dimension.

**Results and discussion**


Type species: *A. perpusillum* De Not.

*Acanthostigma minutum* (Fuckel) Sacc., Syll. Fung. 2: 209. 1883. figs. 1–7

Ascomata superficial to semi-immersed under periderm, globose to subglobose, dark brown to black when dried, (95–)110–300(–350) × 100–300(–330) µm; ostiole papillate, 61–112.5 × 35.7–47.5 µm; surface covered with setae, straight or curved, most densely distributed on upper half, 0–1 septate, dark brown, 46–130 µm long ($x_{av} = 79$ µm), 3–8.2 µm wide at base ($x_{av} = 6$ µm), 1–3.8 µm wide at apex ($x_{av} = 1.9$ µm). **Peridium** of *textura angularis*, two–layered in longitudinal section, outer layer composed of 3–5 rows of thick–walled, dark brown cells, inner layer composed of 2–4 rows of light brown cells, 18–55 µm thick ($x_{av} = 35$ µm). **Pseudoparaphyses** cellular ramified, anastomosed, septate, hyaline, 1–3 µm thick. **Periphysoides** cellular ramified, septate, hyaline, ca. 2.5 µm thick. **Asci** bitunicate, cylindrical to clavate, 80–150 × 12–50 µm ($x_{av} = 116 \times 22$ µm), 8–spored. **Ascospores** elongate fusiform, tapering to ends and rounded, symmetric, straight or slightly curved, (7–) 9 (–12) septate, not constricted or slightly constricted at septa, hyaline, smooth, 35–68(–75) × 5–8 µm ($x_{av} = 50 \times 6.8$ µm). **Anamorph** — *Helicomyces* sp. (not seen).

**Distribution** — America (Argentina, Canada, USA); Asia (China, Taiwan); Europe (France, Germany, Switzerland).

**Ecology** — on decaying wood of deciduous trees and woody, dicotyledonous shrubs and on old ascomata of other ascomycetes. Recorded on *Fagus sylvatica* L., *Gaultheria shallon* Pursh, *Nothofagus dombeyi* (Mirb.) Oerst., *Populus* sp., and *Quercus* sp.

**Material examined** — ARGENTINA: Neuquén, Parque Nacional Lanín, on the way to Hui Hui lake, on old xylariaceous stromata on bark of *Nothofagus dombeyi*, 17. V. 2007, leg. MV Bianchinotti and RM Sánchez 579 (BBB), Paso del Cordoba, on bark of *N. dombeyi*, 18. I. 2009, leg. MV Bianchinotti and RM Sánchez 776 and 781 (BBB). USA: Connecticut, 1 mi south of Canaan, on decayed wood associated with *Hemitrichia clavata*, 2. XI. 1959, CT Rogerson, (as *Acanthostigma decastylum*, NY).

**Comments** — *Acanthostigma minutum* is recorded for the first time in South America. It was found without its anamorph growing on old xylariaceous
stromata on *Nothofagus dombeyi* logs. We compared our specimens with a collection from the USA authenticated by Réblová & Barr (2000), which differs in having ascospores with more septa (10–14). This is the first record of the genus in Argentina.

**Excluded and doubtful species**


**FIGS. 8–9**

Ascomata superficial, globose, setose, dark brown, 155–158 μm diam, ostiole circular, 28 μm diam. Setae septate, brown, 50–250 × 4–5 μm (fide SpégaZZini
1898). ASCI bitunicate. PSEUDOPARAPHYSES not seen. ASCOSPORES fusiform, 3–septate, dark brown, smooth, 18.5–20 × 5 μm.

Material examined — ARGENTINA, La Plata, on Gnaphalium purpureum, III 1899, leg. CL Spegazzini (LPS 2667!).

Comments — The 3–septate, dark brown ascospores exclude this material from Acanthostigma. We think the specimen probably belongs to Herpotrichiellaceae.


FIGS. 10–11

Ascomata superficial, globose, setose, dark brown, 169–170 μm diam, ostiole circular, 35 μm diam. Setae 2–8 septate, brown to pale brown, 95–145 μm long and 3.5–5 μm wide at base. ASCI unitunicate, without any visible apical apparatus, 50–60 × 8 μm. PSEUDOPARAPHYSES not seen. ASCOSPORES fusiform, with one inner cell slightly broader, 3–septate, pale brown, smooth.

Material examined — ARGENTINA, La Plata, Ensenada, on Gnaphalium purpureum, 28. XI. 1906, leg. CL Spegazzini (LPS 2391!).

Comments — Only immature ascospores still in the asci were seen. Spegazzini described it as aparaphysate. This species does not belong to the Tubeufiaceae because of the combination of unitunicate asci and 3-septate, pale brown ascospores. It resembles members of the Chaetosphaeriaceae.


FIGS. 12–16

Ascomata superficial, globose, setose, reddish dark brown, 189–202 μm diam. Setae dark brown, 38 μm long. ASCI not seen. ASCOSPORES fusiform, with one inner cell slightly broader, 3–septate, pale brown, smooth, 13–16 × 4–5 μm.

Material examined — CHILE, Patagonia, Cabo Negro, on Fagus antarcticum [= Nothofagus antarctica], VI 1886, leg. CL Spegazzini (LPS 87!).

Comments — The material is in poor condition and has no asci; however, Spegazzini illustrated the asci as unitunicate. Because of the combination of characters, it probably belongs in the Chaetosphaeriaceae.


FIGS. 17–20

Material examined — PARAGUAY, Caá–Guazú, on Eugenia sp., Leg. Balanza 3452, I 1882, det. CL Spegazzini (LPS 2664!).

Comments — This material is very scarce and consists of a single, small leaf of Eugenia sp. We could not find any ascomata. Brown conidiophores were observed, but no conidia were found. According to Spegazzini’s drawings on the type envelope (available also in Arambarri et al. 2008), this species resembles...

Bars: 9, 11, 13 = 20 µm. 15–16 = 3 µm.
a true *Acanthostigma*. However, Spegazzini described the asci as unitunicate (Spegazzini 1884) so, until authentic material is located, this should be treated as a species dubia.

**Tubeufia** Penz. & Sacc., Malpighia 11: 517. 1897.

*Type species:* *T. javanica* Penz. & Sacc. [= *T. paludosa* (P. Crouan & H. Crouan) Rossman].


Ascomata globose or collabent when dried, bright yellow becoming yellowish brown towards base, a little darker in depression around the papilla, 170–225 × 80–215 µm (*x*<sub>av</sub> = 200 × 130 µm); papilla 30–50 × 55–100 µm (*x*<sub>av</sub> = 40 × 77.5 µm); ostiole circular, 30–40.8 µm (*x*<sub>av</sub> = 36 µm); surface pulverulent with protruding conical cells, sometimes curved, with 1–3 septa, yellow, 5–8 × 4–5 µm. **Peridium** 20–50 µm thick (*x*<sub>av</sub> = 36 µm), forming textura angularis, cells 5–10 × 3–8 µm (*x*<sub>av</sub> = 7.6 × 5 µm). **Asci** bitunicate, cylindrical to claviform, 76–87 × 10–13 µm (*x*<sub>av</sub> = 81.4 × 11.4 µm). **Pseudoparaphyses** narrow, ramified, parallel or somewhat interwoven, septate, 1–2 µm thick. **Ascospores** elongate fusiform, often curved, apices acute, 6–11 septate, not constricted at septa, hyaline or slightly yellowish, smooth, 38.8–58 × 3–6 µm (*x*<sub>av</sub> = 48.7 × 4 µm).

**Anamorph** — *Helicosporium virescens* (Pers.) Sivan. Colonies effuse, forming a loose, cottony layer, yellow to greenish yellow. Mycelium scarcely ramified, hyaline to pale brown, 2–10 µm wide. Conidiophores erect, unbranched, dark brown basally, pale brown to hyaline towards the setiform sterile apex, 61–210 µm long, 2.5–10 µm wide at base, 2–2.5 µm wide at apex. Conidiogenous cells integrated, mono or polyblastic, 7–21 × 2–3 µm. Conidia cochleated, coiled 2–3 times, multisep­tate, hyaline, smooth, coils 10–21 µm diam (x = 16.6 µm), cells 1.5–2 µm wide.

Distribution — Africa (Congo); Asia (USSR, India); America (Argentina, Canada, Guyana, Puerto Rico, USA); Europe (Austria, Belgium, Finland, France, Germany, Netherlands, Poland, Portugal, Sweden, UK).

Ecology — On wood and bark lying on the ground, on herbaceous substrates, and on old ascomata or mycelium of other ascomycetes.


Comments — The genus Tubeufia was erected in 1897 by Penzig and Saccardo to accommodate three species from Java (i.e., T. javanica, T. coronata, T. anceps) characterized by white, cream-pink to brownish, vertically oblong to ovoid ascomata and cylindrical, fusiform to vermiciform, multisepate ascospores.

This is the first record of Tubeufia in Argentina and the first time that Tubeufia cerea is recorded in South America. Our material differs from that described by Munk (1957) in having larger ascospores (36–48 × 2.5–3.5 µm). Tubeufia cerea is widely distributed in temperate areas in the Northern Hemisphere, with a few records from the tropics (Cannon 1999). This is the first report of this species in the subpolar zone.

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**Literature cited**


