Cryptogamie, Mycologie, 2017, 38 (2): 253-258

Aspidothelium silverstonei and *Astrothelium fuscosporum*, two new corticolous lichen species from Colombia

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Abstract – Two species of lichen-forming fungi with pyrenocarpous ascomata are described as new to science: *Aspidothelium silverstonei* and *Astrothelium fuscosporum*. The epiphytic lichens were found in Chocó Biogeographic region of Colombia. *Aspidothelium silverstonei* is characterized by the largest muriform ascospores known in the genus, while *Astrothelium fuscosporum* is the first species of *Astrothelium* known to produce pigmented ascospores.

Chocó biographic region / Dothideomycetes / pyrenocarpous / taxonomy

INTRODUCTION

It is estimated that the diversity of lichenized fungi in the Neotropics is about 7,000 species, with corticolous, terricolous, and saxicolous taxa being the least studied (Sipman & Aptroot, 2001; Lücking *et al.,* 2009; Aptroot *et al.*, 2017). Lichens are particularly understudied in the biogeographic region of the Chocó in Colombia, a region with a high diversity and endemism, both in plants and animals (Myers *et al.,* 2000). To date, only about 250 lichens are known from this area (Sipman *et al.,* 2008).

Trypetheliaceae is an almost entirely tropical lineage of mostly corticolous taxa (Aptroot & Lücking, 2016). Few species (e.g. *Viridothelium virens*) are found in temperate regions and few species grow on other substrata. With a recent generic rearrangement, the genus *Astrothelium* now includes most species previously referred to the artificial genera *Astrothelium*, *Campylothelium*, *Cryptothelium*, *Laurera*, and *Trypethelium* (Nelsen *et al.*, 2014; Lücking *et al.,* 2016), making it the largest genus within the family Trypetheliaceae with other 200 species. *Astrothelium* is distinguished by the corticate, usually olive-green thallus, the simple to aggregate or pseudostromatic ascomata with apical to lateral, separate or fused ostioles; the ascomata or

doi/10.7872/crym/v38.iss2.2017.253

pseudostromata can be immersed to prominent, with the pseudostromata often of a different structure and colour compared to the thallus. The ascospores in *Astrothelium* are distoseptate, with diamond-shaped lumina, which is best seen in species with transversely septate ascospores, but species with muriform ascospores and rather small lumina are also common. Thus far, all known species in the genus produce hyaline ascospores (Aptroot & Lücking, 2016).

On the other hand, Thelenellaceae is a comparatively small family, comprising the genera *Thelenella*, *Chromatochlamys*, and *Aspidothelium*, the latter including 16 species (Aptroot *et al.*, 2008; Flakus, 2009; Jaklitsch *et al.* 2016). Within *Aspidothelium*, six species have muriform ascospores. For Colombia, only two species have been reported: *A. cinerascens* and *A. fugiens* (Sipman *et al.,* 2008).

In this paper, we describe two new species from the biogeographic region of the Chocó, namely *Aspidothelium silverstonei* and *Astrothelium fuscosporum*. *Aspidothelium silverstonei* produces the largest muriform ascospores known in the genus and is also unique for the lateral "belly" in the ascospores. *Astrothelium fuscosporum* forms very characteristic, multiseptate, brown ascospores and is the first species in the genus known to produce pigmented ascospores.

MATERIALS AND METHODS

Material was collected by the first author during a field trip to Cerro del Inglés and Playa Chucheros in the biogeographic region of the Chocó. All specimens were examined using an Olympus SX-21 dissecting microscope. Pictures were taken with a Canon PowerShot SX160 digital camera. Ascoma sections were mounted for microscopic study in water. Measurements of ascomata, hamathecium, exciple, ascospores, and asci were made in water. Voucher specimens are deposited in the herbarium CUVC of the Universidad del Valle in Cali, Colombia.

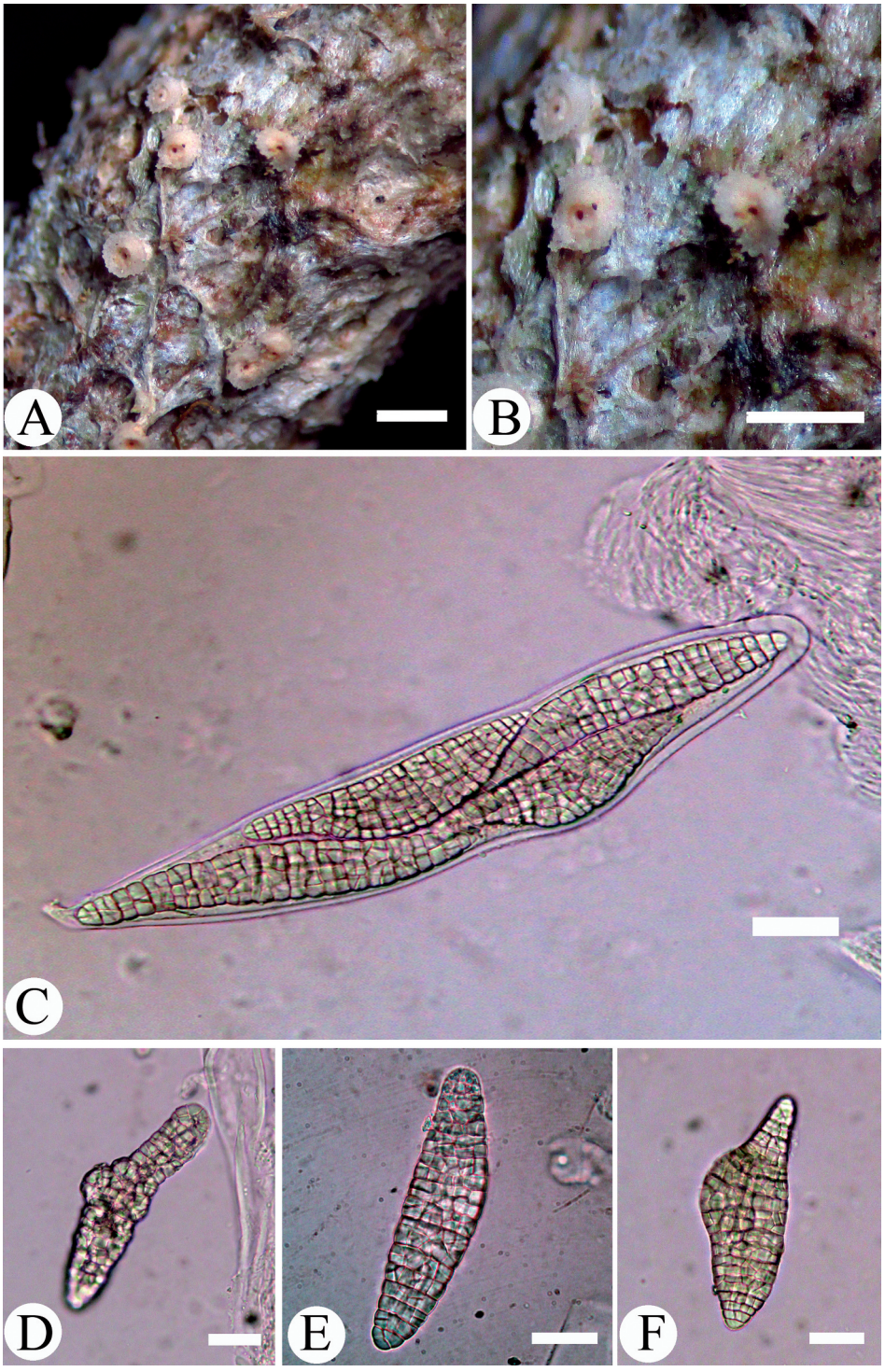
TAXONOMY

Aspidothelium silverstonei Soto-Medina, Aptroot & Lücking, sp. nov. **Fig. 1**

MycoBank: MB818993

Etymology: The new species is named in honour of Dr. Philip A. Silverstone-Sopkin (Universidad del Valle, Cali). Dr. Silverstone-Sopkin was the first botanist to collect plants and lichens in the Cerro del Ingles-Las Amarillas area in 1982 and later led an expedition by the Universidad del Valle, which camped on the summit of the Cerro del Ingles for ten days from December 1986 to January 1987, where several hundred plants and some lichens were collected. In this and subsequent expeditions, many new species were discovered.

Fig. 1. *Aspidothelium silverstonei,* holotype. **A-B.** habit of perithecia with dentate margin; **C.** asci with ▶ ascospores; **D-F.** different forms of ascospores. White bar = 25 μm.


A
B
C
D
E
F

Diagnosis: Differing from *Aspidothelium cinerascens* in the longer ascospores and larger perithecia.

Holotype: COLOMBIA. Dept. Valle del Cauca, El Cairo, Cerro del Inglés, 4°45′16,49″N, 76°17′32,38, ca. 2200 m alt., on bark of Asteraceae, montane cloud forest, 20 June 2014, E. Soto-Medina 2883 (CUVC, holotype).

Thallus corticolous, crustose, thin, smooth, pale mineral grey to greyish green, discontinuous, irregular in shape, with indistinct, translucent prothallus. **Photobiont** chlorococcoid, with green cells. **Perithecia** sessile, cylindrical, with horizontal plate-like expansion with dentate margin, white with slight cream tinge near to ostiole, 0.4-0.7 mm diam. including appendages; perithecial wall 50-75 µm. **Hamathecium** I-, composed of paraphyses; paraphyses ca. 1.5 µm thick, branched and somewhat anastomosing, septate. **Asci** bitunicate, clavate, short-stiped, 220-265 × 30-55 µm (Fig. 1C), wall and apex I-. **Ascospores** 4 per ascus, hyaline, narrowly ellipsoid to fusiform with the central part usually conspicuously widened, lateral "belly", regularly muriform, 23-32 × 5-9-septate with partly oblique septa, 80-130 × 23-38 µm (Fig. 1 D-F). **Chemistry**: Thallus surface UV–, K–, medulla K–.

Notes: *Aspidothelium silverstonei* is very similar to *A. cinerascens,* but differs in having larger ascospores (Aptroot *et al.,* 2008; Lücking *et al.,* 2008). In *A. cinerascens*, the ascospores are smaller (35-70 × 15-25 µm), and hence those of the new species are about twice as large. In addition, the ascospores in *A. silverstonei* present a conspicuous laterally "belly". This species also differs from *A. lueckingii* and *A. trichothelioides* that these have irregular lobules or setae, and smaller ascospores (Flakus, 2009).

Astrothelium fuscosporum Soto-Medina, Aptroot & Lücking, sp. nov. **Fig. 2**

MycoBank: MB818994.

Etymology: The epithet refers to the brown color of mature ascospores.

Diagnosis: Differing from *Astrothelium spectabile* in the somewhat shorter and broader ascospores becoming distinctly brown when mature, and in the erumpent ascomata with exposed, black top.

Holotype: Colombia, Dept. Valle del Cauca, Buenaventura, Bahía Málaga, Playa Chucheros, 3°55′17,5″N, 77°18′53,3″W, ca. 0 m alt., on bark, tropical rain forest, 26 Jan 2014, E. Soto-Medina 2835 (CUVC, holotype).

Thallus corticate, smooth, shiny, continuous, covering areas up to 3 cm diam., olive-green with pale brown spots, surrounded by a brown-black prothallus. **Photobiont** *Trentepohlia.* **Ascomata** globose, 0.5-0.7 mm diam., single, immersed to erumpent within hemispherical thallus verrucae, except for black apical part; ascomata wall fully carbonized, not differentiated into excipulum and involucrellum but containing bark periderm, 50-150 µm wide. Ostioles apical within the convex, black upper part of the ascomata, separate, surrounded by a pale brown area. **Hamathecium** clear. **Asci** 4-spored, 145-200 × 35 µm, with spores arranged laterally. **Ascospores** hyaline when young but becoming brown when mature, I-, 12-14-septate, fusiform, sometimes curved, 105-145 × 25-30 µm, ends pointed, lumina diamond-shaped, surrounded by a gelatinous layer when young (Fig. 2B). **Pycnidia** not observed. **Chemistry**: Thallus surface UV–, K–, medulla K–; pseudostromata surface UV–, inner part of pseudostromata K–.

Notes: *Astrothelium fuscosporum* is the first species in this recently redefined genus known to produce brown ascospores (Aptroot & Lücking, 2016). Four species in the genus have similar, hyaline ascospores and, apart from the lack of ascospore pigmentation, differ in various other features. Thus, *A. spectabile* (Aptroot & Ferraro) Aptroot & Lücking from Argentina has ascomata completely covered by thallus and

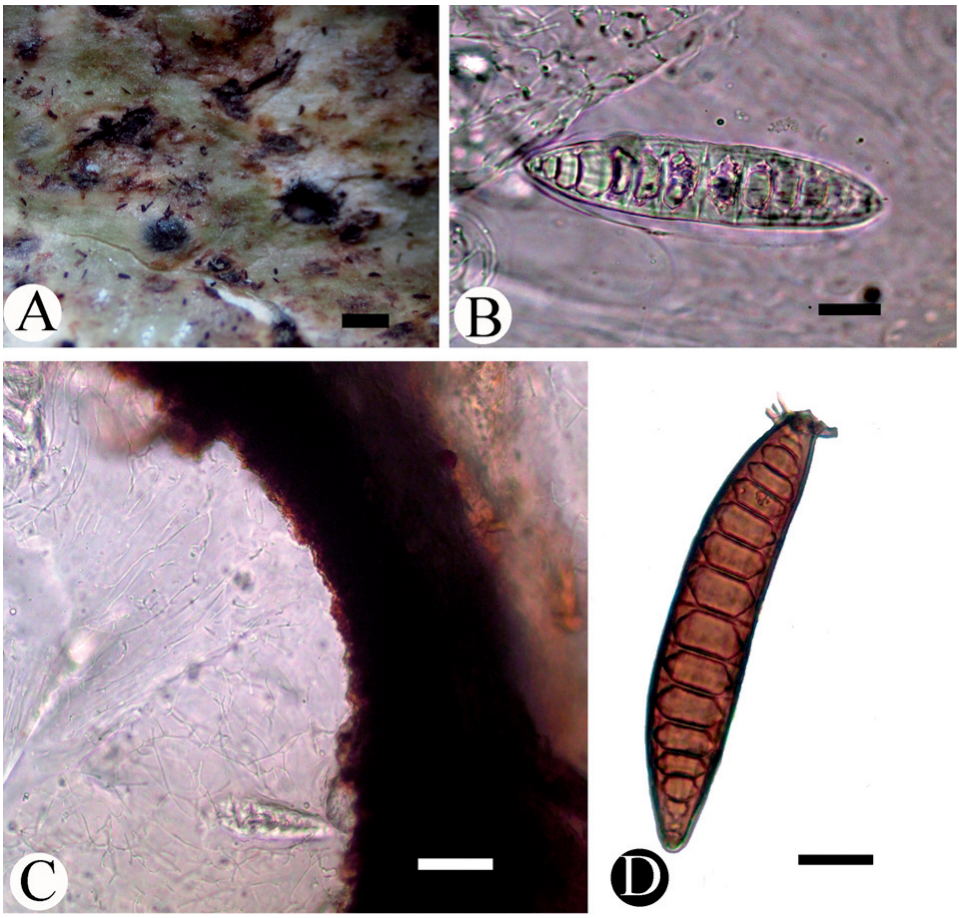


Fig. 2. *Astrothelium fuscosporum,* holotype. **A.** habit of perithecia; **B.** ascospores with hyaline layer; **C.** hamathecium; **D.** old ascospores. White bar = 25 µm on B-D and 1 mm in A.

the ascospores are comparatively longer and narrower. *Astrothelium basilicum* (Kremp.) Aptroot & Lücking from Uruguay differs by its verrucose thallus, prominent ascomata, and also longer and narrower ascospores. *Astrothelium megalophthalmum* (Müll. Arg.) Aptroot & Lücking from Brazil produces a verrucose thallus with immersed ascomata and its ascospores are shorter and have 3-7 septa. Finally, the neotropical *A. olivaceofuscum* (Zenker) Aptroot & Lücking is most similar in general morphology to the new species, but its ascospores, in addition to lacking pigmentation, are much smaller (85-100 × 8-16 µm).

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