A new orange-fruited species of *Monstera* (Araceae: Monsteroideae) from Panama

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**Abstract.** *Monstera alcirana*, endemic to Panamá, is described and illustrated using a color plate based on photographs of the vegetative and reproductive structures of living material. This species is the fourth of the very small species of *Monstera* in Central America. It is morphologically similar to *M. obliqua, M. minima* and *M. gambensis* but differs by has short internodes, thickly coriaceous blade and peduncle longer than the length of the leaf.

**Keywords:** Aroids, Central America, *Monstera obliqua*, Panamanian flora.

**INTRODUCTION**

*Monstera*, a climbing aroid genus best known for its often perforated leaf blades, remains rather poorly understood in the Neotropics as a whole, though progress has recently been made for Mexico and Central America (Grayum 2003; Cedeño-Fonseca 2019; Cedeño-Fonseca et al. 2018, 2020a, 2020b), including the recent publication of several new species in the region: *Monstera anomala* Zuluaga & Croat, *M. integriifolia* Zuluaga & Croat, *M. limitaris* M. Cedeño, *M. guzmanjacobiae* Díaz Jim., M. Cedeño, Zuluaga & Aguilar-Rodr., *M. croatii* M. Cedeño & A. Hay and *M. gambensis* M. Cedeño & M.A. Blanco (Cedeño-Fonseca et al. 2018; Zuluaga & Cameron 2018; Cedeño et al. 2020b; Díaz-Jiménez et al. 2020). Costa Rica and Panama are the centre of diversity of the genus, principally in the Talamanca mountain range below 2300 m elevation (Madison 1977; Cedeño-Fonseca et al. 2020a), and particularly the Caribbean slope.

Hitherto, *Monstera obliqua* Miq., was the only known species in Costa Rica and Panama with an orange fruiting spadix (Madison 1977; Grayum 2003; Cedeño-Fonseca 2019). This species is most common from the south of Panama, mainly in the Chocó biogeographic region, and throughout the...
Amazon basin, where orange spadix is more frequent in the genus (Madison 1977). Other species with orange fruiting spadix are Monstera praetermissa E.G. Gonç. & Temponi, endemic to Bahia, Brazil (Gonçalves & Temponi 2004), and Monstera xanthospatha Madison endemic to the Cordillera Occidental and the Cordillera Central of the Andes in Colombia (Madison 1977). Monstera obliqua itself appears to be a large and variable species complex with orange fruiting spadices. Most probably some populations of M. obliqua in the Amazonian basin might be resolved as separate species with further research.

Here we describe and illustrate a new species endemic from Panama with an orange fruiting spadix, and we include an extensive documentation of the populations of M. obliqua in Costa Rica and Panama.

**TAXONOMIC TREATMENT**

**Monstera alcirana** Croat, M. Cedeño, Zuluaga & O. Ortiz sp. nov.

*Type:* Panamá. Coclé: along ridge of Cerro Gaital, N slopes of mountains near La Mesa, N of El Valle; 28 April 1982, 8°40'N, 80°7'W, 800–900 m, Knapp & Dressler 4880 (holotype, MO; isotypes, K, PMA, US).

**Diagnosis**

*Monstera alcirana* is recognised by its small, entire, thickly coriaceous leaves lacking fenestrations, petioles with deciduous sheath, primary lateral veins arising from the midrib at 35–45°, peduncle longer than the leaf, spathe creamy yellow on both surfaces, and the orange spadix when the fruits are ripe.

**Description**

Nomadic vine with appressed-climbing habit. Seedlings: foliose. Juvenile plants: *stems* smooth, terete, dark-green; *internodes* 1.5–2.5 cm long, 4–6 mm diam.; *petiole* conspicuous, light green, smooth, 4–9 cm long, sheathing to the base of the blade; *petiole sheath* slightly persistent or completely deciduous; *blades* oblong-elliptic to lanceolate, attenuate at the base, coriaceous, 3–6 × 3–4 cm, not appressed to the phorophyte; *fenestrations* absent. Adult plants: *stems* dark green, smooth, terete or slightly flattened; *internodes* 0.5–3 cm long, 5–10 mm diam.; *anchor roots* black and corky, with black root hairs; *feeder roots* black and corky, with black root hairs; *petiole* light green, smooth, 5–15 cm long, sheathing to the base of the geniculum; *petiolar sheath* deciduous; geniculum bulky, 0.5–1 cm long; *blades* narrow, lanceolate, oblong-elliptic or ovate, attenuate at the base, obtuse or short-acuminate at apex, thickly coriaceous, drying yellowish, 7.5–25 × 3–10 cm, 2.4–3.5 times longer than wide, with the base slightly decurrent on the geniculum; *midrib* sunken adaxially, convex abaxially; *primary lateral veins* 4–7 per side, departing from midrib at 35–45°, strongly sunken adaxially, raised abaxially; *tertiary veins* inconspicuous; *collective veins* not visible; *fenestrations* absent; *margins* entire. Inflorescences on ascending stems; *peduncle* smooth, 10–38 cm long, 2–4 mm diam.; *spatha* light-green during development, cream on both surfaces at the anthesis; *spadix* white during development, cream at the anthesis, 3.5–2.5 cm long, 0.7–1 cm diam.; *flowers* 3–4 mm long; stamens with laminar filaments, 1.5–4 mm long; anthers 0.5–1 mm long; ovary quadrangular and ribbed, 1.5–2.5 × 1.5–2 mm; style hexagonal, 1–2 × 2.5–5 mm; stigma linear; basal sterile flowers 1.5–3 mm long; *berries* with orange-green styril cap, greenish during development; pulp white; *seeds* green or black, spherical, 2–4 mm long.

**Etymology**

The species is named in honor of Alcira Pérez de Gómez a Venezuelan botanist from Barquisimeto who did her Master’s thesis under the direction of Tom Croat at St. Louis University in St. Louis.

**Distribution and habitat**

*Monstera alcirana* is endemic to Panama to the Comarca Guna Yala and Provinces of Coclé, Panamá, Colón and Veraguas, at 350–1000 m, in Tropical wet forest and Premontane rain forest life zones (Holdridge 1967).

**Conservation status**

*Monstera alcirana* occurs in nine localities of which four are in protected areas (Chagres National Park, Cerro Gaital Natural Monument, General de División Omar Torrijos Herrera National Park and Santa Fe National Park). The principal threat to this species is the habitat loss due to urban expansion and extensive livestock activities, which were observed mainly in those locations devoid of protection. We calculate an Extent of Occurrence of 9236 km² and an Area of Occupancy of 80 km², therefore, we suggest considering *M. alcirana* as a vulnerable species [VU, B1ab((i,ii,iii,iv)].

**Phenology**

Flowering has been recorded in January–April, July, November, and fruiting in January–May, and July.
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Figure 1. *Monstera alcirana* sp. nov. A. Infrauctescence. B. Fertile flower. C. Sterile flower in lateral view (left) and in longitudinal section (right). D. Stylar plate, top view (left), and individual stamen (right). E. Adult plant. F. Juvenile plant. G. Seedling. H. Seeds. Images by M. Cedeño-Fonseca.
Figure 2. *Monstera alcirana* sp. nov. A. Juvenile plant. B. Pre-adult plant. C. Adult plant without inflorescence. D. Adult plant with infructescence. Images by M. Cedeño-Fonseca.
Notes

The new species is a member of sect. Monstera (sensu Madison, 1977), and is unusual in the genus in having leaves that are somewhat like Stenospermation, and indeed the species was long confused with that genus (Gómez, 1983).

The species superficially resembles Stenospermation, it is impossible to confuse M. alcirana with any other species of Monstera. It is similar to M. obliqua in having the same color of the spathe and spadix, but it differs because M. alcirana has short internodes 0.5–3 cm long (vs. 2–10 cm long), thickly coriaceous blade (vs. a thinly coriaceous blade), peduncle 10–38 cm long (vs. 10–17 cm long), and the juvenile with small leaf blade 3–6 × 3–4 cm (vs. 7–13 × 2–4 cm). The pre-adult and adult plants of M. alcirana are very similar to the juvenile plant of M. standleyana G.S. Bunting.

The other species that can be confused M. alcirana is M. minima Madison, but M. minima is only known from the type locality in the Comarca Guna Yala (formerly San Blas), Panama, and from Colombia. The key differences are that M. alcirana has an orange fruiting spadix (vs. an apparently creamy fruiting spadix), and a thickly coriaceous leaf blade, 7.5–25 × 3–10 cm (vs. a thinly coriaceous blade 9–14 × 2.0–4.0 cm), obtuse or short-acuminate at apex (vs. long-acuminate at the apex). Monstera alcirana is the fourth diminutive species of Monstera in Central America, together with M. minima Madison, M. obliqua Miq., and the recently published species M. gambensis M.Cedeño & M.A.Blanco (Cedeño-Fonseca et al. 2020b). Monstera alcirana differs from the latter species in having a smooth petiole (vs. rough petiole), the petiole sheath deciduous (vs. persistent and involute), and the fruiting spadix orange when ripe (vs. yellow when ripe).

Additional specimens studied (paratypes):

**PANAMA: Coclé, La Mesa above El Valle; in forest on both sides of junction with road to Cerro Pilon, ca. 800 m, 21 Jul 1974, T.B. Croat 25390 (MO). Along road between Llano Grande and Cocolisito (N of Pintada), 4 mi. N of Llano Grande, 600 m, 28 Jan 1980, T. Antonio 3561 (MO). 27 km N of Penomone on road to Cocolisito in forest reserve at Continental Divide, ca. 300 m, 20 Feb 1978, B. Hammel 1635 (MO). Vicinity el Valle de Antón, at forested flat area near Finca Macrenita at La Mesa, 08°36’N, 80°07’W, 800 m, 6 Jul 1994, T.B. Croat & G.H. Zhu 76665A (MO). Parque Nacional General de División Omar Torrijos Herrera, Caño Sucio, camino hacia el Alto Tífe, bosque húmedo con suelos muy rocosos, 8°42’55”N, 80°38’12”W, 243 m, 18 Jul 2013, O. Ortiz et al. 1416 (MO, PMA). Colón: East Santa Rita Ridge, 11 January 1968, M.D. Correa & R.L. Dressler 595 (MO). Near Agua Clara rainfall station, Santa Rita Ridge, 9°20’N, 79°48’W, 23 Apr 1970, R.B. Foster 1752 (PMA). Along ridge of Cerro Gaital, N slopes of mountains near La Mesa, N of El Valle, Premontane rainforest, 08°38’00”N, 80°08’30”W, 800–900 m, 28 Apr 1982, S. Knapp & R. J. Schmalzel 4880 (MO). Flotation Molly, 8°51’12”N, 80°38’18”W, 139 m, 21 May 2014, S. Castillo 402 (PMA). Distrito de Donoso, área de Concesión Minera Panamá, Pipeline Road, 8°53’46”N, 80°38’50”W, 127 m, 6 May 2013, O. Ortiz et al. 1310 (MO, PMA). Panama, Between 6–12 km north of El Llano on Carto road, forest and roadside, 09°15’32”N, 78°55’49”W, 365 m, 13 Jan 1978, B.E. Hammel 889 (MO). Cerro Jefe, ca. 1000 m, J.D. Dwyer 9480 (MO). El Llano-Carti Road, 17.5 km from Inter-American Highway, wet forest, 09°17’45”N, 78°55’59”W, 350 m, 14 Feb 1975, S.A. Mori et al. 4605 (MO). Altos de Pacora, northwest of Cerro Jefe, 09°16’30”N, 79°18’50”W, 650–750 m, 8 Nov 1979, T. Antonio 2502 (MO). 16–18 km from Inter-American Highway on the El Llano-Carti Road, 09°17’50”N, 78°56’03”W, 400 m, 28 Mar 1974, E. L. Tyson & M. H. Nee 7342 (MO). 8.2 miles from the Pan-American Highway on the El Llano-Carti Road, 09°14’N, 79°00’W, 6 Jul 1982, S. Knapp 5917 (MO). Beyond Goofy Lake along road to Cerro Jefe, 9°14’N, 79°21’W, 4 Jan 1968, M.D. Correa et al. 567 (MO, PMA). Campo Tres, 3 miles NE of Altos de Pacifico, 500–800 m, 10 Mar 1973, R.L. Liesner 523 (MO, PMA). Road to Carti (San Blas), 15.5 km north of El Llano, 09°21’30”N, 78°58’00”W, ca. 400 m, 13 Feb 1973, P. Busey 366 (MO). La Eneida, region of Cerro Jefe, 9°14’N, 79°21’W, 650 m, 15 Jan 1973, R.L. Dressler 4253 (PMA). El Llano-Carti Rd. km. 17.4, Tropical wet forest, 9°19’N, 78°55’W, 350 m, 1 Jul 1985, G. de Nevers 5922 (MO, PMA). Altos de Cerro Azul, sendero el Cantar, 500 m, 16 Sept 2015, O. Ortiz et al. 2515 (MO, PMA). Veraguas, Santa Fe, Rio Piedra, bosque secundario maduro, camino cerca del rio, 8°44’06”N, 80°46’30”W, 370 m, 16 Dec 2013, A. Morris & L. Martinez 2062 (PMA). Santa Fe, Parque Nacional Santa Fe, área del Río Veraguas, bosque achaparrado, trocha sobre filo de un cerro, dosel con una altura aproximada de 25 m, con presencia de Colpothrinax, 8°41’21”N, 80°50’09”W, 539 m, 8 Feb 2014, L. Martinez et al. 1672 (PMA).**

**Monstera obliqua** Miq., Linnaea 18: 79. 1844

Type: Surinam, Vredenburger-Zandrits, October 1842, Focke 719 (holotype, U; photos: BH, SEL!).


**Description**

Nomadic vine with appressed-climbing habit. Seedlings: foliose. Juvenile plants: stems smooth, dark green; internodes 3–5 cm long, 2–5 mm diam.; petiole conspicuous, dark green, smooth 5–11 cm long, sheathing to the base of the geniculum; petiole sheath deciduous; blades lanceolate, truncate at the base, acuminate at apex, sub-coriaceous, 7–13 × 2–4 cm, not appressed to the phorophyte; fenestrations absent. Adult plants: stems smooth, light to dark green; internodes 2–10 cm long, 3–5 mm diam.; cataphylls light-green, deciduous but leaving dry fragments on peduncles; anchor roots black; feeder roots black; petiole light green, smooth, 5–18 cm long, sheathing to the geniculum, petiole sheath deciduous; geniculum smooth, 3–5 mm long; blades lanceolate to narrowly elliptical, cuneate at the base, acuminate at apex, membranous to sub-coriaceous, drying blackish, reddish, light brown or greyish, 12–23 × 3–10 cm, not decurrent on geniculum; midrib ribbed adaxially, convex abaxially; primary lateral veins 4–8, obscure adaxially, prominent abaxially, departing midrib at 35–50°; tertiary veins inconspicuous; collective veins not visible; fenestrations absent or scarcely developed (in Central America); margins entire. INFLORESCENCES on ascending stems, 1–3 simultaneously at flowering time, arranged in the axis of the leaves or cataphylls; peduncle smooth, 10–17 cm long, 5–6 mm diam.; spathe acuminate, light-green during development, yellow externally and white internally at anthesis, the margins towards the apex involute, deciduous at the end of the anthesis, up to 4 cm longer than the spadix; spadix with green style margins and white at the medial part during development, cream at anthesis, 3–5 × 0.5–1 cm; flowers 4–7 mm long; stamens with laminar filaments, 1–2 mm long; anthers 1–2 mm long; ovary square and ribbed, 1.5–2 × 1.5–2 mm; style square or hexagonal, 1.5–2 × 2.5–3 mm; stigma linear; basal sterile flowers scarce or absent; berries with a moss-green stylar cap during development, mature stylar cap orange; pulp white; seeds black, 3–5 mm long.

**Distribution and ecology**

*Monstera obliqua* ranges from Costa Rica to Bolivia, Venezuela, the Guianas, Brazil, and Trinidad & Tobago. In Costa Rica it grows at 0–100 m elevation, in Tropical wet forest life zones, but in Panama it grows at 0–1410 m, in Tropical moist forest, Tropical lower montane wet forest and Montane moist forest life zones (Holdridge 1967).

**Phenology**

In Costa Rica and Panama, flowering has been recorded in July and November, and fruiting in January, March, July and November.

**Notes**

The species is a member of sect. *Monstera* (*sensu* Madison, 1977), characterized by its small elliptic-lanceolate, inequilateral blades which have entire margins, usually lack perforations, its inflorescences with peduncles that are as long as or longer than petioles (but not the whole leaf) and by its dark orange, small fruiting spadix.

*Monstera obliqua* in Costa Rica is only known from the southeast Caribbean watershed. It is not common, and possible to find only in primary and secondary forests, at 0–100 m. Most populations have leaf blades without perforations: only the populations in the region of Sixaola have fenestrate blades. This species is the only *Monstera* with orange ripe fruit in Costa Rica, (Figure 3).

However, the situation for Panama is different: *M. obliqua* is very common along the Caribbean slope, at 0–1410 m, growing in Tropical wet forest, Tropical moist forest, Tropical lower montane wet forest, and Montane moist forest life zones (Holdridge 1967). The most common morphotype is one with the leaf blades without perforations similar to the plant from Costa Rica, but the only difference is the much wider altitudinal distribution. (Figure 4–5). *Monstera obliqua* in Panama grows in rocks where it can develop to the adult phase and producing inflorescences. (Figure 4A-B). Some plants from the Cerro Azul in Panamá have coriaceous leaf blades, with the indistinct primary lateral veins in both surfaces and prominently thick geniculum and peduncles (Figure 4F-G, 5).

*Monstera obliqua* has never been recorded for Costa Rica and Panama with perforated and membranaceous
Figure 3. Monstera obliqua from Costa Rica. A. Sterile flower in lateral view (left) and in longitudinal section (right). B. Spathe anomaly. C. Front and back views of open inflorescence. D. Juvenile plant. E. Developing inflorescence. F. Fertile flower. G. Stylar cap, top view (left), and individual stamen (right). H. Mature infructescence, stylar cap detached toward the apical part. I. Seeds. J. Adult plant. Images by M. Cedeño-Fonseca.
Figure 4. Different morphotypes of *Monstera obliqua* from Panama. A. Plant in adult phase with infructescence growing on rocks in the Caribbean in Bocas del Toro. B. Plant in adult phase with infructescence growing on rocks in the Pacific in Santa Fe. C. Adult plant growing 3 m above the ground on trees in Santa Fe. D. Adult plant with a white spathe growing 1 m above the ground on a shrub in the Cope. E. Juvenile individual growing in the Cope. F. Adult plant with inflorescence and infructescence growing on trees in Cerro Azul. G. Inflorescence with creamy spathe in Cerro Azul. H. Adult plant with infructescence growing 2 m above the ground in Santa Rita. Images by M. Cedeno-Fonseca.
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Figure 5. *Monstera obliqua* from Panamá, Cerro Azul. A. Developing inflorescence. B. Mature infructescence. C. Front and back views of open inflorescence. D. Stylar cap, top view (left), and individual stamen (right). E. Fertile flower in lateral view (left) and in longitudinal section (right). F. Sterile flower in lateral view (left) and in longitudinal section (right). G. Adult plant. Images by M. Cedeño-Fonseca.
leaf blades. This characteristic is present solely in one morphotype occurring throughout the Amazon basin and which may be a different species since (the type of *M. obliqua* is not of this morphotype). Madison (1977) speculated that the entire leaf morphotype from Panama (which also occurs in Costa Rica) was probably driven by a limited immigrant line from South America with a consequent decline in genetic variability.

**Additional specimens studied:**


A new orange-fruited species of Monstera (Araceae: Monsteroideae) from Panama


