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New species of lichen  
for Colombia tropical dry forest

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# New species of lichen for Colombia tropical dry forest

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## ABSTRACT

### KEY WORDS

Colombia,  
dry forest,  
crustose lichens,  
new species.

Three new species of lichen are described from Colombia. *Astrothelium caucavallense* Soto-Medina & Aptroot, sp. nov. is characterized by larger ascospores than *A. megaeneum* Flakus & Aptroot; *Pyrenula gigaspora* Soto-Medina, Aptroot & Lücking, sp. nov. has the largest 3-septate ascospores known in the genus; and *Ocellularia vallensis* Soto-Medina & Lücking, sp. nov. is similar to *O. buckii* Lücking, but differs in the larger ascospores and fewer septae.

## RÉSUMÉ

*Nouvelles espèces de lichens pour la forêt tropicale sèche de Colombie.*

### MOTS CLÉS

Colombie,  
forêt sèche,  
lichens crustacés,  
espèces nouvelles.

Trois nouvelles espèces de lichens sont décrites de Colombie. *Astrothelium caucavallense* Soto-Medina & Aptroot, sp. nov. se caractérise par des ascospores plus grandes que celles d'*A. megaeneum* Flakus & Aptroot; *Pyrenula gigaspora* Soto-Medina, Aptroot & Lücking, sp. nov. a les plus grandes ascospores à trois cloisons connues du genre; et *Ocellularia vallensis* Soto-Medina & Lücking, sp. nov. est similaire à *O. buckii* Lücking mais diffère par des ascospores plus grandes et moins de septae.

## INTRODUCTION

The dry forest is one of the most threatened ecosystems in Colombia, being restricted to 5-8% of its original extension (Ramos & Silverstone 2018). Despite its threatened status, studies on plants, fauna and fungi are scarce. In terms of lichenized fungi, there are few records for this ecosystem (Sipman & Aguirre 2016). About 300 species are recorded for the dry forest of Colombia (Soto-Medina *et al.* 2021), with new species in recent years (Lücking *et al.* 2019).

Valle del Cauca has dry forest along the banks of the Cauca River and in sub-xerophytic enclaves (Ramos & Silverstone 2018). These ecosystems lack mycological studies, and very few are well preserved. As an initiative to study the dry forest of the Cauca River Valley, the Institute for Research and Preservation of the Cultural and Natural Heritage of Valle del Cauca” (INCIVA) (Colombia), proposed a “Dry Forest Project” that seeks to estimate the diversity of flora and fauna of this ecosystem, as well as its ecosystem services. Within the framework of this project, the diversity of lichenized fungi was also studied. In this way, the objective of this work is to describe three new species of lichen found in the dry forest of Valle del Cauca.

## MATERIAL AND METHODS

The material studied was deposited in the TULV Herbarium of the “Instituto para la Investigación y la Preservación del Patrimonio Cultural y Natural del Valle del Cauca” INCIVA (Colombia).

Specimens were determined by examining characteristics of the thallus and ascomata such as ascospore type and size. The material was reviewed with the help of a stereoscope and an Olympus SX-21 microscope. The ascospores were measured with a micrometric ruler. Photographs of all specimens were taken with a digital camera Canon PowerShot SX16. Chemical tests were also carried out with reagents K (10% potassium hydroxide), C (10% sodium hypochlorite) and lugol for the case of hymenium and ascospores.

## RESULTS AND DISCUSSION

Family TRYPETHELIACEAE Spreng.  
Genus *Astrothelium* Eschw.

*Astrothelium caucavallense*  
Soto-Medina & Aptroot, sp. nov.  
(Fig. 1)

A new *Astrothelium* similar to *A. megaeneum* Flakus & Aptroot, but differs by its larger ascospores.

HOLOTYPE. — Colombia. Valle del Cauca, Municipio Roldanillo, corregimiento Higueroncito, 4°29'52.2"N, 76°06'39.1"W, 998 m, tropical dry forest, 16.XI.2020, *Soto Medina 28H* (holo-, TULV).

ISOTYPE. — Colombia. Valle del Cauca, Municipio Roldanillo, corregimiento Higueroncito, 4°29'52.2"N, 76°06'39.1"W, 998 m, tropical dry forest, 16.XI.2020, *Soto Medina 82H* (iso-, CUVC).

ETYMOLOGY. — The epithet refers to refers to the Valle del Cauca, a department in Colombia.

ECOLOGY. — This species grows on bark of *Zanthoxylum caribaeum* Lam. and *Euphorbia cotinifolia* L. in tropical dry forest.

CHEMISTRY. — Thallus UV– but orange pruina UV+ red, K+ red, C–; medulla C–, K–, KC–; orange pruina on pseudostromata surface UV+ red, K+ red.

MYCOBANK. — MB 849069.

## DESCRIPTION

Thallus corticolous, crustose, corticate, smooth, (olive-)green but partially covered by orange pruina. Photobiont of a species of *Trentepohlia* Martius. Ascomata globose in section, 0.5-1.0 mm diam., single to laterally aggregated, immersed in weakly delimited pseudostromata, their base often immersed in the bark; pseudostromata covered by orange pruina. Perithecial wall fully carbonized, up to up 100 µm wide. Ostioles apical, not fused, appearing as flat, dark brown spots from above. Hamathecium not inspersed. Asci 8-spored. Ascospores hyaline, 3-septate, oblong, 35-50 × 11-15 µm, their ends rounded and their lumina diamond-shaped, surrounded by a gelatinous layer up to 10 µm thick. Pycnidia not observed.

## NOTES

With the external orange pigment produced on the thallus and particularly the pseudostromata, *Astrothelium caucavallense* Soto-Medina & Aptroot, sp. nov. belongs in the *A. aeneum* complex, but within which it is distinguished by its comparatively large ascospores. Most species in this complex have small ascospores around 20-25 × 6-10 µm large; the only species so far known with somewhat larger ascospores (25-35 × 10-12 µm) is *A. megaeneum* Flakus & Aptroot, but even in that species, the ascospores are considerably smaller than in the new species (Aptroot & Lücking 2016). Within the *A. aeneum* complex, species either have a clear or an inspersed hymenium. An inspersed hymenium is found in *A. inspersaeneum* E.L.Lima, Aptroot & M.Cáceres and *A. aenascens* Aptroot, both with small ascospores, whereas a clear hymenium is found in *A. aeneum* (Eschw.) Aptroot & Lücking (small ascospores), *A. megaeneum* (ascospores of intermediate size), and in the new species, with large ascospores, all with a similar overall morphology (Aptroot & Lücking 2016). The new species would key out in the recent world key to the family (Aptroot 2021) in couplet H31, with: ascospores 35-50 µm long.

Family GRAPHIDACEAE Dumort.  
Genus *Ocellularia* G.Mey.

*Ocellularia vallensis*  
Soto-Medina & Lücking, sp. nov.  
(Fig. 2)

A new *Ocellularia* similar to *O. buckii* Lücking, but differing in the larger ascospores and fewer septae.

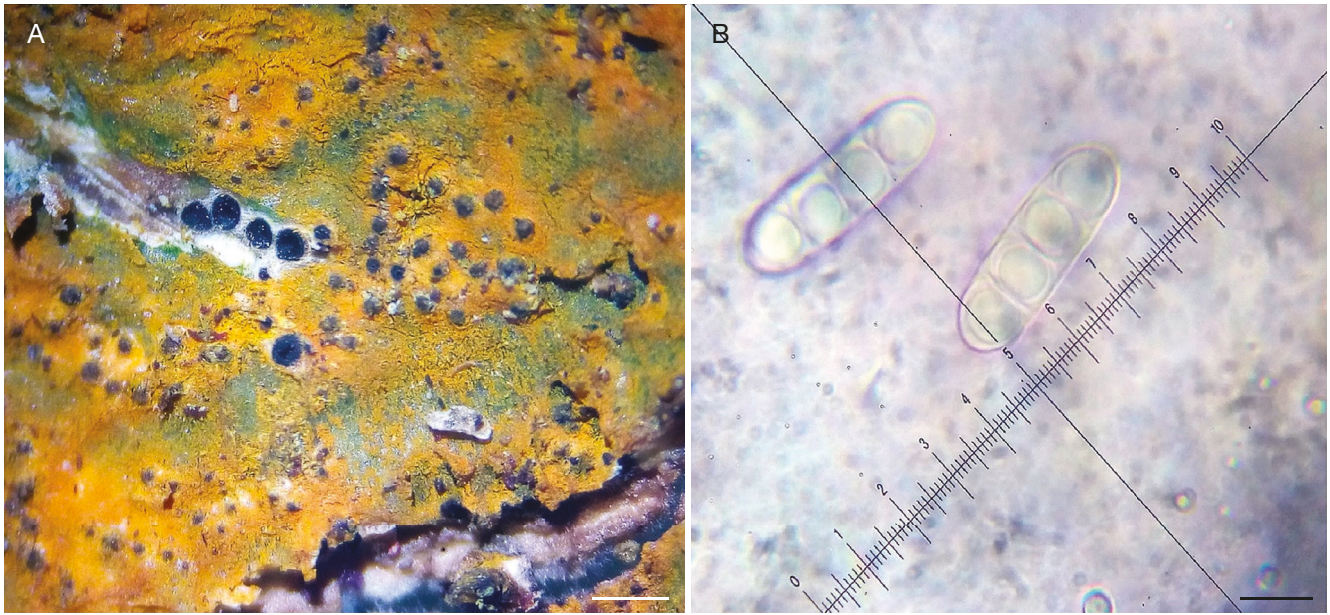


FIG. 1. — *Astrothelium caucavallense* Soto-Medina & Aptroot, sp. nov.: **A**, habitus; **B**, ascospores. Scale bars: A, 10 mm; B, 10  $\mu$ m.

**HOLOTYPE.** — Colombia. Valle del Cauca, Municipio Andalucía, Hacienda el Verdún, 4°06'30"N, 76°07'09"W, 1056 m, tropical dry forest, 8-13.XII.2020, *Soto Medina 87 VER* (holo-, TULV).

**ETYMOLOGY.** — The epithet refers to the Valle del Cauca, in short "Valle".

**ECOLOGY.** — This species grows on bark of *Simira* Aubl. in tropical dry forest.

**CHEMISTRY.** — Thallus UV–, K–, C–; medulla C–, K–, KC–.

**MYCOBANK.** — MB 849070.

#### DESCRIPTION

Thallus corticolous, crustose, up to 7 cm diam., continuous; surface shallowly verrucose-rugose, green-gray to grey; prothallus absent. Photobiont of a species of *Trentepohlia*. Ascomata rounded to slightly irregular in outline, immersed-erumpent, with almost complete thalline margin, 0.4-0.6 mm diam., 0.1 mm high; disc covered by 0.07-0.15 mm wide pore, filled by black-tipped columella; proper margin distinct, visible as brown-black rim around the pore; thalline margin entire, smooth to shallowly verrucose, grey. Excipulum entire, in lower portion brown, apically carbonized, about 30  $\mu$ m wide; columella present, finger-like, up to 90  $\mu$ m broad and 120  $\mu$ m high, completely carbonized; hypothecium 5-10  $\mu$ m high, hyaline; hymenium up to 120  $\mu$ m high, hyaline, not interspersed. Paraphyses unbranched, apically smooth; periphysoids absent; asci cylindrical to clavate, about 120  $\times$  17  $\mu$ m. Ascospores 8 per ascus, more or less uniseriate, ellipsoid, 3-septate, about 42-45  $\times$  14-15  $\mu$ m, I+ violet-blue.

#### NOTES

With its columellate apothecia, the small, hyaline, transversely-septate ascospores, and the lack of secondary compounds, *Ocellularia vallense* Soto-Medina & Lücking,

sp. nov. is to be placed into the *O. papillata* (Leight.) Zahlbr. complex *sensu* Lücking (2015). In this complex, there are four species with apically carbonized excipulum and carbonized columella. *Ocellularia marmorata* L.I.Ferraro, Lücking, Aptroot & M.Cáceres from Argentina differs in the minutely grainy thallus with columnar crystals and the 5-7-septate ascospores, whereas in the paleotropical *O. krathingensis* Homchant. & Coppins the ascospores are 7-11-septate. The pantropical *O. viridipallens* Müll. Arg. differs in the more greenish, finely verrucose thallus and the apothecia lacking a blackish proper margin and with an apically pruinose columella. Most similar is *O. buckii* Lücking from Brazil (Lücking 2015), agreeing well in thallus and apothecial morphology with the new species but has much smaller ascospores (20-25  $\times$  7-8  $\mu$ m).

Family PYRENULACEAE Rabenh.  
Genus *Pyrenula* Ach.

*Pyrenula gigaspora*  
Soto-Medina, Aptroot & Lücking, sp. nov.  
(Fig. 3)

A new *Pyrenula* similar to *P. montocensis* Lücking, but differing by its larger ascospores of 125-140  $\times$  40-45  $\mu$ m.

**HOLOTYPE.** — Colombia. Valle del Cauca, Municipio Bugalagrande, Hacienda la Venta, 4°11'56.2"N, 76°03'56.2"W, 1166 m, bosque seco tropical, 23-27.IX.2020, *Soto Medina s.n.* (holo-, TULV).

**ETYMOLOGY.** — The epithet refers to the giant ascospores.

**ECOLOGY.** — The species grows on branches in the interior of the tropical dry forest.

**CHEMISTRY.** — Thallus UV–, K–, C–; medulla C–, K–, KC–.



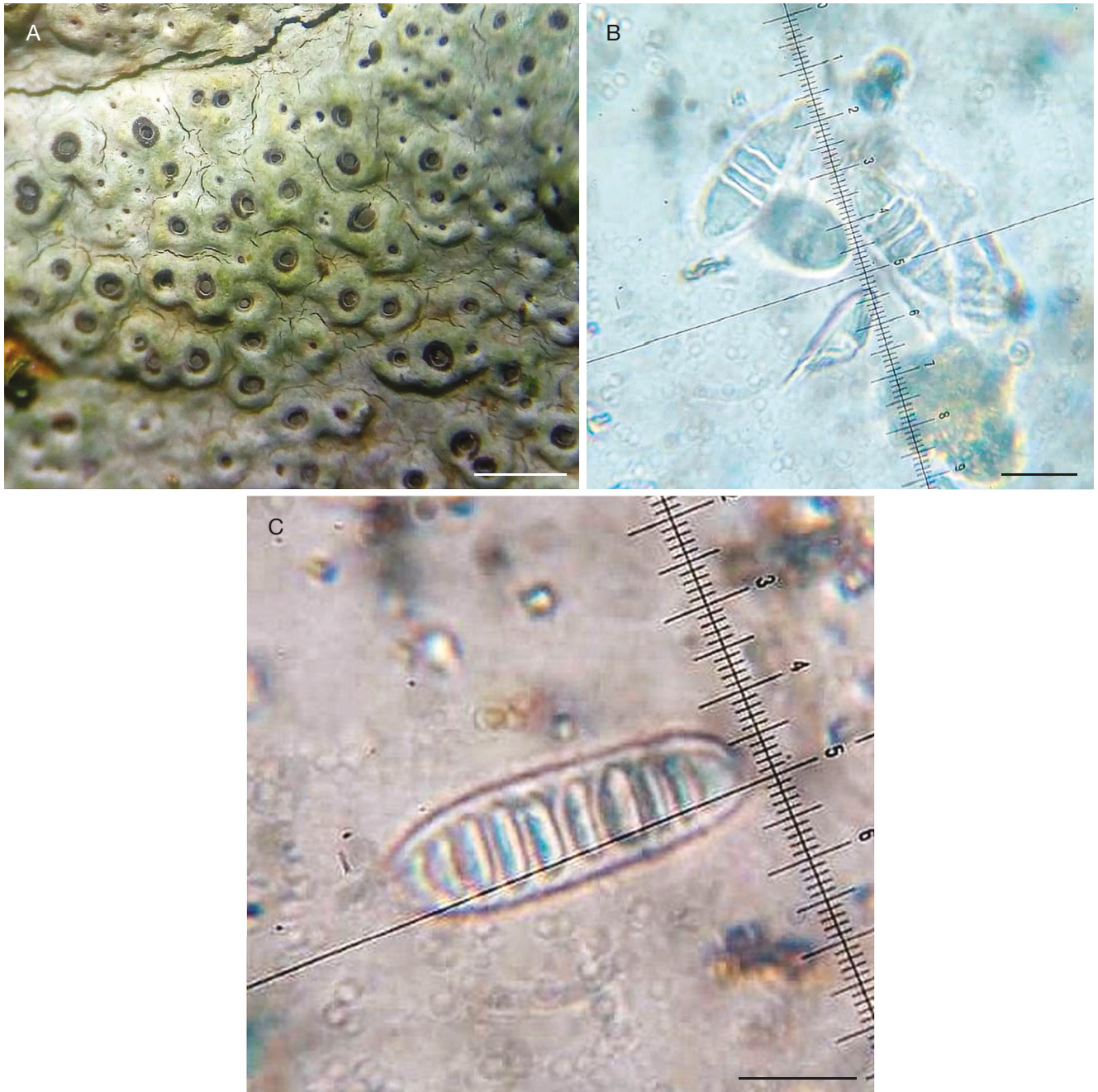


FIG. 2. — *Ocellularia vallensis* Soto-Medina & Lücking, sp. nov.: **A**, habitus; **B**, **C**, ascospores. Scale bars: A, 10 mm; B, C, 10  $\mu$ m.

MYCOBANK. — MB 849071.

#### DESCRIPTION

Thallus crustose, corticate, olive-green, with abundant spots with crystals (pseudocyphellae). Photobiont of a species of *Trentepohlia*. Perithecia solitary, dispersed, hemispherical but mostly immersed and only upper portion erumpent from the thallus, basally and in part laterally covered by thallus, c. 0.9–2 mm diam. Ostioles apical, flat, black. Hamathecium not interspersed. Asci 2-spored. Ascospores becoming dark brown, 3-septate, narrowly ellipsoid to almost fusiform, 125–140  $\times$  40–45  $\mu$ m, ends rounded, lumina more or less

diamond-shaped, separated from the walls by a thickened endospore layer. Pycnidia not observed.

#### NOTES

This new species is characterized by unusually large ascospores occurring singly in the asci. Thus far, the largest 3-septate ascospores in the genus known were those of *Pyrenula montocensis* Lücking, which are up to 90  $\times$  30  $\mu$ m in size, and *P. subpraelucida* Müll. Arg., which are up to 75  $\times$  30  $\mu$ m in size and with small terminal lumina. Some *Pyrenula* species with muriform ascospores have much larger ascospores, in the order of 200  $\mu$ m. The latter also differs in thallus mor-

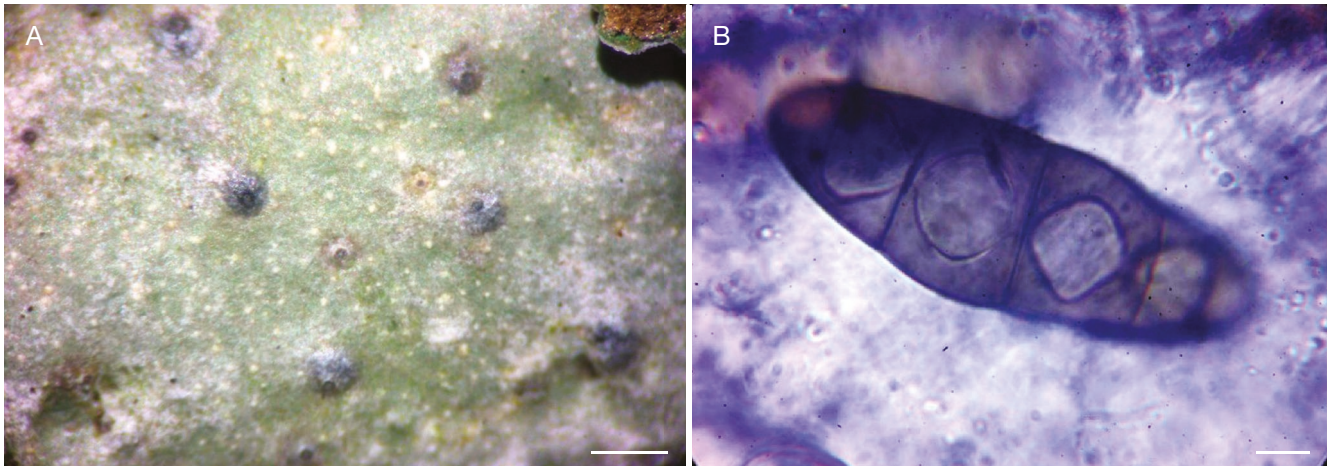


FIG. 3. — *Pyrenula gigaspora* Soto-Medina, Aptroot & Lücking, sp. nov.: A, habitus; B, ascospores. Scale bars: A, 10 mm; B, 20  $\mu$ m.

phology, whereas *P. montocensis* agrees with the new species in the pseudocyphellate thallus and both species are undoubtedly closely related. This thallus morphology is also found in the common *P. quassiicola* Fée which, however, has much smaller ascospores (25–40  $\times$  8–15  $\mu$ m) (Aptroot *et al.* 2008). The new species would key out in the recent world key to the family (Aptroot 2021) in couplet B72 with: ascospores 125–140  $\times$  40–45  $\mu$ m.

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