




Artigo Original

# Celastraceae genera in São Paulo (Brazil): an update 20 years after the "Phanerogamic Flora"

Leonardo Biral<sup>1</sup> 

<sup>1</sup>Universidade Federal de Goiás, Departamento de Botânica, Campus Samambaia, Goiânia, Goiás - Brasil

\* Autor para correspondência: leobiral@hotmail.com

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**Abstract:** After 20 years of the publication of the floristic treatment of Celastraceae in the project "The phanerogamic flora of São Paulo state", two new records of genera have been found. It is presented herein the morphological description of *Celastrus liebmannii* Standl. and *Schaefferia argentinensis* Speg., as well as photos, comments and notes on distribution. With the new records, Celastraceae *sensu stricto* doubled from two to four genera present in São Paulo. An updated identification key for the genera occurring in the state is provided.

**Keywords:** Celastroideae, *Celastrus*, *Monteverdia*, *Schaefferia*, taxonomy.

**Resumo:** (Gêneros de Celastraceae em São Paulo (Brasil): atualização após 20 anos da "Flora Fanerogâmica") Após 20 anos da publicação do tratamento florístico de Celastraceae no projeto "Flora fanerogâmica do estado de São Paulo", foram encontrados dois novos registros de gêneros. Apresenta-se aqui a descrição morfológica de *Celastrus liebmannii* Standl. e *Schaefferia argentinensis* Speg., bem como fotos, comentários e notas sobre a distribuição.

**Palavras-chave:** Celastroideae, *Celastrus*, *Monteverdia*, *Schaefferia*, taxonomia.

## Introduction

It has been 20 years of the publication of the Celastraceae *sensu stricto* treatment in the project "The phanerogamic flora of São Paulo state" (Carvalho-Okano, 2005). When published, the treatment reported two genera and 19 species for the state. *Maytenus* Molina (1782: 177–178) had 18 species recognized, while *Plenckia* Reissek (1861: 29) is represented by a single species, *P. populnea* Reissek (1861: 29). Nine years ago, all *Maytenus* species in the state were transferred to *Monteverdia* A.Rich. (1845: 346–347) due to molecular and morphological evidences (Biral et al., 2017). As currently delimited, the genus *Maytenus* is represented in Brazil by only *Maytenus boaria* Molina (1782: 177–178). Even though *M. boaria* is distributed from Minas Gerais to Rio Grande do Sul, it has not been yet recorded in the state, despite be found in Serra Fina, in Minas Gerais state, an area close to São Paulo border.

The occurrence of Celastraceae s.s. in the São Paulo state has increased with the addition of species from two genera – *Schaefferia* Jacquin (1760: 10) and *Celastrus* Linnaeus (1753: 196) – that were not recorded in the treatment published in the "Phanerogamic Flora"

project (Carvalho-Okano, 2005). Since that publication, I conducted fieldworks and was able to find and collect species from these two genera that had not previously been recorded in the state. The results presented here are noteworthy, as São Paulo is one of the most recognized states in Brazil for its botanical collections (Alves et al., 2018). Furthermore, the recording of these two genera, two decades after the family treatment, underscores the fact that published floras in Brazil are far from to be complete. Other new records in the state of São Paulo have also been confirmed for other families that have already been published, such as Eriocaulaceae (Trovó & Sano, 2016) and Gesneriaceae (Arzolla et al., 2007).

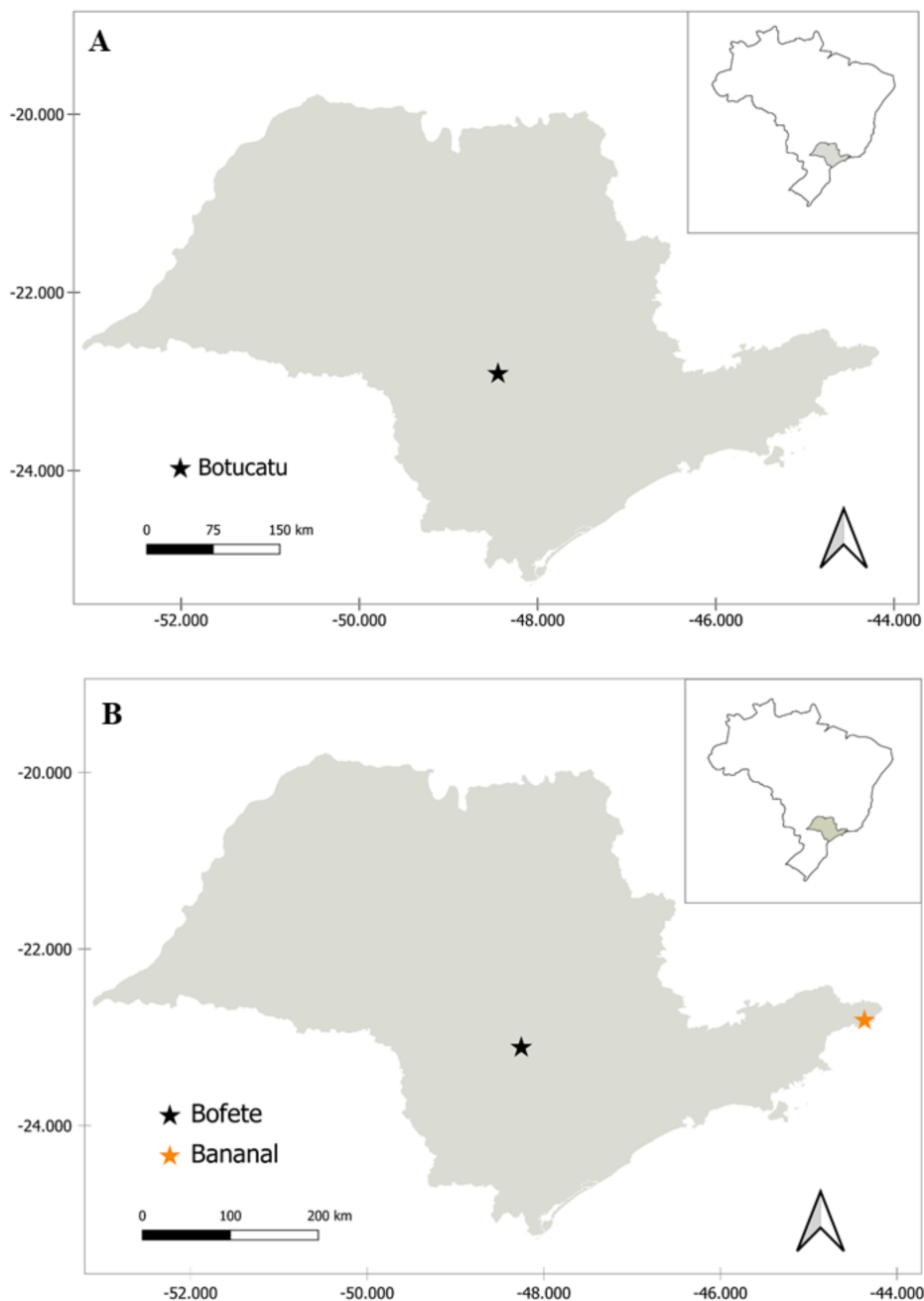
Descriptions for *Schaefferia argentinensis* and *Celastrus liebmannii* based on specimens gathered in São Paulo state, comments and colour plates are provided. An updated identification key for the Celastraceae s.s. genera occurring in the state is also presented.

## Material & Methods

The specimens were collected in the municipalities of Bananal, Bofete and Botucatu, in São Paulo state. *Scha-*

*efferia argentinensis* was collected in “Mata da Pavuna”, in Botucatu (Figure 1a). It is a fragment of ca. 400 ha of semideciduous forest with enclaves of deciduous vegetation on rocky soil, located in a private property (Biral & Lombardi, 2012). *Celastrus liebmannii* was collected in Estação Ecológica Bananal (EEB), a conservation unit located in Serra da Bocaina, in the municipality of Bananal (Figure 1b), covered by Ombrophilous Dense Forest at an altitude ranging from 1200 to 1900 meters, and in Bofete, in central part of the state, in Seasonal Semideciduous forest. The collections followed the stan-

dard botanical collection procedures, as outlined in IBGE (2012) and Mori et al. (1989). The specimens are cited in the "Specimens examined" section in the Results, with the herbaria acronyms according to Thiers (2025). The majority of these specimens are housed in the SHPR herbarium, contributing to efforts to establish its initial collection (Toderke et al., 2021). Identification and the new records of occurrence were validated based on specialized literature (Ding-Hou, 1955; Lourteig & O'Donnell, 1955; Simmons, 2004; Carvalho-Okano, 2005; Lombardi & Barrie, 2015; Biral, 2017; Biral & Marcusso, 2023).



**Figure 1:** A. Map of São Paulo state with the location of the municipality of Botucatu, where *Schaefferia argentinensis* is found; B. Map of São Paulo state with the location of the municipalities of Bofete and Bananal, where *Celastrus liebmannii* is found.

## Results

The species *Schaefferia argentinensis* Spegazzini (1917: 345) was first gathered in the state during the development of my Master dissertation in the Mata da Pavuna, in Botucatu (Biral & Lombardi, 2012). I came back to the place where the specimen was found and re-collected it twice in following years 2012 and 2020. *Celastrus liebmannii* Standley (1931: 316–317) was first collected in Estação Ecológica Bananal (EEB), a conservation unity in the homonym municipality. The species was gathered in 2008 but previously misidentified as Dilleniaceae. I was also able to find the species in the surroundings of EEB and in the municipality of Bofete in 2021.

*Schaefferia argentinensis* Speg., Physis (Buenos Aires), 3: 345. 1917. Figure 2 a-f.

**Description:** Shrubs or treelets (up to 6 meters tall), bark rugose, gray, diverse shades, covered by lichens. Branches terete, 6–10 longitudinal ribs, tenuous, lenticelled, brownish-green dry; twigs terete, longitudinal ribs, verrucose, lenticelled, glabrous to sparsely pubescent, brownish-yellow dry. Leaves, simple, alternate, sometimes clustered in brachyblasts, falsely oppositive or verticillate; stipule 0.75 mm long, caducous, triangular, the margin frimbriate, the apex acuminate blackened dry; petiole 1–4 mm long, flattened; blades 2.6–5.7 × 1.1–2.2 cm, elliptic to ovate-elliptic, the base attenuate to acute,

the margin entire to slightly undulate, flat, the apex acuminate to acute, mucron 0.5–0.6 mm long, membranaceous, glabrous, drying green, commonly wrinkled surface; primary vein flat on the adaxial side, flat to prominulous on the abaxial side, both whitish to yellowish dry; 2–5 secondary veins, the first pair leaving from the base of the leaf, obscure on the adaxial side, flat to inconspicuous on the abaxial side. Inflorescences fascicular, pauciflorous or reduce to a solitary flower; bracts 1–2 per flower, 0.4–0.6 × 0.3–0.5 mm, ovate, the margin erose, the apex acute; pedicels 1–3.75 mm long, cylindrical, sparsely pubescent. Flowers 4-merous, 4–5 mm long at anthesis, sepals 0.5–1.6 × 0.5–1.8 mm, ovate, the margin erose; petals 1.7–2.7 × 1–1.5 mm, oblong to obovate, the margin entire to erose, green to cream; disc short, rounded, absent or reduced in male flowers, filaments 1.9–2.2 mm long (male flowers), flattened, anthers ovate 0.7 mm long, absent or reduced to staminoids (female flowers); ovary 2–(3) locular, stigma bifid, two ovules per locule. Fruits a drupe, 4.4–5 × 3.3–4.4 mm, spheroid to slightly obovate, pericarp coriaceous, surface rugose dry, yellowish to orange ripe, sometimes with the style persistent (reduced). Seeds (1–) 2, 4–5 × 3.3–4.4 mm, spheroids, reddish.

**Specimens examined.** BRAZIL. São Paulo: Botucatu, Mata da Pavuna, à esquerda na trilha da direita, antes do início da descida que leva a cachoeira, 616 m, 13 January 2010, L. Biral & D. G. Gomes 589 (HRCB!, IBGE!, MBM!, NY!); *ibid. loc.*, 27 October 2012, L. Biral & R. C. B. Gonçalves 799 (HRCB!, NY!, RB!); *ibid. loc.*, 12 October 2020, L. Biral & P. Akkawi 2328 (SHPR!).



**Figure 2:** *Schaefferia argentinensis*. A, D. Ripe fruit; B. Twigs and immature fruit; C. leaves; E. Leafy branches; F. Trunk. (Biral & Akkawi 2328 - SHPR).

*Celastrus liebmannii* Standl., Publ. Field Columb. Mus., Bot. Ser. 8: 316. 1931. Figure 3 a-f.

**Description:** Twinning lianas, with some prehensile lateral branches, glabrous; branches cylindrical, with multiple short longitudinal ribs, brown, densely lenticelled, twigs flattened, 4–5 pairs of longitudinal ribs, reddish, lenticels absent. Stipules 0.45 mm long, triangular to large-triangular, margins erose, apex acute; petiole 4.5 – 10 mm long, cylindrical, revolute above; blades 6.7–16.2 × 2.8–6.3 cm, obovoid to elliptic, membranaceous, the base acute, the margin crenate, the apex acute or acuminate; in sicco dull brown on both sides, primary vein slightly raised on the both sides, brownish when dry, secondary veins 5–6(–7) pairs, inserted alternated, inconspicuous on the adaxial side, plane on the abaxial side. Inflorescences in compound cymes (paniculiform), sometimes thyrsoid, or more rarely a simple cyme, axillary or terminal; peduncle evident, 2.8–6.7 mm long, cylindrical, strongly furrowed; bracts 1–2 per ramification, 0.45–1.15 mm long, triangular, apex acute, margin erose; bracteoles 1–2 per flower, 0.35–0.5 mm long, deltoid, margin erose; pedicels 0.4–1 mm long, flattened, furrowed. Flowers

3.5–4 mm diam., whitish; sepals 0.4–0.5 × 0.4–0.55 mm, ovate, margin erose; petals 0.95–1.5 × 0.85–1.15 mm, oblong, obtuse, margin undulate to ciliate; disk 1.5 mm in diam., fleshy, green to yellowish in vivu, margin entire; filaments flattened, broadened at the base, and attenuated at the apex, anthers oblong-ovoid. Fruits 11–17 × 7–11 mm, spheroid (immature) to trigonal (ripe), calyx usually persistent, smooth or slightly rugose, greenish to yellow when ripe, brown to blackened when dry; seeds 7–9 × 4–9 mm, oblong, rugose, glossy.

**Specimens examined.** BRAZIL. São Paulo: Bananal, estrada de terra Sertão do Ariró, sentido Rio Claro (RJ), após a Estação Ecológica Bananal, 22°48'33"S, 44°22'03"W, 1.200 m, 02 January 2021, *L. Biral & P. A. Freitas* 2633 (RB!, SHPR!, SPSF!); *ibid.*, 11 November 2021, *L. Biral & P. A. Freitas* 2913 (SHPR!); Estação Ecológica Bananal, nos arredores da sede da Unidade, 22°48'24"S, 44°22'00"W, 1.115 m, 26 October 2008, *R. Polisel et al.* 836 (SPSF!). Bofete, Fazenda Quilombaria, mata ciliar adjacente ao córrego do Quilombo, 23°07'53"S, 48°18'00"W, 570 m, 21 May 2021, *L. Biral & R. S. Silvério* 2875 (RB!, SHPR!).



**Figure 3:** *Celastrus liebmannii*. A, F. Green fruits; B. Open fruits (dry); C. Branches twinning; D. Prehensile lateral branch; E. Branch with buds; F. Immature fruits (A-B. *Biral & Silvério* 2875 - SHPR; C-F. *Biral & Akkawi* 2633 - SHPR).

**Updated identification key of Celastraceae s.s. genera in São Paulo state. Genera not recorded in the “Phanerogamic Flora of São Paulo state” marked with \***

- 1. Samaroid fruits ..... *Plenckia*
- 1. Capsular or drupaceous fruits
  - 2. Alternate leaves, usually clustered in brachyblasts, unisexual flowers, drupaceous fruits, not arillate seeds ..... *Schaefferia*\*
  - 2. Alternate leaves, laxly arranged along the branches, bisexual flowers, capsular fruits, arillate seeds
    - 3. Shrubs or trees, fruits 2-valved, white aril ..... *Monteverdia*
    - 3. Lianas, fruits 3-valved, orange to red aril ..... *Celastrus*\*

## Discussion

*Schaefferia argentinensis* is distributed in Bolivia, Brazil (South and Southeastern regions), Paraguay, Argentina and Uruguay. It is a shrub or tree from diverse forest formations but mainly deciduous forests in montane and subtropical areas (Biral, 2017). The species is identified by elliptic to ovate-elliptic leaves, alternate, or clustered in brachyblasts (Figure 2b), drying with wrinkled surface, and drupes rugose and spheroid to slightly obovoid. In Brazil, the species was a long time known exclusively for the southern states. The collection Biral & Gomes 589 was the first record of the genus in Brazil outside South region. Currently, besides São Paulo state, the species is also known for Rio de Janeiro (Biral & Lombardi, 2026).

In São Paulo, *Schaefferia argentinensis* is known to occur in a single place, the Mata da Pavuna, in the municipality of Botucatu (Figure 1a). In the Mata da Pavuna, the species was found by a small population of one adult individual of female sex and several seedlings (Figure 2e), restricted to a slope of rocky and shallow soil. Due to be found only from a single place, the species was considered as “Critically Endangered” in the latest List of Endangered Species of São Paulo flora (São Paulo, 2016).

Noteworthy that *Schaefferia* is dioecious (uncommon condition in the family) and the specimen was collected with fruits, but no male specimens were found in the surroundings. Most of Celastraceae genera has bisexual flowers, but in *Schaefferia* the flowers are unisexual or functionally unisexual by strong reduction of sexual parts. Variation on flowers morphology in *S. argentinensis* can be found in Lourteig & O'Donnell (1955). Male flowers of *S. argentinensis* show no gynoeceum or a reduced gynoeceum; female flowers have no stamens or bear staminodes. Trend to unisexuality from reduction of reproductive parts in bisexual flowers is reported for South American species of *Maytenus* and *Monteverdia* genera (Benevides et al., 2013; Godoy et al., 2020).

Some fruits were observed to be inserted asymmetrically on the pedicel (Figure 3 a, b, d). This character is common to be found in Celastraceae genera with distribution restricted or concentrated on northern hemisphere of the New World, such as *Crossopetalum* P. Browne (1756: 145) and *Torrabasia* Krug & Urban (in Urban 1904: 49–50) (Mory, 2010). This character makes sense to be seen in *Schaefferia argentinensis* since *Schaefferia* is a genus with the highest diversity on species in Mexico

and Mesoamerica. The taxon is endemic to the Neotropics with 15 species of which only three occur in South America (POWO, 2026).

*Celastrus liebmannii* is known by three collections gathered in two localities in the state. The collection R. Polisel 836 (SPSF) was first found through the database “speciesLink” (2019). The specimen was gathered in 2008 and identified as Dilleniaceae. Posteriorly, the specimen was determined as *C. liebmannii* by L. Rossi in 2019. I could confirm the identification after contacting by the SPSF curatorship.

During fieldwork in beginning of 2021 in EEB, the specimen previously related in the label of Polisel 836 as present in “the vicinity of the Estação Ecológica’s headquarters”, could not be found. However, another specimen (Biral 2633) was found along the “Estrada do Seridó”, a dirt road that crosses the EEB in direction to the municipality of Rio Claro, in Rio de Janeiro state, less than 10 m after the exit of the area belonging to the Station, in a forest on the roadside. Only a few green fruits were seen on the specimen and most of them were fallen on the ground, ripe and yellowish. Most of them had not the seeds properly developed within. The fallen fruits were put to dry in the shade at room temperature. They dried easily and quickly turned brown to blackened, having shrunk considerably after drying. In May 2021, another specimen of *Celastrus liebmannii* (Biral 2876) was gathered in the municipality of Bofete, central region of the state, in the interior of a fragment of Seasonally Deciduous Forest.

The genus *Celastrus* is mainly Asian with ca. 30–40 species (Ding-Hou, 1955; POWO, 2026) of which five are currently recognized in the Neotropics (Biral & Lombardi, 2026). The genus is characterized by climbing habit, alternate leaves, fruit 3-valved, and orange to red aril completely covering the seeds. The fruits are very similar to those found in *Tricerna* Liebm (1853: 87–98), a small Neotropical genus that does not occur in Brazil (Biral et al., 2017). In the New World, *Celastrus* is the unique climbing genus of the subfamily Celastroideae and the unique in the family bearing exclusively alternate leaves. All other climbing genera of the family in the continent belong to the subfamilies Hippocrateoideae and Salicoidae (*sensu* Simmons 2004), previously recognized in the separate family Hippocrateaceae, that have predominantly opposite leaves (Lombardi, 2014).

In Brazil, *Celastrus liebmannii* is the unique species of the genus found. It is distributed mainly in Omphalophilous Dense Forest with a few records for Season-

ally Deciduous and Riverine Forests, from Bahia to Paraná states ranging from sea level to 1650 m of elevation. The species is characterized by elliptic-obovate leaves and inflorescences in paniculiform cymes (Biral & Lombardi, 2026).

The results presented here highlight the continued importance of fieldworks in documenting new occurrences, even after the publication of local floras. These new records were detected and then confirmed through collection efforts. After just 20 years since publication of Celastraceae in “Phanerogamic Flora” project, the genera number has doubled. New findings, such as those discussed here, underscore that floras published in book form can quickly become outdated as new taxonomic discoveries are made.

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