

ORIGINAL ARTICLE

Tovomita nebulosa (Clusiaceae), a new species from Cerro de la Neblina, Venezuela

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Although the number of recently described *Tovomita* species is relatively high, much more remains to be done, given that each new survey of representative Amazonian collections reveals many potentially undescribed taxa. In the treatment for *Tovomita* published in Flora of the Venezuelan Guayana, at least six distinct morphotypes did not match any previously described species. Here we recognize morphotype “D” as a new endemic species from Cerro de la Neblina. Additionally, we provide an identification key to the *Tovomita* species in Venezuela.

KEYWORDS: Amazon Forest, clusioid clade, Malpighiales, *Pico da Neblina*, South America

Tovomita nebulosa (Clusiaceae), una nueva especie del Cerro de la Neblina, Venezuela

RESÚMEN

A pesar del relativo alto número de especies nuevas de *Tovomita* descritas en los últimos años, aún queda mucho por hacer, ya que en cada nueva investigación de colecciones amazónicas surgen taxa aún no descritos. En el tratamiento de *Tovomita* publicado en la Flora de la Guayana Venezolana, al menos seis morfotipos distintos no coincidían con ninguna de las especies descritas hasta el momento. Aquí reconocemos el morfotipo “D” como una nueva especie endémica del Cerro de la Neblina. Además, proporcionamos una clave de identificación para las especies venezolanas de *Tovomita*.

PALABRAS-CLAVE: Amazonia, clado clusioide, Malpighiales, *Pico da Neblina*, Sudamérica**INTRODUCTION**

Recent estimates indicate there are around 16,000 vascular plant species reported for Venezuela, although many more taxa are yet to be described, particularly from the country's southern region (Huber 2008). The Guiana Shield has largely been considered one of the most biologically fascinating regions, given its physiographic complexity and high levels of endemism. Approximately 10,000 plant species are known from Venezuelan Guayana and about 40% of the species are restricted to the shield (Berry et al. 1995). Within the Guayana Shield, Cerro de la Neblina is the tallest mountain (3014 m) and has the highest level of endemism, with at least 104 endemic plant species (Riina et al. 2019).

There are 20 recorded species of *Tovomita* in Venezuela (see Appendix 1 in Marinho 2019). Although the number of recently described *Tovomita* species is relatively high, much more remains to be done, given that each new investigation of representative Amazonian collections reveals many potentially undescribed taxa (Frazão and Lohmann 2018; Toledo and Souza 2018; Huamantupa-Chuquimaco et al. 2019; Melo et al. 2019), including the Venezuelan Amazon (Cabral et al. 2016, 2018; Marinho et al. 2016a, 2019; Nascimento Jr. et al. 2019). In the treatment of *Tovomita* in the Flora of the Venezuelan Guayana, Cuello (1998) defined at least six distinct morphotypes that did not match any previously described species. Subsequently, morphotype “A” was described as *T. auriculata* Cuello and morphotype “B” was

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described as *T. foldatsii* Cuello (Cuello 1999). Marinho (2019) identified morphotype “E” as *T. acutiflora* M.S. Barros & G. Mariz and segregated morphotype “F” into two new species: *T. clarkii* Pipoly ex. L. Marinho & Gahagen (Marinho *et al.* 2016a), and *T. nervosa* L. Marinho (Marinho *et al.* 2019). Unfortunately, morphotype “C” was not located, but most likely corresponds to an undescribed species.

Here we recognize morphotype “D” as a new endemic species from Cerro de la Neblina. Additionally, we provide an identification key to the species of *Tovomita* in Venezuela.

MATERIAL AND METHODS

The description is based on specimens at NY and VEN (abbreviations according to Thiers 2020). Leaf terminology follows Ellis *et al.* (2009) and flower terminology follows Radford *et al.* (1974). The conservation status of the new species was assessed according to IUCN (2012) criteria. The species distribution map was produced using the SimpleMappr website (Shorthouse 2010) with subsequent style modifications.

RESULTS

Tovomita nebulosa L. Marinho & Luján, sp. nov. Type: Venezuela. Amazonas: Departamento Río Negro, Cerro de La Neblina Camp IV, 15 km NE of Pico Phelps, north branch of river in canyon, 780 m, 0°51'N, 65°57'W, 15–18 Mar 1984 (bud), *R. Liesner 16670* (holotype: NY! barcode NY02859712; isotypes: BRIT image! barcode BRIT554535, MO, US, VEN! no. 327548).

Diagnosis: *Tovomita nebulosa* is similar to *T. tenuiflora* Benth. ex Planch. & Triana by the large number of secondary and intersecondary veins, close and similar to each other, and nigrescent staminate floral buds *in sicco*, 5–7 mm long, with a cuspidate to slightly rostrate apex. The species can be distinguished by the number of secondary veins (< 23 pairs *vs.* > 30 pairs in *T. tenuiflora*) and number and shape of the filaments (c. 20, terete *vs.* c. 50, filiform-terete).

Description: Small tree, up to c. 3 m tall, prop roots and exudate not seen. Petioles 0.9–1.3 cm long, color not seen, smooth, lenticels absent. Leaf blades 4–10 × 2.6–5 cm, dark brown adaxially and light brown abaxially *in sicco*, black dots absent, subcoriaceous, oblong to obovate, the base decurrent, the apex acute to rounded, sometimes slightly acuminate; exudate canals immersed on both surfaces, visible as thin nigrescent lines abaxially, parallel to the secondary veins. Venation: midvein prominent on both surfaces; secondary veins in 20–23 pairs, 2.5–3.2 mm apart, forming a 65°–75° angle to the midvein, prominent on both surfaces, slightly arcuate and connecting near the margin; intersecondary veins present, one or two per intercostal area, similar to the secondary veins, distal course reticulating, > 50% of

the length of subjacent secondary veins; tertiary veins percurrent, sinuous; intramarginal vein present. Staminate inflorescences a lax dichasium with up to 35 flowers, with primary flower; bracts 2, c. 0.8 mm long, triangular, on the base of the inflorescence. Pedicel 4–9 mm long, color not seen, articulated in the middle in lateral flowers of the dichasia, distal portion of pedicel slightly dilated; bracteoles 2, c. 0.5 mm long, triangular; bracteoles not calyprate, lenticels absent. Staminate floral buds 5–7 × 1.5–2 mm, narrowly oblong, apex cuspidate to slightly rostrate, whitish, lenticels absent, nigrescent *in sicco*. Sepals 2, 5–7 × 2.5–3 mm, oblong to narrowly ovate, apex cuspidate to acuminate, acumen 1.5–2 mm long, whitish; petals 4, c. 6.2 × 1.5 mm, the innermost petal c. 3.5 × 1 mm, smaller than the others, linear to narrowly oblong, the apex acute to cuspidate, color not seen. Staminate flowers with c. 20 stamens, arranged in two whorls, 3.3–4.8 mm long, slightly angular, heterodynamous, the central ones larger than the marginal ones; filaments terete, color not seen; anthers 0.3–0.5 mm long, with the same caliber as the filaments, connective not exceeding the thecae; pistillode c. 0.3 mm long, conical, angular, rudimentary stigmas 4, amorphous. Pistillate inflorescences, flowers and fruits not seen (Figure 1).

Etymology: The specific epithet refers to the adjective nebulous, which means vague or unclear, in reference to the long period of over 20 years during which this species has been known under the informal name “*Tovomita* sp. D” (see Cuello 1998). The epithet is also related to the type locality, Cerro de la Neblina. Both “nebulous” and “neblina” have the same origin and derive from the Latin word *nebulosus*, which means clouded or cloudy (Stern 1992).

Occurrence, habitat and conservation status: *Tovomita nebulosa* is presumably endemic to Amazonas State, Venezuela, near the border of Amazonas State, Brazil (Figure 2). The only known specimen of this taxon was collected in Cerro de la Neblina (*Pico da Neblina*, in Portuguese). Although this area is permanently preserved and part of Pico da Neblina National Park, a Brazilian conservation unit, and Serranía de la Neblina National Park, a Venezuelan conservation unit, we assessed the conservation status of the species as Data Deficient (DD), as the species is so far known from a single collection.

DISCUSSION

The arrangement and quantity of secondary and intersecondary veins, as well as floral bud shape (Barros and Mariz 1982; Marinho 2018), have typically been used as important characters to identify *Tovomita* species (Vesque 1893; Engler 1923; Cuello 1998; Marinho *et al.* 2016b). Thus, new taxa can be recognized even when specimens do not bear open flowers. As observed in *T. tenuiflora* Benth. ex Planch. & Triana and *T. carinata* Eyma, the floral buds of *T. nebulosa* become

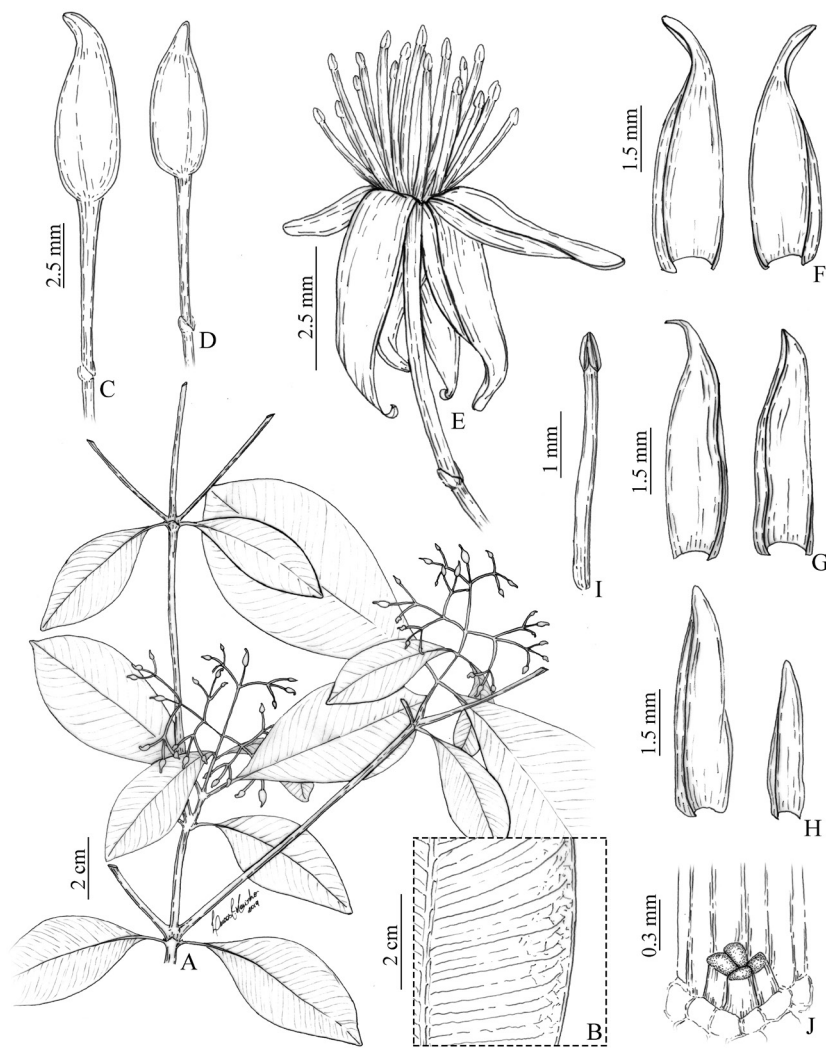


Figure 1. Staminate specimen of *Tovomita nebulosa* L. Marinho & Luján: (a) Branch with staminate floral buds; (b) Detail of the abaxial leaf surface; (c) Mature floral bud; (d) Immature floral bud; (e) Staminate flower representation inferred from closed floral bud; (f) Sepals, adaxial view; (g) Outer petals, adaxial view; (h) Inner petals, adaxial view; (i) Stamen, adaxial view; (j) Detail of the pistillode, some stamens removed. Drawing from the type by L.C. Marinho.

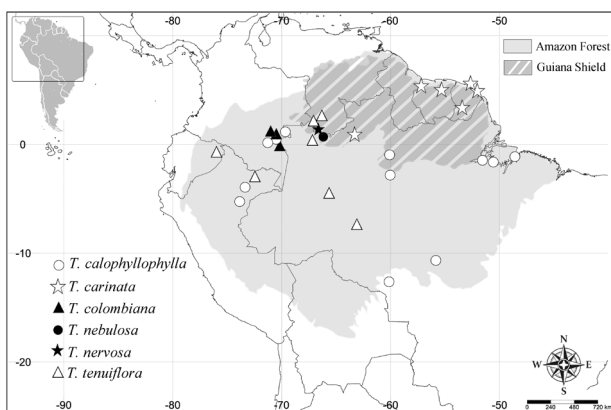


Figure 2. Distribution map of *Tovomita nebulosa* and morphologically similar Amazonian species: *T. calophyllophylla*, *T. carinata*, *T. colombiana*, *T. nervosa*, and *T. tenuiflora*.

nigrescent *in sicco*. Useful features to distinguish *T. nebulosa* from *T. carinata* and *T. tenuiflora* are listed in Table 1.

Although the specimen used here to describe *Tovomita nebulosa* bears few floral buds, the combination of observable characters (i.e., > 20 pairs secondary veins, staminate floral buds with a cuspidate to slightly rostrate apex, and c. 20 terete stamens) is not found in any other species in the genus. *Tovomita nebulosa* shares with *T. calophyllophylla* García-Villacorta & Hammel the presence of > 20 pairs of secondary veins that are almost indistinguishable from the intersecondary ones. From this species, *T. nebulosa* can be distinguished by the smooth petiole (*vs.* longitudinally striated in *T. calophyllophylla*) and narrowly oblong floral bud with a cuspidate to slightly rostrate apex (*vs.* spherical with rounded apex in *T. calophyllophylla*).

Table 1. Comparison among *Tovomita nebulosa* sp. nov. and five morphologically similar species.

	<i>T. nebulosa</i>	<i>T. calophyllophylla</i>	<i>T. carinata</i>	<i>T. colombiana</i>	<i>T. stylosa</i>	<i>T. tenuiflora</i>
Number of secondary veins	20 – 23 pairs	25 – 50 pairs	17 – 20 pairs	11 – 15 pairs	8 – 9 pairs	c. 35 pairs
Staminate floral buds (apex)	Cuspidate to slightly rostrate	Rounded	Rounded to apiculate	Rounded	Acute to cuspidate	Acute
Staminate floral bud length (mm long)	5 – 7	4 – 6	3 – 5.5	5 – 6	8.5 – 11	5 – 7
Stamen number	c. 20	40 – 50	26 – 34	c. 45	45 – 50	c. 50
Filaments (shape)	Terete	Dorsiventrally compressed	Terete	Terete	Filiform-terete	Filiform-terete
Anther length (mm long)	0.3 – 0.5	0.8 – 1	0.2 – 0.3	0.3 – 0.4	0.4 – 0.5	0.2 – 0.3
Carpel number	4	5	5	4	4	4
Geographic distribution	Venezuela	Brazil, Colombia, Peru	Bolivia, Brazil, French Guiana, Peru, Suriname	Colombia	Colombia, Costa Rica, Panama	Brazil, Ecuador, Peru, Venezuela

Leaves with numerous secondary and intersecondary veins are also present in *Tovomita colombiana* L. Marinho and *T. nervosa* L. Marinho, but these species lack floral buds that are narrowly oblong with cuspidate to slightly rostrate apex (i.e., oblong with rounded apex in *T. colombiana* and ovoid with rounded apex in *T. nervosa*). Floral buds with a similar shape are found in *T. stylosa* Hemsl., but this species has fewer secondary veins (8–9 pairs) and is endemic to Mesoamerica and the Chocóan region. Marinho (2018) pointed out that, due to the larger ovary, pistillate floral buds in species with narrowly oblong floral buds are typically wider than staminate buds in the same species. Although the pistillate individual of *T. nebulosa* was not described, we expect its pistillate floral buds to be slightly wider than the staminate ones, and the ovary to be 4-carpellate based on the number of pistillode stigmas observed in staminate buds.

Below, we provide an identification key to all species of *Tovomita* in Venezuela, which is based mostly on vegetative and floral bud characters. The species endemic to Venezuela are indicated with an asterisk (*).

Taxonomic key to species of *Tovomita* in Venezuela

- 1. Petioles < 5 mm long *T. auriculata*
- 1'. Petioles > 6 mm long 2
- 2. Petioles longitudinally striate 3
- 2'. Petioles smooth 4
- 3. Leaves with < 20 pairs of secondary veins; floral buds spheroid; with c. 25 stamens *T. clarkii**
- 3'. Leaves with > 24 pairs of secondary veins; floral buds ovoid to oblong; with > 40 stamens *T. nervosa**
- 4. Petioles and inflorescences with lenticels 5
- 4'. Petioles and inflorescences without lenticels 6

- 5. Leaves with 20–30 pairs of secondary veins; inflorescence with primary flower, bracteoles free from each other; ovary 5-carpellate; epicarp smooth *T. acutiflora*
- 5'. Leaves with 10–13 pairs of secondary veins; inflorescence lacking primary flower, bracteoles connate, forming calyptra; ovary 4-carpellate; epicarp asperous ... *T. albiflora* A.C. Sm.
- 6. Secondary and intersecondary veins similar to each other, intersecondary veins parallel to major secondary ones 7
- 6'. Intersecondary veins thinner than secondary veins, intersecondary veins basiflexed or reticulating 11
- 7. Intramarginal vein absent
..... *T. fructipendula* (Ruiz & Pav.) Cambess.
- 7'. Intramarginal vein present 8
- 8. Floral buds nigrescent *in sicco* 9
- 8'. Floral buds not nigrescent *in sicco* 10
- 9. Leaves with > 30 pairs of secondary veins; stamens c. 50 *T. tenuiflora*
- 9'. Leaves with < 23 pairs of secondary veins; stamens c. 20 *T. nebulosa*
- 10. Leaf blades broadly elliptic to oblong, secondary veins > 20 pairs, exudate channels inconspicuous; floral buds > 5 mm long; ovary 5-carpellate..... *T. acutiflora*
- 10'. Leaf blades narrowly elliptic, secondary veins < 14 pairs, exudate channels appearing as continuous blackish lines abaxially; floral buds < 4 mm long; ovary 4-carpellate *T. stergiosii* Cuello
- 11. Intramarginal vein present 12
- 11'. Intramarginal vein absent 15
- 12. Floral buds spheroid, apex rounded; stamens (or staminodes in pistillate flowers) < 20, subclavate, yellow *T. guianensis* Aubl.
- 12'. Floral buds ovoid, apex acute or apiculate, rarely rounded; stamens (or staminodes in pistillate flowers) > 20, terete, white 13

13. Floral buds 7–11.5 mm long; stigmas not sessile, styles 2–3.5 mm long *T. grata* Sandwith
 13'. Floral buds 5.5–7 mm long; stigmas sessile 14
 14. Staminate inflorescences with up to c. 150 flowers; stamens (or staminodes in pistillate flowers) c. 60, 4.5–6 mm long; epicarp asperous *T. turbinata* Planch. & Triana
 14'. Staminate inflorescences with up to 9 flowers; stamens (or staminodes in pistillate flowers) 20–35, 3.5–5 mm long; epicarp smooth *T. umbellata* Benth.
 15. Inflorescences one-flowered or a congested dichasium; petals purplish red; ovary 4-carpellate *T. atropurpurea* Steyerl.*
 15'. Inflorescences a lax dichasium or pleiochasium; petals white, cream or yellowish; ovary 5–6-carpellate 16
 16. Secondary veins < 7 pairs 17
 16'. Secondary veins > 8 pairs 18
 17. Leaf blades with rounded to straight apex; floral buds 7–9 mm long *T. nidiae* L. Marinho*
 17'. Leaf blades with acuminate apex; floral buds 3.5–5.5 mm long *T. schomburgkii* Planch. & Triana
 18. Floral buds < 5 mm long 19
 18'. Floral buds > 6 mm long 20
 19. Leaf blades purplish-red *in sicco*, drip tip frequent, secondary veins clearly connecting near the margin; floral buds spheroid *T. gracilipes* Planch. & Triana
 19'. Leaf blades greenish to grayish *in sicco*, drip tip rarely present, secondary veins slightly connecting near the margin; floral buds spheroid to oblong *T. schomburgkii*
 20. Floral buds ovoid 21
 20'. Floral buds oblong 22
 21. Floral buds 5.5–7.5 mm long; ovary 4-carpellate; immature fruits spheroid, epicarp rugose... *T. macrophylla* (Poepp.) Walp.
 21'. Floral buds 8–15 mm long; ovary 5-carpellate; immature fruits oblong to ovoid, sometimes falcate, epicarp smooth *T. foldatsii*
 22. Floral buds with rounded apex; fruit pedicels dilated *T. spruceana* Planch. & Triana
 22'. Floral buds with acute apex, sometimes mucronulate; fruit pedicels not dilated *T. volkeri* L. Marinho

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