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Miconia rheophytica (Melastomataceae: Miconieae), a new and endangered species from the Magdalena Medio region of Colombia

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Abstract

Miconia rheophytica is described, illustrated, and compared with presumed relatives in the Octopleura clade. It is distinguished by its narrowly elliptic to ovate-lanceolate leaf blades with entire to subentire margins that have evenly spaced spreading smooth eglandular trichomes 0.8–1.4 mm long, an indumentum of dendritic trichomes with short axes and terete radiating arms on distal internodes, adaxial petiole surfaces, and primary and secondary veins on abaxial leaf surfaces, unribbed hypanthia that are constricted and tapered distally below the torus and covered with a mixture of basally roughened trichomes and dendritic trichomes with short axes, anthers with two ± truncate apical pores, eglandular anther appendages, 3-locular ovary, and berries that are bright blue at maturity. It is known only from flash-flooded riverbanks in three river canyons in the Magdalena Medio region of Antioquia, Colombia. A conservation assessment of “Endangered” is recommended for this species based on IUCN Red List Categories and Criteria.

Resumen

En el presente artículo se describe e ilustra *Miconia rheophytica* y se compara con las potenciales especies cercanas dentro del clado Octopleura. *M. rheophytica* se distingue por sus hojas con láminas estrechamente elípticas a ovado-lanceoladas y margen entero a sub-entero, presencia de tricomas de tipo sencillo no glandulares (0.8–1.4 mm de largo) los cuales se encuentran uniformemente distribuidos en el margen; los entrenudos distales, la superficie adaxial de los peciolo y las venas principales (envés de la lámina) se caracterizan por la presencia de tricomas dendríticos con ejes cortos y brazos teretes; el hipanto presenta una constricción distal conspicua debajo del torus y una mezcla de tricomas rugosos y dendríticos con ejes cortos; las anteras presentan dos poros apicales más o menos truncados y apéndices eglandulares; el ovario es 3-locular y las bayas de color azul brillante en la madurez. Esta especie solo se conoce de riberas fluviales inundadas en tres cañones en la región del Magdalena Medio de Antioquia, Colombia. Se sugiere una clasificación de conservación de “En Peligro” para esta especie con base en las Categorías y Criterios de la Lista Roja de la UICN.

Key words: Andes, rheophyte, endangered species, neotropics, Octopleura clade

Introduction

With more than 990 species, Colombia is a major center of diversity for neotropical Melastomataceae (Almeda *et al.* 2016). In terms of species numbers, Colombia is surpassed only by Brazil which has 1367+ species of melastomes (BFG 2015). However, the number of species for Colombia is tentative and approximate at best because botanical exploration is expected to increase in areas where armed conflict has impeded access in the past. To be sure, new species from both countries will continue to be described with regularity each year.

Miconia Ruiz & Pavón (1794: 60), the largest genus of Melastomataceae and one of the largest exclusively Neotropical genera of angiosperms, is represented in Colombia by some 384 species (Almeda *et al.* 2016). In their recently published monograph using morphological and molecular data sets, Gamba & Almeda (2014) recognized the

Octopleura group of 33 species as a nested clade within *Miconia*. This accords with the recent proposal to unite all neotropical genera of Melastomataceae with fleshy baccate fruits, small to medium-sized flowers, and multiflowered inflorescences into a monogeneric Miconieae (Michelangeli *et al.* 2016). The Octopleura clade of *Miconia* is a natural assemblage of species distributed from southern Mexico, Central America, and the West Indies (Jamaica and Hispaniola), the Andes of Venezuela and Colombia south to Peru, and the adjacent state of Acre in Brazil.

The Octopleura clade is characterized by the combination of diplostemonous flowers with isomorphic stamens that release pollen through one or two dorsally inclined apical pores, anther connectives prolonged into deflexed dorso-basal commonly gland-edged appendages, and petals that are typically reflexed at anthesis (Gamba & Almeda 2014). We here describe another new species of *Miconia* in the Octopleura clade from the Magdalena Medio area of Colombia where it appears to be restricted to river margins with calcareous rocks. This rheophytic habitat has not been previously documented for any other member of this clade. It makes this species especially vulnerable to the hydroelectric projects that are being planned for the region where it appears to be endemic.

Materials and Methods

Analysis of gross morphological characters was based on dried and spirit preserved material of the type collection together with six other collections from near the type locality housed at HUA and JAUM. Measurements of vegetative parts and the inflorescence were taken with an Electronic Digital Caliper with 0.1 mm precision. Measurements of floral parts, fruits, and seeds are based on fresh material that was preserved in 70% ethanol in the field when the type specimen was collected. Other measurements of fresh material were made with scale photography in the Fiji program (Schindelin *et al.* 2012). For trichome morphology, we followed the descriptive terminology in Wurdack's (1986) atlas of melastome hairs. Descriptive terminology for seeds is adapted from Ocampo & Almeda (2013). The distribution map was constructed in Quantum GIS using coordinates obtained from specimen labels. The conservation status was assessed using georeferenced data from available collections using IUCN guidelines and criteria (IUCN 2017). The online geospatial conservation assessment tool (GeoCat) was used to calculate extent of occurrence (EOO) and area of occupancy (AOO) with a user-defined cell width of 2 km (Bachman *et al.* 2011).

Miconia rheophytica Posada-Herrera & Almeda, **sp. nov.** (Figs. 1 & 2)

Type:—COLOMBIA. Antioquia: Municipio de San Luis, río Samaná Norte, 2 km abajo del puente de la carretera Medellín–Bogotá. 6° 0' 59.19"N, 75° 55' 51.04"W, 430 m, 18 diciembre 2016 (fl, fr), *S. E. Hoyos-Gómez 3105* (holotype: HUA!). Figs. 1, 2.

Diagnosis: Unusual and unique among species of the Octopleura clade in being rheophytic and in having a combination of narrowly elliptic to ovate-lanceolate leaf blades with entire to subentire margins that have evenly spaced spreading smooth eglandular trichomes 0.8–1.4 mm long, unribbed hypanthia covered with a mixture of basally roughened trichomes and dendritic trichomes with short axes, anthers with two \pm truncate apical pores, eglandular anther appendages, 3-locular ovary, and berries that are bright blue at maturity.

Shrub 0.6–1.5 m tall with open and lax branching. Distal *internodes* rounded-quadrate, nodal line absent. *Indumentum* on distal internodes, adaxial surfaces of petioles, and primary and secondary elevated veins on abaxial foliar surfaces consisting of a moderate to dense cover of brown dendritic trichomes with short axes and terete radiating arms. *Leaves* of a pair somewhat anisophyllous; petioles 0.3–1.8 cm long, deeply canaliculate adaxially but this is often obscured by indumentum; blades 5.2–9.4 \times 1–1.8 cm, narrowly elliptic to ovate-lanceolate, the base rounded to obtuse, the apex acuminate to attenuate, the margin essentially entire or vaguely subentire with evenly spaced spreading smooth eglandular trichomes 0.8–1.4 mm long, papyraceous when dry; adaxial surface of mature blade glabrous, abaxial surface essentially glabrous but commonly with dendritic trichomes with short axes persisting to varying degrees along contact points of primary and secondary veins with blade surface and at the point where these veins diverge from one another at the blade base, 3–5-plinerved including the tenuous marginal veins with the innermost pair of secondary veins diverging from the midvein above the blade base. *Inflorescences* axillary in short dichasia 0.6–1 cm long with 2–3 flowers or dichasia sessile to subsessile in leaf axils; bracts and bracteoles 0.5–0.7 \times 0.2–0.3 mm, triangular-subulate, light green or pale red, glabrous, persistent in fruit. *Flowers* 5-merous on pedicels 3.4–4.3 mm long with dendritic trichomes like those on the petioles and distal internodes but less dense. *Hypanthia* 3–3.4 \times 1.4–1.7 mm, campanulate and unribbed but somewhat constricted and tapered distally below the torus into a neck-like distension 1.8–2 mm long, densely covered with a mixture of reddish-purple elongate somewhat

spreading trichomes 0.3–0.5 mm long with roughened bases and dendritic trichomes with short axes. *Calyx* open in bud and persistent in fruit, greenish-yellow, adaxially glabrous, abaxially nearly glabrous or with indumentum like the hypanthium but much sparser, lobes 1.2–1.3 mm, depressed-triangular, the margin entire, the apex bluntly acute; exterior calyx teeth 1.4×1.3 mm, bluntly conic-triangular and tipped with a smooth trichome that slightly exceeds the lobes. *Petals* 1.2–1.3 \times 1.6–1.8 mm, obovate, the margin entire, the apex rounded-truncate, white, densely papillose on both surfaces, reflexed at anthesis. *Stamens* 10, isomorphic, erect and closely encircling the style at anthesis; filaments 1.6–1.8 \times 1.2 mm, white but yellow distally, glabrous; anther thecae 1.5 \times 0.5 mm, linear-oblong, opening by two \pm truncate apical pores, yellow; connective yellow, prolonged dorso-basally into a blunt deflexed eglandular appendage 0.3 mm long. *Ovary* 3 \times 3 mm long at anthesis, 3-locular with axile placentation, completely inferior; style 5.3 mm long, 0.7 mm wide at the middle, terete and tapering to 0.5 mm distally, white, glabrous; stigma rounded-truncate, 0.66 mm wide and somewhat expanded when receptive. *Berries* with enveloping hypanthia 3.4–4.2 \times 3.4–5 mm, \pm globose to subglobose, reddish-purple when immature turning bright indigo blue when mature, the indumentum of mature hypanthia persistent but scattered and inconspicuous. *Seeds* 0.75–0.77 \times 0.4–0.45 mm, ovoid, lateral and antiraphal symmetrical planes elliptic to elliptic-ovate, the highest point toward the chalazal side; raphal zone oblong, extending the entire length of the seed and expanded along its entire length on all sides into a well-developed skirt-like angled appendage that exceeds the corpus of the seed and collapses when dry.

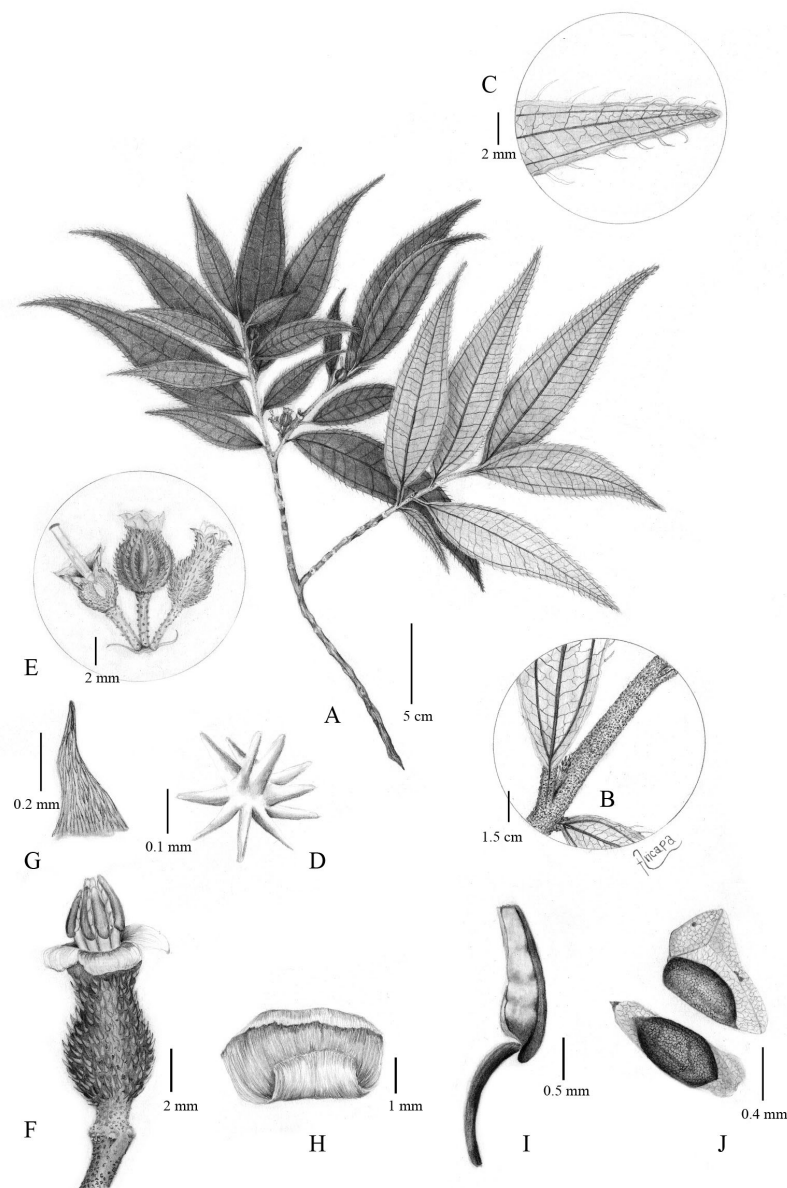


FIGURE 1. A. Habit. B. Cauline node and internode enlargement. C. Leaf apex, showing evenly spaced smooth marginal trichomes. D. Dendritic trichome with terete radiating arms. E. Simple axillary dichasium. F. Flower at anthesis (profile view). G. Elongated trichome with roughened base. H. Petal, showing reflexed posture. I. Stamen (profile view). J. Seeds, dorsal view (lower) and profile view (upper). All drawn from the holotype.



FIGURE 2. Images of *Miconia rheophytica*. A. Habit with immature and mature berries. B. Flower and immature berries. C. Flower (at anthesis) and flower bud. D. Berry at maturity. Image credits: A, C, Rodrigo Bernal; B, D, Saúl E. Hoyos-Gómez.

Phenology:—This species has been collected in flower in March, June, July, November, and December; fruiting material has been collected in March, June, July, September, November, and December. It seems possible that it may flower and fruit most months of the year.

Distribution and habitat:—*Miconia rheophytica* appears to be largely restricted to the Magdalena Medio region of Colombia where it is known only from the Department of Antioquia (Fig. 3). It grows along rocky banks of Río Nechí, and in the Río Samaná Norte and Río Claro river canyons in the municipalities of Anorí and San Luis at elevations of 110–600 m.

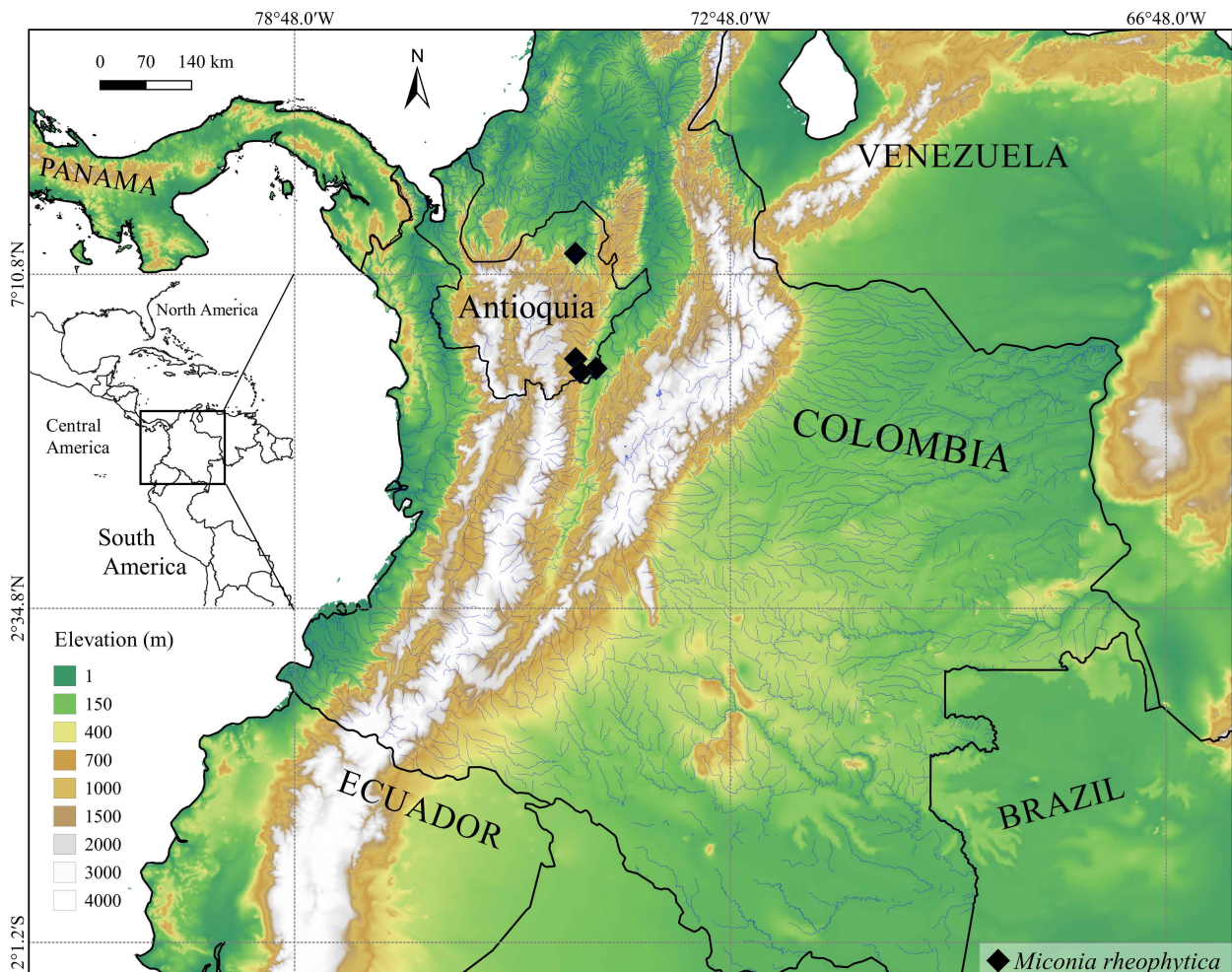


FIGURE 3. Geographic distribution of *Miconia rheophytica*.

Conservation status:—This species is known to us from the type and eight other collections. The type and one of the paratypes were recently collected in the river canyon of Samaná Norte. Two collections were made in the municipio of Anorí and the other four come from the river canyon of Río Claro. Collections from Río Claro may be afforded some protection in Reserva Natural Cañón de Río Claro, a private conservation area covering some 500 hectares. The other collections come from areas that have no official protected status. The Samaná Norte river canyon is the type locality of *Miconia rheophytica*. This region has recently attracted the attention of scientists and conservationists. The rheophytic plants that grow along this river are under threat because a dam for a hydroelectric plant is planned to flood a large tract of the Samaná Norte river. Plans for this dam are already in progress and a license has been granted to the interested firm by the Colombian Environmental Licensing Agency (ANLA) based on an environmental impact study (Hoyos-Gómez & Bernal 2018). The EOO is 12,900 km² and the AOO is 16 km². Because of its limited AOO, fragmented population structure in isolated river canyons, and the threat that rheophytic plants in these canyons face from massive flooding for dam construction, we recommend a conservation classification of Endangered (EN): B2ab(iii).

Discussion:—*Miconia rheophytica* is readily distinguished from all other members of the Octopleura clade by its rheophytic habitat preference, narrowly elliptic to ovate-lanceolate leaf blades with entire to subentire margins that

have evenly spaced spreading smooth eglandular trichomes 0.8–1.4 mm long, indumentum of dendritic trichomes with short axes and terete radiating arms on distal internodes, adaxial petiole surfaces, and primary and secondary veins on abaxial leaf surfaces, unribbed hypanthia that are constricted and tapered distally below the torus and covered with a mixture of basally roughened trichomes and dendritic trichomes with short axes, eglandular anther appendages, 3-locular ovary, and berries that are bright blue at maturity. By virtue of having moderately anisophyllous leaf blades at each node, papillose petals, and seeds with raphal margins that are expanded on all sides into well-developed fleshy appendages, *M. rheophytica* can confidently be assigned to the Quinquenervia subclade within the Octopleura clade (Gamba & Almeda 2014). Of the seven species presently included in this subclade, *M. rheophytica* appears to be closest to *M. atropurpurea* Gamba & Almeda (2014: 57), *M. neocoronata* Gamba & Almeda (2014: 95), and *M. reitziana* (Cogn. & Gleason ex Gleason 1939: 115) Gamba & Almeda (2014: 117). All three of these species differ consistently from *M. rheophytica* in having anthers with one dorsally inclined apical pore, 5-locular ovaries, and bluntly 10-ribbed hypanthia.

Among these three close relatives, only *M. atropurpurea* has mature berries that are bright blue like *M. rheophytica* but it otherwise differs consistently in having elliptic to elliptic-ovate leaves that are wider (5–7 cm) and typically flushed red-purple abaxially, and hypanthia with persistent spreading smooth trichomes 1–1.3 mm long. Both *M. neocoronata* and *M. reitziana* differ from *M. rheophytica* in having berries that are blue-black at maturity. The former has ovate to elliptic-ovate leaves that are also wider (5–9.5 cm). The latter also has ovate to elliptic-ovate leaves that are much wider (7.8–11 cm) and its hypanthia are covered with spreading persistent elongate smooth trichomes 0.9–1.2 mm long that are intermixed with resinous slightly furrowed more or less stalked glands ca. 0.05 mm long. For additional descriptive and distributional information for these species see Gamba & Almeda (2014).

Etymology:—The specific epithet is derived from the word rheophyte, a plant that grows along margins of fast moving river currents with frequent flooding. This is an environment that is particularly harsh for many organisms.

Additional specimens examined:—COLOMBIA. Antioquia: Municipio de San Luis, Cañón del Río Claro, sector sur-oriental 5° 53' N, 74° 39' W, 350–400 m, 30 marzo 1984 (fl, fr), *A. Cogollo 1499* (HUA!, JAUM!); Municipio de San Luis, 600 m, 12 septiembre 1982 (fr), *E. Rentería & A. Cogollo 2628* (JAUM!); Municipio de Anorí, vía Dos Bocas-Providencia, de Toná-Liberia a lo largo del río Nechí 7° 28' N, 74° 56' W, 110–280 m, 11 julio 1987 (fl), *R. Callejas, J. Betancur & F. J. Roldán 4538* (HUA!); Municipio de San Luis, Cañón del Río Claro, 5° 49' 59.76" N, 74° 52' 00.04" W, 435 m, 4 noviembre 2006 (fl, fr), *H. David, F. Giraldo, A. Patiño & Estudiantes de Ecología Tropical 1423* (HUA!); Municipio de Anorí, corregimiento de Charcón, 500 m, 8 junio 1971 (fl, fr), *D. D. Soejarto 1971* (HUA!); Municipio de San Luis, Parque Ecológico Cañón del Río Claro, sector sur, orilla del río, margen izquierda, 325 m, 10 julio 1983 (fr), *A. Cogollo & R. Borja 548* (HUA!). Municipio de San Luis, río Samaná Norte, margen derecha, 360 m, 18 diciembre 2016 (fl, fr), *S. E. Hoyos-Gómez et al. 3118* (HUA!).

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