

***BRYMELA ANTIOQUIANA* S.P. CHURCHILL & J.J. ATWOOD (PILOTRICHACEAE) A NEW SPECIES FROM COLOMBIA**

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Abstract: A new species, *Brymela antioquiana* S.P. Churchill & J.J. Atwood, is described and illustrated from Colombia. The new species is superficially similar to *B. parkeriana* (Hook. & Grev.) W.R. Buck – a species from northern Amazonia, the Guianas and Lesser Antilles – in its weakly complanate habit and straight, oblong-lanceolate leaves. *Brymela antioquiana* differs from *B. parkeriana* in having: longer leaves (3.6–4.0 versus 2.1–3.2 mm); long-acuminate versus obtuse to acute leaf apices; more strongly undulate upper laminae; and entire to weakly serrulate leaf margins with simple teeth versus serrulate to moderately serrate leaf margins with occasionally bifid teeth. A key to the 13 species of *Brymela* is provided.

Keywords: *Brymela*, Colombia, *Hookeriopsis*, new species, Pilotrichaceae, *Thamniopsis*, *Trachycephium*

INTRODUCTION

Brymela Crosby & B.H. Allen (Pilotrichaceae) is a neotropical genus of 13 species (Tropicos 2022) distributed primarily in the montane regions of Central America, the Caribbean and the tropical Andes. The genus is characterized by its often lustrous, medium to robust plants; stems in cross-section with a multistratose sclerodermis (hyalodermis absent); monomorphic dorsal/ventral and lateral leaves that are usually undulate, rugose or plicate; prominent double costae that extend 2/3 to 7/8 the leaf length; homogeneous, thick-walled, porose leaf cells; and elimbate leaf margins.

Brymela was described for an especially robust, Panamanian species (*B. tutezona* Crosby & B.H. Allen) with strongly undulate leaves (Crosby and Allen 1985), but was later expanded by Buck (1987) to include nine additional species transferred from *Hookeriopsis* (Besch.) A. Jaeger *sensu lato*. As presently



circumscribed, species of *Hookeriopsis sensu lato* are now distributed across four genera: *Brymela*, *Hookeriopsis*, *Thamniopsis* (Mitt.) M. Fleisch. and *Trachyxiphium* W.R. Buck. Although these genera are superficially similar, they differ somewhat in discreet morphological characters as well as in the degree of development of their character states. For example, *Brymela*, *Hookeriopsis* (*sensu* Buck 1987) and *Trachyxiphium* morphologically share a homogeneous leaf cell areolation, elimbate leaves and a sclerodermis rather than a hyalodermis. *Hookeriopsis* differs from the others in its smaller plant size and shorter costae that extend to $\pm 1/3$ the leaf length. *Hookeriopsis* (*sensu* Buck 1987) and *Trachyxiphium* species are similar in often having homomallous to falcate leaves that lack undulations, but this morphology also occurs in some *Brymela* species. *Thamniopsis* differs from these three genera in having a stem hyalodermis, variably enlarged basal leaf cells, and lateral leaves that are usually distinctly different from the dorsal/ventral leaves. Furthermore, in *Thamniopsis* and *Trachyxiphium* the leaf margins and upper dorsal surface of the costae are strongly toothed with usually bifid, sometimes swollen teeth, though this character state occurs in some *Brymela* species as well.

A molecular phylogeny of the Hookeriales found *Brymela* to be paraphyletic (Buck *et al.* 2004). In the phylogeny, an accession of *B. tutezona* forms a clade with an accession of *Trachyxiphium vagum* (Mitt.) W.R. Buck [= *Thamniopsis glandulifera* (Hampe) B.H. Allen], a seemingly morphologically dissimilar species in having a hyalodermis and spiculose-papillose leaf cells. Also, an accession of *B. websteri* forms a clade with an accession of *Trachyxiphium drepanophyllum* (Geh. & Hampe) Schäf.-Verw., a species that is sometimes regarded as a synonym of *B. fluminensis* (Hampe) W.R. Buck (Buck 1987). *Trachyxiphium drepanophyllum*, *B. fluminensis* and *B. websteri* are morphologically similar in sharing long acuminate, falcate leaves with costae that extend to at least $4/5$ the leaf length into the acumina. The species differ in that *T. drepanophyllum* has regularly bifid and sometimes swollen teeth on the upper leaf margins whereas the upper leaf margins of *B. fluminensis* and *B. websteri* have simple teeth. However, a duplicate of the *B. websteri* accession, *Schäfer-Verwimp 17861* (MO), that was used in the Buck *et al.* (2004) phylogeny has bifid and sometimes swollen teeth on the upper leaf margins. The MO duplicate of this

specimen has been re-determined as *Trachyxiphium drepanophyllum* for this reason. Needless to say this is a group of closely allied and taxonomically difficult genera. The distinctions between them are not always clear and are difficult to evaluated.

After Buck (1987) expanded *Brymela*, a newly described species, *B. complanata* B.H. Allen, was added to the genus along with three more species transferred from *Hookeriopsis sensu lato* (Vaz-Imbassahy and Costa 2009; Allen 2010). The recent synonymy of *B. cuspidata* (A. Jaeger) W.R. Buck with *B. cavifolia* (Mitt.) Vaz-Imbassahy & D.P. Costa, and the transfer of *B. callicostelloides* (Herzog & Thér.) W.R. Buck to *Callicostella* (Müll. Hal.) Mitt. [≡ *C. callicostelloides* (Herzog & Thér.) B.H. Allen] has resulted in a total of 13 currently accepted *Brymela* species (Vaz-Imbassahy and Costa 2009; Allen 2010).

In their key to the Colombian species of *Brymela*, Churchill and Linares (1995, pp. 213–215) noted two unusual collections. One of these, designated '*Brymela* sp. 2 S.P. Churchill in ed.' from Antioquia, *Fonnegra et al. 4074* (HUA, NY) was distinguished in the key by its particularly long leaves with long-acuminate apices. Indeed, the leaves of this collections are considerably longer than all other *Brymela* species except for those of *B. tutezona*. In addition, the upper leaf lamina is distinctly and strongly undulate. Another collection with the same morphology has since been made in Antioquia, approximately 150 km northwest of the original station, *Giraldo-Cañas 899* (HUA, MO). It has the same long leaves with long-acuminate apices, strongly undulate upper leaf laminae and leaf margins that are entire to serrulate similar to a duplicate of *Fonnegra et al. 4074* deposited at MO. The collections differ from all other previously described *Brymela* species, cannot be placed in any of the *Hookeriopsis sensu lato* genera, nor are they comparable to the several remaining insufficiently known *Hookeriopsis sensu lato* species from the Neotropics based on published type descriptions. The two collections are described here as a new *Brymela* species, *B. antioquiana*.

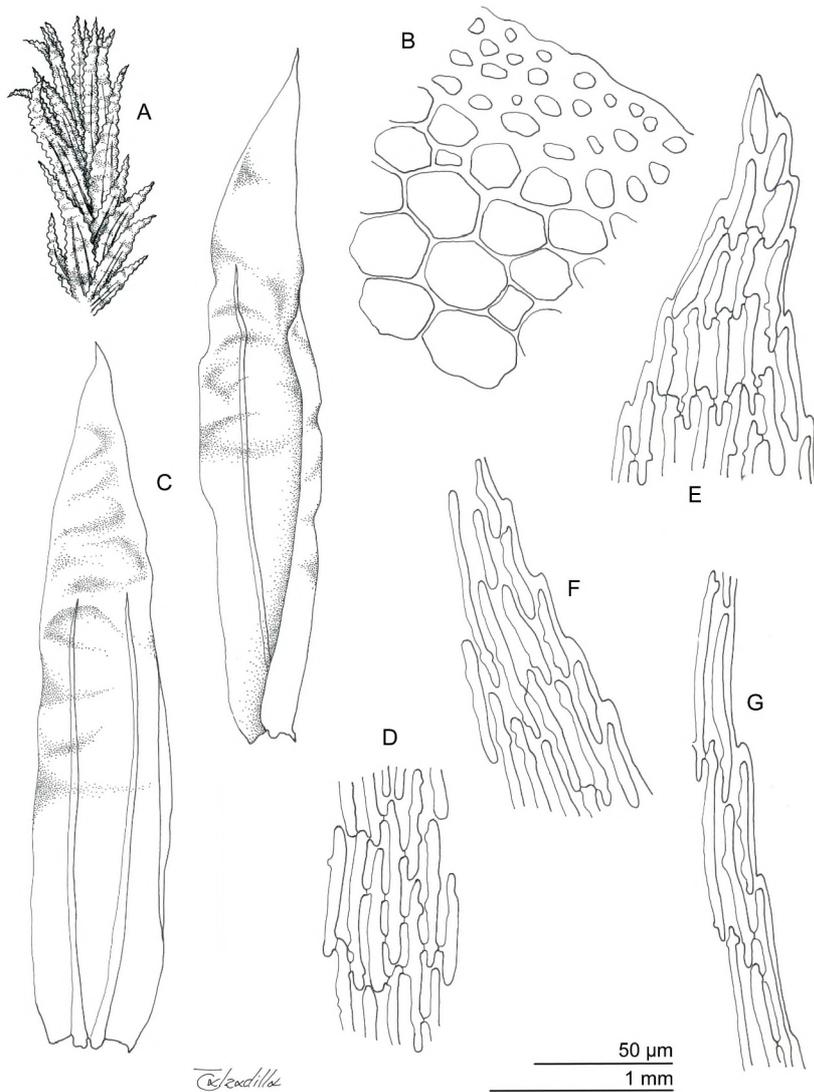


Figure 1. *Brymela antioquiiana* S.P. Churchill & J.J. Atwood. A. Habit. B. Portion of stem cross-section. C. Leaves. D. Upper median leaf cells. E. Leaf apex. F. Upper marginal cells. G. Median marginal cells. Scale bars: A, C = 1.0 mm; B, D–G = 50 µm. Based on *Fonnegra et al.* 4074 (isotype, MO). Drawing by E. Calzadilla.

MATERIALS AND METHODS

Measurements for the species description of *Brymela antioquiiana* were made using a Nikon Labophot-2 light microscope equipped with a Nikon digital camera and are based on rehydrated material mounted in water. The cited morphological characters used in the species comparisons and key are based on examined specimens at MO as well as detailed descriptions and published illustrations of *Brymela* species by Welch (1976 as *Hookeriopsis sensu lato*); Churchill (1994); Churchill and Linares (1995); Buck (1998); Vaz and Costa (2006); Allen (2010) and Churchill (2022).

RESULTS AND DISCUSSION

Taxonomic Treatment

Brymela antioquiiana S.P. Churchill & J.J. Atwood, *sp. nov.*

Type: Colombia. Antioquia: Municipio de San Francisco, Corregimiento de Aquitania, Tierra Linda, 1350 m, 2 Abr 1992, *G. Fonnegra* (*y Curso de Tax. Plant. Vasc. Sem. 1/92*) 4074 (holotype: HUA; isotypes: COL, MO, NY). (*Figure 1*)

Diagnosis. *Brymela antioquiiana* S.P. Churchill & J.J. Atwood differs from *B. parkeriana* (Hook. & Grev.) W.R. Buck, in its longer and more strongly undulate leaves, long-acuminate leaf apices and entire to weakly serrulate leaf margins.

Description. Plants large to robust, yellowish green to red-brown, forming loose, glossy mats. Stems prostrate, dark-red, to 5 cm long, irregularly branched, weakly complanate-foliate; branches spreading, shortest about 1 cm long; stem epidermal cells linear-rectangular, $75 \times 10 \mu\text{m}$; stems in cross-section with 3–4 layered sclerodermis consisting of small, thick-walled, dark rusty-red cells, cortical cells large, yellow to hyaline, hyalodermis absent; paraphyllia and pseudoparaphyllia absent; axillary hairs 2–3-celled, basal cell red, quadrate, upper cells hyaline, oblong-rectangular; rhizoids sparse, from initials abaxial to the leaf insertions, reddish brown, smooth, unbranched. Leaves monomorphic, loosely erect, symmetric, oblong-lanceolate, 3.6–4.0 \times 1.0 mm, concave, strongly undulate, apices gradually long-acuminate, sometimes slightly twisted above, margins plane to somewhat reflexed on one or both sides, mostly entire or serrulate in the distal 1/3 of the lamina with simple, non-swollen teeth, leaf

bases rounded; costae double, extending to 2/3–3/4 the leaf length, parallel at apices, weakly terminating in a spine, with 1–2 simple teeth on the upper dorsal surfaces; leaf cells homogenous throughout except near the insertions, median and upper cells long-rhomboidal to linear, 70–95 × 3–5 µm, smooth, thick-walled and porose, basal cells near insertions golden-yellow, 24–35 × 18–20 µm, alar regions with a few subquadrate to short-rectangular cells, 10–30 × 5–10 µm. Dioicous? Perigonia not observed.

Perichaetia lateral, leaves linear to ovate-lanceolate, 2.0–2.4 mm long, ecostate, leaf cells similar to those of the vegetative leaves; archegonia numerous, 475 µm long, intermixed with numerous, slightly longer paraphyses. Sporophytes not seen.

Paratype: Colombia. Antioquia: Municipio de Amalfi, Vereda Jardín, camino a las minas de oro de La Vetilla, 850–1000 m, *Giraldo Cañas 899* (HUA, MO).

Distribution: *Brymela antioquiiana* is known from the premontane to lower montane forest of Colombia at 850–1,350 m elevation. The species grows as an epiphyte on shrubs (*Pouteria* Aubl.) as well as on decaying logs.

Notes: *Brymela antioquiiana* is a large to robust, weakly complanate-foliate species. Its leaves are 3.6–4.0 mm long, and have long-acuminate, strongly undulate apices (*Figure 2*). Of the 13 accepted species within *Brymela*, few have leaves much greater than 3.0 mm long, except as noted previously in *B. tutezona*, whose leaves range from 6.0–8.0 mm long. *Brymela tutezona* and *B. antioquiiana* are further similar in sharing long-acuminate and strongly undulate apices that are little changed when wet or dry. Besides the difference in leaf length, *B. tutezona* differs from *B. antioquiiana* in having more evenly foliate stems, broader leaves (2.0–3.0 versus 1.0 mm wide) and leaf bases that are more broadly rounded to weakly auriculate at the insertions. There are three other *Brymela* species, in addition to *B. tutezona*, that have long-acuminate apices: *B. crosbyi* (B.H. Allen) B.H. Allen, *B. fluminensis* (Hampe) W.R. Buck and *B. websteri*. (H.A. Crum & E.B. Bartram) W.R. Buck. *Brymela crosbyi* differs from *B. antioquiiana* in having plicate rather than strongly undulate leaves, as well as gemmiferous branches that are unique within the genus. *Brymela fluminensis* and *B. websteri* differ from *B. antioquiiana* in their narrower, homomallous or falcate leaves and usually longer costae that extend to at least 4/5 the leaf length. By comparison, *B.*

antioquiana has straight leaves and costae that extend to 2/3–3/4 the leaf length. The three *Brymela* species known from Colombia, *B. acuminata* (Mitt.) W.R. Buck, *B. obtusifolia* (E.B. Bartram) W.R. Buck and *B. parkeriana* (Hook. & Grev.) W.R. Buck, differ from *B. antioquiana* in having shorter leaves as well as obtuse or acute apices. Of these, *B. parkeriana* is the most superficially similar to *B. antioquiana* in its weakly complanate habit and straight, oblong-lanceolate leaves that although shorter (2.1–3.2 versus 3.6–4.0 mm) are approximately the same width (0.9 versus 1.0 mm wide). *Brymela parkeriana* differs in having less strongly undulate upper leaf laminae and leaf margins that are serrulate to moderately serrate throughout. The leaf margins of *B. parkeriana* also differ in occasionally having a few bifid teeth. A key is provided below to separate *B. antioquiana* from the other *Brymela* species.

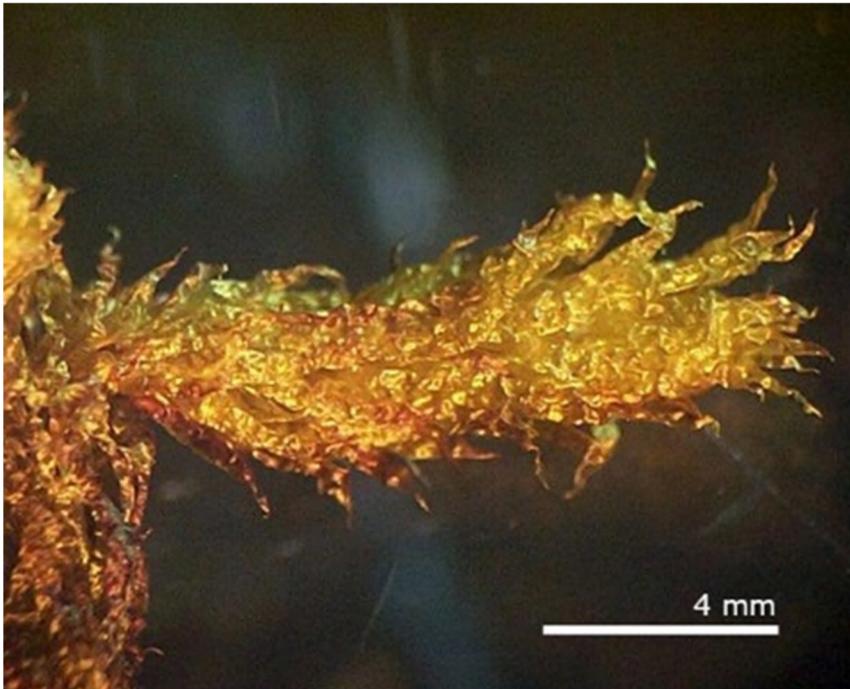


Figure 2. Short leafy branch of *Brymela antioquiana* S.P. Churchill & J.J. Atwood from Fonnegra et al. 4074 (isotype, MO).

Among the species of *Hookeriopsis sensu lato* that resemble *B. antioquiana*, only *Thamniopsis undata* (Hedw.) W.R. Buck is

perhaps superficially similar enough to be confused. In size and aspect, *T. undata* (Hedw.) W.R. Buck is equally robust, lustrous and the stems are weakly complanate-foliate. The long-acuminate, sometimes monomorphic leaves, 2.5–4.0 mm long, overlap in their upper range with *B. antioquiiana*, and the two species share a strongly undulate lamina when wet or dry. However unlike *B. antioquiiana*, *T. undata* has an autoicous sexuality and the stem has a distinct hyalodermis in cross-section. Furthermore, the leaves are ovate-lanceolate rather than oblong-lanceolate in shape, and the leaf cells are not as homogeneous as those of *B. antioquiiana*, becoming narrowly elongate near the margins and forming a \pm distinct border. Lastly, the upper leaf margins of *T. undata* are sharply serrate with simple, although long and projecting, teeth.

KEY TO THE SPECIES OF *BRYMELA* CROSBY & B.H. ALLEN

- 1 Leaves smooth.....2
- Leaves undulate, rugose, or plicate.....4
- 2 Plants evenly foliate, leaves falcate.....*B. fluminensis*
- Plants complanate-foliate, leaves straight.....3
- 3 Leaves 0.9–1.2 mm long.....*B. complanata*
- Leaves 1.8–2.7 mm long.....*B. fissidentoides*
- 4 Leaves plicate, plants with branches ending in masses of gemmae.....*B. crosbyi*
- Leaves undulate or rugose, plants lacking gemmae.....5
- 5 Leaf apices acute to obtuse-rounded.....6
- Leaf apices cuspidate or acuminate.....8
- 6 Leaves falcate to falcate-secund, 1.0–1.5 mm long.....*B. obtusifolia*
- Leaves \pm straight, 2.2–3.2 mm long.....7
- 7 Leaf margins sharply serrate, teeth strongly bifid and swollen.....*B. rugulosa*
- Leaf margins serrulate to moderately serrate, teeth occasionally bifid, not swollen.....*B. parkeriana*
- 8 Leaf apices cuspidate, notched or constricted at the base of the acumina.....9
- Leaf apices gradually to \pm abruptly acuminate, not notched or constricted at the base of the acumina.....10
- 9 Upper dorsal costal surface crested or toothed.....*B. cavifolia*

- Upper dorsal costal surface weakly toothed or smooth.....**B. laevinervis**
- 10** Leaves 1.2–1.8 mm long, apices short-acuminate..... **11**
- Leaves 2.0–8.0 mm long, apices long-acuminate..... **12**
- 11** Costae extending 4/5–7/8 the leaf length, upper dorsal costal surface sharply toothed.....**B. acuminata**
- Costae extending 2/3 the leaf length, upper dorsal costal surface weakly toothed or smooth.....**B. angustiretis**
- 12** Leaves homomallous or falcate, costae extending 4/5–7/8 the leaf length.....**B. websteri**
- Leaves straight, costae extending 2/3–3/4 the leaf length... **13**
- 13** Leaves 3.6–4.0 mm long.....**B. antioquiiana**
- Leaves 6.0–8.0 mm long.....**B. tutezona**

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