

TAXONOMY AND SYSTEMATICS

# Rediscovery of the enigmatic *Hypericum radicans* (Hypericaceae): Insights into its affinities and sympatry with congeneric species in the Eastern Cordillera of Colombia

Redescubrimiento del enigmático *Hypericum radicans* (Hypericaceae): Consideraciones sobre sus afinidades y simpatría con sus especies congéneres de la Cordillera Oriental de Colombia

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## ABSTRACT

*Hypericum radicans*, an enigmatic species barely known from a severely fragmented specimen with uncertain provenance, was recently rediscovered in subpáramos and páramos from the department of Boyacá. Here, we amend and complement the original description, adding critical traits onto the diagnosis of the species, and confirming its status as a distinct one. Additionally, we discuss its affinities with four species having similar life-form and vegetative and reproductive traits. Specifically, we compare it with páramo and subpáramo chamaephytes with very short main shoots that radially branch forming cushion-like clumps. A key to identify the five species is provided along with photographic records. Notably, most *H. radicans* flowers and fruits exhibit four or five carpels, an uncommon trait on neotropical species of *Hypericum*, where three carpels usually prevail. Finally, we comment on the outstanding sympatry of *Hypericum* species in the high montane ecosystems of the Eastern Cordillera of Colombia, and argue against sympatric speciation as a major driver of the diversification of the genus in the northern Andes.

**Keywords:** Andean endemics, Flora of Boyacá, Flora of Colombia, páramo chamaephytes, subpáramo vegetation

## RESUMEN

*Hypericum radicans*, especie enigmática apenas conocida a partir de un ejemplar severamente fragmentado y de procedencia incierta, fue redescubierta recientemente en subpáramos y páramos del departamento de Boyacá. En esta contribución, precisamos y complementamos la descripción original con rasgos diagnósticos críticos, y confirmamos su estatus como especie distinta. Además, discutimos sus afinidades con cuatro especies con forma de vida y características vegetativas y reproductivas simi-

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lares, en particular con caméfitas de páramo y subpáramo con el vástago principal muy corto y ramificado radialmente formando macollas. Se proporciona una clave para la identificación de estas especies, junto con registros fotográficos. Cabe destacar que muchas de las flores y frutos de *H. radicans* presentan cuatro o cinco carpelos, un rasgo inusual entre las especies neotropicales de *Hypericum*, en las que prevalecen tres carpelos. Finalmente, discutimos la evidente simpatria de las especies de *Hypericum* en los ecosistemas de alta montaña de la Cordillera Oriental de Colombia, y argumentamos en contra de especiación simpátrica como un factor clave para la diversificación del género en los Andes del norte.

**Palabras clave:** Caméfitas de páramo, endemismos andinos, Flora de Boyacá, Flora de Colombia, vegetación de subpáramo

## INTRODUCTION

With an estimated number of species between c. 450 and 500 species (Robson 2003, Nürk and Blattner 2010, Vogel Ely *et al.* 2020), *Hypericum* L. is the largest and the most widespread genus of the family Hypericaceae (Malpighiales). The páramos and supápamos of Colombia are primary centers of diversification of the genus worldwide. Out of the 43 native species of *Hypericum* in Colombia, 28 (64 %) are endemic to the country (González 2025), and most of them are restricted to high-Andean, subpáramo and páramo vegetation of the Eastern Cordillera. Most high-montane species from Colombia are upright herbs to multi-stemmed shrubs up to 4 m tall, and are dominant floristic elements in all types and subtypes of páramo and sub-páramo vegetation in this Cordillera (Cleef 1981). By contrast, a group of five species exhibit growth forms as caespitose, prostrate chamaephytes (life-form as defined by Hedberg 1964) forming cushion-like clumps. The *Hypericum* species exhibiting the latter life-form are less dominant components, and they are zonally interspersed and more restricted to certain isolated subpáramo and páramo habitats, primarily peat bogs (Cleef 1981, Kuhry 1988a, b).

While preparing the monograph of *Hypericum* for Flora of Colombia, we have noted that some species restricted to the country remain barely known upon completion of Robson's (1987, 1990, 2012) extensive monographic work on the genus in the Americas. Thus, we have increased fieldwork in the Andes, especially in the páramos and subpápamos of the Eastern Cordillera, as it holds most of the diversity of *Hypericum* species in the country, some of them awaiting to be better documented. One such species, *H. radicans* N. Robson, was described based on a single, severely fragmented specimen of uncertain provenance, collected by the

Argentinian botanist Carlos Saravia Toledo (1932–2021) on April 15th 1964, and housed at the Herbario Nacional Colombiano (COL; Fig. 1). Apart from the annotation “Departamento de Boyacá, alt. 2700 m”, the specimen label provides no further data. Since then, this enigmatic species has not been collected. Thus, its description has remained incomplete and its identity continues to be uncertain.

Two specimens recently collected by the authors (González and Pabón-Mora 4959, COL; Pabón-Mora and González 552, HUA; Fig. 2) in a subpáramo of the municipality of Paipa (Boyacá) (Fig. 3) tentatively matched Robson's (1990) description of *Hypericum radicans*. Thus, we carried out a detailed comparison of these two collections with the type specimen of *H. radicans* (deposited at COL), and came to the conclusion that they correspond to this species. The new collections allowed us: (i) to corroborate that *H. radicans* represents a distinct species; (ii) to amend and complement the description of this species, and pinpoint some of its floral traits that are atypical for the species of *Hypericum* in Colombia; (iii) to report two fully documented localities for the species; (iv) to propose its affinity with a group of caespitose, prostrate chamaephytes forming cushion-like clumps, primarily in the páramos of the Eastern Cordillera of Colombia; and (v) to comment on the hyperdiversity and remarkable sympatry of the genus in the subpápamos and páramos of the department of Boyacá.

## MATERIAL AND METHODS

**Fieldwork.** Extensive fieldwork was carried out to various *Hypericum* hotspots in the Eastern Cordillera of Colombia, especially in the department of Boyacá. In order to optimize collection efforts, each specimen consists of a conventional herbarium sheet as well as leaves, flowers

and fruits fixed in 70 % ethanol, leaf tissue dried in silica gel, and *in vivo* photographs. Conservation assessment criteria followed the IUCN (c2022) guidelines.

**Herbarium work.** Extensive study of herbarium specimens was carried out at COL (Herbario Nacional Colombiano, Universidad Nacional de Colombia, sede Bogotá), and HUA (Herbario Universidad de Antioquia). The following herbaria abroad were also consulted: A and GH (Harvard University), B (Botanical Museum and Botanical Garden of Berlin), BM (Natural History Museum, London), K (Royal Botanical Gardens, Kew), MA (Jardín Botánico de Madrid), NY (The New York Botanical Garden), P (Muséum national d'Histoire naturelle, Paris), S (Naturhistoriska Riksmuseet, Stockholm), and US (US National Herbarium, Smithsonian Institution, Washington). In addition, the Jstor Global Plants database (JSTOR c2017) was consulted.

**Descriptions.** The taxonomic framework for this work follows the extensive monographic contributions by Kunth (1821), Treviranus (1856), Triana and Planchon (1862), Gleason (1929), Gleason and Pierce (1943), Cuatrecasas (1943, 1944, 1959, 1964), and especially Robson (1987, 1990, 2012). Standard morphological terminology follows Hedberg (1964), Stearn (1966), Mora-Osejo and González (1995), Hickey and King (2001), and Robson (2003).

## RESULTS

Here we present an amended description of *Hypericum radicans*, including the newly observed traits that substantially complement Robson's (1990) original description of the species.

***Hypericum radicans*** N. Robson, Bull. Brit. Mus. (Nat. Hist.), Bot. 20: 24. 1990. Type:—COLOMBIA. Boyacá: Without exact locality, 2700 m, 15 Apr 1964 (fl), *C. Saravia 3938* (holotype: COL! [COL00002686]). (Figs. 1, 2, 3e)

Prostrate, profusely branched shrublets, branches radiating from the base above the root and forming dense caespitose clumps to 40 cm in diameter. Stems reddish to brown, 4-lined and rhomboid in transection when young, later terete, each to 20 cm long, internodes 2–4 mm long, cortex exfoliating in strips. Leaves sessile, patent, persistent; blade 9–13.5 × 1.2–1.7 mm, narrowly elliptic, plane, not cucullate or carinate, 1-veined, higher order veins

lacking, densely irregularly punctate-glandular on both sides especially beneath, glands not prominent, glaucous especially beneath, base cuneate, margin hyaline, plane, apex acute. Flowers terminal, solitary, sometimes with two younger, subsidiary flowers subtended by the distalmost pair of leaves. Floral peduncle 1–1.5 mm long. Flowers 6–12 mm in diameter at full anthesis; sepals valvate at its base, narrowly ovate, 4.5–5.5 × 0.9–1.1 mm, the midvein flanked by two pairs of lateral veins, glaucous, densely punctate-glandular on the distal 1/3, margin hyaline, apex acute; petals 8–10 × 2.5–3.5 mm, obovate, apiculus acute, subterminal, short; stamens 30–40, 4–4.5 mm long, loosely grouped into five fascicles opposite to the petals; carpels and styles (3)4 or 5, 2–3.5 mm long; stigmas capitate. Capsules ovoid, 2.2–2.5 × 1–1.2 mm.

**Phenology:** *Hypericum radicans* sets flowers at least in February and April, and fruits in February.

**Distribution, ecology and conservation status:** *Hypericum radicans* is known only from two collections in the Colombian Eastern Cordillera, at elevations between 2700 and 3419 m, in the municipality of Paipa (department of Boyacá). It is expected that the protection of the species inside a Natural Reserve benefits its conservation. By applying IUCN (c2022) criteria B1 (Extent of Occurrence < 100 km<sup>2</sup>) and B2 (Area of Occupancy severely fragmented or low number of locations), and considering the low number of individuals known, *H. radicans* qualifies as Critically Endangered. However, assessing an accurate conservation status of this species will require additional collections and field observations.

**Eponymy:** The epithet of the species refers to its life-form as a caespitose chamaephyte with a massive root above which the extremely short aerial shoots branch radially and profusely (Fig. 2).

**Additional specimens examined:** COLOMBIA. Boyacá. Paipa, carretera hacia Palermo, vereda Los Medios, entrada a la Reserva Natural Ranchería, pasando la Gruta de Santa Rosalía, 5°51'10.58" North, 73°07'15.45" West, 3419 m, 09 Feb 2025 (fl, fr), F. González and N. Pabón 4959 (COL); entrada a la Reserva Natural Ranchería, 09 Feb 2025 (fl), Paipa, carretera a Palermo, vereda Los Medios, Reserva Natural Ranchería, near to la Gruta de Santa Rosalía, 5°52'36.2" North, 73°07'21.3" West, 3144 m, 09 Feb 2025 (fl, fr), N. Pabón and F. González 552 (HUA).

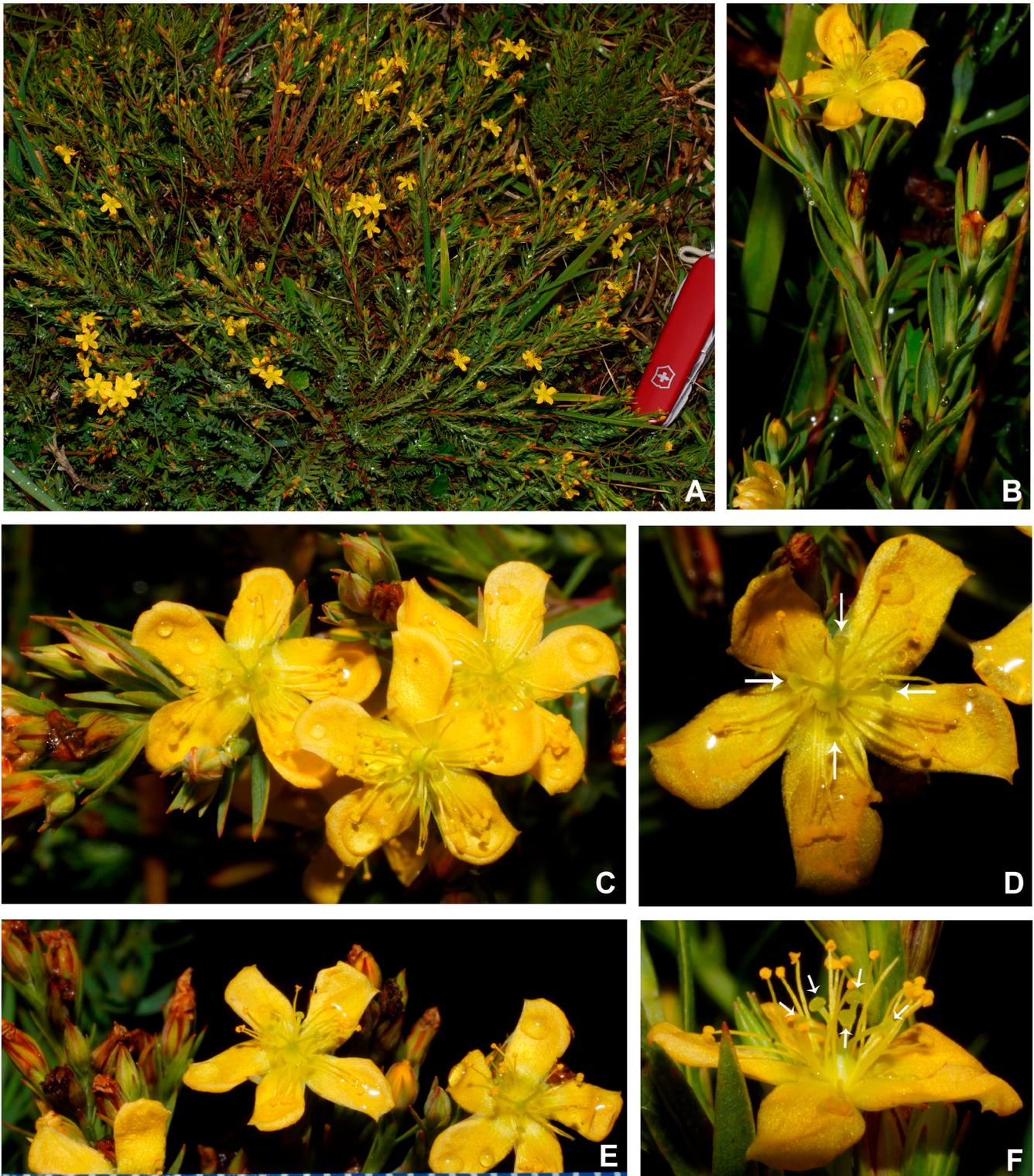


**Figure 1.** *Hypericum radicans* (Saravia 3938). (a) Holotype (COL). (b) Detail of leaves. (c) Detail of flower. Scale bars: 1 cm in a; 2 mm in b, c.

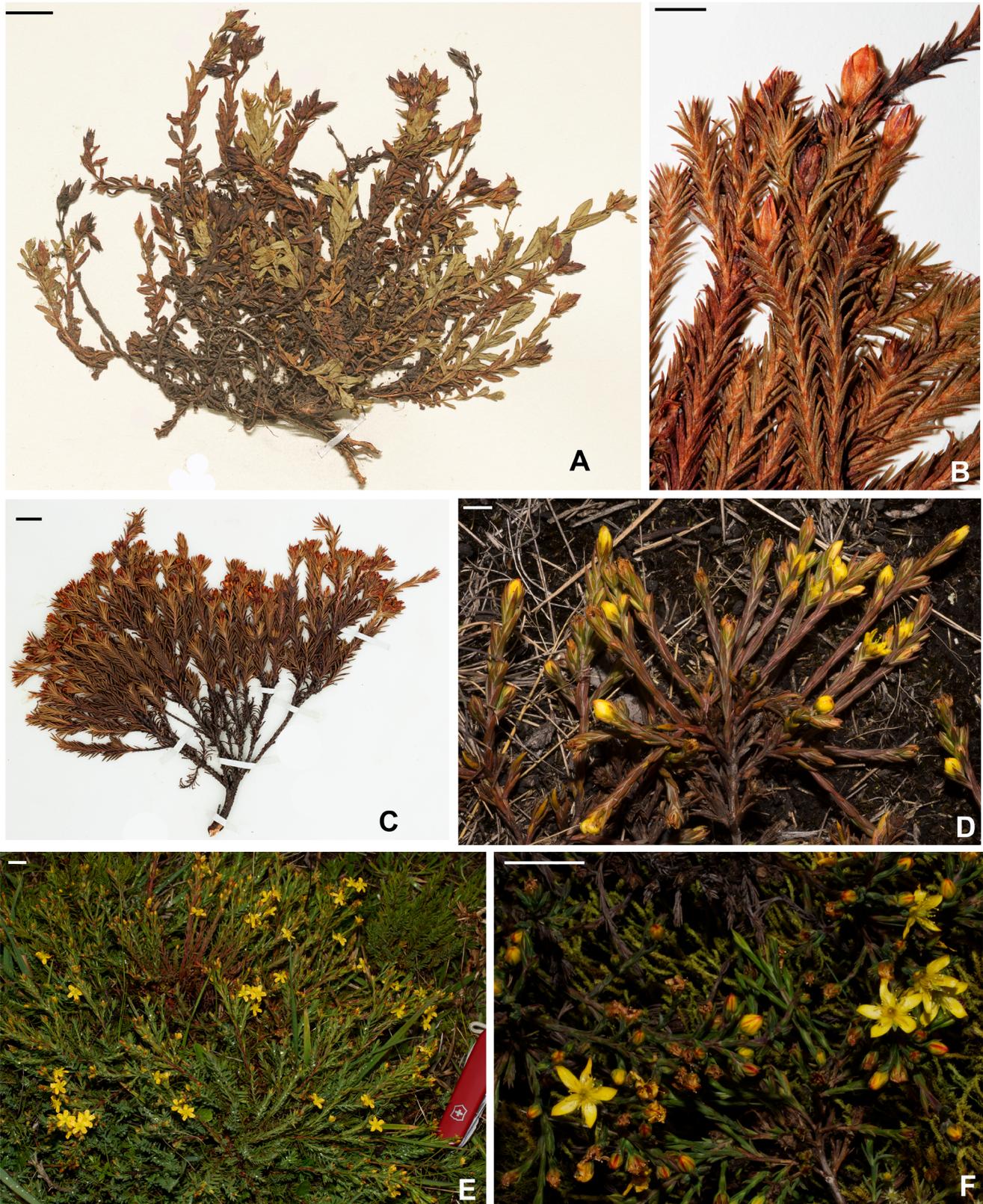
## DISCUSSION

**Affinities of *Hypericum radicans*:** Robson (1990:24) stated that *Hypericum radicans* is closely related to *H. asplundii* N. Robson (“*H. asplundii* affinis, sed habitu humiliori diffusiori graciliori, foliis supra mediam latioribus, floribus minoribus, staminibus circa 2 mm longis, differt”), from Pichincha (Ecuador). This statement was affected by the incompleteness of the original *H. radicans* material (Fig. 1). In contrast, a thorough comparison of our new collections (Fig. 2) reveals a close similarity be-

tween *H. radicans* and four other chamaephytic, caespitose species characterized by a low stamen count (6 to 40) (i.e. *H. bryoides*, *H. horizontale*, *H. prostratum* and *H. selaginella*; Fig. 3), all from subpáramos and páramos of the Colombian Eastern Cordillera (departments of Arauca, Boyacá, Cundinamarca, Meta, Norte de Santander and Santander). In addition, the new gatherings corroborate that *H. radicans* stands as a distinct taxon (see key below), and provide at least two accurate localities for this remarkable species.



**Figure 2.** *Hypericum radicans* (Pabón-Mora and González 552, HUA). (a) Individual plant. (b) Flowering branch. (c) Terminal flower (center) and two subsidiary lateral flowers. (d) Flower, top view; arrows point to four styles. (e) Flowers and forming capsules (left). (f) Flower, lateral view; arrows point to five styles.



**Figure 3.** Shrublet to herbaceous chamaephytes of *Hypericum* in Colombia. (a) *H. brevistylum* (Cuatrecasas 20730, BM). (b) *H. bryoides* (Wood 4504, NY). (c) *H. horizontale* (Killip and Smith 17490, NY). (d) *H. prostratum* (González 4668, COL). (e) *H. radicans* (Pabón-Mora and González 552, HUA). (f) *H. selaginella* (González 4950, COL). Scale bars: 1cm in a, c, e, f; 5 mm in b, d.

**Key to identify the chamaephytic, caespitose species of *Hypericum* from Colombia**

1. Internodes (0.5–) 1–2.5 cm. Leaves loosely arranged, oblong, ovate or elliptic, midvein usually flanked by a pair of basal veins. Inflorescences in terminal, bracteate dichasia (rarely monochasia), with 3–11 flowers each. Colombia (growing as a ruderal herb, paddocks; occasionally, it reaches páramos of the departments of Antioquia, Cundinamarca, Nariño, Risaralda and Valle del Cauca at elevations between 2000 and 3700 m) .....*Hypericum brevistylum* Choisy (Fig. 3a)
  - 1' Internodes <5 mm long. Leaves densely arranged, narrowly ovate to narrowly oblong, 1-veined. Flowers terminal, solitary, the leaves immediately below them not reduced. Restricted to subpáramos and páramos of the Colombian Eastern Cordillera (departments of Arauca, Boyacá, Cundinamarca, Meta, Norte de Santander and Santander), at elevations between 2800 and 4500 m.....2
2. Leaves patent, narrowly elliptic, 9–13.5 × 1.2–1.7 mm. Flowers terminal, solitary, sometimes with two subsidiary, younger flowers subtended by the distalmost leaf pair. Stamens 30–40, 4–4.5 mm long.....*Hypericum radicans* (Figs. 1, 2, 3e)
  - 2' Leaves ascending and tightly appressed to the stems, very narrowly elliptic, 2.5–9 × 0.5–1.2 mm. Flowers terminal, strictly solitary (*i.e.* not accompanied by subsidiary flowers below them). Stamens 7–30, 2–4 mm long.....3
3. Flowers 1–1.2 cm in diameter at full anthesis; sepals 4–6 × 1–1.4 mm; petals 6–7 × 3–3.5 mm.....*Hypericum horizontale* N.Robson (Fig. 3c)
  - 3' Flowers 5–9 mm in diameter at full anthesis; sepals 2.5–4.5 × 0.8–1.4 mm; petals 3.5–6 × 1.5–2.8 mm.....4
4. Stamens 20–30. Stigmas subcapitate. Capsule ellipsoid, 4–4.5 × 3–3.4 mm.....*Hypericum bryoides* Gleason (Fig. 3b)
  - 4' Stamens 7–20. Stigmas capitate. Capsule subglobose, 2.5–3.2 × 2–3 mm.....5
5. Leaves 3–5 mm long. Sepals 4 or 5, 2.5–3.5 mm long; petals often 5, occasionally 4 or 6; stamens 7–10, 2.5–3 mm long.....*Hypericum prostratum* Cuatrec. (Fig. 3d)

5' Leaves 5–8 mm long. Sepals always 5, 3.5–4.3 mm long; petals always 5; stamens 10–20, 3–4 mm long. ....*Hypericum selaginella* N.Robson (Fig. 3f).

**Sympatry of *Hypericum radicans* and seven congeneric species of páramos and subpáramos in central Boyacá**

The northern Andes are major centers of diversification of *Hypericum* worldwide (Robson 1987, 1990, Nürk and Blattner 2010). In Colombia, 28 (64 %) out of the 43 native species of the genus are endemic to the country (González, 2025), and most of them are restricted to high-Andean, subpáramo and páramo vegetation of the Eastern Cordillera (Mora-Osejo and González 1995). The number of species dramatically decreases in the Central and the Western cordilleras. Notably, 25 species (*H. bryoides*, *H. cardonae* Cuatrec., *H. chamaemyrtus* Triana and Planch., *H. cuatrecasii* Gleason, *H. cymobrachys* N.Robson, *H. garciae* Pierce, *H. gleasonii* N.Robson, *H. horizontale*, *H. humboldtianum* Steud., *H. juniperinum* Kunth, *H. lancifolium* Gleason, *H. lancioides* Cuatrec., *H. laricifolium* Juss., *H. magniflorum* Cuatrec., *H. mexicanum* L., *H. papillosum* N.Robson, *H. prostratum*, *H. radicans*, *H. ruscooides* Cuatrec., *H. sabinaeforme* Trevir., *H. selaginella*, *H. strictum* Kunth, *H. tetrastichum* Cuatrec., *H. thesiifolium* Kunth and *H. thuyoides* Kunth) converge in high-montane thickets, subpáramos and páramos of the northern range of the Eastern Cordillera. Three of them (*H. cymobrachys*, *H. radicans* and *H. sabinaeforme*) are restricted to the páramos and subpáramos of Chita, Cocuy, Güina, Pisba and Siscunsi, as well as high-Andean thickets of the Chicamocha river (Department of Boyacá). Locally, up to seven species can co-occur in areas as small as 100 m<sup>2</sup>. This is the case for *H. radicans*, which grows, nearly side by side, with *H. cardonae*, *H. laricifolium*, *H. selaginella* and *H. thuyoides* in one locality (Fig. 4a, b), and with *H. juniperinum*, *H. mexicanum*, *H. strictum* and *H. thuyoides* in a second locality nearby (Fig. 4c). In the most comprehensive phylogenetic analysis of Andean *Hypericum* (Nürk et al., 2018; excluding *H. radicans*, which was not sampled), these species appear scattered and not closely related within the “core páramo” clade. This remarkable case of geographical and ecological convergence underscores the need for further studies to test whether ancient allopatric speciation within the “core páramo” clade of *Hypericum* was followed by more recent secondary sympatry in the high Andean ecosystems of Colombia.



**Figure 4.** Seven sympatric species of *Hypericum* in the two localities of *H. radicans* newly reported here. a, b. Four species growing in an approximately 100 m<sup>2</sup> area at the *H. radicans* locality 5°52'36.2"N, 73°07'21.3"W, 3144 m: (a) *H. laricifolium* (1), *H. thuyoides* (2), and *H. selaginella* (3). (b) *H. cardonae*. (c) Four species growing in an approximately 100 m<sup>2</sup> area at the *H. radicans* locality 5°51'10.58"N, 73°07'15.45"W, 3419 m: *H. strictum* (4), *H. mexicanum* (5), *H. laricifolium* (6) and *H. juniperinum* (7).

## AUTHOR CONTRIBUTIONS

FG and NPM equally contributed with the planning of this research, the field and herbarium work, the interpretation of results, and the writing of the manuscript.

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## CONFLICT OF INTEREST

The authors declare no competing interests that are relevant to the content of this article.

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