

Taxonomy and systematics

New records of the *Tabebuia* Alliance (Bignoniaceae) for the state of Paraíba, northeastern Brazil

Nuevos registros de la Alianza Tabebuia (Bignoniaceae) para el estado de Paraíba, nordeste del Brasil

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Abstract

This study presents 3 new records of the *Tabebuia* Alliance (Bignoniaceae) for the state of Paraíba, northeastern Brazil: *Godmania dardanoi* (J. C. Gomes) A. H. Gentry, *Handroanthus umbellatus* (Sond.) Mattos and *Tabebuia stenocalyx* Sprague & Staph. These species were found in preserved areas of Atlantic rain forest, growing in swampy areas, on sandy and clay soils, and flowering between December and June. For each new record for the state of Paraíba, we present detailed descriptions, taxonomic notes, geographic distribution and photographs.

Keywords: Lamiales; Brazilian flora; Diversity; Atlantic forest; Caatinga

Resumen

Este estudio presenta 3 nuevos registros de la Alianza *Tabebuia* (Bignoniaceae) para el estado de Paraíba, nordeste de Brasil: *Godmania dardanoi* (J. C. Gomes) A. H. Gentry, *Handroanthus umbellatus* (Sond.) Mattos y *Tabebuia stenocalyx* Sprague & Staph. Estas especies se encuentran en el bosque atlántico, creciendo en pantanos con suelos arenosos y arcillosos, con floración de diciembre a junio. Para cada nuevo registro en el estado de Paraíba, presentamos descripciones detalladas, notas taxonómicas, información sobre fenología, distribución geográfica y fotografías.

Palabras clave: Lamiales; Flora brasileña; Diversidad; Bosque atlántico; Caatinga

Introduction

The Bignoniaceae is a large family of trees, treelets, lianas, shrubs, and herbs (Fischer et al., 2004) that belongs to the order Lamiales (APG IV, 2016). This plant family is

composed by 82 genera and 827 species (Lohmann & Ulloa, 2007) that are distributed throughout the tropical regions of the world, occurring predominantly in the Neotropics (Gentry, 1980; Lohmann, 2004). Bignoniaceae currently comprises 6 monophyletic tribes and 2 informally named

clades (Olmstead et al., 2009): Bignonieae, Catalpeae, Jacarandeae, Oroxyleae, Tecomeae, Tourrettiae, *Tabebuia* Alliance and the Paleotropical clade.

The *Tabebuia* Alliance is the second largest clade of the Bignoniaceae and includes Neotropical trees, treelets and shrubs (Olmstead et al., 2009). *Handroanthus* Mattos and *Tabebuia* Gomes ex A.P. de Candolle, with 30 and 67 species, respectively, are the largest genera within this clade (Grose & Olmstead, 2007). The genus *Handroanthus* is distributed through South and Central America, with a single species [i.e., *H. billbergii* (Bur. ex K. Schum.) S. Grose] in the Antilles (Grose & Olmstead, 2007). The genus is mainly characterized by the tree habit, (3-)5-9-foliolated and palmately-compound leaves, 5-lobed calyces, with simple, dendritic or stellate trichomes, and corollas usually yellow (Grose & Olmstead, 2007). *Tabebuia*, on the other hand, is distributed throughout South and Central America and centered in the Antilles (Grose & Olmstead, 2007). It is composed of trees and shrubs, with (1-)7-9-foliolated and palmately-compound leaves, tubular-campanulate and densely lepidote calyces, and white to red corollas, less commonly yellow (Grose & Olmstead, 2007).

Handroanthus and *Tabebuia* occur in all Brazilian phytogeographical domains. In the state of Paraíba, in particular, the species are associated to Caatinga and Atlantic Forest areas (Lohmann, 2010). Members of the *Tabebuia* Alliance are extremely important ecologically as they represent one of the most abundant and diverse elements of various Brazilian biomes. Despite this, taxonomic studies on this clade are still scarce in northeastern Brazil.

Here, we present 3 new records of the *Tabebuia* Alliance for the state of Paraíba: *Godmania dardanoi* (J. C. Gomes) A. H. Gentry, *Handroanthus umbellatus* (Sond.) Mattos and *Tabebuia stenocalyx* Sprague & Stafp (Bignoniaceae). While the former was previously known from the Brazilian states of Bahia, Minas Gerais, Paraná, Rio Grande do Sul, Rio de Janeiro, Santa Catarina and São Paulo, the latter was only known from the Brazilian states of Bahia, Espírito Santo, Pernambuco and Rio de Janeiro (Gentry, 1992; Lohmann, 2010).

Paraíba is located within 06°02'12"-08°19'18" S, 34°45'54"-38°45'45" W and includes 223 counties and 56,469.46 km² of extension (IBGE, 2015), being limited in the north by the Brazilian state of Rio Grande do Norte, in the south by the state of Pernambuco, in the east by the Atlantic Ocean, and in the west by the state of Ceará. The state of Paraíba is divided into 4 mesoregions: Agreste, Mata, Borborema and Sertão (Governo da Paraíba, 2015) (Fig. 1). Multiple botanical studies were conducted in the state of Paraíba since 1999, such as the Flora da Paraíba (Agra et al., 2009; Cabral & Agra, 1999; Coelho et al.,

2008; Costa et al., 2015; Loiola et al., 2007; 2009; Nurit et al., 2005; Pontes & Barbosa, 2004; Silva et al., 2005; Vasconcelos & Melo, 2015; Vasconcelos et al., 2015), the inventory of the Protected Areas of Cariri (Buril et al., 2013; Ferreira et al., 2015; Melo et al., 2011), the Flora of the Coastal Areas (Araújo & Lima, 2013; Melo & Barbosa, 2007; Pereira & Barbosa, 2006), and the Flora of Pico do Jabre (Pontes & Agra, 2001; Rocha & Agra, 2002), among others (Lourenço & Barbosa, 2003; Silva & Melo, 2013; Silva et al., 2015).

Material and methods

Field expeditions were conducted between 2014-2016 through various counties of the state of Paraíba to obtain fertile specimens. During the collecting expeditions, samples were pressed in the field and flowers and fruits were stored in 70% alcohol. Collected samples were pressed and dried following Bridson and Forman (1998). In addition, specimens deposited at EAN (Herbarium Jayme Coelho de Moraes, Areia), JPB (Herbarium Lauro Pires Xavier, João Pessoa) and RB (Herbarium Jardim Botânico do Rio de Janeiro, Rio de Janeiro) were also studied. Phenology was compiled from herbarium specimens. Identifications were based on expert knowledge, specialized bibliography, and morphological comparisons with herbarium specimens and images deposited at the Instituto de Pesquisas Jardim Botânico do Rio de Janeiro (JBRJ, BR), Virtual Herbarium of the Flora and Fungi-REFLORA (BR), and the New York Botanical Garden (NY). Morphological descriptions were made following the terminology of Hickey (1973), Rizzini (1977), Payne (1978), and Harris and Harris (1994).

Redescription

During the course of this study, we encountered 3 species from the *Tabebuia* Alliance that had not been previously documented for the state of Paraíba (Gentry, 1992; Lohmann, 2010). Below we describe each of these taxa, as well as present taxonomic notes, illustrations (Fig. 1A-H) and information on their distribution within the state (Fig. 2).

1. *Godmania dardanoi* (J. C. Gomes) A. H. Gentry, Ann. Missouri Bot. Gard. 63: 74, 1976. (Figs. 1A-C, G; 2)

Tree or shrubs 4-15 m high; stems cylindrical, brown to red, with yellow and vertical stretch marks, scattered lenticels, pubescent. Leaves: 3-7 foliolate, digitately and petiolate; petiole 2.0-2.7 cm long, cylindrical, pubescent; petiolules lacking or reduced; leaflets obovate-oblong, chartaceous, 4.1-6.0 × 2.4-2.7 cm, sessile, base rounded to cuneate, apex attenuate to cuneate, margin entire, discolor,



Figure 1. *Godmania dardanoi*. A, Habit; B, detail of the branches; C, indument; G, reproductive branch. *Handroanthus umbellatus*. D and F, inflorescences; E, flowers (Photographs from J.M.P. Cordeiro 1043). *Tabebuia stenocalyx*. H, vegetative branch (Photograph from I.J.N. Brito).

abaxial face green-grey, adaxial face dark green, pilose above and below, with glandular and tector trichomes; venation brochidodromous. Inflorescence arranged in a panicle, 3.2-3.8 cm long, puberulous. Calyx: vinaceous to green, campanulate, 0.7-0.8 × 0.8-0.9 cm, 5-parted, lobes acute and triangular, pilose outside, with trichomes tector to glandular, puberulous inside, with short glandular trichomes; corolla yellow or greenish yellow outside, cream to magenta inside, campanulate, gibose, 3.2-3.5 × 1.0 cm, puberulous, stamens inserted, anthers 0.5 × 0.2 cm, pilose, pistil ca. 1.8 cm long; ovary 0.3 × 0.2 cm long, linear to oblong, densely lepidote. Capsule greenish, linear-cylindrical, spirally twisted, lepidote, striated

longitudinally, puberulous, 34.0 × 0.8 cm; seeds flat, 0.5 × 1.0 cm long, wings hyaline to membranaceous, narrowed at apices.

Taxonomic summary

Material examined: Brazil: Paraíba: Patos, Road between the municipalities of Patos and Passagem, 18 Sep. 1984, fl., fr., W.N. Fonseca, M.M. Santos 430 (RB 242239).

Taxonomic notes: *Godmania dardanoi* can be recognized by the calyx with lobes acute and triangular, corolla campanulate, yellow or greenish yellow outside, cream to magenta inside, capsules linear-cylindrical,

spirally twisted and striated longitudinally.

2. *Handroanthus umbellatus* (Sonder) Mattos, Loefgrenia, 50: 2, 1970. (Figs. 1D-F; 2)

Tree 5-10 m high; stems cylindrical, bark yellow to gray, with ferruginous trichomes in the branchlets, young shoots of the tree. Leaves 5-6 foliolate, digitately and petiolate; petiole 3.9-6.0 cm long, pubescent; petiolules 0.3-2.3 cm long; leaflets oblong-elliptic or obovate, membranaceous, 5.5-9.0 × 1.9-4.1 cm, base cuneate, apex acute to acuminate, margin entire, concolor, pubescent, ferruginous pubescent, especially on the abaxial surface, venation camptodromous. Inflorescence arranged in a thyrsus, 12-18 cm long, with 4-8 flowers, covered by ferruginous trichomes, villose. Calyx yellow-green, campanulate, with ridged longitudinally, ca. 12 × 0.4 cm, 5-parted, lobes cuneate to cuspidate, pubescent, with ferruginous trichomes; corolla yellow, tubular-campanulate, membranaceous, ca. 2.6-4.7 × 0.5-1.2 cm, glabrous; stamens inserted bellow the corolla, anthers ca. 2.4 × 0.1 cm, dorsifixed, glabrous, short filaments ca. 1.5-1.6 cm long, long filaments ca. 2.2-2.4 cm long, staminode shorter than stamens; ovary 0.2-0.6 cm long, surrounded by a cupular disk. Fruits and seeds not observed.

Taxonomic summary

Material examined: Brazil: Paraíba: Areia, Sítio Pirauá, 29 Jun. 2016, fl., J.M.P. Cordeiro 1050; Serra da Raíz, Sítio Boa Ventura, 25 Dec. 2016, fl., J.M.P. Cordeiro

1080; Sertãozinho, Sítio Canafistula, 10 Jan. 2016, fl., J.M.P. Cordeiro 1043 (EAN 23122).

Taxonomic notes: *Handroanthus umbellatus* can be recognized from all the other species of the genus present in the area by its ferruginous pubescent calyx, with ridged longitudinally and the yellow corolla.

3. *Tabebuia stenocalyx* Sprague & Stapf, Bull. Misc. Inform. Kew, 1910: 196, 1910. (Figs. 1H; 2)

Tree, ca. 25 m tall; stems subterete, puberulous. Leaves simple, alternate; petiole cylindrical, 7.4-10.5 cm long, lepidote; leaflets oblanceolate to narrowly-elliptic, chartaceous, 28.5-33.8 × 6.7-8.1 cm, base attenuated, apex acuminate or rounded to obtuse, margin entire, discolor, adaxial surface greenish-olive, abaxial surface greenish-gray, lepidote on both sides, venation brochidodromous. Inflorescence in a terminal panicle, 14.8-16.8 cm long, ca. 2.5 cm diam., with 2-3 flowers, velutinous. Calyx green to vinaceous, tubular, without transverse lines, smooth, 1.7-2.0 × 0.5-0.6 cm, 5-parted, lobes cuneate, densely lepidote; corolla white, salverform, membranaceous, 2.8-5.3 × 0.5-0.6 cm, glabrous; stamens inserted, anthers ca. 0.3 cm long, dorsifixed, short filaments 0.7-0.8 cm long, long filaments 0.9-1.0 cm long, staminode shorter than stamens; ovary ca. 6 mm long, surrounded by a cupular disk. Capsule greenish, linear-oblong, narrow at apices and base, coriaceous, 16.7-17.8 × 1.2-1.3 cm; seeds flat, elliptic, ca. 1.3 × 4 cm long, wings hyaline to membranaceous, 0.9-1.0 cm long.

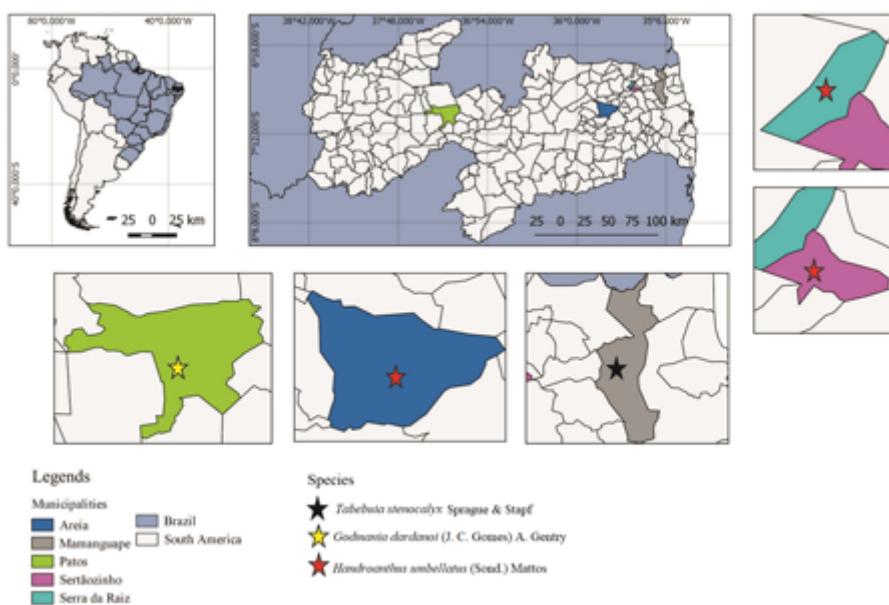


Figure 2. Map showing the points of occurrence of the species: *Godmania dardanoi*, *Handroanthus umbellatus* and *Tabebuia stenocalyx* in Paraíba state, Brazilian northeast. (Prepared by E.M. Rodrigues).

Taxonomic summary

Material examined: Brazil: Paraíba: Mamanguape, 15 Apr. 2011, fl., P.C. Gadelha-Neto s.n. (JPB 46643).

Taxonomic notes: *Tabebuia stenocalyx* can be recognized by the subterete and lenticellate branchlets, simple and alternate leaves, white and salverform corollas.

Discussion

In this study, we document 3 new records of the *Tabebuia* Alliance for the state of Paraíba. The genus *Godmania* is represented by 2 species in Brazil: *Godmania aesculifolia* (Kunth) Standl. and *G. dardanoi*. These species occur in the areas of Amazonia, Caatinga and Cerrado, in steppe vegetation and Amazon Savannah, along the states of Pará, Roraima, Bahia, Ceará, Pernambuco, Piauí and Paraíba (Lohmann, 2015). *Godmania dardanoi* occurs only in Brazilian northeast (Gentry 1992), in Cerrado and Caatinga vegetation in the states of Bahia, Ceará, Pernambuco and Piauí (Lohmann, 2015). In the state of Paraíba, the genus is being recorded for the first time, represented by the species *G. dardanoi* where is locally called “Chifre-de-bode”. It was found in an environmental of Caatinga tree, flowering and fruiting in September.

Handroanthus umbellatus is a tree endemic to Brazil and restricted to the Atlantic Forest, where it occurs from Bahia to Rio Grande do Sul, Minas Gerais and Distrito Federal (Gentry, 1992; Lohmann, 2010). We document this species for the state of Paraíba for the first time, where it occurs in the counties of Areia, Serra da Raíz and Sertãozinho, growing on seasonally deciduous forest and Ombróphyllous forest (tropical rain forest), respectively. This species is usually found in disturbed areas and is locally called “pau d’arco amarelo,” “pau d’arco manicoba,” and “pau d’arco peroba.”

In the state of Paraíba, *Handroanthus umbellatus* is sympatric with *H. impetiginosus* (Mart. ex DC.) Mattos and *H. serratifolius* (Vahl) S.O. Grose. *H. umbellatus* is commonly misidentified as *H. serratifolius* due to the yellow corolla. However, *H. umbellatus* can be separated because of its tomentose calyx ridged longitudinally (vs. calyx pubescent, with stellate trichomes and without transversal striations in *H. serratifolius*), and tomentose fruits, with thin valves (vs. glabrate to lepidote fruits, with scattered trichomes, and thick valves in *H. serratifolius*) (Gentry, 1992; Espírito-Santo et al., 2013). *H. umbellatus* is broadly used as an ornamental and in landscape; it is a valuable hard wood used in construction and to produce charcoal; though these uses are common for various species within the genus. Other species are bee forage (Gentry, 1992). *Handroanthus umbellatus* was found growing between 130-483 m above the sea level and collected with flowers

in December to June (Fig. 2).

Tabebuia stenocalyx Sprague & Staph is distributed throughout Northern South America, where it occurs from eastern Venezuela to the state of Amapá, in Brazil. Within Brazil, this species has a disjunct distribution along the coast of Bahia, Espírito Santo and Rio de Janeiro; it is proper of swampy areas (500 m asl) of the Atlantic Rainforest (Gentry, 1992; Lohmann, 2010). Within the state of Paraíba, this species is found in preserved seasonal semideciduous forests (Mamanguape County), growing on sandy-clay soil, and flowering in April.

Taxonomic studies on the *Tabebuia* Alliance (Bignoniaceae) for the state of Paraíba help us to improve our botanical knowledge for northeastern Brazil. Although *H. umbellatus* and *T. stenocalyx* are known from other Brazilian states, these new records for Paraíba reinforce the importance for detailed floristic surveys of northeastern vegetation types. Improved knowledge on the geographic distribution of taxa is essential for a detailed understanding of patterns of endemism, for an improved understanding of the biogeographical history (Sylvestre, 2002), for the identification of processes underlying the assembly of the tropical biota, and what is more important the conservation of the local flora.

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