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RESEARCH ARTICLE

Synopsis of *Maracanthus* (Loranthaceae) and description of *M. kuijtii,* a new species from the Eastern Andes of Colombia

Jhon S. Murillo-Serna[1,*], Isabel Carmona-Gallego[1,2,*], Francisco J. Roldán[1], Julio A. Sierra-Giraldo[3,4], Fernando Alzate-Guarín[1]

1 Grupo de Estudios Botánicos (GEOBOTA) and Herbario Universidad de Antioquia (HUA), Instituto de Biología, Facultad de Ciencias Exactas y Naturales, Universidad de Antioquia, Medellín, Colombia
2 INIBIOMA, CONICET-Universidad Nacional del Comahue, Río Negro, Argentina
3 Grupo de Investigación Biodiversidad y Recursos Fitogenéticos and Herbario Universidad de Caldas (FAUC), Universidad de Caldas, Manizales, Colombia
4 Fundación Conservación de la Selva Colombiana, Manizales, Caldas, Colombia
* These authors contributed equally to this work.

Corresponding author: Jhon S. Murillo-Serna (murillojsteven@gmail.com)

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Abstract

Background and aims – Ongoing studies on Colombian mistletoes revealed an undescribed species of *Maracanthus* (Loranthaceae) endemic to the Colombian Eastern Cordillera (Cordillera Oriental). This species is described and illustrated here, and a checklist of the species accepted in *Maracanthus* is also provided, including a taxonomic key, references to the known iconography of the genus, and taxonomic and geographic comments.
Material and methods – This study is based on a literature review according to the International Code of Nomenclature for Algae, Fungi, and Plants, examination of herbarium specimens using physical specimens and digital images, and morphological studies based on samples from dried and rehydrated specimens.
Key results – A detailed morphological analysis revealed that the new species is part of the little-known genus *Maracanthus*. The dichotomous key, as well as the taxonomic and geographic notes, allow users to recognise the five known species in this genus, showing that they occur in restricted distribution areas.

Keywords

Flora of Colombia, Flora of Venezuela, hemiparasitic, mistletoe, *Oryctanthus*, *Oryctina*, palynology, Santalales

INTRODUCTION

The neotropical mistletoe genus *Maracanthus* Kuijt was proposed by Job Kuijt (1976) as a taxon closely related to *Oryctanthus* (Griseb.) Eichler, sharing characters such as: inflorescences in spikes with small flowers (corolla less than 12 mm), arranged in monads and inserted in cavities, where each flower is accompanied by one basal bract and two lateral bracteoles, and dimorphic fertile stamens. Nevertheless, *Oryctanthus* has hermaphroditic flowers, leaf blades with stellate fibre bundles and very distinctive pollen morphology, being round-shaped with three circular depressions on each face, whereas *Maracanthus* is dioecious, with leaf veins lacking stellate fibre bundles, and a more typical triangular loranthaceous pollen, lacking circular depressions (Kuijt 1976, 2013; Kuijt and Hansen 2015).

Nowadays, *Maracanthus* comprises four species: three of them are distributed in northern Venezuela and

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Colombia, and one is in Costa Rica (Kuijt 1976, 1987, 2007, 2014). Even when this genus has not been included in published phylogenies of Loranthaceae to date (Liu et al. 2018; Vidal-Russell and Nickrent 2008; Nickrent et al. 2019), its affinity to some genera of subtribe Psittacanthinae has been discussed by Feuer and Kuijt (1985), who propose that *Maracanthus* is morphologically related to other small-flowered genera, such as *Phthirusa* Mart., *Struthanthus* Mart., and *Oryctina* Tiegh.

A specimen, previously identified as *Oryctanthus*, was found during the revision of herbarium sheets from Colombian small-flowered mistletoes. After analysing the morphological and palynological features of this specimen, we concluded that it corresponds to a new species of *Maracanthus*, which is described and illustrated in this article. An annotated checklist of the species accepted in *Maracanthus*, as well as a distribution map and a taxonomic key, are also provided.

MATERIAL AND METHODS

Type and representative specimens from all accepted species of *Maracanthus* according to Kuijt (1976, 1987, 2007, 2014) and other small-flowered genera such as *Cladocolea* Tiegh., *Oryctanthus*, *Oryctina*, and *Struthanthus* were examined from digital images available online through the Global Plants project (https://plants.jstor.org), virtual herbaria (K, MO, NY, P, U, and US), and physical specimens (COAH, COL, FAUC, FMB, HUA, HUAZ, HUCO, JAUM, JBB, MEDEL, MEXU, UDBC, and UIS). Acronyms of herbaria follow Index Herbariorum (Thiers 2024).

Vegetative morphology was described from dried material, while floral characteristics were observed and measured from material rehydrated using 70% ethanol. Measurements of morphological traits from similar species were obtained from herbarium observations, digital images, and protologue information. The descriptive terminology follows Kuijt (1976, 1987, 2007, 2014), Caires (2012), Beentje (2016), and Carmona-Gallego et al. (2020).

Pollen grains from the type material of the species described here were recollected, acetolysed, and mounted on microscope slides with glycerin jelly without stain, according to Erdtman (1986). These slides were deposited at the HUA herbarium. The pollen description follows the terminology used by Punt et al. (2007), the order and format of description follows Fontes et al. (2019), and the measurements were performed using the software ImageJ v.1.51n. Photographs were taken with a Leica ICC50 HD camera using the Leica Application Suite LAS EZ v.3.4.0.

Fragments of leaf blade extracted from the type material of the new species were used for leaf clarifications following the protocol described by Shobe and Lersten (1967), with some modifications from Caires (2012) suitable for Loranthaceae species. Leaf sclerenchyma was observed in an Olympus BH-2 optical microscope.

Shapefiles of administrative areas for Colombia and Central America were obtained from the DIVA-GIS website (DIVA-GIS 2022), and a distribution map was produced with QGIS v.3.10 (QGIS Development Team 2020).

TAXONOMIC TREATMENT

Maracanthus Kuijt (Kuijt 1976: 231)

Oryctanthus (Griseb.) Eichler in Martius (Eichler 1868: 22, 87) pro parte

Oryctina Tiegh. (Van Tieghem 1895: 168) pro parte

Phthirusa Mart. (Martius 1830: 110) pro parte

Type species. *Maracanthus chlamydatus* (Rizzini) Kuijt.

Description. Hemiparasitic plants, glabrous or partly furfuraceous. Stems percurrent or determinate by apical abortion. Internodes terete, ancipitate or quadrangular, with conspicuous furfuraceous stripes or glabrous. Leaves opposite, oblanceolate to broadly elliptical, apex rounded, base with or without distinct petiole, when indistinct, the petiole is observed as the prolongation of the leaf blade base, venation pinnate. Dioecious or monoecious. Inflorescences simple, axillary spikes and/or terminal, pedunculate or sessile, bearing pairs of scale-leaves subtending single sessile flowers; each flower flanked by a pair of acute, conspicuous, naviculate bracteoles. Flower hexamerous, less than 5 mm in length. Corolla with petals dimorphic. Androecium with stamens dimorphic, attached at two different heights, with 2 or 4 pollen sacs, filaments short or lacking in short stamen series, dorsifixed, anther apex with papillate or massive connective protuberance. Style straight; stigma distinct. Fruit an oblong, one-seeded berry. Embryo dicotyledonous, cotyledons long and narrow, haustorial pole weakly developed.

Distribution. Five species of *Maracanthus* are recognised here, four of which are distributed in northern South America (Venezuela and Colombia) and one in western Costa Rica. *Maracanthus chlamydatus* and *M. badilloi* (G.Ferrari) Kuijt are the taxa with the widest distributional range and the most collected species of the genus. The remaining three species are known from very few collections and restricted localities.

Key to the species of *Maracanthus*

1. Spikes sessile to subsessile. Venezuela (Formación Lara-Falcón-Yaracuy) and Colombia (Northern Caribbean region) ..... **2. *M. chlamydatus***
– Spikes conspicuously pedunculate..... **2**

2. Peduncle of the spike keeled or ancipitate with 2–4 sharp, furfuraceous edges **3**
– Peduncle of the spike terete to slightly quadrangular, glabrous and without sharp edges furfuraceous **4**
3. Spike rachis furfuraceous; the shorter stamens with connective horns with an obtuse apex and a smaller size compared with the anther. Venezuela (Cordillera de Mérida) ..... **5. *M. pedunculatus***
– Spike rachis glabrous and essentially black when dry, sometimes with two faint furfuraceous lines; the shorter stamens with filiform connective horns similar in size compared with the anther. Costa Rica (Osa Peninsula) ..... **3. *M. costaricensis***
4. Twigs entirely furfuraceous; spikes 4–8 flowered and less than 1 cm long when bearing flowers. Venezuela (Cordillera de Mérida and Coastal Range) ..... **1. *M. badilloi***
– Twigs entirely glabrous; spikes 12–44 flowered and more than 1 cm long when bearing flowers. Colombia (Western slope of the Eastern Cordillera) ..... **4. *M. kuijtii***

1. *Maracanthus badilloi* (G.Ferrari) Kuijt (Kuijt 1990: 114)

Phthirusa badilloi G.Ferrari in Luces and Steyermark (Ferrari 1982: 45)

Maracanthus pusillus Kuijt (Kuijt 1987: 452), nom. illeg. superfl.

Type. VENEZUELA • A 2 km bifurcación carretera El Junquito-Colonia Tovar, en la vía hacia El Limón, vertiente hacia del mar; 20 Apr. 1965; fl., fr.; *V.M. Badillo 4203*; holotype: MY not seen; isotype: US [03546019] digital image.
Iconography. Kuijt (1987: fig. 4).
Distribution. This species is distributed in Venezuela, in cloud and montane forests at the Cordillera de Mérida and Venezuelan Coastal Range, at elevations between 1447–2700 m.
Additional material examined. VENEZUELA – **Trujillo** • Boconó, Parque Nacional Guaramacal, sector El Cafenol, hacia El Recortadero, vía páramo el Pumar; 1790–2200 m; 12 Jun. 2001; fl., fr.; *Dorr, Stergios & Niño* 8938; UC, US • Boconó, Parque Nacional Guaramacal, sector El Cafenol, hacia El Recortadero, vía páramo el Pumar; 1950 m; 27 Oct. 2018; fl., fr.; *Niño, Canelón, Caracas & Hidalgo 6747*; US • Pampám, vía Bolivia; 1447 m; 7 Jul. 2018; fl.; *Niño & Canelón 5082*; US.
Notes. *Maracanthus badilloi* is recognised by the combination of young stems densely covered by scaly-furfuraceous indumentum, with terete, pedunculate spikes and terete to slightly quadrangular peduncles, and the fertile portion of the inflorescence glabrous, with 4–8 flowers. The name *Maracanthus pusillus* Kuijt is nomenclaturally superfluous since it was based on the same type as *M. badilloi*.

2. *Maracanthus chlamydatus* (Rizzini) Kuijt (Kuijt 1976: 231)

Oryctanthus chlamydatus Rizzini (Rizzini 1972: 73)

Oryctina chlamydata (Rizzini) Kuijt (Kuijt 1991: 290)

Type. VENEZUELA • Falcón: 19 Kms. al Oeste de Churuguara; 800 m; 24 Jul. 1967; fl.; *J.A. Steyermark 99522*; holotype: VEN not seen; isotype: US [03546022] digital image.
Iconography. Rizzini (1972: fig. 1A, B; 1982: fig. 30); Kuijt (1976: figs 1–7).
Distribution. This species is distributed in dry ecosystems of Venezuela, at the Formación Lara-Falcón-Yaracuy and the northern Caribbean region of Colombia, at elevations between 0–800 m.
Additional material examined. COLOMBIA – **La Guajira** • Riohacha, corregimiento Camarones, bordel del Río Camarones; 11°23'30"N, 73°05'25"W; 1 m; 12 Oct. 2000; fl.; *Pérez-Zabala & Pérez 1633*; MEDEL • Riohacha. 5.5 km. de Riohacha, sobre la carretera a Bibulla; 15 Apr. 1962; fl.; *Saravia & Johnson 534*; US • Riohacha, along the road between Riohacha and Camarones; 15 m; 26 Nov. 1943; fl., fr.; *Haught 3888*; COL, NY, UC.
VENEZUELA – **Falcón** • Bolivar, limestone ridges. 2–4 km W of Carrizalito; 11°08'N, 69°46'W; 1200–1400 m; 19 Oct. 1985; fl.; *van der Werff & Wingfield 7459*; U • La Vela de Coro, Fila Baragua, cerca Chipare; 200 m; 28 Dec. 1978; fl.; *van der Werff 3309*; RB, U • Mapararí, a lo largo de un arroyo, en un sitio de piedras calcáreas con árboles enanos, 19 Kms. al Oeste de Churuguara; 800 m; 24 Jul. 1967; fl.; *Steyermark 99522*; US • Puente Piedra, playa cerca a Puente de Piedra; 5 m; 23 Dec. 1978; fl.; *van der Werff 3288*; RB • Tocópero, s.l.; 21 m; 14 Sep. 2018; fl.; *Niño & Canelón 6007*; US. – **Lara** • Barquisimeto, La Ruezga, near Barquisimeto; Nov. 1923; fl.; *Saer 89*; US • Palavecino, entre Terepaima y Cabudare, mirando al noroeste; 500–900 m; 5–10 Aug. 1970; fl.; *Steyermark, Delascio, Dunsterville & Dunsterville 103636*; RB • s.l., cerca de Río Claro; 9 Feb. 1963; fl., fr.; *Aristeguieta 4973*; US.
Notes. *Maracanthus chlamydatus* is recognised as the only species in the genus with conspicuously lenticellate greyish stems and sessile spikes with marginally greyish floral bracts. Several types and paratypes have handwritten notes with the binomial "Maracanthus strobiloideus Kuijt". However, this name was never validated nor effectively published.

3. *Maracanthus costaricensis* (Kuijt) Kuijt (Kuijt 2014: 176)

Oryctina costaricensis Kuijt (Kuijt 2007: 476)

Type. COSTA RICA • Puntarenas: Cantón de Osa, Reserva Forestal Golfo Dulce, Península de Osa, Rancho Quemado, Sector Sureste; 8°40'50"N, 83°33'00"W; 250 m; 16 Sep. 1992; fl., fr.; *J. Marin & D. Marin 521*; holotype: UC [UC 1955568] digital image; isotypes: CR not seen, INB not seen, MO [MO-2061852] digital image.

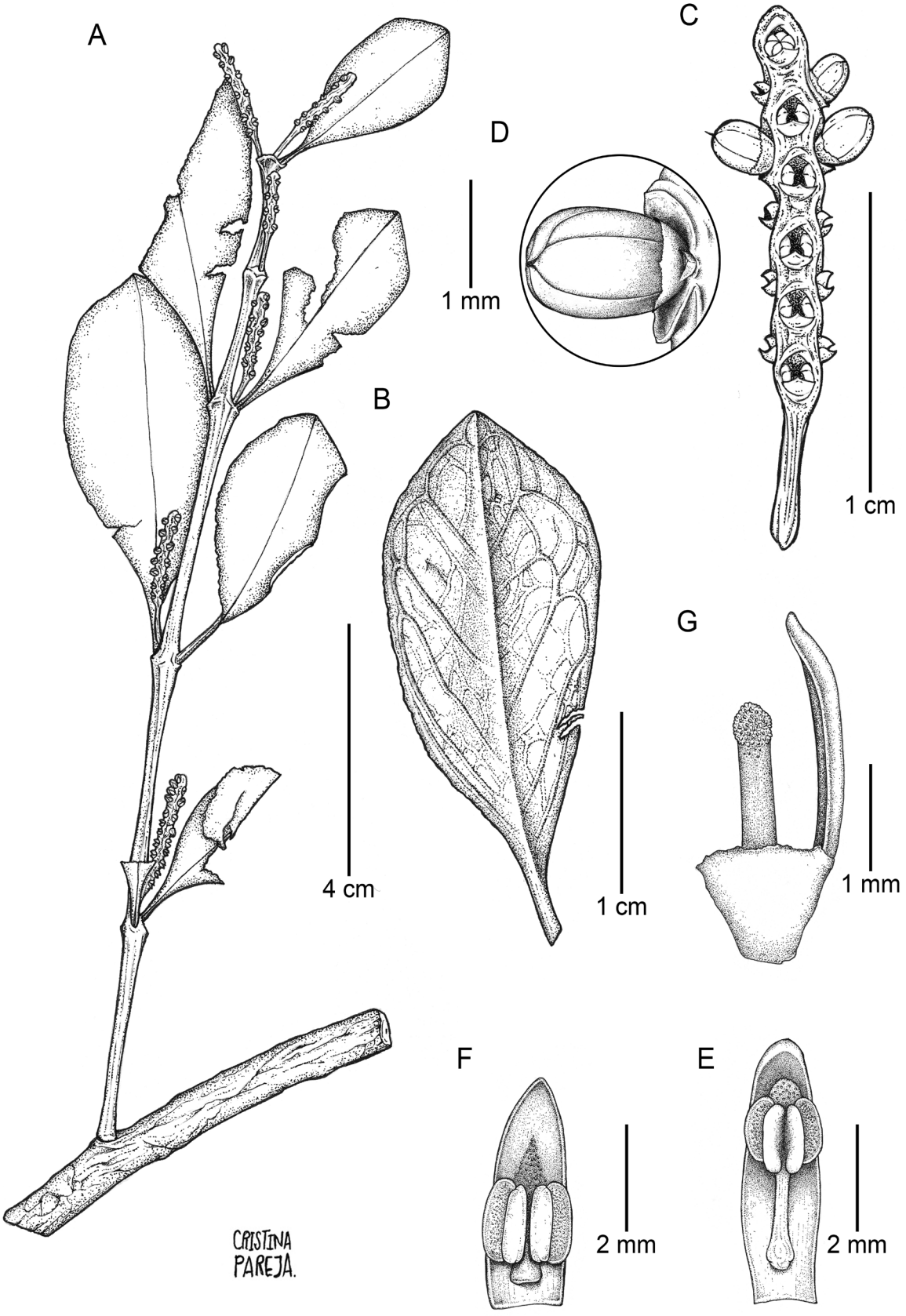

Figure 1. *Maracanthus kuijtii*. **A**. Habit. **B**. Leaf. **C**. Inflorescence. **D**. Detail of flower bud in the inflorescence. **E**. Petal with long stamen. **F**. Petal with short stamen. **G**. Ovary, style, and petal. Illustration made by Cristina Pareja based on *Alzate et al. 1191* (holotype, HUA, HUA134843).

Figure 2. Holotype of *Maracanthus kuijtii* (HUA, HUA134843).

Iconography. Kuijt (2007: figs 1, 2).
Distribution. The species is distributed in the remnants of tropical moist forest at the Osa Peninsula in southwestern Costa Rica at elevations close to 250 m.
Notes. *Maracanthus costaricensis* is recognised by the combination of young ancipitate stems, with vertices conspicuously covered by creamy-greyish cork lines, pedunculate spikes, peduncles keeled or ancipitate with sharp edges as the young stems, the fertile portion of the inflorescence black with acute bracts, and short stamens with the connective horn acute and similar in size to the anther.

4. *Maracanthus kuijtii* J.S.Murillo, Carmona, F.J.Roldán & Alzate, **sp. nov.**
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Figs 1–5

Type. COLOMBIA – **Santander** • Municipio de Floridablanca, Corregimiento La Corcova, estación experimental El Diviso (CDMB), bh-MB; 7°06'44"N, 73°01'48"W [7.112, -73.030]; 2300 m; 21 Oct. 2001; fl.; *Alzate F., López J.M. & López J. 1191*; holotype: HUA [HUA134843].
Diagnosis. *Maracanthus kuijtii* differs from the remaining species of the genus by the combination of glabrous twigs, spike peduncles terete, glabrous, without furfuraceous, sharp edges and with a rachis glabrous, bearing more than 12 flowers.
Description. Stem hemiparasites. Haustorium not seen. Shoots percurrent, branches erect, young branches ancipitate, keeled, very soon covered by griseous cork and profusely lenticellate. Internodes terete when mature, 1.1–4 cm long, 1.2–5.4 mm diam., glabrous, the vertices not covered by furfuraceous indumentum; nodes slightly swollen. Leaves opposite, black in sicco. Petioles 4–6.6 mm long, 1.3–1.6 mm diam., slender, adaxially flattened, abaxially rounded. Leaf blades elliptic, 3–6 × 14–2.8 cm, coriaceous, glabrous on both surfaces, base cuneate, apex obtuse, margin entire, slightly covered with furfuraceous cork; venation camptodromous, midvein raised and keeled in abaxial surface, primary and secondary veins slightly raised in both surfaces. Inflorescences a spike, erect, axillary, 1 per axil, peduncles 5.4–6.8 mm long, 0.7–1.1 mm diam., glabrous, slightly quadrangular, rachis

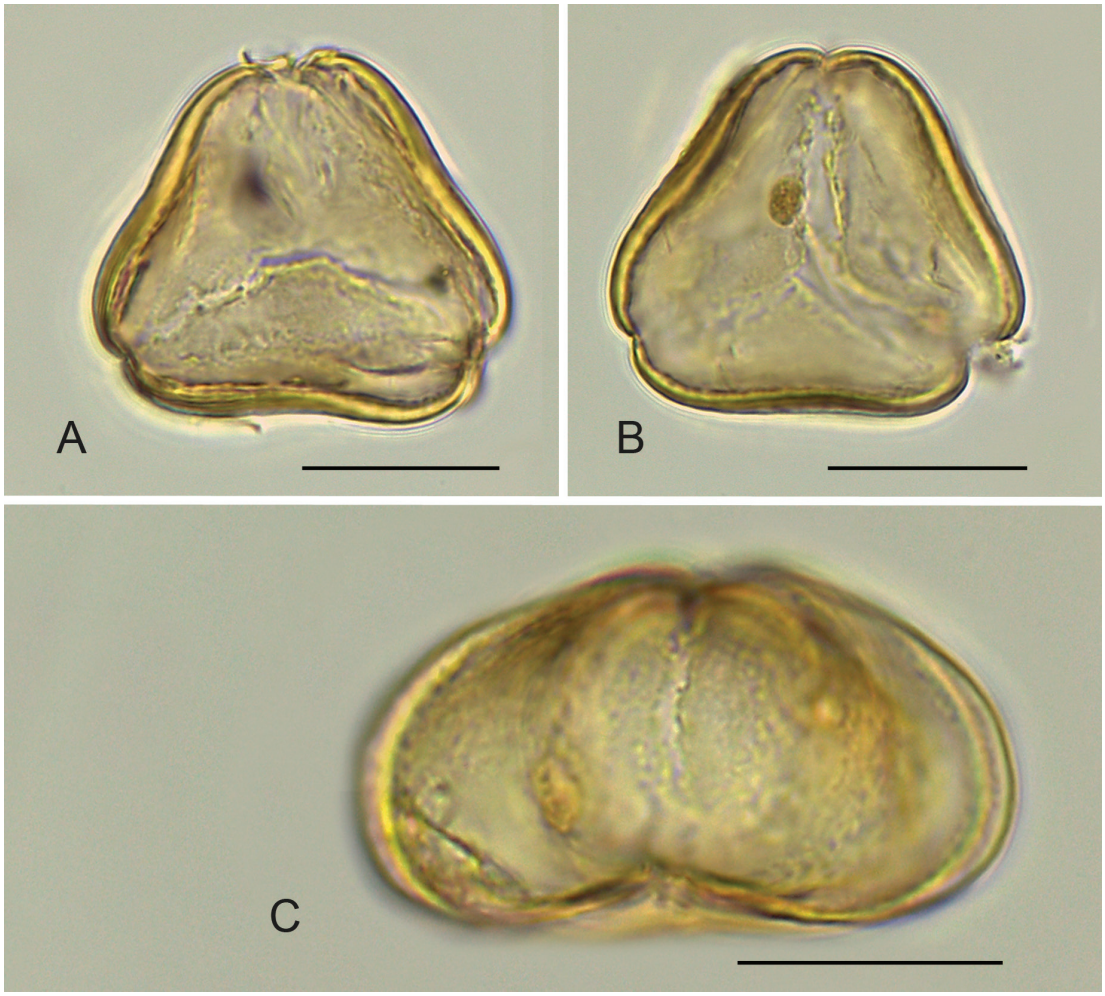

Figure 3. Pollen of *Maracanthus kuijtii*. **A**–**B**. Polar view. **C**. Equatorial view. From *Alzate et al. 1191* (HUA, HUA134843). Scale bars: 20 µm.

fleshy, glabrous, bearing up to 44 flowers in four series of distichous pairs; flowers sunken in foveae accompanied by a basal scale-like bract of ca 0.5 mm long; bracteoles paired, conspicuous, beyond the margin of the fovea, navicular-elliptic, ca 0.6 × 0.5 mm. Flowers inserted at 90° to the axis when mature, sessile, straight, ca 3.5 mm long, 6-merous, bisexual. Corolla in preanthesis rounded apically; petals dimorphic, 2.4–2.5 × 0.7–0.9 mm, margin entire. Androecium epipetalous. Stamens dimorphic, the longer ones in petals with obtuse apex, the smaller ones in petals with acute apex; filaments 0.8–1 mm long (in longer stamens), ca 0.4 mm long (in shorter stamens); anthers 4-loculate, dehiscence longitudinal, 0.7–1 mm long, 0.8–0.9 mm diam. in longer stamens, 0.8–0.9 mm long, 0.9–1 mm diam. in shorter stamens; connective horn 0.2–0.3 mm long, with rounded apex in longer stamens, 0.3 mm long, with the acute apex in shorter stamens. Pollen triangular-concave, oblate, syncolpate. Ovary partially sunken in the cavity of the rachis, 0.7–1.1 mm long, 1.3–1.4 mm diam., obconical. Calyculus 0.2–0.3 mm long, membranous, smooth. Style 1.7–1.8 mm long, 0.3 mm diam. in proximal portion, straight; stigmatic region 0.3 mm diam., as an extension of the style, ensiform and micropapillate. Fruits and seeds not seen.

Palynology. Monad; amb triangular-concave; oblate; isopolar; symmetry radial; syncolpate (tricolpate); exine tectate; columellae (0.6–0.9 µm length); homobrochate; muri width 0.3–0.5 µm, brochi width 0.9–1 µm, lumina width 0.6–0.8 µm; equatorial view length 23.3 µm (21.8–24.8, n = 3); equatorial view width 40.5 µm (37.4–44.4, n = 3); polar view length 36.6 µm (33.5–38.9, n = 10) (Fig. 3).

Distribution, habitat, and phenology. *Maracanthus kuijtii* is endemic to the Eastern Cordillera of the Colombian Andes, collected only at the department of Santander, at elevations close to 2300 m (Fig. 5). This species grows in remnants of Andean forest near plantations of *Cupressus lusitanica* Mill. and *Pinus patula* Schltdl. & Cham., and agricultural areas. This mistletoe has been collected parasitising a 12-meter tall *Zanthoxylum melanostictum* Schltdl. & Cham. (Rutaceae) tree. The only known specimen of *M. kuijtii* to date was flowering in October.

Etymology. The epithet honours Job Kuijt (1930–), taxonomist and mistletoe specialist, who has contributed notably to our knowledge of parasitic plants, especially mistletoes.

Preliminary IUCN conservation assessment. *Maracanthus kuijtii* is only known from the type

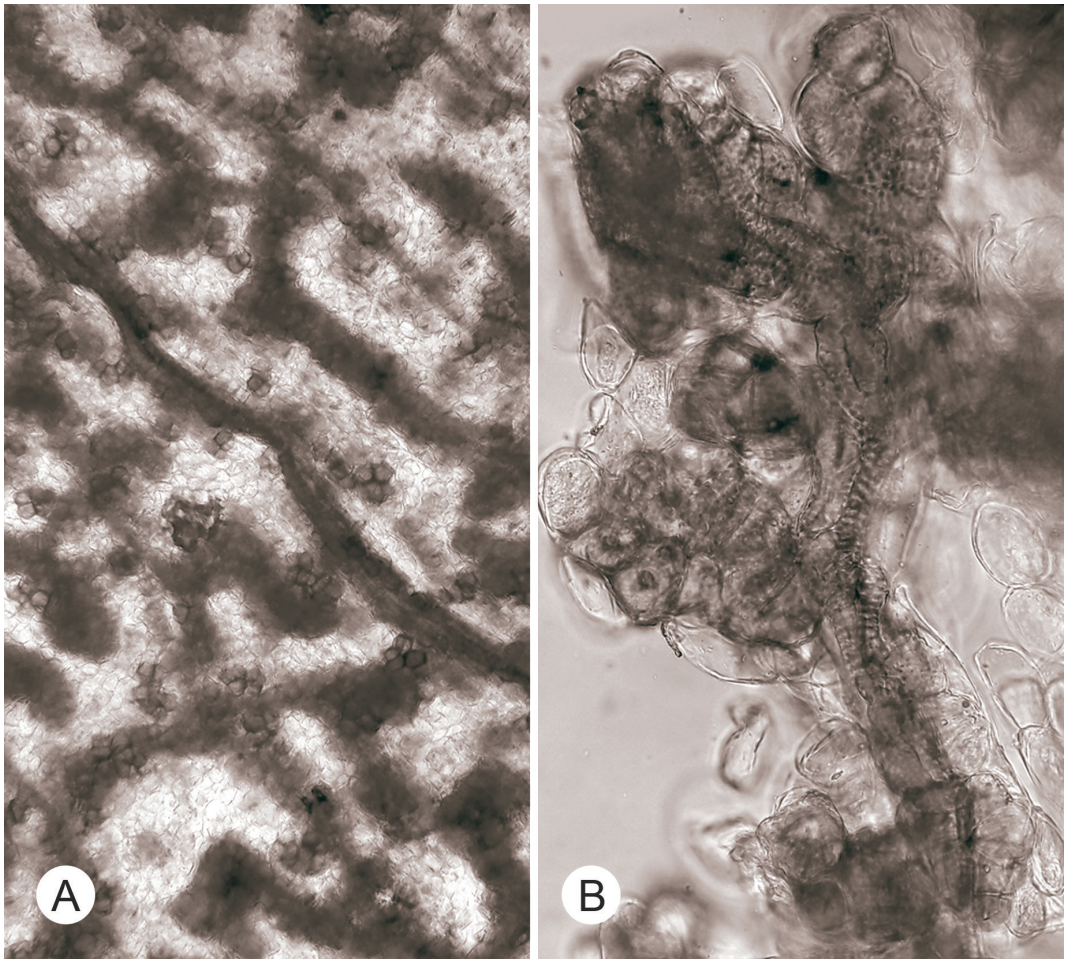

Figure 4. Microscopic details of the venation of *Maracanthus kuijtii*. **A**. Detail of free-ending veins of the leaf blade. **B**. Foliar sclerenchyma on free-ending veins. From *Alzate et al. 1191* (HUA, HUA134843).

specimen, which was collected in an Andean Forest, a region severely threatened by agricultural activities. Additional studies are required to obtain more information about this mistletoe, especially regarding its demography, host range, distribution, and ecology. We suggest considering this species as "Data Deficient" [DD], according to the IUCN Red List Categories and Criteria (IUCN 2012), awaiting the results of future studies.

Notes. The species here described belongs to the genus *Maracanthus,* distinguished by leaf veins without stellate fibres (Fig. 4), conspicuous bracteoles, flowers with all fertile anthers and filaments, and triangular and syncolpate pollen, lacking circular depressions (Kuijt 1976, 2013; Feuer and Kuijt 1985; Kuijt and Hansen 2015; Grímsson et al. 2017). The remaining genera of neotropical Loranthaceae with monadic spikes differ from *Maracanthus* by the following characters: *Dendropemon* (Blume) Rchb. in having flowers alternating fertile stamens with staminodia; *Oryctanthus* in having stellate fibre bundles in the mesophyll and pollen with circular depressions alternate to colpi; *Oryctina* in having sessile anthers and minute bracteoles, and *Cladocolea* in lacking bracteoles accompanying the flowers (Kuijt 2013; Kuijt and Hansen 2015).

Among the species of the genus, *M. kuijtii* resembles *M. badilloi.* However, *M. badilloi* has entirely furfuraceous twigs and spikes less than 1 cm long, bearing 4–8 flowers. In contrast, *M. kuijtii* has twigs that are entirely glabrous and spikes that are more than 1 cm long, 12–44 flowers. To date, *M. badilloi* is endemic to Venezuela, occurring at the Venezuelan Coastal Range (Cordillera de la Costa) on slopes towards the sea and in the Venezuelan Andes at the Cordillera de Mérida. In contrast, *M. kuijtii* occurs in the Colombian Andes at the Eastern Cordillera (Cordillera Oriental) on slopes towards the valley of the Magdalena River (Fig. 5).

Maracanthus kuijtii can be differentiated from the other four species of the genus by traits on its inflorescence, indumentum, and floral morphology, as shown in the taxonomic key provided above.

5. *Maracanthus pedunculatus* Kuijt (Kuijt 1976: 232)

Oryctanthus pedunculatus (Kuijt) Rizzini in Luces and Steyermark (Rizzini 1982: 140)

Oryctina pedunculata (Kuijt) Kuijt (Kuijt 1991: 290)

Type. VENEZUELA • Mérida: selva nublada, vertientes del Río Capaz, arriba de La Azulita; 2100–2400 m; 1 Sep. 1966; fl., fr.; *J.A. Steyermark & M. Rabe 97098*; holotype: US [00107389] digital image; isotypes: K [K000852890] digital image, US [00107388] digital image, VEN not seen.

Iconography. Kuijt (1976: figs 8–12).

Distribution. The species is distributed in cloud forests from Venezuela, in the Cordillera de Mérida, at elevations between 2100–2400 m.

Notes. *Maracanthus pedunculatus* is recognised by the combination of young ancipitate stems with the vertices conspicuously covered by furfuraceous cork lines, greyish stems, remarkably pedunculate spikes, peduncles keeled or ancipitate with sharp edges furfuraceous, fertile

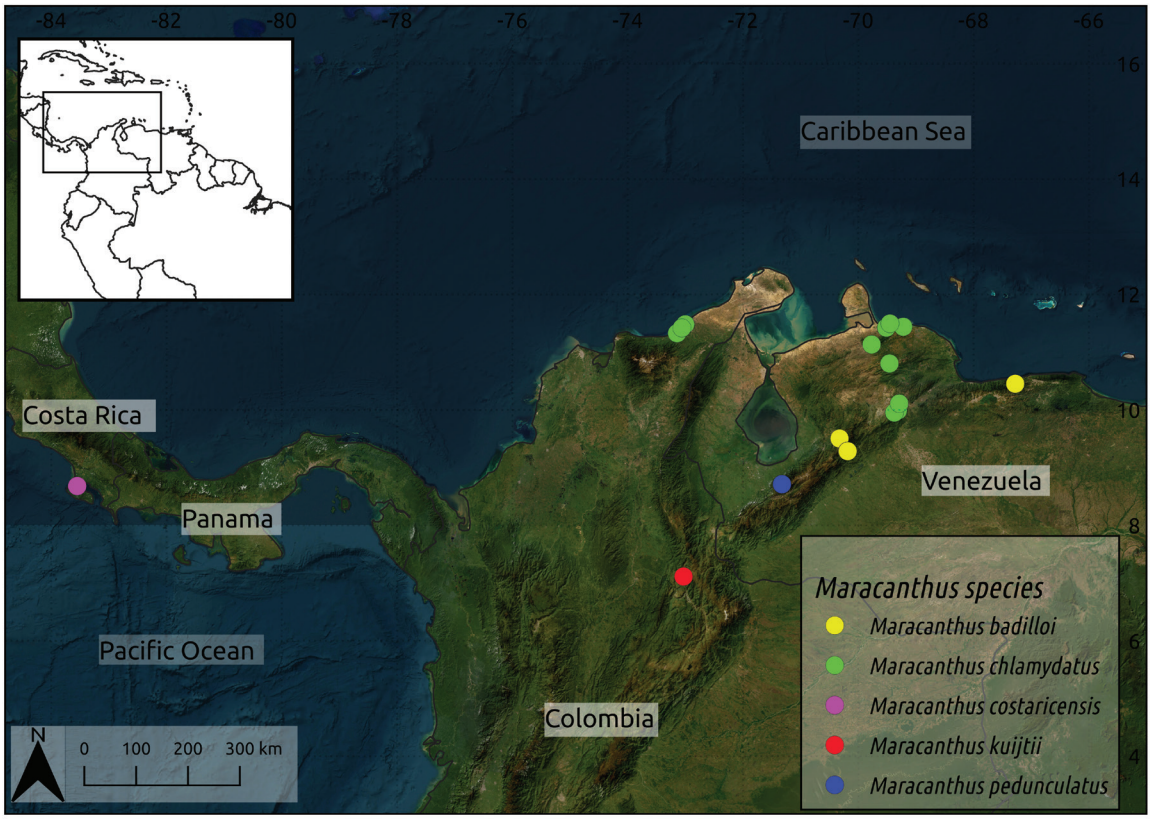

Figure 5. Distribution map of the genus *Maracanthus* (Loranthaceae). Basemap: ESRI Satellite.

portion of the inflorescence furfuraceous, obtuse bracts, and stamens in short series with the connective horn obtuse and smaller than the anther.

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