




REDISCOVERY OF *TIMMIELLA ACAULON* (TIMMIELLACEAE) IN THE CHACO PROVINCE, NORTHEASTERN ARGENTINA

REDESCUBRIMIENTO DE *TIMMIELLA ACAULON* (TIMMIELLACEAE) EN LA PROVINCIA DE CHACO, NORESTE DE ARGENTINA


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SUMMARY

Background and aims: Herbarium specimens were reviewed as part of broader project that deals with the diversity of bryophytes from the Chaco province (Argentina). One of the samples matched the description of *Timmiella acaulon*, a species poorly known. The aim of this work is to record *T. acaulon* as new to Chaco Province and to describe morphologically and illustrate in detail this remarkable species.

M&M: Herbarium samples were analyzed with standard techniques for bryophytes. Examination with scanning electron microscope was made using samples mounted directly on double-sided tape and coated in gold-palladium.

Results: *Timmiella acaulon* is newly registered for Chaco province. A complete and detailed morphological description, and illustrations are here presented.

Conclusions: Due to the rediscovery of the species more than 100 years after its original description, the distribution range of *T. acaulon* is extended to northeastern Argentina, and details of morphological characters of systematic value are provided.

KEW WORDS

Haplolepido, Timmiellaceae, Timmielloideae, *Trichostomum*.

RESUMEN

Introducción y objetivo: Se revisaron especímenes de herbario como parte de un proyecto más amplio que trata sobre la diversidad de briófitas de la provincia del Chaco (Argentina). Un ejemplar coincidió en su descripción con *Timmiella acaulon*, una especie escasamente conocida. El objetivo de este trabajo es registrar a *T. acaulon* como nueva para el Chaco, y describir morfológicamente e ilustrar en detalle esta singular especie.


M&M: Los ejemplares de herbario se analizaron según técnicas tradicionales para briófitas. Los análisis en microscopio electrónico de barrido se realizaron con muestras montadas directamente en cinta doble faz y recubiertas de oro-paladio.

Resultados: *Timmiella acaulon* se registra por primera vez para la provincia del Chaco. Se presenta una descripción morfológica detallada e ilustraciones.

Conclusiones: Debido al redescubrimiento de la especie después de más de 100 años de su descripción original, la distribución de *T. acaulon* se amplía al noreste argentino, y se proporcionan detalles de caracteres morfológicos de valor sistemático.

PALABRAS CLAVES

Haplolérido, Timmiellaceae, Timmielloideae, *Trichostomum*.

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INTRODUCTION

Timmiella (De Not.) Limpr. is an haplolepidous genus of mosses placed in the monogeneric subfamily Timmielloideae in family Pottiaceae following Zander (1993). Based on molecular analysis performed by Inoue & Tsubota (2014), *Timmiella* and *Luisierella* Thér. & P. de la Varde were segregated to a separate family Timmiellaceae. The former genus includes ca. 13 species easily recognized by the presence of a well-developed central strand in the stem, margin of leaf plane and dentate, laminal cells bistratose at midleaf, adaxially bulging and abaxially flat, and peristomes sinistrorse or straight, when present (Zander, 1993; Inoue & Tsubota, 2014). It is usually found growing on soil or rocks, in arid lands and mountainous areas of North and South America, Europe, Asia and Africa (Zander, 1993).

In Argentina, three species of the genus have been described and recorded to date: *Timmiella acaulon* (Müll. Hal.) R.H. Zander, *T. argentinica* Broth. and *T. umbrosa* (Müll. Hal.) Broth. (Matteri, 2003). Originally, current *T. acaulon* was described by Müller (1879) as *Trichostomum acaulon* Müll. Hal. based on collections from province of Córdoba (in the center of the country) by German-Argentine botanist Paul Lorentz. Later, it was transferred to *Tortella* (Müll. Hal.) Limpr. by Brotherus (1902), and finally to *Timmiella* by Zander (1993). In making this last combination, Zander (1993) also proposed *T. argentinica* Broth., a species described by Finnish botanist Viktor Brotherus in 1918 based on samples collected in province of Jujuy (northwestern Argentina), as a new synonym of *T. acaulon*. *Timmiella umbrosa* has also been described by Müller based on samples collected in Córdoba, and it is distinguished from *T. acaulon*, mostly by its monoicous sexual condition. Despite the fact that *T. acaulon* has been well described by Müller, it has been sparsely recorded, and consequently poorly illustrated so far.

As part of a major project that aims to study the diversity of bryophytes in the Chaco province (northeastern Argentina), a revision of herbarium samples has been performed. As a result of the discovery of a complete specimen, *T. acaulon* is rediscovery more than 100 years after its original description, and its distribution range is extended to northeastern Argentina. For the first time, a detailed morphological description with illustrations in SEM and LM of the taxon is here presented.

MATERIAL AND METHODS

Specimens were studied morphologically following classical techniques for bryophytes, and mounted in Hoyer's solution (Anderson, 1954). Microscopic characters were analyzed by using LM Arcano XSZ-100BNT, and SEM JEOL 5800 LV operating at 20 KV. Characters illustrated using SEM were obtained from samples mounted directly on double-sided tape and coated with gold-palladium. Spores were obtained from mature capsules by removing with alcohol, mounted directly on aluminum stubs, and subsequently coated with gold-palladium. Spores were described following the concepts of McClymont (1955) and Punt *et al.* (2007).

RESULTS

Taxonomic treatment

Timmiella acaulon (Müll. Hal.) R. H. Zander, *Bull. Buffalo Soc. Nat. Sci.* 32: 70. 1993. Fig. 1-4.

Tortella acaulon (Müll. Hal.) Broth., *Nat. Pflanzenfam.* 1(3): 397. 1902. *Trichostomum acaulon* Müll. Hal., *Linnaea* 42: 320. 1879. TYPE: ARGENTINA. Córdoba, Colón, "Ascochinga, cum *Barbula umbrosa*", IX-1871 (*syntype*, not seen); "cum *Barbula sedifolia* et *B. amphidiifolia* aliis loci circa Ascochinga", IV-[1871, P. G. Lorentz s.n.] (*syntypes*, B not seen; NY 01448932!).

Timmiella argentinica Broth., *Ark. Bot.* 15(6): 3. 1918. TYPE. ARGENTINA. Jujuy, Santa Bárbara, "Quinta prope Laguna de la Brea, loco salso ad "salina", 1901-1902, R. E. Fries 23" (*Type*, H!).

Plants forming cushions, yellow-green above, brown below. Stem simple to branching irregularly, to 0.5 cm long, transverse section rounded, central strand very strong, sclerodermis in 1 layer, hyalodermis present, absent in older section of stem. Leaves incurved and tubulose when dry, spreading when moist, ligulate, 0.2-3.2 × 0.4-0.5 mm; upper lamina broadly channeled across leaf, margins incurved, plane at base, entire to weakly serrate at apex, lamina bistratose except along margins; apex acute; base broadened, sheathing; costa percurrent tapering to apex, superficial cells isodiametric and ventrally bulging, costal transverse section

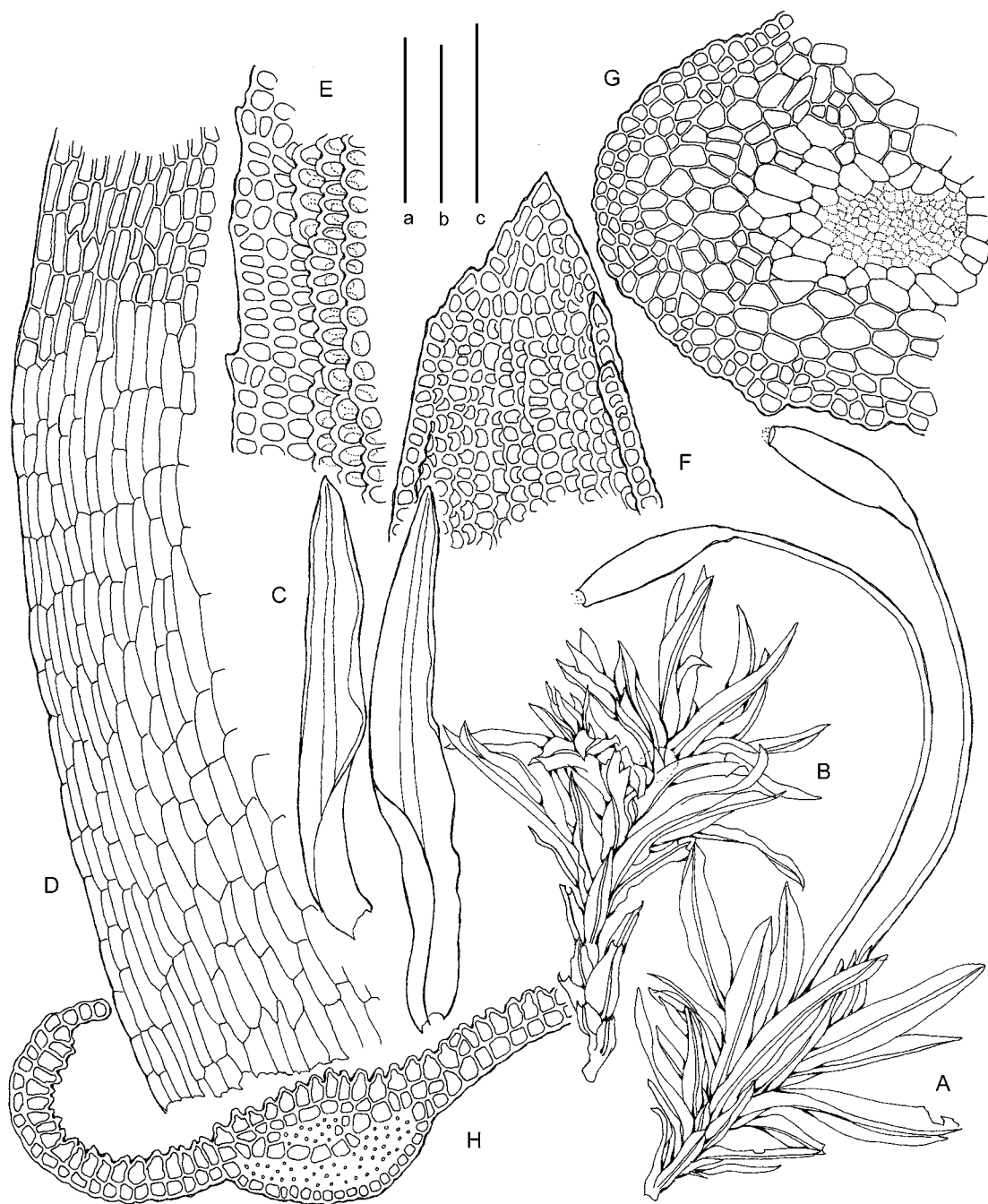


Fig. 1. Illustration of *T. acaulon*. **A:** Habit with sporophyte, wet. **B:** Habit of male plant, wet. **C:** Two cauline leaves. **D:** Basal laminal cells. **E:** Distal marginal cells. **F:** Leaf apex. **G:** Stem cross section. **H:** Section at mid leaf. Scales= A-B: 2.5 mm (scale bar a); C: 2 mm (b); D-H: 100 μ m (c) (Iriart 282-4, MO; illustration by P. Eckel).

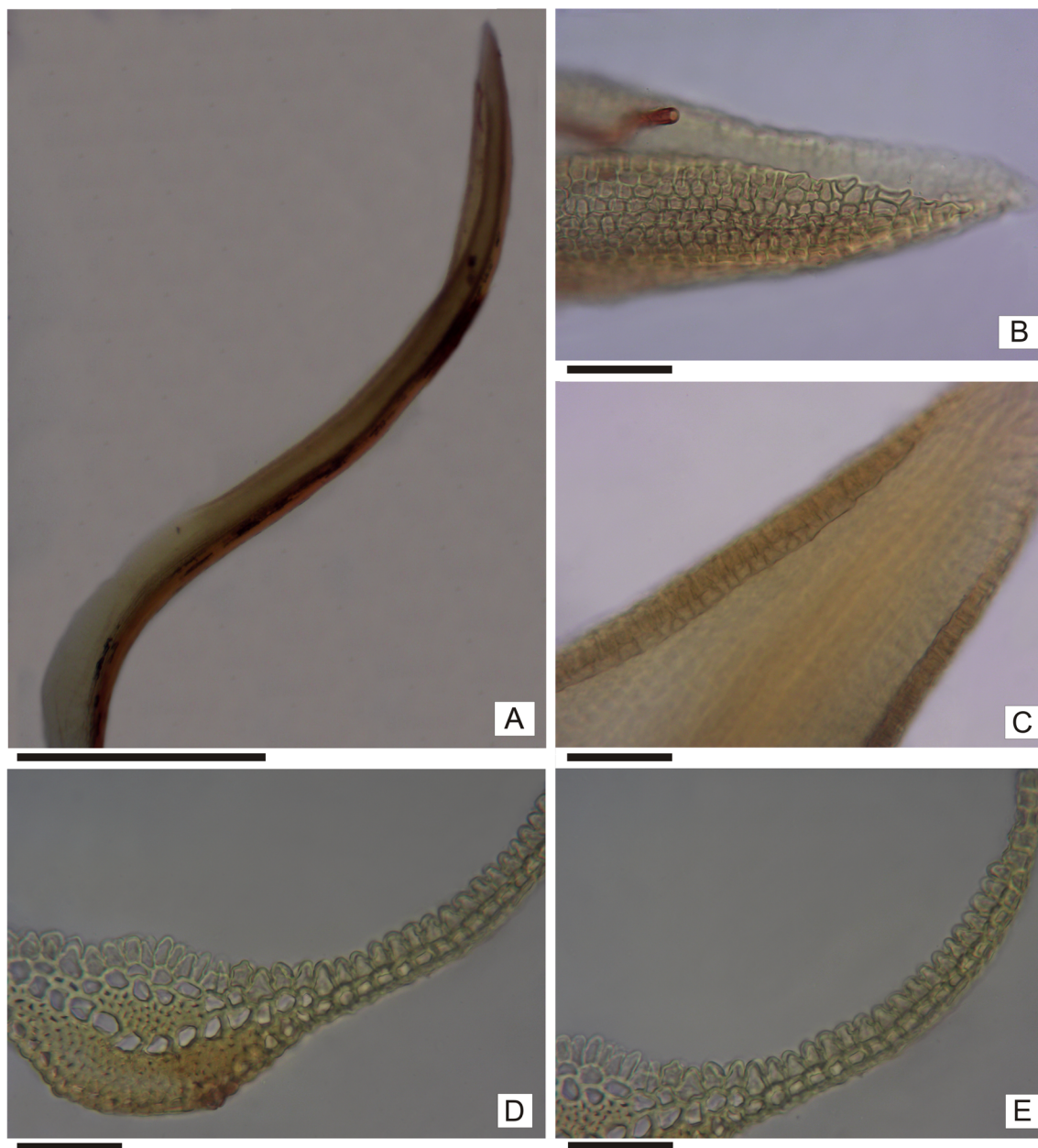


Fig. 2. Morphological characters of *T. acaulon* with a light microscope. **A:** Stem leaf. **B:** Leaf apex. **C:** Leaf margin. **D:** Detail of the costa section. **E:** Detail of lamina section. Scales= A: 0.1 mm; B-E: 50 μm. (Iriart 282-4, CTES; photo by S. Jimenez)

flattened to reniform, two stereid bands present, ventral epidermis present, unistratose, guide-cells 10-12 in 1(-2) layers, hydroid strands 2-3; upper laminal cells isodiametric, 9-10 × 6-8 μm; bulging ventrally and nearly flat dorsally, basal cells bulging-

rectangular 10-20 × 7-8 μm, hyaline. Dioicous. Perichaetia terminal. Seta ca. 1-1.5 cm long, reddish brown, twisted clockwise, theca 2.8 × 0.8 mm, brown, elliptical, exothecial cells rectangular to oblong-rectangular, 58-71 × 21-33 μm; annulus absent.

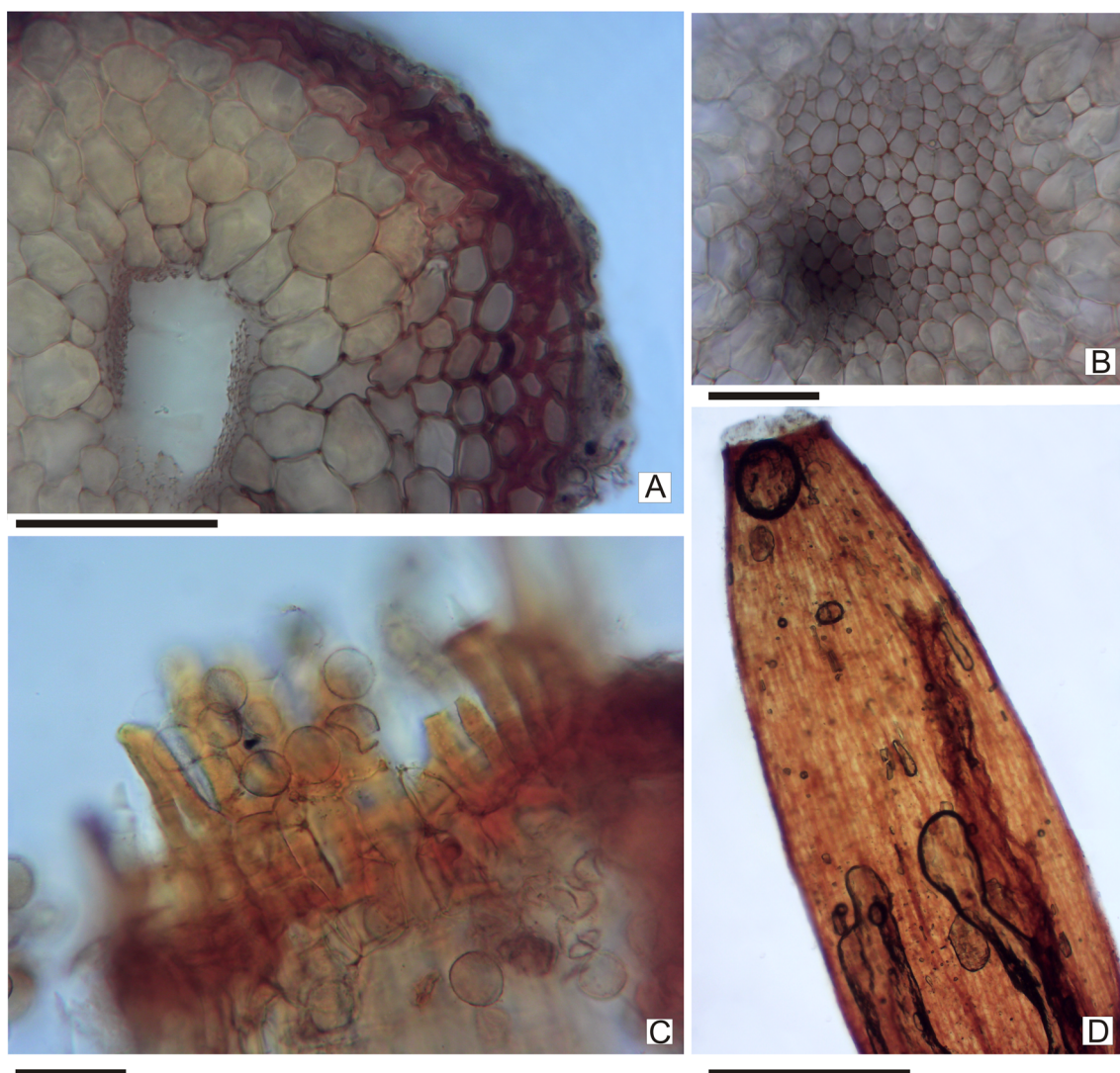


Fig. 3. Morphological characters of *T. acaulon* with a light microscope. **A:** Stem in transverse section. **B:** Detail of the stem central cylinder. **C:** Detail of peristome, annulus absent. **D:** Detail of shape, color and position of the capsule. Scales= A-C: 50 μ m; D: 0.1 mm (Iriart 282-4, CTES; photo by S. Jimenez)

Peristome teeth very short, straight. Spores spherical, 14-19 μ m diam., yellowish, finely verrucose, verrucae 0.2-0.3 μ m wide, evenly distributed on the surface. Laminal color reaction to KOH yellow.

Specimens examined. ARGENTINA. Chaco Prov.: *Libertador General San Martín Dept.*, Gral. San Martín, 26° 32' 16.33" S, 59° 20' 54.12" W, on old brick wall, 6-III-1997, Iriart 282-4 (CTES, CTESN, MO).

Distribution and habitat. Originally *T. acaulon* (Fig. 1-4) was described from central Argentina in Córdoba province. Later, Zander (1993) with the synonymy of *T. argentinica* under *T. acaulon* expanded its distribution range northwards up to northwestern Argentina, in Jujuy province. In this work, its range of distribution is extended to northeast Argentina, in the Chaco province. It was found growing in crevices of a shady old brick

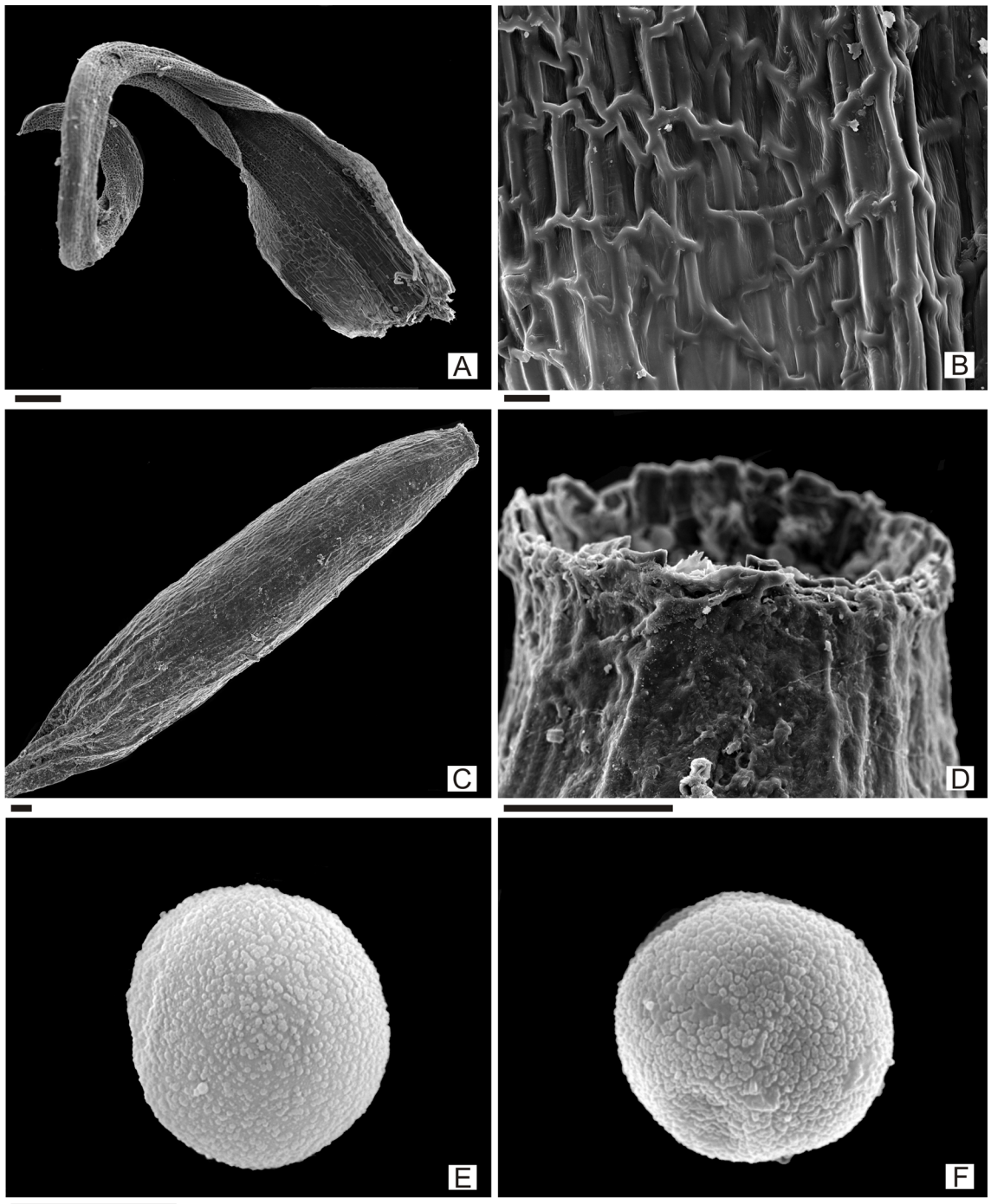


Fig. 4. Morphological characters of *T. acaulon* with a scanning electron microscope. **A:** Stem leaf. **B:** Laminal cells at base. **C:** Capsule, depericulate. **D:** Detail of the capsule mouth. **E-F:** Detail of spores ornamentation. Scales= A: 0.1 mm; B-D: 100 μ m; E-F: 10 μ m. (Iriart 282-4, CTES; photo by S. Jimenez)

wall in an urban area in the locality of San Martín, profusely fructified. Wet shaded ancient walls represent a singular habitat for mosses and ferns in urban environments from northern Argentina (Iriart, 2015).

AUTHORS CONTRIBUTIONS

SJ determined, described and illustrated, the samples. RZ corroborated the identity of the species. DI collected the samples. All authors contributed to the writing of the manuscript.

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