A New Species of *Peperomia* (Piperaceae) from the Cauca Valley, Colombia

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ABSTRACT. A new species of *Peperomia* Ruiz & Pav., *P. rivulamans* Silverst. (Piperacaeae), is described from the Cauca Valley, Colombia. The new species is saxicolous and inhabits forested creek banks. It differs from all other known peltate-leaved species of *Peperomia* in the following combination of characters: rhizome creeping, with internodes very short (less than 1 cm); petioles very long (to 22 cm); leaves ovate, white on abaxial surface; inflorescences simple (not paniculate) and axillary; floral bracts mucronate, butterfly-shaped, imbricate at their corners, forming a roof above the fertile rachis, with openings for the ovary and anthers, each opening surrounded by four bracts; ovary turbinate, stigma bifid, apical; and fruits sessile, subclavate, not rostrate. Based on its morphology, the new species is placed in *Peperomia* subg. *Tildenia* Miq., but a published study of chloroplast DNA has shown that subgenus *Tildenia* is polyphyletic.

RESUMEN. Una nueva especie de *Peperomia* Ruiz & Pav., *P. rivulamans* Silverst. (Piperaceae), se describe del valle geográfico del río Cauca, Colombia. Es saxícola, y se encuentra en bosque en las orillas de quebradas. Difiere de todas las otras especies conocidas de *Peperomia* que presentan hojas peltadas en la siguiente combinación de caracteres: rizoma rastrero, con entrenudos muy cortos (menos de 1 cm); pecíolos muy largos (hasta 22 cm); hojas ovadas, blancas en la superficie abaxial; inflorescencias simples (no paniculadas) y axilares; brácteas florales mucronadas, de forma de mariposa, traslapándose en sus ángulos, formando un techo sobre el raquis fértil, con aberturas para el ovario y las anteras, cada abertura rodeada por cuatro brácteas; ovario turbinado, estigma bífido, apical; y frutos sésiles, subclavados, no rostrados. Con base en su morfología, la nueva especie se coloca en *Peperomia* subg. *Tildenia* Miq., pero un estudio publicado de DNA de cloroplasto ha mostrado que el subgénero *Tildenia* es polifilética.

Key words: Cauca Valley, Colombia, IUCN Red List, *Peperomia*, Piperaceae.

Peperomia Ruiz & Pav. (Piperaceae) is one of the largest genera of angiosperms; Mathieu (2008) recognized 1613 species, of which 245 are known from Colombia. Many parts of Colombia (particularly the Pacific coastal region, which has a very high biodiversity) are not well known botanically, and many undescribed species of *Peperomia* are likely to occur there. Even regions such as the Cauca Valley, which has lower biodiversity than the Pacific region and has lost most of its forests, still harbor undescribed species of *Peperomia*. During fieldwork for the catalog of the remnant flora of the Cauca Valley, an undescribed species of *Peperomia* was encountered at the extreme northern end of the valley.

Peperomia rivulamans Silverst., sp. nov. TYPE: Colombia. Risaralda: Mpio. Pereira, Hacienda Alejandría, Km 7 Cerritos–La Virginia rd., N end of Cauca Valley, ca. 4°51′31″N, 75°52′55″W, ca. 950 m, 13 Oct. 2008, *P. A. Silverstone-Sopkin*, *H. Sanint* & *M. E. Cardona 10856* (holotype, CUVC 42381; isotype, COL). Figure 1.

Haec species ab omnibus aliis speciebus *Peperomiae* Ruiz & Pav. quae folia peltata habent rhizomatibus repentibus, internodiis multo brevioribus, petiolis longioribus, foliis ovatis abaxialiter albis, inflorescentiis simplicibus axillaribus, bracteis florum mucronatis papilioniformibus ad angulos imbricatis supra rhachim fertilem tectum quod super ovaria et antheras apertum est producentibus, ovario turbinato, stigmate bifido apicali, fructibus sessilibus subclavatis non rostratis distinguitur.

Saxicolous herb; rhizomes exposed, repent, glabrous, producing roots along entire lower surface, rhizome internodes < 1 cm. Leaves alternate, peltate; petioles 6.2–22 cm, inserted 1.5–2.4 cm from leaf base, glabrous, succulent, in life very pale whitish pink or mottled red-violet; blades 6–11.8 × 3.7–7.5 cm, subcoriaceous, in life adaxial surface green (sometimes with white veins), abaxial surface white, glabrous, ovate, base rounded, apex shallowly acuminate, tip obtuse to acute, margin entire, 7(or 8) major veins radiating from petiole insertion, with

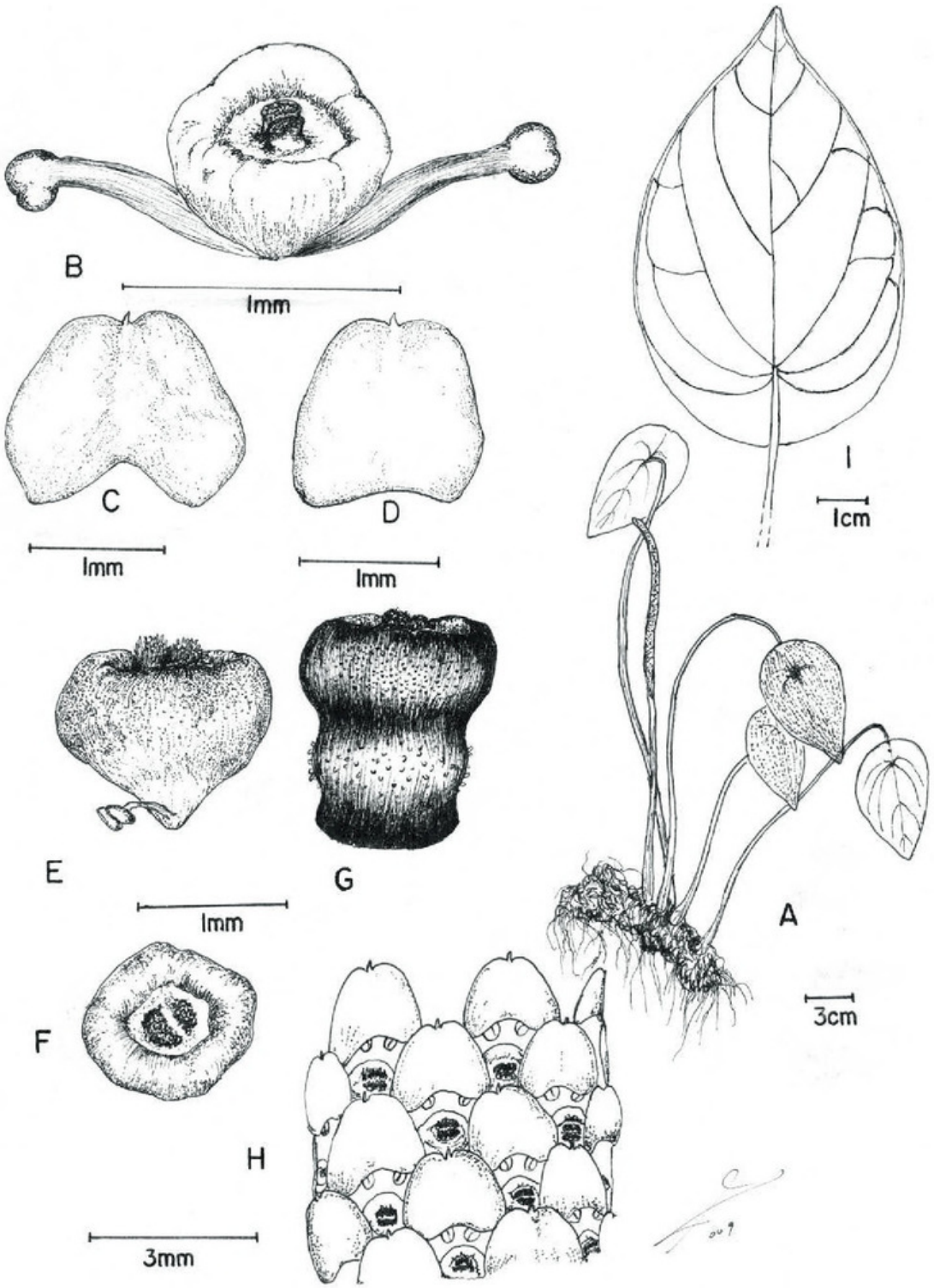

Figure 1. *Peperomia rivulamans* Silverst. —A. Fertile habit. —B. Flower in male stage. —C, D. Floral bracts, showing variation between inflorescences. —E. Flower in female stage, lateral view. —F. Flower in female stage, apical view. —G. Mature fruit. —H. Portion of inflorescence. —I. Leaf, abaxial view. A drawn from the paratype, *Silverstone-Sopkin et al. 10444* (CUVC); B, D from *D. Gamba s.n.* (inflorescence in alcohol only, 27 Feb. 2009, CUVC, not designated as paratype); C, E–I from the holotype, *Silverstone-Sopkin et al. 10856* (CUVC). All floral parts drawn from material in alcohol.

black (in dried material) punctate glands (most prominent in perimarginal zone of adaxial surface). Inflorescences produced in axils of new leaves, solitary, unbranched; peduncle 4–9.5 cm, glabrous, in life pink; rachis 5.4–13.7 × 0.5–0.6 cm; floral bracts in life greenish white, ca. 1.5 × 1.7 mm, glabrous, peltate, papilioniform (butterfly-shaped) but basal sinus sometimes shallow, apex emarginate and mucronate, overlapping at corners (2 anterior corners overlap above 2 adjacent distal bracts, 2 posterior

corners are overlapped by anterior corners of 2 adjacent proximal bracts), forming a roof over the fertile rachis, leaving openings that provide access to flowers, each opening surrounded by 4 adjacent bracts, in each opening 1 ovary and 2 anthers are exposed (these anthers are not from the same flower as the visible ovary, but from 2 adjacent distal flowers). Flowers adnate to distal side of stalk of floral bracts, protandrous, stamens 2, filaments well-developed, at male stage extended laterally, at female stage withdrawn to base of ovary, anthers ca. 0.3 × 0.2 mm; ovary turbinate, apex flattened and surrounded by raised rim, at male stage ca. 0.7 × 1 mm, at female stage ca. 1 × 1 mm (width at apex), stigma distinctly bifid, fimbriate, apical. Fruits ca. 1.5 × 1.2 mm, dark brown in alcohol (much darker than ovaries), sessile, subclavate, apex flattened (not rostrate) and surrounded by raised rim, constricted below apex, swollen at midlevel and bearing numerous tiny subulate glands, constricted again at base.

Note. At the Hacienda Riobamba, where one of the paratypes was collected, some individuals had white veins on the adaxial surface of the leaves; other syntopic individuals lacked white veins on the adaxial surface. At the type locality, all individuals had the adaxial surface of the leaves completely green. In both populations, the abaxial surface of all leaves was white.

Distribution, habitat, and ecology. *Peperomia rivulamans* is known from only two localities, at the northern end of the Cauca Valley. Its specialized habitat restricts its potential distribution. It probably occurred formerly in suitable habitats in other parts of the Cauca Valley and the adjacent piedmont, but most of this region has been deforested; only small fragments of forest remain, and most of these do not contain a stream. The type locality is a gallery forest surrounded by low hills covered with cattle pasture. This is not a true gallery forest; the entire region was covered with forest before 1915, and this forest was spared because the steep banks were not suitable for cattle (Hilda Sanint, pers. comm.). Through this forest passes the Quebrada Alejandría, a shallow, slow-flowing creek with many large rocks. *Peperomia rivulamans* is found at several sites in this forest, creeping over large rocks adjacent to the creek. *Dicranopygium callithrix* Silverst. (Cyclanthaceae) and a fern, *Thelypteris angustifolia* (Willd.) Proctor (Thelypteridaceae), are abundant in and adjacent to this creek. The vegetation here belongs to the tropical dry forest formation (Holdridge, 1967), but the microclimate within the gallery forest allows the presence of some plants typical of more humid formations, such as the tree fern *Cyathea pungens* (Willd.) Domin (Cyatheaceae) and *Blakea rosea* (Ruiz & Pav.) D. Don (Melastomataceae). The habitat of the paratype from the Hacienda Riobamba also is the bank of a shallow creek within tropical dry forest.

IUCN Red List category. *Peperomia rivulamans* is evaluated here as Critically Endangered (CR B2; D) according to IUCN Red List criteria (IUCN, 2001). Fewer than 30 individuals were seen at the two known localities; all plants were within 1.5 m from the edge of the creek.

Phenology. *Peperomia rivulamans* has been found with flowers in February and September, and with flowers and fruits in October.

Etymology. The specific epithet refers to the habitat (brooklet-loving).

Discussion. Dahlstedt (1900) divided the genus *Peperomia* into nine subgenera. Most of these subgenera were based on the morphology of the fruits, but *Peperomia* subg. *Tildenia* Miq. included the species with peltate leaves. Trelease and Yuncker (1950), in their revision of the Piperaceae of northern South America, did not mention Dahlstedt's subgenera, but their primary key to *Peperomia* separates the species into eight groups, some of which correspond to some of Dahlstedt's subgenera. Their group VII includes the species with peltate leaves; this group includes part of Dahlstedt's subgenus *Tildenia*.

Based solely on morphology, *Peperomia rivulamans* would be placed in subgenus *Tildenia* (group VII of Trelease & Yuncker, 1950) because of its peltate leaves. Wanke et al. (2006), however, found that subgenus *Tildenia* is polyphyletic. They compared the *trnK/matK* region of chloroplast DNA of 48 species of *Peperomia* from eight of Dahlstedt's nine subgenera. Their results indicated that only one of the subgenera (*Micropiper* Dahlst.) is monophyletic. The species of subgenus *Tildenia* that were studied fall into three different clades (designated as C, E, and G). As there is no information available on the DNA of *P. rivulamans*, it is not possible to assign this species to any of Wanke's clades.

Morphologically, *Peperomia rivulamans* differs from most of the described peltate-leaved species of *Peperomia* in its combination of creeping habit, very short internodes (< 1 cm long), glabrous leaves with a white abaxial surface, unbranched inflorescence, and subclavate nonrostrate fruit with an apical bifid stigma. It resembles *P. lanceolatopeltata* C. DC., which has short internodes and similarly shaped leaves, but the latter differs in having the petiole insertion closer to the basal margin of the blade (0.5 cm vs. 1.5–2.4 cm in *P. rivulamans*), leaves villous

on both sides (vs. glabrous), and fruits globose-ovoid with a suboblique apex and slightly subapical stigma (vs. subclavate fruits with a flattened apex surrounded by a raised rim, and apical stigma). *Peperomia rivulamans* also resembles *P. villibacca* Yunck., which has a creeping habit, very short internodes, glabrous leaves that are white on the abaxial surface, and an apical stigma. *Peperomia villibacca* differs from *P. rivulamans* in having shorter petioles (< 10 cm long vs. 6.2–22 cm in *P. rivulamans*), a rounded leaf apex (vs. shallowly acuminate), shorter inflorescences (4–5 cm vs. 5.4–13.7 cm), circular floral bracts (vs. papilioniform), and white-villous fruits (vs. glabrous fruits).

Paratypes. COLOMBIA. **Risaralda:** Mpio. Pereira, Hac. Alejandría, Km 7 Cerritos–La Virginia rd., northern end of Cauca Valley, ca. 4°51′31″N, 75°52′55″W, ca. 950 m, 17 Oct. 2005, *P. A. Silverstone-Sopkin, H. Sanint & M. E. Cardona 10444* (CUVC, HUA). **Valle del Cauca:** Mpio. La Victoria, Hac. Riobamba, base of piedmont of western slope of Cordillera Central, 4°26′24″N, 75°54′01″W, 1082 m, 15 Sep. 2010, *P. A. Silverstone-Sopkin, G. A. Reina-Rodríguez & M. E. Cardona 11179* (CUVC).

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