

# A TAXONOMIC SURVEY OF THE RAUVOLFOID GRADE (APOCYNACEAE) IN PARAÍBA STATE, BRAZIL

MICKAELLY DE LUCENA MAMEDE,<sup>1</sup> INGRID KOCH,<sup>2</sup> AND JOSÉ IRANILDO MIRANDA DE MELO<sup>3,4</sup>

**Abstract:** This study presents a taxonomic treatment of the Rauvolfioideae grade (Apocynaceae) in Paraíba state, Brazil. Morphologically, Rauvolfioideae are distinguished from the other groups in the family by including representatives with white flowers, stamens free from the style head and fully fertile anthers, and sinistrorse corolla lobes. We carried out field trips to municipalities in Paraíba state between September 2018 and August 2019, visited the herbaria of Paraíba, Pernambuco, and Bahia states, and consulted records of Apocynaceae available at: Virtual Herbarium of Flora and Fungi (Reflora) and SpeciesLink. We found seven genera and 16 species: *Allamanda* (three spp.), *Aspidosperma* (six spp.), *Hancornia* (one sp.), *Himatanthus* (one sp.), *Macoubea* (one sp.), *Rauvolfia* (one sp.), and *Tabernaemontana* (three spp.). *Aspidosperma confertiflorum* A.C.D. Castello and *A. discolor* A.D.C. are recorded for Paraíba state for the first time in this study. The treatment presents a key, taxonomic descriptions, comments on the morphological characters for species recognition, data on flowering and fruiting, distribution and preferential environments, images of the main characters for species identification, and distribution maps.

**Keywords:** Conservation, diversity, flora, Gentianales, taxonomy

**Resumo:** Este estudo apresenta um levantamento taxonômico do grau Rauvolfioideae (Apocynaceae) no Estado da Paraíba, Brasil. Morfologicamente, o grau Rauvolfioideae se diferencia dos demais grupos da família por incluir representantes com flores brancas, estames livres da cabeça do estilete e anteras totalmente férteis, e geralmente apresentam os lobos da corola sinistrorsos. Foram realizadas expedições para coletas em municípios da Paraíba entre setembro/2018 e agosto/2019, analisados os materiais incorporados aos herbários da Paraíba, Pernambuco e Bahia, além de consultados os registros de Apocynaceae disponíveis para a área de estudo nas plataformas: Herbário Virtual da Flora e Fungos (Reflora) e SpeciesLink. Foram encontrados sete gêneros e 16 espécies: *Allamanda* (três spp.), *Aspidosperma* (seis spp.), *Hancornia* (uma sp.), *Himatanthus* (uma sp.), *Macoubea* (uma sp.), *Rauvolfia* (uma sp.), e *Tabernaemontana* (três spp.). *Aspidosperma confertiflorum* A.C.D. Castello e *A. discolor* A.D.C. estão sendo registradas pela primeira vez para a Paraíba nesse estudo. O tratamento taxonômico apresenta chave de identificação, descrições taxonômicas e comentários sobre os caracteres morfológicos para o reconhecimento das espécies, dados de floração e frutificação, distribuição, ambientes preferenciais, imagens dos principais caracteres para a identificação das espécies e mapas de distribuição.

**Palavras-chave:** Conservação, diversidade, flora, Gentianales, taxonomia

According to Endress et al. (2014), Rauvolfioideae are an Apocynaceae subfamily comprising 11 tribes and 79 genera with a pantropical distribution. However, Fishbein et al. (2018) recognizes the Rauvolfioideae grade, a group comprising 12 tribes. In Brazil, Rauvolfioideae comprises 206 species in 24 genera, with 74 species in 18 genera in the Northeast region, and, in the state of Paraíba, nine species and six genera were initially recorded (Flora e Funga do Brasil, 2024).

The species in this grade have latex, flowers with gamopetalous corollas, epipetalous stamens, and usually a superior ovary (semi-inferior in *Himatanthus*), formed by two carpels united to different degrees, with a style and a style head with compartmentalized functions. However, members of the Rauvolfioideae grade can be recognized by typically having white flowers, usually with sinistrorse corollas, stamens free of the style head, and fully fertile anthers. Within Apocynaceae, Rauvolfioideae has great

morphological variation, with its representatives exhibiting all types of habits and phyllotaxis, and an impressive diversity of fruits.

Some representatives of the subfamily have edible fruits, such as ‘mangaba’ (*Hancornia speciosa* Gomes), which has a sweet flavor and is highly appreciated in northeastern Brazil, has high nutritional value and protein content compared to other fruit species (Vieira-Neto, 1994). The latex of the Amazon ‘sorva’ (*Couma utilis* (Mart.) Müll. Arg.) is edible and employed on a large scale in the industrial production of chewing gum. It also provides varnishes and rubber (Falcão and Lleras, 1981). Some species of *Aspidosperma* are appreciated for their wood (Carvalho 2003, 2010), and *Allamanda* and *Thevetia* are cultivated as ornamental species (Sakane and Shepherd, 1986; Lorenzi et al., 2003).

Several species of Rauvolfioideae have pharmacological and toxic properties. Species of *Himatanthus* Willd. Ex Schult. have been tested for their effectiveness for the treatment of

M. Mamede thanks CAPES (Coordenação de Aperfeiçoamento de Pessoal de Nível Superior) for granting her a master’s scholarship; the State University of Paraíba (UEPB) for the infrastructure for the execution of this research; and the Graduate Program in Biodiversity at the Federal Rural University of Pernambuco - PPGBio/UFRPE, for the opportunity to take the master’s course. J. I. M. Melo and I. Koch would like to thank CNPq (National Council for Scientific and Technological Development) for the Research Productivity Grant award (PQ-2 Proc. N. 306658/2022-4 and PQ-2 Proc. N. 315048/2021-2, respectively). Thanks also to A. C. D. Castello for suggestions that were very useful for improving the manuscript.

<sup>1</sup> Programa de Pós-Graduação em Biodiversidade, Departamento de Biologia, Universidade Federal Rural de Pernambuco, Rua Dom Manuel de Medeiros, 52171-900 Recife, PE, Brazil. ORCID: 0000-0001-9418-9905

<sup>2</sup> Departamento de Biologia Vegetal, Instituto de Biologia, Universidade Estadual de Campinas, Rua Monteiro Lobato, 255, Cidade Universitária Zeferino Vaz, 13083-862, Barão Geraldo, Campinas, São Paulo, Brazil. ORCID: 0000-0002-9404-3807

<sup>3</sup> Departamento de Biologia, Centro de Ciências Biológicas e da Saúde, Universidade Estadual da Paraíba, Rua das Baraúnas, 351, Bairro Universitário, 58429-500, Campina Grande, Paraíba, Brazil. ORCID: 0000-0003-3256-5922

<sup>4</sup> Corresponding author: tournefort@gmail.com

*Harvard Papers in Botany*, Vol. 29, No. 2, 2024, pp. 257–278.

© President and Fellows of Harvard College, 2024

ISSN: 1938-2944, DOI: 10.3100/hpib.v29iss2.2024.n5, Published online: 31 December 2024

external wounds, worm infections, and arthritis (Endo et al., 1994; Villegas et al., 1997; Miranda et al., 2000; Camaioni-Neto et al., 2002; Rodrigues et al., 2010), and species of *Aspidosperma* have anti-inflammatory, antineoplastic properties, and are used for treating malaria and fevers (Oliveira et al., 2009; Trindade et al., 2016). Lactonic iridoids (plumericin, alamandin, and isoplumericin) were observed on the bark of *Himatanthus*; plumericin and isoplumericin are toxic to fungi (Silva et al., 1998). Confluence acid, a mono-amino oxidase B inhibitor, has also been isolated from *Himatanthus* spp. and used in studies to treat Parkinson's disease (Endo et al., 1994). Indole alkaloids are recorded for several species of *Aspidosperma*, and these substances are known to act on the central nervous system (Oliveira et al., 2009). The genus *Rauvolfia* L. has species with antimicrobial

actions in addition to toxic potential (Agra et al., 2007; Agra et al., 2008). Indole alkaloids, such as reserpine, with hypotensive and sedative properties, have been widely used in the pharmaceutical industry (Koch, 2002) and isolated from several species of *Rauvolfia*, especially *R. serpentina* (L.) Benth. ex Kurz (Monachino, 1954).

Considering the attributes of this taxonomic group and the importance of expanding studies on the diversity of Apocynaceae in the flora of northeastern Brazil, we present the taxonomic treatment of the Rauvolfioideae grade (Apocynaceae) for Paraíba state, Brazil. We include an identification key, descriptions, examined material, and comments on the diagnostic morphological characters for each species, as well as data on reproductive phenology, preferential environments, and geographical distribution maps.

#### MATERIALS AND METHODS

##### Study area

Paraíba state (Fig. 1) has an area of 56,467.239 km<sup>2</sup> (IBGE, 2018) and comprises predominantly Caatinga vegetation, which occupies approximately 90% of its territory. The other vegetation types include semideciduous seasonal forest, open ombrophilous forest, wooded savanna, forested savanna, mangrove, palm trees, 'tabuleiros' [a Brazilian type of coastal natural formation like cliffs], and the pioneer vegetation of beaches, 'restingas,' and open areas (IBGE, 2004; SERVIÇO FLORESTAL BRASILEIRO, 2019).

According to Francisco et al. (2015), the Paraíba Forest is characterized by a hot and humid tropical climate. In the Borborema region, in central Paraíba, the climate is hot semi-arid with summer rains and between February and May, the greatest amounts of rain occur in the Cariri/Curimataú and Sertão regions and in the west of the state, the climate is tropical hot semi-humid, also with summer rains (BSHw). The rainy season in the Midwest sector is the most intense during the months from February to May, while in the East sector, it takes place from April to July

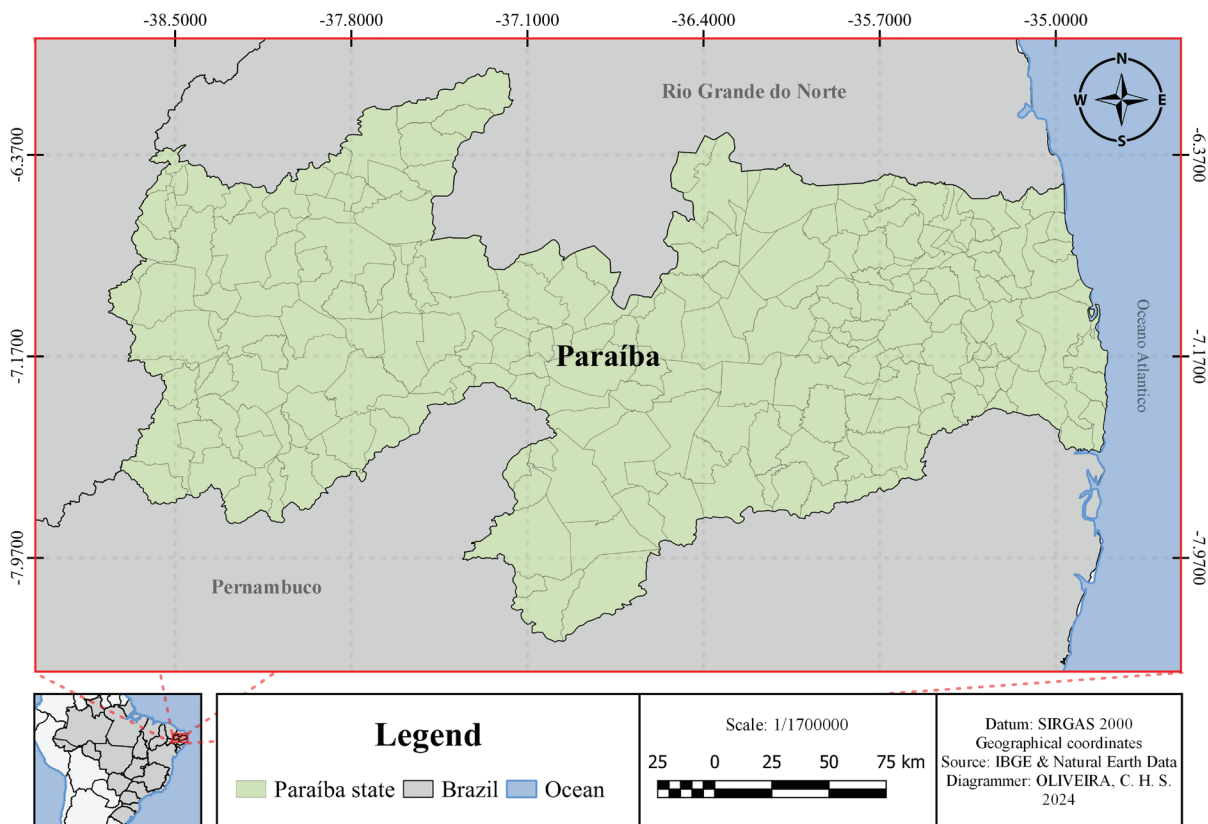


FIGURE 1. Location of the study area, Paraíba state, Brazil.

(AESAs, 2006) with the annual rainfall ranges from 300 to 1900 mm, with the lowest precipitation occurring in the West and central regions with greater rainfall averages on the Paraíba coast. (Francisco et al., 2015).

#### Taxonomic treatment

We conducted field expeditions from September 2018 to August 2019, covering the Paraíba state, including dry and rainy seasons, and all intermediate regions. Specimens were collected and processed according to the methods outlined in Judd et al. (2009). We incorporated the specimens into the João Vasconcelos-Sobrinho Herbarium (PEUFR) at the Rural Federal University of Pernambuco (UFRPE) and sent duplicates to the Manuel de Arruda Câmara Herbarium (HACAM) at the State University of Paraíba, *Campus I*. We visited the herbaria of Paraíba state (CSTR, EAN, HACAM, and JPB) as well as the herbaria of Pernambuco state (HST, IPA, and PEUFR) and Bahia state (ALCB and HUEFS). The herbaria acronyms are in accordance with Thiers (continuously updated). We also consulted the platforms of the INCT: Virtual Herbarium of the Flora and Fungi (2024) and SpeciesLink (2024). We checked the correct spelling of taxon names in the database 'Flora and Fungi

of Brazil' (Koch et al., continuously updated) and Tropicos (continuously updated). We also used these databases to obtain data on the Brazilian and general distribution of each species.

We used specialized literature for the identification of genera and species (Sakane and Shepherd, 1986; Leeuwenberg, 1994; Koch and Kinoshita, 1999; Koch, 2002; Simões and Kinoshita, 2002; Matozinhos and Konno, 2008, 2011; Morokawa et al., 2013; Pereira et al., 2016; Castelo et al., 2018; Fernandes et al., 2018), and consulted protologues and nomenclatural types. We used the terminologies of Harris and Harris (2000) and Gonçalves and Lorenzi (2011), in addition to those of the classic studies for Apocynaceae for taxonomic descriptions. We based species morphological and flowering and fruiting data on field observations and information on the labels of the analyzed exsiccatae; when pertinent, we complemented this with literature data. We used our observations and exsiccatae labels to obtain geographical distribution data and preferential environments of the species in Paraíba state. We used the studies of Cabrera (1973), Morrone (2014, 2015), and Boechat and Longhi-Wagner (2000) to determine the distribution patterns of the species.

#### RESULTS AND DISCUSSION

We identified 16 species in seven genera: *Allamanda blanchetii* A.DC., *Allamanda cathartica* L., *Allamanda doniana* Müll. Arg., *Aspidosperma confertiflorum* A.C.D. Castello, *Aspidosperma cuspa* (Kunth) S.F. Blake ex Pittier, *Aspidosperma discolor* A.DC., *Aspidosperma melanocalyx* Müll. Arg., *Aspidosperma nigricans* Handro, *Aspidosperma pyriforme* Mart. & Zucc., *Hancornia speciosa* Gomes, *Himatanthus bracteatus* (A.DC.) Woodson, *Macoubea guianensis* Aubl., *Rauvolfia ligustrina* Willd., *Tabernaemontana catharinensis* A.DC., *Tabernaemontana flavicans* Willd. ex Roem. & Schult., and *Tabernaemontana laeta* Mart. *Aspidosperma confertiflorum*, *A. discolor*, *A. melanocalyx*, *Macoubea guianensis*, *Tabernaemontana catharinensis*, *T. flavicans*, *T. laeta*, and the genus *Macoubea* were first recorded in Paraíba state by Mamede et al. (2020). Furthermore, three species are restricted to the Northeast region: *Aspidosperma confertiflorum*, *A. nigricans*, and *A. discolor*. *Aspidosperma pyriforme* and *Allamanda blanchetii* are the most widely distributed species in the state.

We found Rauvolfioid species in upland forests ('Brejos de altitude'), dry forests (*Aspidosperma confertiflorum*, *Tabernaemontana laeta*), Caatinga (*Aspidosperma pyriforme*), and coastal Atlantic vegetation, including 'restingas' and 'tabuleiros' (*Hancornia speciosa* and *Himatanthus bracteatus*). We also observed species of Rauvolfioid in forest edges, roadsides, and disturbed areas. *Allamanda cathartica* and *A. doniana* had few collection records, many of which were in areas disturbed by humans. However, because these species are widely used in gardening projects, we are unsure of their native distribution.

We found several species in the Atlantic Forest and the Caatinga protected areas, including the upland forests. In the municipality of Mamanguape, there are records for

*Hancornia speciosa*, *Himatanthus bracteatus*, and *Macoubea guianensis* at the 'Reserva Biológica de Guaribas,' and for *Tabernaemontana flavicans*, *Aspidosperma discolor*, and *H. bracteatus* at the 'Estação Ecológica do Pau-Brasil.' Some species have been recorded at the 'Jardim Botânico Benjamin Maranhão,' known as 'Mata do Buraquinho,' municipality of João Pessoa, such as *Aspidosperma melanocalyx*, *Hancornia speciosa*, *H. bracteatus*, *M. guianensis*, and *T. flavicans*. *Allamanda blanchetii*, *Aspidosperma nigricans*, and *A. pyriforme* were recorded at the 'Parque Estadual do Pico do Jabre,' in the municipality of Maturéia. The species *H. bracteatus* and *Rauvolfia ligustrina* were recorded at the 'Parque Estadual Mata do Pau-Ferro,' municipality of Areia. At the 'Parque Estadual da Pedra da Boca,' located between the municipalities of Araruna and Tacima, we found *Allamanda blanchetii*, *Himatanthus bracteatus*, and *Rauvolfia ligustrina*. At the Monumento Natural (MONA) do Vale dos Dinossauros, municipality of Sousa, we recorded *Aspidosperma pyriforme*, *Himatanthus bracteatus*, and *Rauvolfia ligustrina*.

*Aspidosperma pyriforme* and *Allamanda blanchetii* were recorded at the 'Área de Proteção Ambiental (APA) de Onças,' municipality of São João do Tigre; *Himatanthus bracteatus* and *Hancornia speciosa* were found at the Tambaba APA, municipality of Conde; *Rauvolfia ligustrina* and *Tabernaemontana laeta* were obtained at the Roncador APA, municipality of Bananeiras.

Regarding Private Natural Heritage Reserves (RPPN), *Allamanda blanchetii* and *Aspidosperma pyriforme* were recorded at the Fazenda Almas RPPN, municipality of São José dos Cordeiros; *A. pyriforme* at the Fazenda Tamanduá RPPN, municipality of Santa Terezinha; and *Hancornia speciosa*, *Himatanthus bracteatus*, and *Tabernaemontana laeta* at the Fazenda Pacatuba RPPN, municipality of Sapé.

*Aspidosperma discolor* and *A. melanocalyx* have a few records of occurrence in these conservation units. Still, these records are quite old, dated from 1995, and new searches for the species are necessary to assess their current occurrence in Paraíba state.

We used the following characters to identify the

Rauvolfioid grade species in the study area: stem surface, latex coloration, foliar phyllotaxy, leaf size, texture, shape, base and apex of the leaf blade, venation type, bract shape, calyx lacinia, length relationship between tube and lobes, corolla shape and color, nectariferous disc shape, characters related to the ovary, fruit type, fruit surface, and fruit shape.

#### TAXONOMIC TREATMENT

##### Rauvolfioideae Kostel

*Shrubs*, with climbing *branches* or not, and *trees*, with woody, subwoody, flat, or grooved *stems*, usually white or reddish *latex*; *branches* lenticellate or non-lenticellate, glabrous or pilose. *Leaves* petiolate or sessile, simple, alternate, opposite, or verticillate, lax or congested at the apex of the branches; blade oblanceolate, elliptical, lanceolate, obovate, with margin flat, slightly undulate, or revolute, chartaceous, or membranaceous, concolorous or discolorous; brochidodromous, craspedodromous, camp-todromous, or reticulodromous venation. *Inflorescence* terminal or axillary; bracts linear, oval, or navicular. *Flowers* pink, white, cream, dark red, or yellow; calyx usually with 5 sepals, with subequal lacinia or unequal to

each other; hypocrateriform or infundibuliform corolla; stamens longitudinal, anthers free from the head of the style, triangular, lanceolate, or oval; ovary bicarpellar, hemisyncarpic (rarely syncarpous: *Allamanda* spp.; *Rauvolfia ligustrina*), usually superior, rarely semi-inferior (*Himatanthus*), glabrous or tomentose; style head fusiform or spool-shaped, with two apical appendages and trichomes forming small crowns at the apex and/or base. Nectariferous disc present or absent, lobed, or entire. *Fruit* a follicle, berry, capsule, or drupe with a smooth, costate, verrucose, or spinescent surface; sessile or stipitate, lenticels conspicuous or inconspicuous; seeds smooth or rough, orbicular, rounded, elliptical, ovate, or oblong, naked, with aril, or winged.

#### KEY TO SPECIES OF RAUVOLFOID GRADE (APOCYNACEAE) IN PARAÍBA STATE, BRAZIL

- 1a. Leaves opposite . . . . . 2  
 1b. Leaves whorled or alternate . . . . . 6  
 2a. Tree ca. 20 m tall; leaves 8.2–16.0 × 5.4–10.0 cm, blade obovate, base rounded to obtuse, apex rounded; calyx lacinia oval; fruit a berry, with a dried pericarp . . . . . *Macoubea guianensis*  
 2b. Tree 2–8 m tall; leaves 2.5–10.8 × 0.8–4.0 cm, blade oblong or elliptical, base obtuse or cuneate, apex cuneate, acuminate or acute; calyx lacinia deltoid, oval, or triangular; fruit a follicle or a berry, when a berry, with a fleshy pericarp . . . . . 3  
 3a. Leaves 2.5–5.2 × 0.8–2.6 cm, blade oblong to elliptical, apex acuminate; flowers pubescent, calyx lacinia deltoid; corolla with tube 29–31 × 2–3 mm, lobes 5–9 × 1–2 mm, fruit a berry . . . . . *Hancornia speciosa*  
 3b. Leaves 5.3–10.8 × 2.3–4.0 cm, blade elliptical, apex cuneate, acute, or acuminate; flowers glabrous, calyx lacinia triangular or oval; corolla tube 5–27 × 1–2 mm, lobes 4–21 × 4–8 mm, fruit a follicle . . . . . 4  
 4a. Venation brochidodromous; follicle smooth, ellipsoid . . . . . *Tabernaemontana flavicans*  
 4b. Venation camp-todromous venation; follicle muricate, ellipsoid, or convex concave . . . . . 5  
 5a. Leaf apex cuneate to acuminate, chartaceous; bracts 1.5 × 1.0 mm, oval; calyx 3 × 2 mm, lacinia oval; floral tube shorter than lobes; follicle ellipsoid . . . . . *Tabernaemontana laeta*  
 5b. Leaf apex acute, membranaceous, bracts ca. 2 × 2 mm, lanceolate; calyx ca. 4 × 3 mm, lacinia triangular; floral tube longer than lobes; follicle convex-concave . . . . . *Tabernaemontana catharinensis*  
 6a. Leaves whorled; fruit a capsule or drupe . . . . . 7  
 6b. Leaves alternate; fruit a follicle . . . . . 10  
 7a. Leaves 2.4–3.7 × 1.0–1.5 cm; blade elliptical to oval; corolla hypocrateriform; fruit a drupe . . . . . *Rauvolfia ligustrina*  
 7b. Leaves 3.5–8.0 × 2.0–3.3 cm; blade lanceolate to elliptical; corolla infundibuliform; fruit a capsule . . . . . 8  
 8a. Branches and leaves hispid; leaves sessile, 3 per node, flowers dark red or pinkish . . . . . *Allamanda blanchetii*  
 8b. Branches glabrous or pubescent; leaves petiolate, 4 per node; flowers yellow . . . . . 9  
 9a. Blade lanceolate, margin flat; lower corolla tube longer than the upper corolla tube and lobes; corolla lobes orbicular; nectariferous, disc slightly 5-lobed . . . . . *Allamanda cathartica*  
 9b. Blade oblanceolate to oval, margin slightly bullate; lower corolla tube shorter than the upper corolla tube and the lobes; corolla lobes obovate; nectariferous disc entire . . . . . *Allamanda doniana*  
 10a. Inflorescence bracts navicular (3.8 × 2.2 cm); ovary semi-inferous; follicle oblong . . . . . *Himatanthus bracteatus*  
 10b. Inflorescence bracts non-navicular (ca. 1 mm long) or absent; ovary superior; follicle falcate, dolabriform, or pyriform . . . . . 11  
 11a. Cataphylls protecting the gems; leaves congested at the apex of branches . . . . . 12  
 11b. Cataphylls absent, leaves lax at the apex of branches . . . . . 14  
 12a. Leaf blade concolorous, glabrous adaxially and strigose abaxially; venation brochidodromous; flowers white; corolla tube shorter than the lobes; follicle pyriform . . . . . *Aspidosperma pyrifolium*  
 12b. Leaf blade discolorous, adaxially pubescent to glabrous, abaxially pubescent, tomentose or glabrous; venation craspedodromous or eucamp-todromous; flowers cream or yellowish green; corolla tube equal to or longer than the lobes; follicle dolabriform . . . . . 13

## KEY TO SPECIES OF RAUVOLFIOD GRADE (APOCYNACEAE) IN PARAÍBA STATE, BRAZIL CONT.

- 13a. Leaf blade with margin slightly undulated, base acute and strongly revolute, adaxial surface pubescent to glabrous, abaxial surface tomentose to glabrous; venation craspedodromous; flowers cream; corolla with tube equal to or longer than the lobes; ovary tomentose; follicle yellow brown, densely tomentose. . . . . *Aspidosperma nigricans*
- 13b. Leaf blade with margin flat, base cuneate, adaxial and abaxial surfaces pubescent; venation eucamptodromous; flowers yellowish to green; corolla tube longer than the lobes; ovary glabrous; follicle brown, glabrous. . . . . *Aspidosperma confertiflorum*
- 14a. Venation reticulodromous; follicle falcate, smooth surface . . . . . *Aspidosperma cuspa*
- 14b. Venation brochidodromous or craspedodromous; follicle dolabriform or pyriform, grooved or muricate. . . . . 15
- 15a. Stem grooved, latex white; blade elliptical; flowers white; follicle dolabriform, muricate, glabrous, midrib inconspicuous . . . . . *Aspidosperma discolor*
- 15b. Stem cylindrical, latex red; blade oblong; flowers yellow; follicle pyriform, grooved, tomentose, midrib conspicuous . . . . . *Aspidosperma melanocalyx*

*Allamanda* L., Mant. Pl. 2:146, 214–215. 1771.

Type: *A. cathartica* L., Mant. Pl. 2:214–215. 1771.

*Shrubs or subshrubs*, herbaceous or subwoody stem, white latex; branches non-lenticellate. Leaves petiolate or sessile, whorled, 3–4 per node, lax; blade lanceolate to elliptical, with flat margin, chartaceous, discolorous; brochidodromous; colleters axillary or absent. Inflorescences terminal, cymose; bracts linear. Flowers pink, dark red, or yellow; calyx with 5 sepals, equal in length or unequal to each other; corolla infundibuliform. Stamens with trichomes at the base. Ovary globose, superior; nectariferous disc present. Fruit capsular, circular-compressed, or elliptical, thorny. Seeds winged, orbicular.

*Allamanda blanchetii* has a wide distribution in the remaining areas of Caatinga and upland forests. This species is the only one in the genus to have flowers with dark red or pink coloration, which facilitates its identification. The other species have yellow flowers and similar characteristics. The two species with yellow flowers recorded in this study, *A. cathartica* and *A. doniana*, have few collection records from the state of Paraíba. As they are widely used in gardening projects, their native distribution is not well known.

*Allamanda blanchetii* A.DC., Prodr. 8:319. 1844. (Fig. 2; Fig. 3A–D; Fig. 10A).

*Shrubs*, 1.5–4.0 m tall, stem subwoody; branches hispid. Leaves sessile, 3 per node; blade 3.5–8.0 × 2.0–3.3 cm, lanceolate to elliptical, margin flat, base cuneate, apex cuspidate to acuminate, discolorous, hispid on both surfaces, prominent midrib; brochidodromous; axillary colleters. Inflorescence 6–10 cm long; peduncle ca. 4 mm long, hispid; bracts 1.5 × 1.0 mm, linear, pubescent. Flowers dark red or pink; calyx 2.8 × 0.7 cm, lacinia lanceolate to ovate, subequal, hispid to glabrescent on the outer surface, hispid on the inner surface; corolla infundibuliform, 2.3 × 0.4 cm lower tube, 2.8 × 1.4 cm upper tube, 2.0 × 2.7 cm lobes, orbicular with slightly undulating margin. Anthers ca. 3 mm long. Ovary 2–3 mm long, globose, glabrous; nectariferous disc ca. 0.5 mm long, 5-lobed. Capsule 4.3 × 3.7 cm, elliptic to obovate-compressed, thorny, glabrous. Seeds 2.1 × 1.7 mm, orbicular, winged.

**Specimens examined:** BRAZIL. Paraíba: Alagoa Grande, 28 January 2010, fl., *Félix 16011* (EAN); Alcantil, 21 December 2007, fl., *Félix 12059* (EAN); Araruna, 14 April 2002, fl., *Barbosa 2412* (JPB); Areia, 26 May 2001,

fl., *Félix 7104* (HST); Cuité, 11 March 2008, fl., *Félix 12135* (EAN); Cuitegi, Sítio Palmeira, 22 April 2009, fl., *Gadelha-Neto 2575* (JPB); Coremas, 7 February 2015, fl., *Whelley s/n* (HCSTR); Esperança, 17 June 2003, fl., *Pitrez 273* (EAN); Guarabira, Serra da Jurema, 03 April 2015, fl., *Gadelha-Neto 3930* (JPB); Itaporanga, 7 February 2015, fl., fr., *Souza 81* (CSTR); Itapororoca, 17 November 2008, fr., *Félix 12633* (EAN); Juazeirinho, 3 March 1993, fl., *Agra et al. 1593* (IPA); Mamanguape, ReBio Guaribas, 26 November 2002, fl., *Sevilha 2564* (CEN); Maturéia, 8 April 1999, fl., *Agra 5443* (JPB); Monte Horebe, 15 March 2000, fl., *Barbosa 2054* (JPB); Monteiro, 9 July 2009, fl., fr., *Siqueira-Filho 2176*; Ibidem, 13 May 2009, fr., *Carvalho-Sobrinho 2189* (HVASF); Patos, 24 April 2015, fl., *Mamede 04* (CSTR); *Ibidem*, Inselberg Espinho Branco, 26 April 2012, fl., *Angelis 201* (HCSTR); Picuí, 29 January 1998, fl., *Rocha 256* (IPA); Pilões, Serra do Espinho, 7 March 2012, fl., *Guedes 19665* (HUEFS); Queimadas, 27 May 2014, fl., *Oliveira 5802* (IPA); Ibidem, 29 January 2006, fl., *Dantas 748* (HACAM); Remígio, 30 April 2019, fl., *Mamede 30* (PEUFR); São Bentinho, 28 May 2015, fr., *Silva 5942* (CSTR); São João do Tigre, 13 March 2010, fl., fr., *Pessoa 566* (JPB); São José de Piranhas, 03 April 2018, fl., *Mamede16* (PEUFR); Ibidem, 17 July 2008, fl., *Andrade 61* (PEUFR); São José dos Cordeiros, 20 May 2017, fl., *Figueira 621* (JPB); Serraria, 26 January 2007, fl., *Félix 12385* (EAN); Serra Branca, 26 April 2006, fl., fr., *Gadelha-Neto 1510* (JPB); Sobrado, 28 January 2010, fl., *Félix 16010* (EAN); Solânea, 30 August 2001, fl., fr., *Grisi-Veloso 287* (JPB); Tenório, 7 February 2006, fl., *Aurino 08* (JPB).

**Distribution and habitat:** *Allamanda blanchetii* is endemic to Brazil, with a disjunct geographical distribution and a Caatinga-Cerrado pattern (Flora e Funga do Brasil, 2024). The species can be found throughout the Northeast (Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, and Sergipe) and in the states of Goiás and Minas Gerais (Flora e Funga do Brasil, 2024). In Paraíba, it is frequently observed in the Caatinga and upland forests on sandy, stony soils. It has been found on roadsides, at forest edges, on slabs, inselbergs, and mountains and can be found in high altitudes and cattle pastures. The species is found in protected areas, such as Parque Estadual da Pedra da Boca, municipalities of Araruna and Tacima; Parque Estadual do Pico do Jabre, Maturéia; Fazenda Almas RPPN, São José dos Cordeiros; and Onças APA, São João do Tigre.

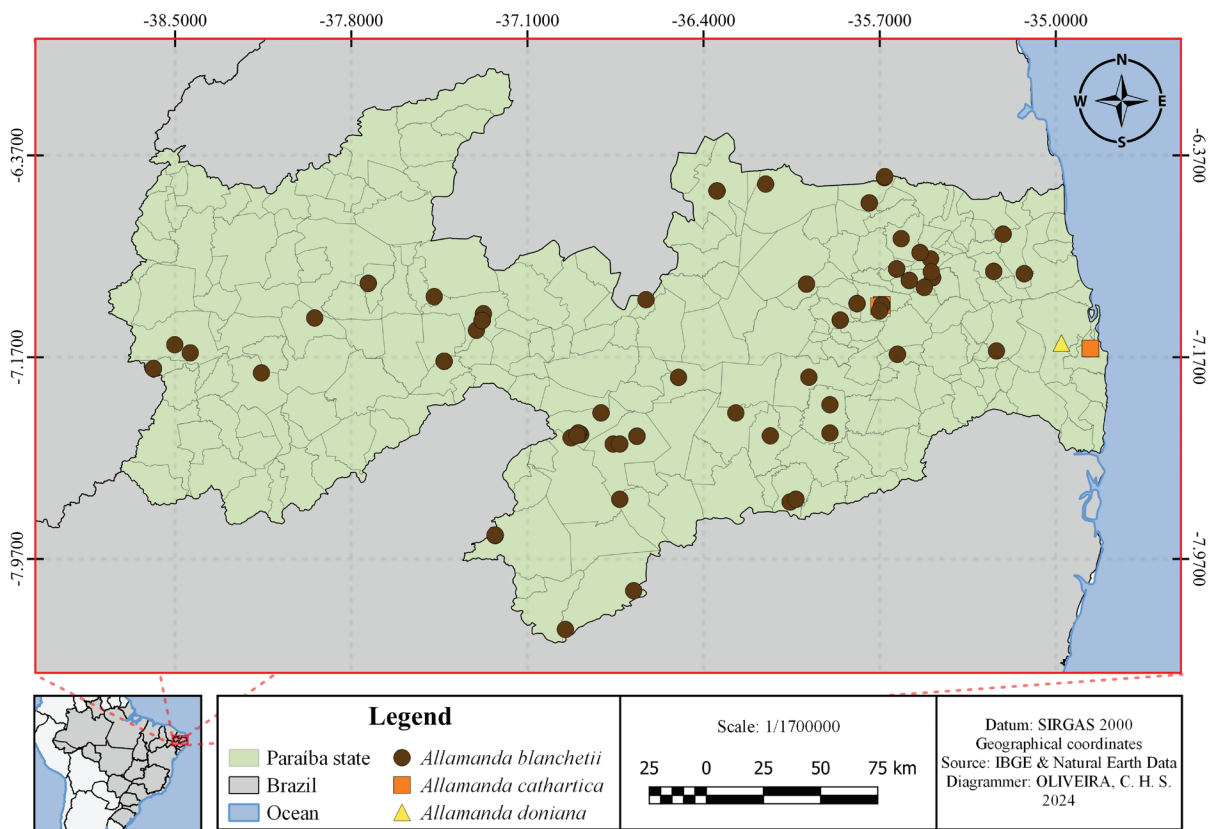


FIGURE 2. Distribution of the *Allamanda* species in Paraíba state, Brazil.

**Phenology:** It blooms from December to August and bears fruit from February to November.

It is a shrub covered with a hispid indumentum, has a pink to dark red corolla that stands out in the landscape, and it has a 5-lobed nectariferous disc.

*Allamanda cathartica* L., Mant. Pl. 2:214. 1771. (Fig. 2; Fig. 3E–G; Fig. 10B–C).

Climbing *shrubs* or *subshrubs*, ca. 0.5 m high, *stem* herbaceous or subwoody; *branches* glabrous. *Leaves* petiolate, 4 per node; blade 6.5–10.2 × 2.9–4.1 cm, lanceolate, margin flat, base cuneate, apex acuminate, discolorous, glabrous, glossy dark green adaxially, glabrous light green abaxially, with a prominent midrib; brochidromous. *Petiole* 0.3–0.5 cm long, glabrous. *Inflorescence* 8–9 cm long; *peduncle* 2–6 cm long, glabrous; *bracts* 1–4 mm long, linear, glabrous. *Flowers* yellow, *pedicel* 0.5–1.0 cm long, glabrous; *calyx* 1.2–1.5 × 0.4–0.6 cm, lacinia lanceolate, unequal to each other, glabrous to pilose only on the abaxial surface; *corolla* infundibuliform, 3.0–3.8 × 0.3 cm lower tube, 2.8–3.0 × 1.9–2.8 cm upper tube, lobes 2.2–3.5 × 2.2–3.4 cm, apex rounded, glabrous. *Anthers* ca. 6 × 2 cm, oblong. *Ovary* ca. 2 × 2 mm, globose, glabrous; *nectariferous disc* ca. 1 × 3 mm, slightly 5-lobed. *Capsule* ca. 3.2 × 3.0 cm, circular-compressed, thorny, glabrous. *Seeds* not seen.

**Specimens examined:** BRAZIL. Paraíba: Areia, 13 August 2013, fl., *Félix 14295* (EAN); João Pessoa, 29 August 1982, fl., *Montenegro 21* (JPB).

**Additional specimen examined (outside Paraíba):** BRAZIL. Bahia: Mucuri, 23 September 2018, fr., *Martinelli et al. 20598* (RB).

**Distribution and habitat:** This species occurs from Central America to Brazil and Bolivia and was introduced in Mexico, South Asia, and Southeast Africa (POWO, 2024). In Brazil, it occurs throughout the territory, mainly in coastal regions (Sakane and Shepherd, 1986; Simões and Kinoshita, 2005; Flora e Funga do Brasil, 2024) at forest edges. It has a continuous distribution and an Amazonian-Cerrado-Atlantic pattern. It is found in capoeira, high and humid places, and urbanized areas, often in gardens. The records found do not clarify whether the species occurs in native areas.

**Phenology:** Recorded with flowers in August.

*Allamanda cathartica* can be climbing or a subshrub that is glabrous, and can be recognized mainly by its yellow, showy flowers, with unequal calyx lacinia and a slightly 5-lobed nectariferous disc.

*Allamanda doniana* Müll. Arg., Fl. Bras. 6(1):11. 1860. (Fig. 2; Fig. 3H–K; Fig. 10D).

*Shrubs*, ca. 1.5 m high, *stem* subwoody; *branches*

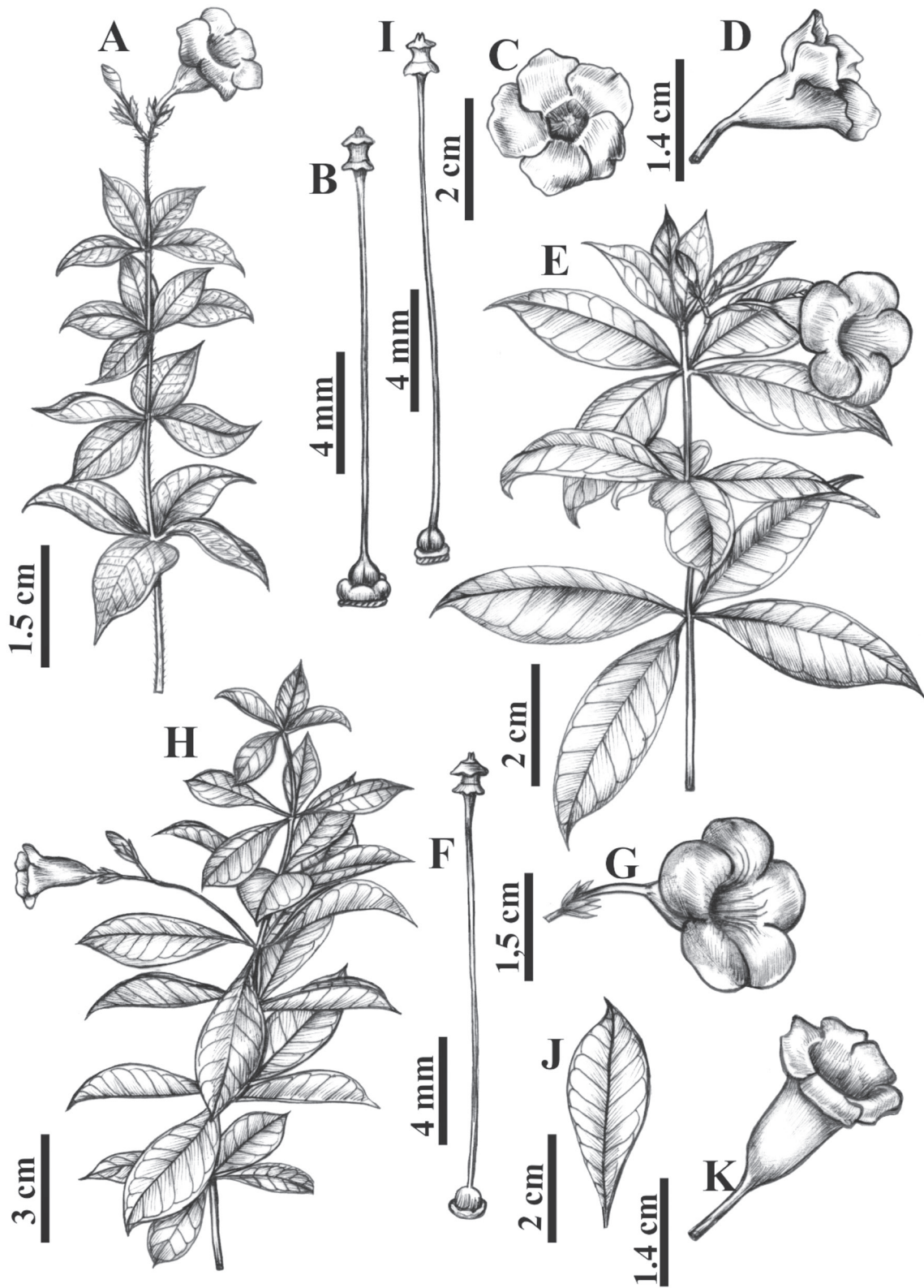


FIGURE 3. A–D, *Allamanda blanchetii*: A, flowering branch; B, gynoeceium; C, flower (front view); D, flower (lateral view); E–G, *Allamanda cathartica*: E, flowering branch; F, gynoeceium; G, flower (lateral view); H–K, *Allamanda doniana*: H, flowering branch; I, gynoeceium; J, leaf; K, flower (lateral view). Photos: M. L. Mamede.

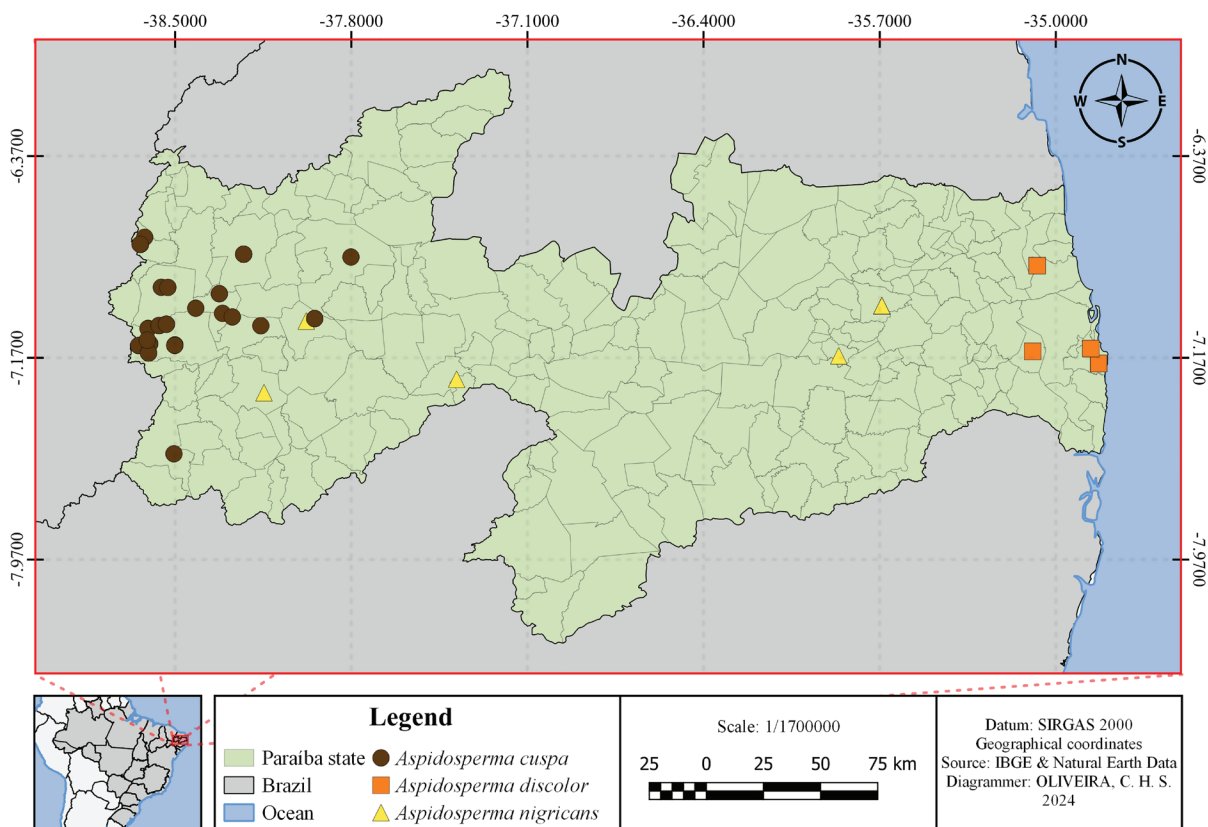


FIGURE 4. Distribution of the *Aspidosperma* species in Paraíba state, Brazil: *A. cuspa*, *A. discolor*, and *A. nigricans*.

pubescent. *Leaves* petiolate, 4 per node; blade 7.0–10.7 × 2.5–3.8 cm, oblanceolate to obovate, margin slightly undulate, base attenuate, apex acuminate, concolorous, sparsely pubescent adaxially, pubescent abaxially with hispid midrib and secondary veins; brochidodromous. *Petiole* 0.5–1.0 cm long, hispid. *Inflorescence* ca. 12 cm long; peduncle ca. 3 cm long, hispid; bracts 3 × 1 mm, linear, glabrous. *Flowers* yellow, pedicel 0.3–0.7 cm long, hispid; calyx 1.5–2.0 × 0.4 cm, lacinia lanceolate to oval, pubescent; *corolla* infundibuliform, lower tube 2.8 × 0.2–0.3 cm, upper tube 3–4 × 1.6–2.6 cm, lobes 2 × 2.0–2.4 cm, obovate, glabrous. *Anthers* ca. 5 × 2 mm, oblong. *Ovary* ca. 2 × 2 mm, globose, glabrous; nectariferous disc ca. 1 × 3 mm, slightly undulated. *Capsule* 2.7 × 2.3 cm, circular-compressed, thorny, glabrous. *Seeds* not seen.

**Specimens examined:** BRAZIL. Paraíba: Areia, 10 March 1997, fl., fr., *Félix et al.* 7094 (HST); Santa Rita, 15 October 2018, fl., *Mamede* 22 (PEUFR); Ibidem, 7 April 2008, fl., *Félix et al.* 12262 (EAN).

**Distribution and habitat:** This species is endemic to Brazil, occurring in the North (Amazonas, Amapá, and Pará) and Northeast (Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, and Sergipe) regions (Flora e Funga do Brasil, 2024). It has a restricted, continuous distribution and an Amazonian-Caatinga-Cerrado distribution pattern. In Paraíba, it is found only in the municipalities of Areia and Santa Rita, on

roadsides, sandy soils, and ‘capoeira’ in urbanized places. Few collections were obtained in the natural environment, which leaves doubt about its current native distribution.

**Phenology:** It blooms in March and April and bears fruit in March.

*Allamanda doniana* morphologically resembles *A. cathartica*, differing by the ratio between the length of the lower and upper corolla tube (the lower tube is smaller than the upper tube and lobes in *A. doniana*, while in *A. cathartica* the lower tube is larger than the upper tube and lobes) and because it presents an entire nectariferous disc, while in *A. cathartica*, the nectariferous disc is 5-lobed.

*Aspidosperma* Mart. & Zucc. in Flora 7(1, Beil. 4): 135. 1824.

Type: *A. tomentosum* Mart., Flora 7(1):135. 1824.

*Trees* or *shrubs*, stem cylindrical or grooved, white or red latex; *branches* densely or sparsely lenticellate. *Leaves* with flattened *petioles*, canaliculate, cylindrical, pilose or glabrous, alternate, congested at the apex or lax; elliptical, oblanceolate, oblong, or obovate blade, margin flat or revolute, chartaceous, concolorous, or discolorous; craspedodromous, eucamptodromous, brochidodromous, or reticulodromous. *Inflorescence* terminal or axillary, corymbiform, paniculate, or multiflora; bracts absent. *Flowers* yellow, white, or cream; calyx lanceolate, filiform, or oval, with lacinia equal or unequal to each other; corolla

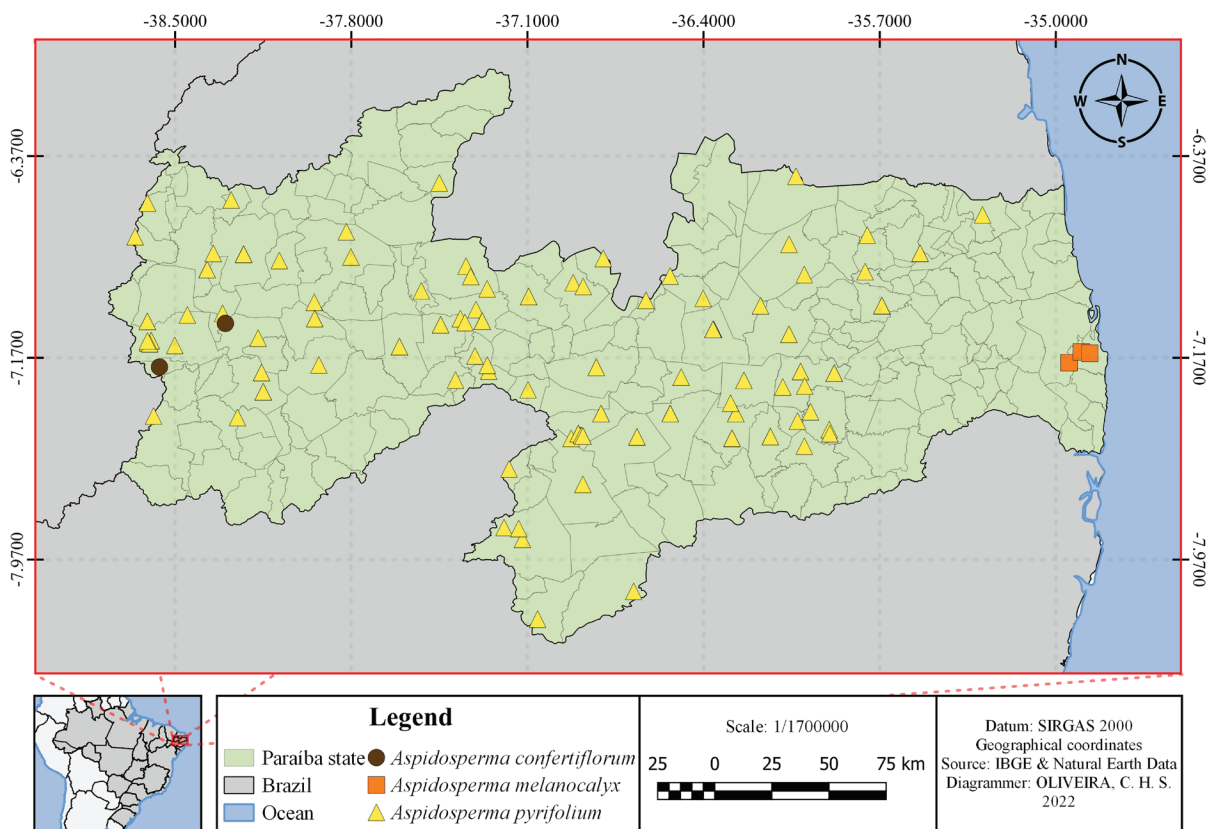


FIGURE 5. Distribution of the *Aspidosperma* species in Paraíba state, Brazil: *A. confertiflorum*, *A. melanocalyx*, and *A. pyriformum*.

hypocrateriform. Stamens with free, triangular, lanceolate, or oval anthers. *Ovary* globose, superior, tomentose, or glabrous. Nectariferous disc absent. *Follicle* falcate, dolabriform, or piriform, smooth, muricate, or grooved; lenticels conspicuous or inconspicuous, midrib evident or absent; stipe present or absent; apex mucronate or rounded, pilose or glabrous. *Seeds* oblong, rounded, ovate, or elliptical, winged.

*Aspidosperma* had the highest number of species (six) among the Rauvolfioid grade for Paraíba state. The record of *Aspidosperma confertiflorum* is the first for the state. The most widely recorded species were *A. pyriformum* and *A. cuspa*, respectively, in Caatinga. *Aspidosperma* can be found mainly in drier areas, predominating in Caatinga vegetation, associated with stony soils, inselbergs, the interior and at the edge of semideciduous forests. However, it is also possible to observe species of this genus, such as *A. discolor* and *A. melanocalyx*, in humid forests along the Atlantic Forest, including in swampy areas near the coast.

***Aspidosperma confertiflorum*** A.C.D. Castello, Syst. Bot. 43(4):1040. 2018. (Fig. 5).

*Trees*, ca. 5 m high, *stem* cylindrical, white *latex*; *branches* glabrous. *Leaves* petiolate, congested at apex; *blade* 4.0 × 1.3 cm, elliptical to oblanceolate, margin flat, base cuneate, apex acuminate, discolorous, pubescent adaxially and abaxially; eucamptodromous. *Petiole* 0.5–

0.7 cm long, cylindrical, tomentose. *Inflorescence* ca. 1.5 cm long, terminal, corymbiform; *peduncle* ca. 2 mm long, pubescent. *Flowers* yellow-green, *pedicel* ca. 1 mm long; ca. 3 × 1 mm, *lacinia* ovate to triangular, apex unequally acute, externally pubescent, internally glabrous; *corolla* hypocrateriform, tube ca. 3 mm long, pubescent outer and inner surfaces, *lobes* ca. 2.5 × 0.6 mm, oblong, pubescent. *Anthers* ca. 2 mm long. *Ovary* ca. 1 mm long, globose, glabrous. *Follicle* ca. 2.5 × 1.5 cm, dolabriform, brown, smooth, lenticels conspicuous, midrib evident, with stipe, mucronate apex, glabrous. *Seeds* not seen.

**Specimens examined:** BRAZIL. Paraíba: Carrapateira, Guaribas, 27 November 2014, fl., *Fontana 8886* (HUEFS); Monte Horebe, 31 May 2012, fr., *Silva 1981* (HVASF).

**Distribution and habitat:** This species is endemic to the Northeast region, presenting a Caatinga pattern and a very restricted geographical distribution. *Aspidosperma confertiflorum* has been recorded in the state of Ceará, mainly in high-altitude areas and in dry forests (Castello et al., 2024), but it is recorded for the first time in Paraíba state in this study.

**Phenology:** It was recorded with flowers in November and with fruit in May.

*Aspidosperma confertiflorum* can be recognized mainly by having eucamptodromous venation, a corolla with a tube larger than the lobes, a glabrous ovary, and a dolabriform, glabrous follicle.

*Aspidosperma cuspa* (Kunth) S.F. Blake, Manual de las plantas usuales de Venezuela 110. 1926. (Fig. 4; Fig. 6A–C).

*Trees*, ca. 4 m high, *stem* cylindrical, white latex; *branches* glabrous. *Leaves* petiolate, lax; *blade* 2.1–4.0 × 0.9–1.3 cm, elliptic to obovate, margin revolute, base cuneate to obtuse, apex cuneate to rounded, chartaceous, discolorous, sparsely pubescent on both surfaces; reticulodromous. *Petiole* 0.7–0.9 cm long, canaliculate, pubescent. *Inflorescence* ca. 4.5 cm long, axillary, paniculate; *peduncle* ca. 2 mm long, tomentose. *Flowers* yellow, *pedicel* ca. 1 mm long, glabrous; *calyx* 1.5–1.9 × 1.0 mm, *lacina* ovate, equal, apex acute, externally tomentose, internally glabrous; *corolla* hypocrateriform, tube ca. 3 mm long, cylindrical, slightly inflated at the corolla apex, externally glabrous, internally pubescent to glabrescent, *lobes* ca. 1.0 × 0.5 mm, oblong, glabrous on both surfaces, tomentose at the insertion of the stamens. *Anthers* ca. 1 mm long, lanceolate, glabrous. *Ovary* ca. 1 mm long, globose, glabrous. *Follicle* 1.6–3.7 × 0.7–2.0 cm, falcate, brown, smooth, lenticels conspicuous, midrib evident, with stipe, apex mucronate, pubescent. *Seeds* ca. 1.2 × 0.7 cm, oblong, apical wing 1.3 × 0.9 cm.

**Specimens examined:** BRAZIL. Paraíba: Aguiar, Serra de Santa Catarina, Sítio Mata Fresca, 29 May 2014, fl., Fontana 8082 (HUEFS); Cajazeiras, Sítio Campos de Fora, 27 May 2014, fr., Fontana et al. 8076 (HUEFS); Ibidem, Serra do Vital, 25 February 2010, fl., Fontana 6522 (HVASF); Coremas, 17 July 2009, fr., Andrade 27 (PEUFR); Lagoa, 31 July 2011, fr., Laboratório de Etnoecologia s/n (EAN - 17.564); Nazarezinho, 8 September 2002, fl., Gadelha-Neto 755 (JPB); Santa Helena, 21 May 2014, fr., Costa-Lima et al. 1272 (HUEFS); São José de Piranhas, 8 June 2010, fr., Oliveira 4946 (IPA); Ibidem, 25 February 2010, fl., Fontana et al. 6522 (IPA); Ibidem, Povoado de Boa Vista, 18 September 2009, fr., Carvalho-Sobrinho 2378 (HUEFS); Ibidem, 17 July 2008, fr., Andrade 62 (PEUFR); Ibidem, 8 June 2010, fr., Oliveira 4946 (HVASF); Ibidem, Reservatório Cuncas, 21 February 2013, fr., Silva 684 (HVASF); Sousa, 07 February 1998, fl., Gadelha-Neto 403 (JPB).

**Distribution and habitat:** This species is distributed from the Caribbean and Panama to South America (POWO, 2024). In Brazil, it is found in the Northeast (Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, and Rio Grande do Norte), North (Pará and Tocantins), Midwest (Goiás, Mato Grosso do Sul, and Mato Grosso), and Southeast (Minas Gerais, Rio de Janeiro, and São Paulo) (Castello et al., 2024). It has a wide, continuous geographical distribution and an Amazonian-Caatinga-Cerrado-Atlantic pattern. In Paraíba, *A. cuspa* was found in the arboreal, shrubby Caatinga, in stony and sandy soils, and near the mountains.

**Phenology:** It blooms in February, May, and September and bears fruit in May, June, July, and September.

*Aspidosperma cuspa* differs from the other congener species recorded by its discolorous leaves, with reticulodromous venation (*vs.* brochidodromous in *A. discolor* and *A. pyrifolium*; craspedodromous in *A. melanocalyx* and *A. nigricans*), falcate follicles (piriform in *A. pyrifolium* and *A. melanocalyx*, dolabriform in the other species), and by the apical wings of the seeds (central in the seeds of the other analyzed species).

*Aspidosperma discolor* A.DC., Prodr. 8:398. 1844. (Fig. 4; Fig. 6D–F).

*Trees*, ca. 20 m high, *stem* grooved, white latex; *branches* glabrous. *Leaves* petiolate, lax; *blade* ca. 9 × 3 cm, elliptic, margin flat, base cuneate and strongly revolute, apex obtuse to cuneate, chartaceous, discolorous, pubescent in both surfaces; brochidodromous. *Petiole* ca. 0.6 cm long, flattened, canaliculate, pubescent. *Inflorescence* ca. 4 cm long, terminal, corymbiform; *peduncle* 1–3 mm long, pubescent. *Flowers* white, *pedicel* ca. 1 mm long, pubescent; *calyx* 1–2 × 1 mm, *lacina* lanceolate, unequal, apex acute, externally pubescent and internally glabrous; *corolla* hypocrateriform, tube ca. 4 × 1 mm, slightly inflated at the apex, pubescent internally and externally; *lobes* ca. 2 × 1 mm, oval, internally glabrous and externally pubescent. *Anthers* ca. 1 mm long, lanceolate, glabrous. *Ovary* 1.2–1.3 mm long, globose, tomentose. *Follicle* ca. 4.5 × 3.0 cm, dolabriform, brown, muricate, lenticels inconspicuous, midrib inconspicuous to absent, with stipe, round apex and glabrous. *Seeds* ca. 2.0 × 1.6 cm, oval, membranous eccentric wings.

**Specimens examined:** BRAZIL. Paraíba: Cruz de Espírito Santo, 25 November 1968, fl., Andrade-Lima 68–5471 (IPA); João Pessoa, 10 March 1995, fr., Barbosa et al. 1456 (JPB); Rio Tinto, 21 November 1991, fl., Félix et al. 4554 (EAN).

**Distribution and habitat:** *Aspidosperma discolor* is an endemic species of the Brazilian Northeast, found in the states of Alagoas, Bahia, Pernambuco, and Sergipe (Castello et al., 2024), and is recorded in Paraíba state for the first time in this study. It has a Caatinga-Atlantic pattern and a disjunct distribution. In Paraíba, it can be found in the Atlantic Forest, in forest remnants, and in a protected area, the Estação Ecológica do Pau-Brasil.

**Phenology:** It blooms in November and bears fruit in March.

This species can be characterized by its grooved stem, lax leaves, discolorous leaf blades, and strongly revolute base and by its muricate, glabrous fruit.

*Aspidosperma melanocalyx* Mull. Arg., in Mart. Fl. Bras. 6(1):52. 1860. (Fig. 5; Fig. 6M).

*Trees*, ca. 20 m high, *stem* cylindrical, red latex; *branches* glabrous. *Leaves* petiolate, lax; *blade* 6.2–10.4 × 2.9–4.5 cm, oblong, margin flat, base cuneate, apex cuneate, chartaceous, discolorous, glabrous on both surfaces; craspedodromous. *Petiole* ca. 0.6 cm long, flattened, glabrous. *Inflorescence* ca. 6.5 cm long, axillary, multiflora; *peduncle* 5–8 mm long, tomentose. *Flowers* yellow, *pedicel* 1–3 mm long, tomentose; *calyx* 2.0–2.5 × 1.5 mm, oval, *lacina* equal, tomentose, apex acute, glabrous; *corolla* hypocrateriform, tube ca. 3 × 1 mm, slightly inflated at the base, externally glabrous, internally tomentose, *lobes* ca. 2 × 1 mm, linear, glabrous. *Anthers* ca. 4 mm long, oval, glabrous. *Ovary* ca. 1 mm long, flattened, globose, glabrous. *Follicle* ca. 10.0 × 5.2 cm, piriform, dark green, surface sulcate, lenticels inconspicuous, midrib evident, with stipe, round apex, densely tomentose. *Seeds* not seen.

**Specimens examined:** BRAZIL. Paraíba: João Pessoa, 9 March 1995, fr., Barbosa et al. 1446 (JPB); Ibidem, 8

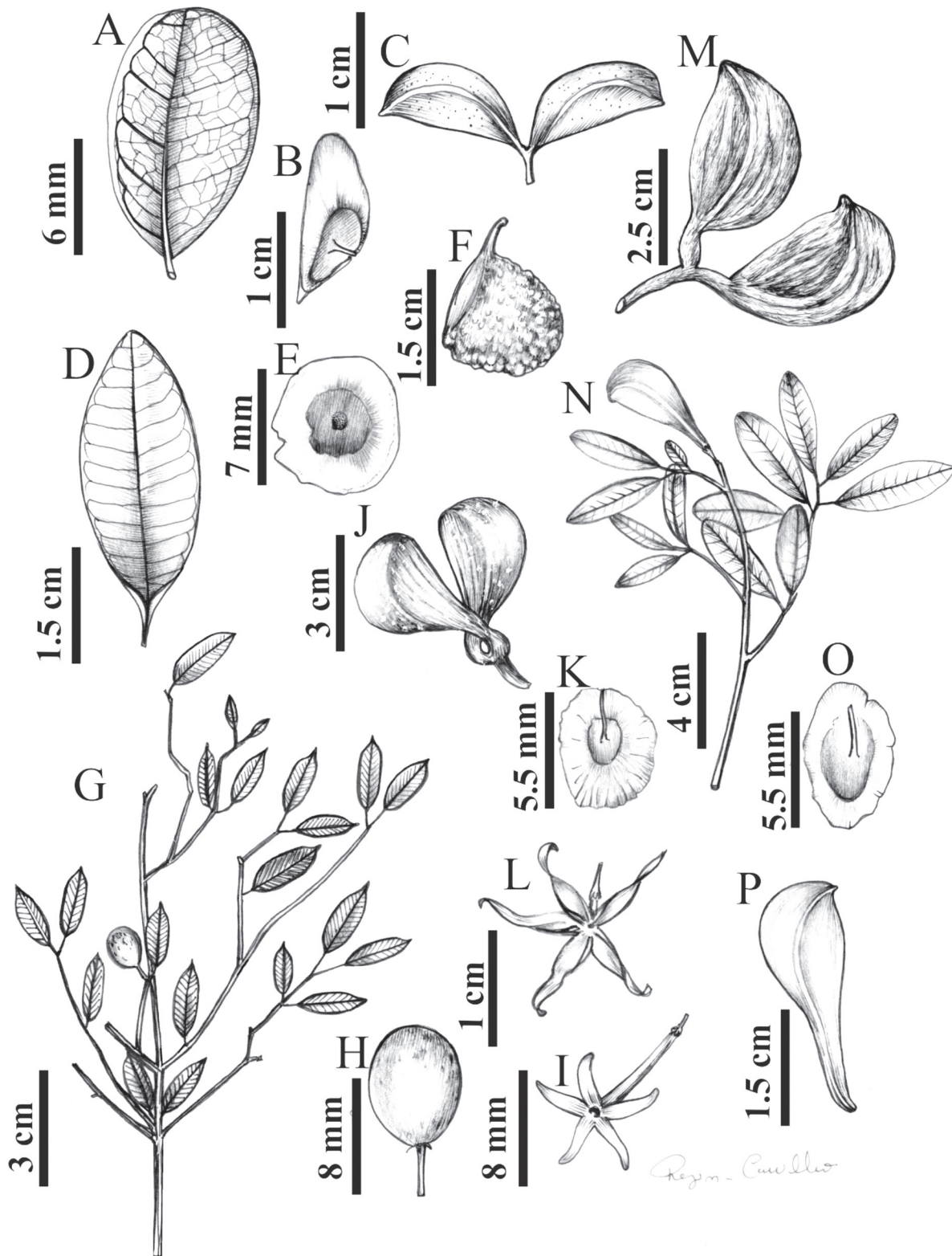


FIGURE 6. A–C, *Aspidosperma cuspa*: A, leaf; B, seed; C, fruit; D–F, *Aspidosperma discolor*: D, leaf; E, seed; F, fruit; G–L, *Hancornia speciosa*: G, fructified branch; H, fruit; I, flower; J–L, *Aspidosperma pyriformium*: J, fruit; K, seed; L, flower. M, *Aspidosperma melanocalyx* fruit; N–P, *Aspidosperma nigricans*: N, fructified branch; O, seed; P, fruit.

October 1988, fl., *Miranda 7767* (JPB); *Ibidem*, 24 February 1984, fl., *Alonso 56697* (JPB).

**Distribution and habitat:** This species is restricted to the Brazilian territory, being found in the Northeast (Alagoas, Bahia, Pernambuco, and Sergipe), Southeast (Espírito Santo, Minas Gerais, Rio de Janeiro, and São Paulo), and Midwest (Federal District, Goiás, and Mato Grosso) (Castello et al., 2024). It has a Cerrado-Atlantic pattern and a disjunct distribution. *Aspidosperma melanocalyx* was recorded in the Atlantic Forest of Paraíba, in a permanent preservation area at Jardim Botânico Benjamin Maranhão, known as 'Mata do Buraquinho,' in the municipality of João Pessoa.

**Phenology:** *Aspidosperma melanocalyx* blooms from October to February and bears fruit in March.

This species can be recognized by its red latex, oblong, glabrous leaves, yellow flowers, and piriform follicles, that are densely tomentose, sulcate, and dark green. It is often confused in herbarium collections with *A. spruceanum* Benth. ex Müll. Arg.; in Brazil, the latter is restricted to the state of Amazonas (Castello et al., 2024). *Aspidosperma melanocalyx* can be recognized by its leaves with oblong blades and a cuneate apex, a glabrous abaxial surface, and a piriform follicle, while *A. spruceanum* has leaves with an obovate blade with a rounded apex, a whitish abaxial surface, and dolabriform follicles (Castello et al., 2024).

*Aspidosperma nigricans* Handro, Arq. Bot. Estado São Paulo 3:282, t. 69. 1962. (Fig. 4; Fig. 6N–P).

*Trees*, ca. 4–8 m high, *stem* cylindrical, white *latex*; *branches* glabrous. *Leaves* petiolate, congested at the apex of the branches; *blade* 6.0–7.4 × 1.2–2.0 cm, oblanceolate to oblong, margin slightly undulated, base acute, strongly revolute; apex acute to cuneate, chartaceous, discolorous, pubescent to glabrescent adaxially, tomentose to glabrous abaxially; craspedodromous. *Petiole* ca. 3 mm long, flattened, pubescent to glabrous. *Inflorescence* ca. 3 cm long, terminal, corymbiform; *peduncle* ca. 1.5 mm long, pubescent. *Flowers* cream, *pedicel* ca. 2 mm long, pubescent; *calyx* 1.5–2.0 × 0.7–1.0 mm, oval, *lacina* subequal to each other with acute apex, pubescent outer surface, glabrous inner surface; *corolla* hypocrateriform, tube 2–4 × 1 mm, cylindrical, slightly inflated in the upper portion, pubescent; *lobes* ca. 2 × 1 mm, oval, pubescent. *Anthers* ca. 1 mm long, oval. *Ovary* ca. 1 mm long, globose, tomentose. *Follicle* 3.7–6.5 × 1.5–3.0 cm, dolabriform, yellow-brown, smooth, lentils conspicuous, midrib prominent, stipe elongated, apex mucronate, densely tomentose. *Seeds* ca. 14 × 7 mm, caramel-colored, elliptical to ovate, membranous surrounding wing, 12 × 5 mm.

**Specimens examined:** BRAZIL. Paraíba: Areia, May 1944, fl., *Moraes 243* (EAN); *Ibidem*, Mata da Escola de Agronomia, 15 May 1944, fl., *Vasconcelos 243* (USP); Areia–Cuité ou Campina Grande, 25 May 1978, fr., *Andrade-Lima 78-8.412* (IPA); Coremas, 16 July 2008, fr., *Andrade et al. 07* (PEUFR); Itaporanga, 1 March 2015, fr., *Souza 72* (CSTR); Lagoa Seca, 29 July 2001, fr., *Lourenço et al. 241* (JPB); *Ibidem*, 10 December 2000, fr., *Carneiro et al. 56* (JPB); Maturéia, 29 July 2014, fr., *Cordeiro et al. 330* (EAN); *Ibidem*, 10 May 1998, fr., *Agra et al. 5153* (JPB); *Ibidem*, 17 November 1997, fr., *Agra et al. 4396* (JPB).

**Distribution and habitat:** This species is endemic to the Northeast region of Brazil, in the states of Paraíba, Pernambuco, and Alagoas (Castello et al., 2024). It has a Caatinga pattern and a very restricted geographical distribution. In Paraíba, it was found in Caatinga, generally associated with the shrub-tree stratum, forest edges, near the mountain area, at high altitudes. *A. nigricans* was recorded in a Conservation Unit, the Parque Estadual do Pico do Jabre, municipality of Maturéia.

**Phenology:** It blooms in May and bears fruit from November to July.

*Aspidosperma nigricans* can be recognized by its congested leaves at the apex of the branches, cream-colored flowers, and yellow-brown fruit, densely tomentose, with an elongated stipe.

*Aspidosperma pyrifolium* Mart. & Zucc., Flora 7(1, Beil.):136. 1824. (Fig. 5; Fig. 6J–L; Fig. 10E–G).

*Trees*, ca. 5 m high, *stem* cylindrical, white *latex*; *branches* densely lenticellate, glabrous. *Leaves* petiolate, congested at the apex of the branches; blade 3.9–5.0 × 4.0 cm, elliptical, margin flat, base acute, apex acute to acuminate, chartaceous, concolorous, glabrous adaxially, strigose abaxially; brochidodromous. *Petiole* 1.1–1.5 cm long, cylindrical, glabrous. *Inflorescence* ca. 4 cm long, terminal, corymbiform; *peduncle* 5–8 mm long, pubescent. *Flowers* white, *pedicel* ca. 3 mm long, pubescent; *calyx* 1.0–2.9 × 0.5 mm, filiform, *lacina* equal or unequal to each other, *corolla* glabrous, hypocrateriform, tube ca. 4 × 1 mm, cylindrical slightly inflated at the apex, tomentose in the median portion and the throat, lobes ca. 12 × 2 mm, linear, flat margin, glabrous. *Anthers* ca. 1 mm long, triangular. *Ovary* ca. 2.2 mm long, globose, glabrous. *Follicle* 4.0–6.5 × 2.5–4.0 cm, piriform, brown, smooth, densely lenticellate, lenticels conspicuous, midrib inconspicuous to absent, round apex, glabrous. *Seeds* ca. 2 cm long, rounded, with concentric wings.

**Specimens examined:** BRAZIL. Paraíba: Aparecida, 18 May 2019, fr., *Mamede 31* (PEUFR); Areia, 14 November 2016, fr., *Félix 16118* (EAN); Boa Vista, 15 April 2010, fl., *Machado-Filho 140* (HACAM); Cabaceiras, 21 November 2007, fr., *Pessoa 204* (JPB); Campina Grande, 20 November 2006, fl., *Félix 11314* (EAN); Carrapateira, Guaribas, 27 November 2014, fr., *Fontana et al. 8883* (RB); Catingueira, 17 March 2010, fl., *Santos 01* (CSTR); Coremas, 16 February 2019, fr., *Mamede 27* (PEUFR); Diamante, 2 May 2011, fr., *Diniz 2082* (CSTR); Itaporanga, 12 October 2011, fr., *Félix 17261* (EAN); Malta, 12 February 2013, fr., *Ferreira 3910* (CSTR); Maturéia, Pico do Jabre, 29 July 2014, fr., *Cordeiro et al. 330* (HUEFS); Monteiro, Serra do Morcego, 6 June 2010, fr., *Araújo 1649* (HVASF); Natuba, 26 September 1971, fl., *Andrade-Lima 1038* (IPA); Patos, 5 October 2018, fr., *Mamede 21* (PEUFR); *Ibidem*, 22 September 2018, fr., *Mamede 19* (PEUFR); *Ibidem*, 28 May 2015, fr., *Mamede 11* (CSTR); *Ibidem*, 25 June 2006, fr., *Nóbrega 70203* (IPA); *Ibidem*, 29 November 2000, fr., *Silva 411* (JPB); Pocinhos, 21 June 2011, fr., *Nóbrega 247* (CSTR); *Ibidem*, Parque das Pedras, 19 November 2001, fl., *Heringer et al. 2357* (EAC); Pombal, 28 October 2011, fl., *Queiroga 151* (CSTR); Queimadas, 18 December 2013, fr., *Félix 14629* (EAN);

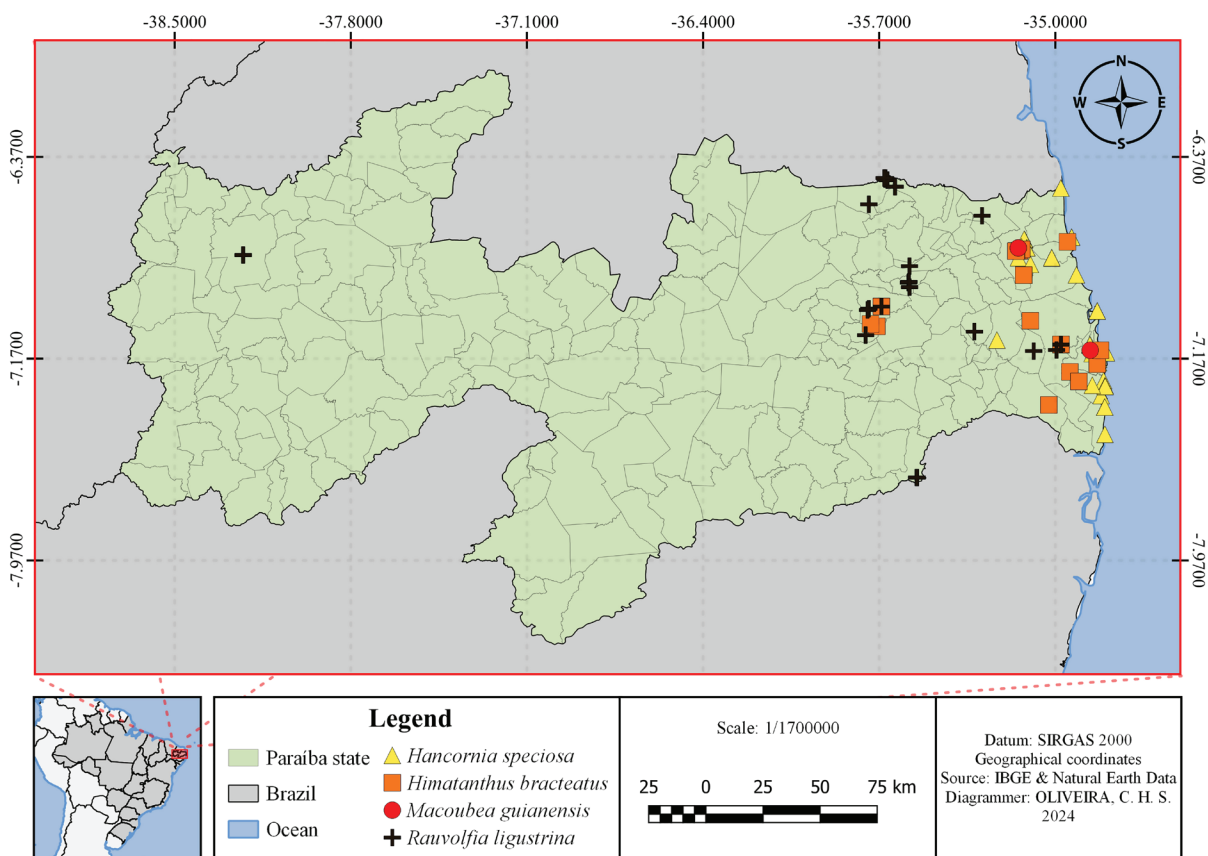


FIGURE 7. Distribution of the species: *Hancornia speciosa*, *Himatanthus bracteatus*, *Macoubea guianensis*, and *Rauvolfia ligustrina* in Paraíba state, Brazil.

Santa Helena, Sítio Retiro, 6 June 2013, fr., *Oliveira et al.* 2570 (HVASF); Santa Terezinha, 18 April 2006, fr., *Pegado* 24 (EAN); São Bento, 12 April 2015, fr., *Silva* 5928 (CSTR); São João do Cariri, 13 March 2003, fr., *Lacerda* 51 (JPB); São João do Tigre, 13 March 2010, fr., *Pessoa* 567 (JPB); São João do Rio do Peixe, Sítio Pititinga, 29 August 2012, fr., *Oliveira et al.* 1529 (HVASF); São José de Piranhas, 14 January 2009, fr., *Andrade* 63 (PEUFR); Ibidem, Riacho da Boa Vista, 18 May 2011, fr., *Silva* 423 (HVASF); São José do Bonfim, 23 April 2010, fr., *Duarte* 22 (CSTR); São José dos Cordeiros, RPPN Fazenda Almas: Lajedo Aveloz, 25 October 2009, fr., *Costa* 43 (HUEFS); São José do Sabugi, 3 October 2018, fr., *Mamede* 20 (PEUFR); São Sebastião do Umbuzeiro, Povoado Capitão Mor., 29 November 2012, fl., *Oliveira et al.* 2035 (HVASF); Serra Branca, 11 March 2002, fr., *Baracho* 5696 (JPB); Solânea, 21 January 2000, fl., fr., *Grisi* 84 (JPB); Soledade, 30 March 2006, fr., *Lucena* 216 (PEUFR); Ibidem, 22 February 2006, fr., *Sá* 342 (HST); Sousa, 3 October 2000, fl., *Gadelha-Neto* 602 (JPB); Ibidem, Riacho João Gonçalves, Sítio Pedregulho, 23 January 2013, fl., fr., *Silva* 705 (HVASF); Ibidem, Vale dos Dinossauros, 9 August 2003, fl., *Gadelha-Neto* 927 (JPB); Taperoá, 20 July 1986, fr., *Agra* 525 (JPB); Ibidem, 1 July 1986, fr., *Agra et al.* 48681 (IPA); Triunfo, Sítio Gamela, 29 August 2012, fr., *Oliveira et al.* 1540 (HVASF).

**Distribution and habitat:** This species occurs in Paraguay, Brazil, and Bolivia (POWO, 2024). In Brazil,

it can be found in the Northeast (Alagoas, Bahia, Ceará, Maranhão, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, and Sergipe), North (Tocantins), Midwest (Federal District, Goiás, Mato Grosso do Sul, and Mato Grosso), and Southeast (Minas Gerais) (Castello et al., 2024). It has a Caatinga-Cerrado pattern and a disjunct distribution. In Paraíba, it is distributed in the Caatinga, mainly in the interior of the state, and it is associated with sandy, stony soils and dry forests. It was found in the interior and at the edge of woods, roadsides, inselbergs, and surrounding granitic rock outcrops. It has been recorded in protected áreas, such as Fazenda Almas RPPN, in São José dos Cordeiros; Parque Estadual Vale dos Dinossauros, in Sousa; Fazenda Tamanduá RPPN, in Santa Terezinha; Onças APA, in São João do Tigre; and Pico do Jabre, in Maturéia.

**Phenology:** It blooms in October, November, April, May, and August and bears fruit in January.

*Aspidosperma pyriforme* can be especially recognized by its white flowers, with lobes ca. 12 mm long being larger than the tube, which is ca. 4 mm long, and by its piriform, densely lenticellate follicles.

*Hancornia speciosa* Gomes, Mem. Math. Phis. Acad. Real Sci. Lisboa 2:1, pl. 1. 1803. (Fig. 6G–I; Fig. 7; Fig. 11A).

*Trees*, 2–5 m high, stem straight, white latex; branches lenticellate, glabrous. *Leaves* petiolate, opposite, lax; *blade* 2.5–5.2 × 0.8–2.6 cm, oblong to elliptical, margin flat,

base cuneate, apex acuminate, chartaceous, concolorous, glabrous on both surfaces, profuse secondary veins parallel and close together; craspedodromous. *Petiole* 0.6–1.0 cm long, glabrous. *Inflorescence* ca. 6 cm long, terminal, sessile; bracts absent. *Flowers* white, pedicel 0.8–0.9 cm long, pubescent; *calyx* 1.8–2.0 × 1.0 mm, deltoid, glabrous on inner surface and pubescent on outer surface; *corolla* hypocrateriform, tube 2.9–3.1 × 2–3 mm, externally glabrous, internally hirsute, lobes 5–9 × 1–2 mm, deltoid, glabrous. *Anthers* ca. 2.3 mm long, triangular, glabrous. *Ovary* 1–2 × 1 mm, ovoid, superior, glabrous. *Nectariferous disc* absent. *Drupe* 1.9–2.6 × 1.3–2.3 cm, globose, yellow, smooth, lenticels absent, midrib absent, fleshy pericarp, glabrous. *Seeds* not seen.

**Specimens examined:** BRAZIL. Paraíba: Baía da Traição, Aldeia São Miguel, 26 April 2008, fl., *Lima et al.* 2265 (JPB); Cabedelo, 19 November 1999, fl., *Pontes* 292 (JPB); Conde, 6 October 2012, fl., *Lima* 23 (EAN); *Ibidem*, Assentamento Tambaba, 10 July 2012, fr., *Brito* 250 (JPB); *Ibidem*, Área de Preservação Permanente de Tambaba, 11 August 2008, fr., *Gadelha-Neto et al.* 2404 (JPB); *Ibidem*, Área de Preservação Permanente de Tambaba, 20 November 2009, fr., *Araújo* 209 (RB); João Pessoa, Mangabeira, 25 March 2019, fr., *Mamede* 28 (PEUFR); *Ibidem*, Mangabeira, Mata Ciliar do Rio Cabelo, 22 February 2011, fr., *Pereira* 158 (JPB); *Ibidem*, Cabo Branco, Falésia do Cabo Branco, 28 March 2008, fr., *Araújo* 125 (JPB); *Ibidem*, 7 August 1993, fl., fr., *Moura* 1036 (JPB); Mamanguape, 27 October 2013, fr., *Félix* 14519 (EAN); *Ibidem*, Reserva Biológica Guaribas, 25 November 2002, fl., *Sevilha et al.* 2511 (CEN); *Ibidem*, Reserva Biológica Guaribas, 19 August 2002, fr., *Sevilha et al.* 2258 (CEN); Marcação, Aldeia Tramataia, 26 September 2006, fl., fr., *Freitas et al.* 166 (JPB); Mataraca, 4 October 2007, fl., fr., *Gadelha-Neto* 1859 (JPB); Rio Tinto, Tabuleiro do Miriri, falésia costeira, 3 March 2003, fr., *Barbosa et al.* 2753 (JPB); *Ibidem*, without dated, fr., *Gadelha-Neto* 3266 (W); Santa Rita, 5 February 1992, fr., *Agra* 1365 (JPB); *Ibidem*, Mata de Jacuípe, Tabuleiro Cova do Caboclo, 27 March 2013, fr., *Pontes* 861 (NY); *Ibidem*, 29 March 2012, fr., *Gadelha-Neto* 3266 (NY); Sapé, 9 March 2001, fr., *Dionísio* 100 (JPB).

**Distribution and habitat:** This species is distributed from the Brazilian North to Paraná (Flora e Funga do Brasil, 2024), as well as in Peru, Bolivia, and Paraguay (POWO, 2024). It has an Amazonian-Caatinga-Cerrado-Atlantic pattern and a wide, continuous geographic distribution. In Paraíba, it was recorded in the Atlantic Forest on sandy soil. It can be found in the interior of ‘tabuleiros’ forests, roadsides, and cliffs. *Hancornia speciosa* was registered in environmental preservation areas, such as Reserva Biológica (ReBio) Guaribas, in the municipalities of Mamanguape and Rio Tinto; Fazenda Pacatuba RPPN, in Sapé; Tambaba APA, in Conde; and Jardim Botânico Benjamin Maranhão, in the municipality of João Pessoa.

**Phenology:** Flowering and fruiting between August and March.

*Hancornia speciosa* is characterized by opposite leaves with profuse secondary veins parallel to each other and

globular berries. This species is known as ‘mangaba,’ an edible fruit with a pleasant aroma (Kinoshita, 2005). According to Flora and Funga of Brasil (2024), as well as the treatment on cultivated Brazilian and exotic fruits (Lorenzi et al., 2003), the individuals of the region belong to the typical variety, called ‘mangaba-da-restinga,’ being recognized for having leaves with a distinct, reddish petiole, and glabrous blades.

***Himatanthus bracteatus*** (A. DC.) Woodson, Ann. Missouri Bot. Gard. 25(1):200. 1938[1937]. (Fig. 7; Fig. 9A–C; Fig. 11B–C).

*Trees*, 2–6 m high, *stem* straight, white latex; *branches* woody, glabrous. *Leaves* petiolate, alternate, congested at the apex of the branches; blade 12.7–21.5 × 4–7 cm, oblanceolate, flat margin, base attenuated, apex cuspidate to rounded, chartaceous, concolorous, glabrous on both surfaces; brochidodromous. *Petiole* 1–4 cm long, hispid. *Inflorescence* ca. 10 cm long, terminal, thyrsoid; *peduncle* 0.8–0.9 cm long, glabrous; *bracts* 3.8 × 2.2 cm, petaloid, navicular, glabrous. *Flowers* white with yellow throat, pedicel 3–9 mm long; calyx with 1 conspicuous lacinia and the others reduced, glabrous; *corolla* hypocrateriform, tube 20–25 × 3 mm, glabrous externally and pilose on the inside, lobes 36–48 × 9 mm, oblanceolate to obovate, glabrous. *Anthers* 2.5–3.0 mm long, triangular, glabrous. *Ovary* 2.0–2.5 × 2 mm, ovoid, hypanthium, glabrous. *Nectariferous disc* absent. *Follicle* 16–18 × 3.9–4.0 cm, oblong, brown, smooth, glabrous, lenticels and midrib absent. *Seeds* 2.0–2.3 cm long, elliptic, elliptical wings.

**Specimens examined:** BRAZIL. Paraíba: Alagoa Nova, 8 March 2012, fl., *Guedes* 19715 (HUEFS); *Ibidem*, Mata do Urucu, 12 December 2011, fl., *Melo* 10867 (HUEFS); Areia, 28 February 2001, fl., *Nascimento* 26565 (JPB); *Ibidem*, Chão do Jardim, 13 March 1975, fl., *Perazzo Barbosa* 130 (RB); *Ibidem*, Próximo a Mata Pau Ferro, 23 November 1980, fl., *Fevereiro et al.* 104 (K); Baía da Traição, 24 January 2007, fl., *Lima* 2168 (JPB); Conde, 15 October 2018, fl., fr., *Mamede* 23 (PEUFR); *Ibidem*, 22 August 2008, fr., *Gadelha-Neto* 2411 (JPB); João Pessoa, Mangabeira, 25 March 2019, fl., *Mamede* 29 (PEUFR); *Ibidem*, 28 March 2008, fl., *Araújo* 128 (JPB); *Ibidem*, 23 November 2002, fr., *Gadelha-Neto* 849 (JPB); *Ibidem*, Cabo Branco, 25 February 2005, fl., *Carauta* 962 (RB); Mamanguape, 6 January 2008, fl., *Satyro* 08 (JPB); *Ibidem*, 22 May 1994, fl., *Rodrigues* 89 (HST); *Ibidem*, 1 February 1989, fl., *Félix* 6336 (EAN); *Ibidem*, Reserva de Guaribas, 21 October 2012, fr., *Silva* 198 (HUEFS); *Ibidem*, Reserva Biológicas Guaribas, 30 November 2002, fl., *Sevilha* 2600 (EMBRAPA); *Ibidem*, Reserva Biológicas Guaribas, 20 August 2002, fr., *Sevilha et al.* 2298 (UEC); Pedra de Fogo, 28 February 1998, fl., *Lucena* 403 (PEUFR); Santa Rita, 7 February 1986, fl., *Plumel* 6528 (JPB); Sapé, 27 October 2000, fl., *Dionísio* 58 (JPB).

**Distribution and habitat:** This species is endemic to Brazil, occurring in the coastal regions of the Northeast (Alagoas, Bahia, Paraíba, Pernambuco, Rio Grande do Norte, and Sergipe) and Southeast (Espírito Santo, Minas

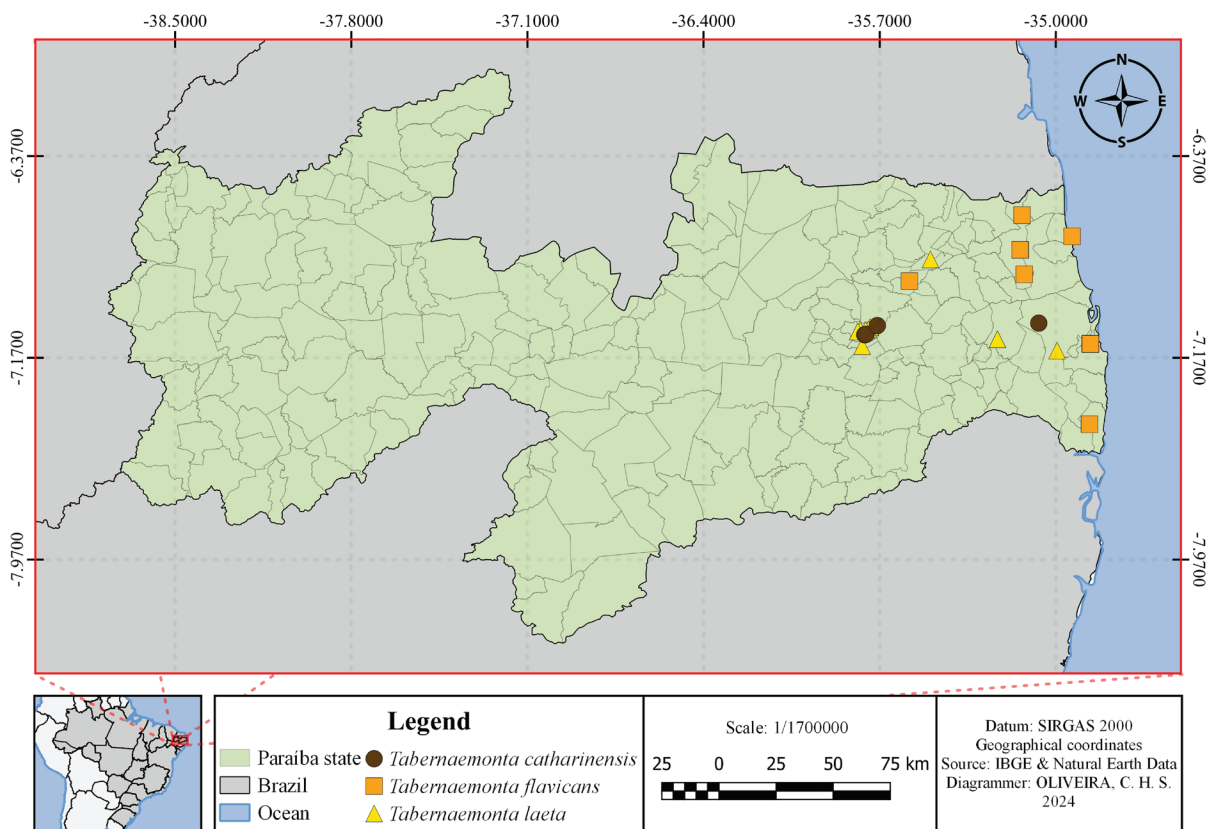


FIGURE 8. Distribution of the *Tabernaemontana* species in Paraíba state, Brazil.

Gerais, and Rio de Janeiro) (Flora e Funga do Brasil, 2024; Spina, 2004). It has an Atlantic pattern and a very restricted geographical distribution. In Paraíba, this species is mainly associated with the Atlantic Forest vegetation, including upland forests, in ‘restinga,’ ‘tabuleiro,’ and riparian forests. Its individuals have been sighted on the edges and interior of forests, cliffs, capoeiras, and roadsides. It has been recorded in the APA of Parque Estadual da Pedra da Boca, in the municipalities of Araruna and Tacima; Parque Estadual Mata do Pau Ferro, in Areia; Parque Estadual Vale dos Dinossauros, in Sousa; Reserva Biológica de Guaribas, in Mamanguape and Rio Tinto; Tambaba APA, in Conde; Estação Ecológica do Pau-Brasil, in Mamanguape; Fazenda Pacatuba RPPN, in Sapé; and Jardim Botânico Benjamin Maranhão, in João Pessoa.

**Phenology:** Flowering from January to October and fruiting from August to November.

It is characterized by having congested leaves at the apex of the branches, oblanceolate leaf blades, and large white flowers with lobes longer than the corolla tube. The buds are protected by petaloid bracts, navicular, and elongated oblong follicle-like (2) fruit.

*Macoubea guianensis* Aubl., Hist. Pl. Guiane 2(Suppl.):18, t. 378. 1775. (Fig. 7; Fig. 9D–F; Fig. 11D–E).

*Trees*, ca. 20 m high, *stem* straight, white *latex*; *branches*

lenticellate, glabrous. *Leaves* petiolate, opposite, lax; blade 8.2–16.0 × 5.4–10.0 cm, obovate, margin flat, base rounded to obtuse, apex rounded; chartaceous, concolorous, glabrous on both surfaces; craspedodromous. *Petiole* 1.5–2.0 cm long, glabrous. Inflorescence ca. 3 cm long, terminal, corymbiform; *peduncle* ca. 1.5 cm long, glabrous; *bracts* ca. 2 mm long, navicular, glabrous. Flowers white; *pedicel* ca. 0.6 mm long, glabrous; *calyx* ca. 2.5 mm long, oval, *lacina* subequal to each other, glabrous; corolla hypocrateriform, lower tube ca. 2 mm long, cylindrical, upper tube ca. 4 mm long, cylindrical; lobes ca. 1.6 × 1 mm, linear, glabrous. *Anthers* 4–5 mm long, glabrous; ovary 2.0–2.3 mm long, pubescent. *Drupe* 5.8 × 5.5 cm, subglobose, smooth, dry pericarp, glabrous. *Seeds* 1.7 × 0.6 cm, rough, oblong, not winged, *arils* viscous.

**Specimens examined:** BRAZIL. Paraíba: João Pessoa, Jardim Botânico, 3 May 2016, fl., *Gadelha-Neto* 4034 (JPB); Mamanguape, Reserva Biológica Guaribas: Área de cabeça do boi – Sema II, 10 February 2012, fr., *Thomas et al.* 15653 (JPB).

**Distribution and habitat:** This species occurs in Panama and South America (Suriname, Venezuela, Guyana, French Guiana, Bolivia, Brazil, and Peru) (POWO, 2024). In Brazil, it has a disjunct geographical distribution from the North (Acre, Amazonas, Pará, and Rondônia), Northeast (Bahia, Maranhão, and Pernambuco), Midwest (Mato

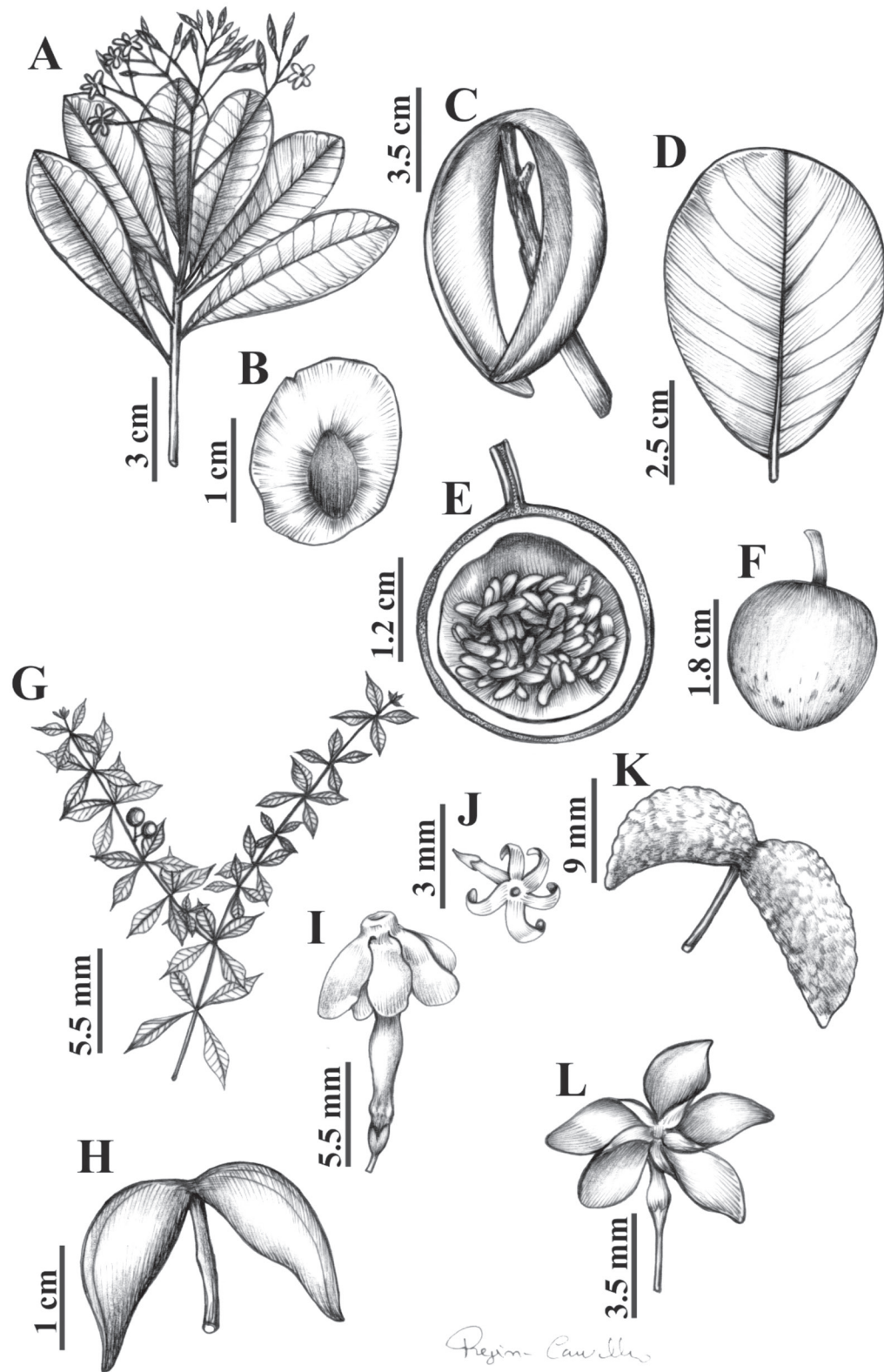


FIGURE 9. A–C, *Himatanthus bracteatus*: A, flowering branch; B, seed; C, fruit; D–F, *Macoubea guianensis*: D, leaf; E, fruit and seeds; F, fruit; G, *Rauvolfia ligustrina* fructified branch; H–I, *Tabernaemontana flavicans*: H, fruit; I, flower; J–K, *Tabernaemontana catharinensis*: J, flower; K, fruit; L, *Tabernaemontana laeta* flower.

Grosso) to the Southeast (Espírito Santo) (Flora e Funga do Brasil, 2024), presenting an Amazonian-Atlantic pattern. In Paraíba, the species can be found in the Atlantic Forest, in the APA of Jardim Botânico Benjamin Maranhão, in João Pessoa, on sandy, clay substrate soils, and in the Reserva Biológica Guaribas: Área de Cabeça do Boi, municipality of Mamanguape.

**Phenology:** Flowers and fruit were recorded in May and February, respectively.

*Macoubea guianensis* can be recognized by its opposite leaves, obovate leaf blade, and subglobose drupe, with a dry pericarp, oblong seeds, and viscous arils.

***Rauvolfia ligustrina*** Willd., Syst. Veg. 4:805. 1819. (Fig. 7; Fig. 9G).

*Trees*, ca. 0.5–1.0 m high, *stem* cylindrical, white latex; *branches* lenticellate, pubescent. *Leaves* petiolate, whorled, 3 per node, lax; blade 2.4–3.7 × 1.0–1.5 cm, elliptical to oval, margin flat to slightly undulating, base obtuse, apex cuspidate; membranaceous, discolorous, glabrous surfaces with trichomes on the main vein; brochidodromous. *Petiole* ca. 1 mm long, pubescent. *Inflorescence* ca. 3 cm long, terminal, cymose, pleiochasium; peduncle 8–5 mm long, pubescent; bracts ca. 1 mm long, linear, glabrous. *Flowers* white, *pedicel* ca. 2 mm long, glabrous; calyx 2 × 1 mm; *lacinia* triangular, equal, green, apex acute, margin ciliate; *corolla* hypocrateriform, tube ca. 2 × 1 mm constricted in the throat, *lobes* ca. 1 mm long, oval, apex rounded, glabrous. *Anthers* ca. 0.6 mm long, triangular, glabrous. *Ovary* ca. 1.5 mm long, superior, glabrous. *Nectariferous disc* ca. 0.5 mm long. *Drupe* 5–7 × 6 mm, syncarpous, globose, red to black, smooth, lenticels and midrib absent. *Seeds* not seen.

**Specimens examined:** BRAZIL. Paraíba: Alagoa Nova, Sítio do Preguiçoso, May 2012, fl., fr., *Guedes et al. 19451*(UFPB); Araruna, Parque Estadual da Pedra da Boca, 17 March 2003, fl., *Lima 1755* (JPB); Ibidem, Parque Estadual da Pedra da Boca, 14 April 2002, fr., *Barbosa et al. 2419* (JPB); Ibidem, 18 October 2003, fl., fr., *Pessoa et al. 7* (JPB); Areia, Mata do Pau-Ferro, 16 February 2000, fr., *Barbosa et al. 1957* (JPB); Ibidem, 17 March 1992, fr., *Félix 4733* (HST); Ibidem, Engenho Cepilho, 16 March 1975, fl., *Perazzo Barbosa 175* (RB); Borborema, 16 January 1998, fl., *Schindwein 869* (JPB); Cruz de Espírito Santo, 29 January 1991, fr., *Moura 525* (JPB); Dona Inês, 10 April 1971, fr., *Carvalho 3495* (JPB); Mari, 25 April 2017, fr., *Figueira et al. 579* (IPA); Natuba, 13 August 1952, fr., *Xavier 1623* (JPB); Ibidem, 26 November 1971, fl., *Andrade-Lima et al. 1038* (PEUFR); Pilões, Cruzeiro do Espinho, 7 III 2012, fr., *Melo 10993* (HUEFS); Ibidem, Serra do Espinho, 6 III 2012, fl., *Melo 10960* (HUEFS); Ibidem, Serra do Espinho, 7 III 2012, fl., *Guedes 19651* (HUEFS); Santa Rita, Lagoa do Paturi, 16 VI 2001, fl., fr., *Agra 5594* (JPB); Ibidem, 12 December 1992, fr., *Agra et al. 1509* (JPB); Ibidem, Usina São João, Tibirizinho, 12 July 1990, fl., fr., *Agra 1185* (K); Sousa, Vale dos Dinossauros, 6 September 2002, fl., *Gadelha-Neto 751* (JPB); Ibidem, 1 January 1992, fr., *Gadelha-Neto 399* (JPB); Tacima, 11 March 2002, fl., fr., *Agra 5627* (JPB); Ibidem, 8 March 2002, fl., fr., *Agra 5637* (JPB).

**Distribution and habitat:** This species is recorded from Mexico to South America and the Caribbean (Argentina, Belize, Bolivia, Brazil, Colombia, Costa Rica, Cuba, El Salvador, Guatemala, Guyana, Mexico, Nicaragua, Paraguay, Suriname, Trinidad and Tobago, and Venezuela) (POWO, 2024). In Brazil, it has a wide distribution, with an Amazonian-Caatinga-Cerrado-Atlantic pattern and disjunct populations, being found in the North (Amazonas and Pará), throughout the Northeast and Midwest, and in the Southeast (Rio de Janeiro) (Koch et al., 2007; Flora e Funga do Brasil, 2024), and is associated with the interior of forests. In Paraíba, it was recorded in the Atlantic Forest, including upland forest. It can be found in the interior of forests, capoeira, rocky outcrop surroundings, near streams, slabs, and roadsides. It has been recorded in the APA of Parque Estadual da Pedra da Boca, municipalities of Araruna and Tacima; Parque Estadual Mata do Pau-Ferro, in Areia; Parque Estadual Vale dos Dinossauros, in Sousa; and Roncador APA, in Bananeiras.

**Phenology:** It can be found with flowers and fruit from March to September.

*Rauvolfia ligustrina* is characterized by having whorled leaves, 3 per node, an elliptical to oval blade, and small, white flowers, with a tube ca. 2 mm long, and syncarpous drupes. In some regions, it is called ‘arrebenta-boi’ (ox-buster) for its toxic properties.

***Tabernaemontana*** L., Sp. Pl. 1:210. 1753.

Type: *T. citrifolia* L., Sp. Pl. 1:210. 1753.

*Trees* or shrubs, *stem* cylindrical, white latex, *branches* non-lenticellate, glabrous. *Leaves* opposite, lax, unequal at the same node; *petiole* cylindrical, glabrous; blade elliptic, margin flat or slightly undulate, membranous or chartaceous, concolorous; brochidodromous or camptodromous. *Inflorescences* axillary or terminal, cymose; bracts oval. *Flowers* white, yellow throat; *calyx* with subequal or unequal *lacinia*, with or without collectors on the inside of the sepals; *corolla* hypocrateriform. *Stamens* with free *anthers*, triangular. *Ovary* globose, superior, glabrous. *Nectariferous disc* absent. *Follicles* convex-concave or ellipsoid, smooth or muricate, lenticels and midrib absent, round, or acute apex, glabrous.

***Tabernaemontana catharinensis*** A.DC., Prodr.8:365. 1844. (Fig. 8; Fig. 9J–K).

*Trees*, ca. 8 m high. *Leaf* blade 5.3–10.8 × 2.3–3.6 cm, elliptical, margin flat, base cuneate, apex acute, membranous, glabrous in both surfaces; camptodromous. *Petiole* 0.5–0.7 cm long. *Inflorescence* ca. 5 cm long, axillary; peduncle 0.4–0.6 cm long, glabrous; bracts ca. 2 × 2 mm, lanceolate. *Flower* pedicel ca. 7 mm long, glabrous; *calyx* ca. 4 × 3 mm, with triangular, revolute, glabrous *lacinia*, collectors arranged on the inner surface of the sepal; *corolla* hypocrateriform, yellow-green, spiral, glabrous, tube 5 × 2 mm, cylindrical inflated at the base, lobes 4 × 4 mm, dolabriform. *Anthers* ca. 4 × 1 mm, glabrous. *Ovary* ca. 2 × 2 mm. *Follicle* 2.4–3.0 × 1.3–1.4 cm, convex-concave, brown, muricate. *Seeds* not seen.

**Specimens examined:** BRAZIL. Paraíba: Alagoa Nova, 8 March 2012, fl., fr., *Melo et al. 11052* (HUEFS); Ibidem,

Fazenda Sr. José Roberto, 8 March 2012, fl., fr., *Melo et al. 11064* (HUEFS); Ibidem, 5 March 2012, fl., *Melo et al. 10910* (HUEFS); Ibidem, Brejo Paraibano, 5 March 2012, fl., *Melo 10910* (HUEFS).

**Distribution and habitat:** *Tabernaemontana catharinensis* is native to South America and occurs in Argentina, Bolivia, Paraguay, Uruguay, and Brazil; however, it is also cultivated in the United States of America and Italy (POWO, 2024). In Brazil, it has a disjunct distribution and a Cerrado-Atlantic pattern. It can be found in the Northeast (Bahia, Ceará, Maranhão, Pernambuco, and Sergipe), Midwest (Mato Grosso do Sul), and in all states of the Southeast and South (Flora e Funga do Brasil, 2024). Mamede et al. (2020) recorded *T. catharinensis* for the first time in Paraíba state. In Paraíba it occurs in upland forests, on roadsides, in the forest's interior, capoeira, pasture areas, and riparian forests.

**Phenology:** It was found with flowers and fruit in March.

This species can be recognized by its membranous leaf blades with camptodromous venation; its flowers with triangular and revolute calyx lacinia; its corolla tube that is inflated at the base, yellow inside, white outside; its spiral corolla lobes that are yellow-green and smaller than the tube; and its muricate, convex-concave follicle.

*Tabernaemontana flavicans* Willd. ex Roem. & Schult., Syst. Veg., ed. 15 bis. 4:797. 1819. (Fig. 8; Fig. 9H–I; Fig. 11F).

*Shrubs*, ca. 2 m high. *Leaf* blades 8.5–10.8 × 3.4–3.9 cm, elliptical, margin flat, base cuneate, apex acuminate, chartaceous, glabrous on both surfaces; brochidodromous. *Petiole* 0.7–1.0 cm long. *Inflorescence* ca. 6 cm long, axillary; peduncle 0.6–0.4 cm long, glabrous; bracts ca. 1 mm long, oval. *Flowers* white with yellow throat extending to the beginning of the lobes, *pedicel* 1.4–2.0 cm long, glabrous; calyx 2–3 mm long, oval, *lacinia* unequal to each other, glabrous; corolla hypocrateriform, *tube* ca. 27 mm long, cylindrical, white, slightly inflated at the beginning of the tube, *lobes* ca. 21 × 8 mm, dolabriform, glabrous. *Anthers* 2.5 × 1.0 mm, glabrous. *Ovary* ca. 1 × 1 mm. *Follicle* 3.7 × 1.0 cm, ellipsoid, brown, apex acute, smooth. *Seeds* not seen.

**Specimens examined:** BRAZIL. Paraíba: Baía da Traição, 11 October 2004, fl., *Gadelha-Neto et al. 1264* (JPB); João Pessoa, Jardim Botânico, 20 January 2012, fr., *Gadelha-Neto 3147* (JPB); Ibidem, Jardim Botânico, 12 September 2011, fl., *Gadelha-Neto 3053* (JPB); Ibidem, 6 September 2005, fr., *Amazonas et al. 44* (JPB); Ibidem, 12 August 2002, fl., *Gadelha-Neto et al. 727* (JPB); Mamanguape, 4 September 2004, fl., *Barbosa et al. 3045* (JPB); Pilões, Cruzeiro do Espinho, 7 March 2012, fl., *Melo 10985* (HUEFS).

**Distribution and habitat:** This species occurs from Venezuela, Colombia, Peru, Bolivia, to Brazil (POWO, 2024). In Brazil, it has a continuous, restricted distribution and an Amazonian-Cerrado-Atlantic pattern, being found in the North (Amazonas, Rondônia, and Pará), Northeast (Pernambuco, Maranhão, Alagoas, and Bahia), Midwest (Mato Grosso), and Southeast (Espírito Santo, Minas Gerais, and Rio de Janeiro) (Flora e Funga do Brasil, 2024).

Mamede et al. (2020) verified *T. flavicans* as a new record in Paraíba state. It occurs in the Atlantic Forest, inside the forest between trails in sandy, clay soils, and was recorded at the Pau-Brasil Ecological Station-Mamanguape and at the Benjamin Maranhão Botanical Garden, municipality of João Pessoa.

**Phenology:** It was found with flowers between August and October and with fruit between September and January.

This species is characterized by its chartaceous leaf blades, with brochidodromous venation, a white corolla with a yellow throat extending to the beginning of the lobes, a tube that is longer than the lobes and slightly inflated, and the smooth, ellipsoid follicle with an acute apex.

*Tabernaemontana laeta* Mart., Flora 20(2): Beibl. 98. 1837. (Fig. 8; Fig. 9L).

*Trees*, ca. 6 m high; *branches* striated. *Leaf* blade 8.4–10.5 × 3–4 cm, elliptical, margin slightly undulated, base obtuse to cuneate, apex cuneate to acuminate, chartaceous, glabrous on both surfaces; camptodromous; colleters in the nodal region. *Petiole* 1.0–1.4 cm long. *Inflorescences* ca. 7 cm long, terminal; peduncle ca. 8 mm long, glabrous; *bracts* 1.5 × 1.0 mm, oval. *Flowers* white with yellow throat, *pedicel* ca. 7 mm long, glabrous; *calyx* 3 × 2 mm, lacinate, oval, glabrous, colleters on the inner surface of the sepal; *corolla* hypocrateriform, *tube* 10–12 × 2 mm, cylindrical, inflated at the base, greenish-yellow, *lobes* 13–16 × 7 mm, dolabriform, outer basal portion yellowish, glabrous. *Anthers* 5 × 1 mm, glabrous. *Ovary* 2 × 1 mm. *Follicle* 3.3 × 2.1 cm, ellipsoid, brown, apex round, muricate. *Seeds* not seen.

**Specimens examined:** BRAZIL. Paraíba: Alagoa Nova, 19 November 2016, fl., *Bordon and Chaves 6* (UEC); Ibidem, 19 November 2016, fl., *Bordon and Chaves 8* (UEC); Ibidem, 19 November 2016, fl., *N.G. Bordon and C. L. Chaves 4* (UEC); Matinhas, 6 December 2000, fl., *Barbosa et al. 2091* (JPB); Pirpirituba, 2 April 2008, fl., *Gadelha-Neto et al. 2152* (JPB); Santa Rita, 8 November 1995, fr., *Agra et al. 3681* (JPB); Sapé, 25 November 2000, fl., *Dionísio 74* (JPB); Ibidem, 10 November 2000, fl., *Dionísio 69* (JPB).

**Distribution and habitat:** This species constitutes a new record for Paraíba state. *Tabernaemontana laeta* is endemic to Brazil, where it has a disjunct geographical distribution, occurring in the Northeast (Pernambuco, Alagoas, Bahia, and Sergipe), Midwest (Federal District), and Southeast (Espírito Santo, Minas Gerais, Rio de Janeiro, and São Paulo) regions (Flora e Funga do Brasil, 2024), presenting a Cerrado-Atlantic distribution pattern. It can be found in Paraíba forest uplands, in sandy, clay soils. It was recorded in the protected areas of the RPPN - Fazenda Pacatuba, municipality of Sapé, and APA do Roncador, municipality of Bananeiras.

**Phenology:** Flowering in April, November, and December and fruiting in November.

It is distinguished from other congeneric species recorded in the study area by the corolla with lobes longer than the tube and by the ellipsoid, muricate follicle.

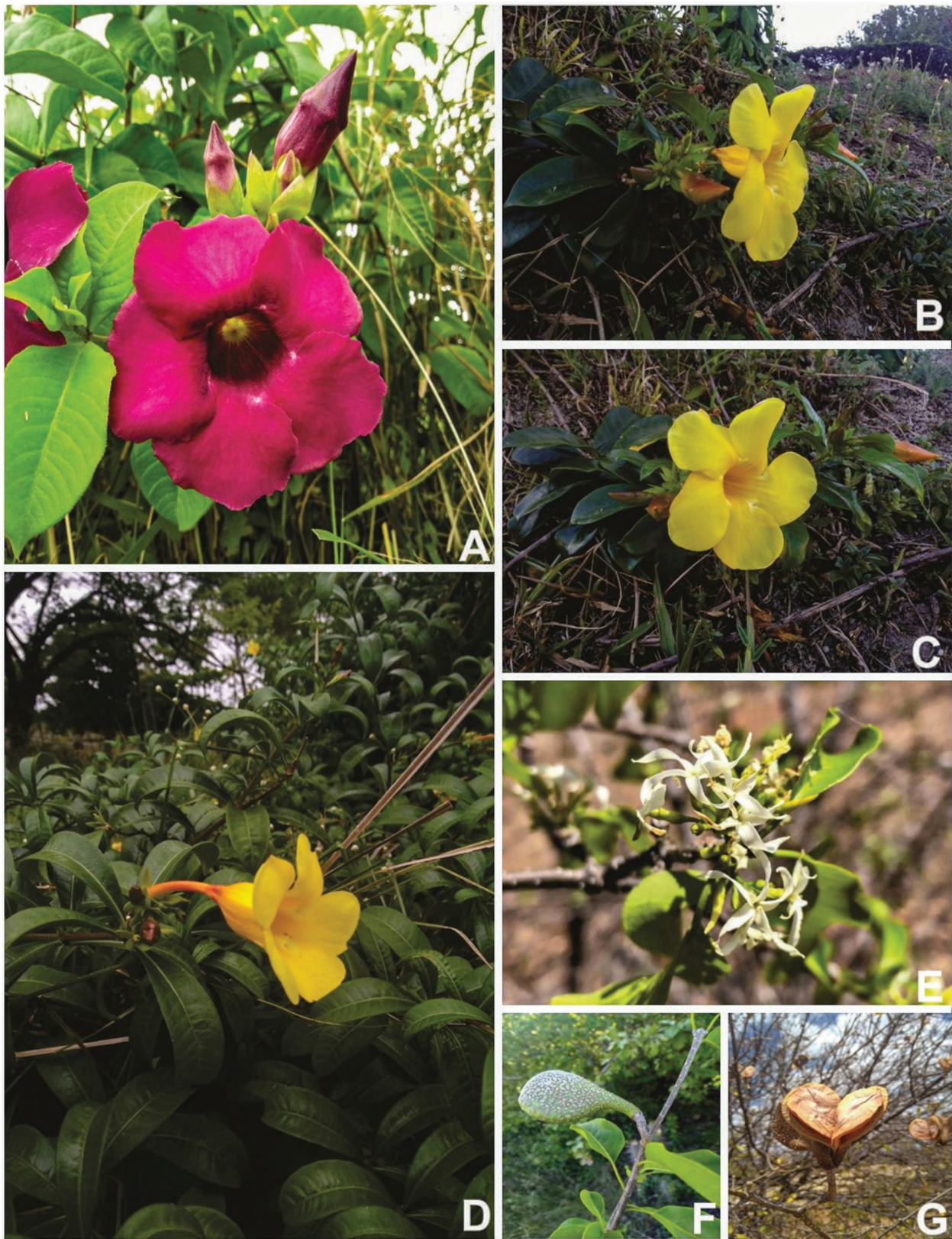


FIGURE 10. Species of Rauvolfioid grade in Paraíba state, Brazil. A, *Allamanda blanchetii*; B–C, *Allamanda cathartica*; D, *Allamanda doniana*; E–G, *Aspidosperma pyriformium*. Photographs by M. L. Mamede (A–D, F–G) and E. M. P. Fernando (E).

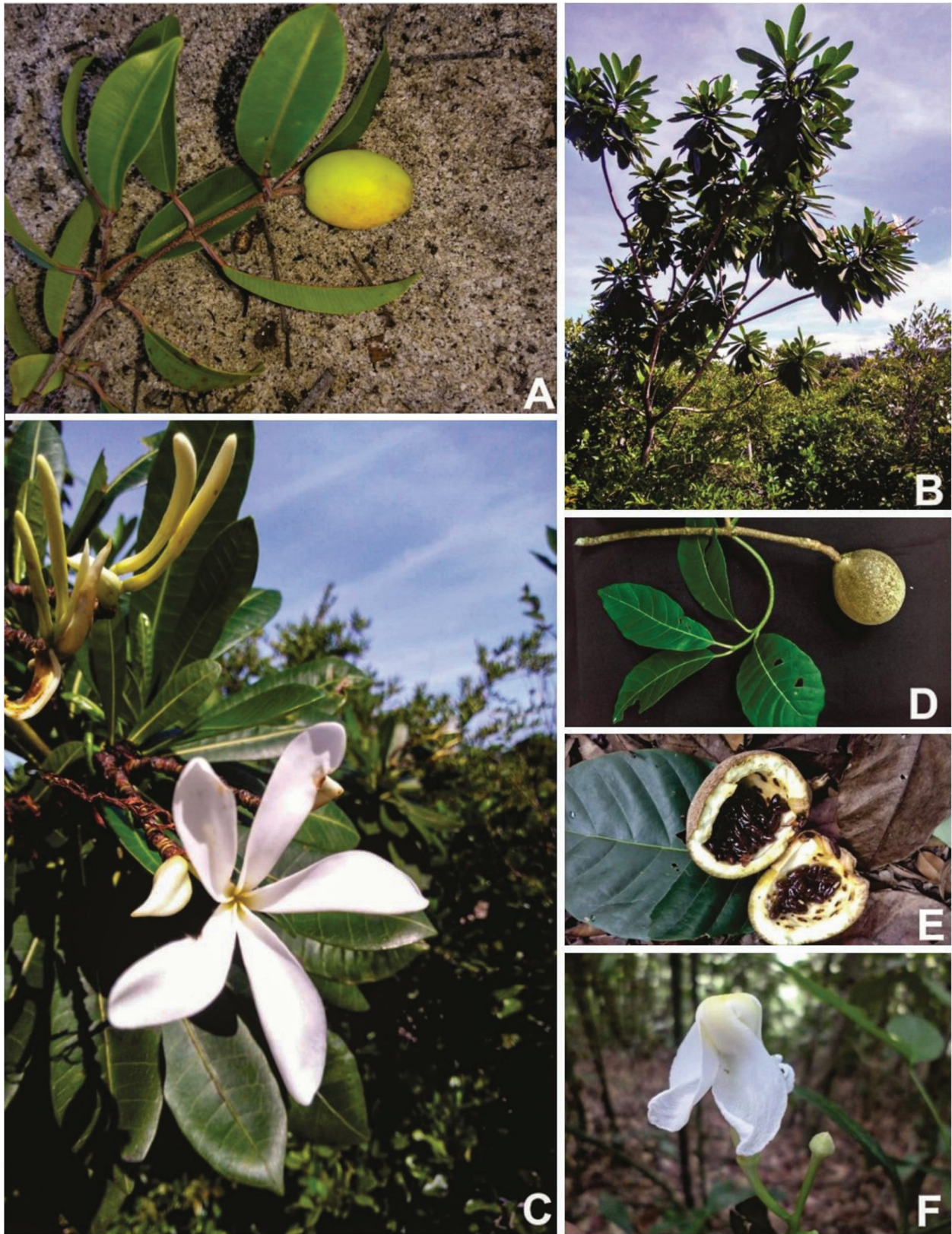


FIGURE 11. Species of Rauvolfioideae in Paraíba state, Brazil. **A**, *Hancornia speciosa*; **B–C**, *Himatanthus bracteatus*; **D–E**, *Macoubea guianensis*; **F**, *Tabernaemontana flavicans*. Photographs by M. L. Mamede (A–C), Lucas Monteiro (D–E), and Thales Coutinho (F).

## LITERATURE CITED

- AESA 2006. Agência Executiva de Gestão das águas do Estado da Paraíba. Governo do Estado da Paraíba. Relatório Final, Pages 1–253.
- AGRA, M. F., P. F. FREITAS, AND J. M. BARBOSA-FILHO. 2007. Synopsis of the plants known as medicinal and poisonous in Northeast of Brazil. *Braz. J. Pharm.* 17: 114–140. <https://doi.org/10.1590/S0102-695X2007000100021>
- AGRA, M. F., K. N. SILVA, I. J. L. BASÍLIO, P. F. FREITAS, AND J. M. BARBOSA-FILHO. 2008. Survey of medicinal plants used in the region Northeast of Brazil. *Braz. J. Pharm.* 18: 472–508. <https://doi.org/10.1590/S0102-695X2008000300023>
- BOECHAT, S. C., AND H. M. LONGHI-WAGNER. 2000. Padrões de distribuição geográfica dos táxons brasileiros de *Eragrostis* (Poaceae, Chloridoideae). *Rev. Bras. Bot.* 23: 177–194. <https://doi.org/10.1590/S0100-84042000000200008>
- CABRERA, A. L. 1973. *Biogeografía de América Latina*. Secretaria General de la Organización de los Estados Americanos, Chesneau.
- CAMAIONI-NETO, C., C. W. OWENS, R. D. LANGFIELD, A. B. COMEAU, J. S. ONGE, A. J. VAISBER, AND G. B. HAMMOND. 2002. Antibacterial activity of some medicinal plants from the Callejón de Huaylas. *J. Ethn.* 79: 133–138. [https://doi.org/10.1016/s0378-8741\(01\)00398-1](https://doi.org/10.1016/s0378-8741(01)00398-1)
- CARVALHO, P. E. R. 2003. *Espécies arbóreas brasileiras*. Vol. I. Brasília: Embrapa Informação Tecnológica; Embrapa Florestas, Colombo.
- . 2010. *Espécies arbóreas brasileiras*. Vol. IV. Brasília: Embrapa Informação Tecnológica; Embrapa Florestas, Colombo.
- CASTELLO, A. C. D., A. S. S. PEREIRA, P. A. MESSIAS, A. L. SCUDELER, Y. A. MOURA, AND I. KOCH. 2018. Two new species of *Aspidosperma* (Apocynaceae) from Northeast Brazil and a Monograph of the Species from Ceará State. *Syst. Bot.* 43: 1030–1045. <https://doi.org/10.1600/036364418X697742>
- CASTELLO, A. C. D., A. S. S. PEREIRA, A. O. SIMÕES, AND I. KOCH. 2024. *Aspidosperma*. In *Flora e Funga do Brasil 2024*. Jardim Botânico do Rio de Janeiro. <http://floradobrasil.jbrj.gov.br/reflora/floradobrasil/FB4520> (accessed on January 25, 2024).
- ENDO, Y., H. HAYASHI, S. SATO, M. MARUNO, T. OHTA, AND S. NOZOE. 1994. Confluent acid and 2'-O-Methylperlatolic acid, monoamine oxidase B inhibitors in Brazilian plant, *Himatanthus sucuuba*. *Chem. & Pharm. Bull.* 42: 1198–1201.
- ENDRESS, M. E., S. LIEDE-SCHUMANN, AND U. MEVE. 2014. An updated classification for Apocynaceae. *Phytotaxa* 159: 175–194. <https://doi.org/10.11646/phytotaxa.159.3.2>
- FALCÃO, M. A., AND E. LLERAS. 1981. Aspectos fenológicos, ecológicos e de produtividade da sorva (*Couma utilis* Müll. Arg.). *Acta Amaz.* 11: 729–741.
- FERNANDES, G. E. A., N. F. O. MOTA, AND A. O. SIMÕES. 2018. Flora das cangas da Serra dos Carajás, Pará, Brasil: Apocynaceae. *Rodriguésia* 69: 3–23. <https://doi.org/10.1590/2175-7860201869102>
- FISHBEIN, M., T. LIVSHULTZ, S. C. K. STRAUB, A. O. SIMÕES, J. BOUTTE, A. McDONNELL, AND A. FOOTE. 2018. Evolution on the backbone: Apocynaceae phylogenomics and new perspectives on growth forms, flowers, and fruits. *Amer. J. Bot.* 105(3): 495–513. <https://doi.org/10.1002/ajb2.1067>
- FLORA E FUNGA DO BRASIL 2024. Apocynaceae. In *Flora e Funga do Brasil*. Jardim Botânico do Rio de Janeiro. <https://floradobrasil.jbrj.gov.br/FB48> (accessed on January 25, 2024).
- FRANCISCO, P. R. M., R. M. MEDEIROS, D. SANTOS, AND R. M. MATOS. 2015. Classificação Climática de Köppen e Thornthwaite para o Estado da Paraíba. *Rev. Bras. Geo. Fís.* 8: 1006–1016.
- GONÇALVES, E. G., AND H. LORENZI. 2011. *Morfologia Vegetal: Organografia e Dicionário Ilustrado de Morfologia das Plantas Vasculares*. 2nd edition Instituto Plantarum, Nova Odessa.
- HARRIS, J. G., AND M. W. HARRIS. 2000. *Plant identification terminology: an illustrated glossary*. Spring Lake Publishing, Utah.
- INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA – IBGE. 2004. Mapa de Biomas do Brasil, primeira aproximação. Rio de Janeiro: IBGE. <https://www.ibge.gov.br/geociencias/informacoes-ambientais/15842-biomas.html?edicao=16060&t=downloads> (accessed on January 26, 2024).
- INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA – IBGE. 2018. Área da unidade territorial. Rio de Janeiro: IBGE. <https://cidades.ibge.gov.br/brasil/pb/panorama> (accessed on January 25, 2024).
- INCT- Herbário Virtual da Flora e dos Fungos. SpeciesLink.
- JUDD, W. S., C. S. CAMPBELL, E. A. KELLOGG, P. F. STEVENS, AND M. J. DONOGHUE. 2009. *Sistemática Vegetal: Um Enfoque Filogenético*. 3rd edition, Artmed, Porto Alegre.
- KINOSHITA, L. S. 2005. Apocynaceae. Pages 35–92 in WANDERLEY M. G. L., G. J. SHEPHERD, T. S. MELHEM, S. E. MARTINS, M. KIRIZAWA, AND A. M. GIULIETTI, EDs., *Flora Fanerogâmica do Estado de São Paulo 4*. Instituto de Botânica de São Paulo, São Paulo.
- KOCH, I. 2002. Estudos das espécies neotropicais do gênero *Rauvolfia* L. (Apocynaceae). Ph.D Thesis, Universidade Estadual de Campinas.
- KOCH, I., AND L. S. KINOSHITA. 1999. As Apocynaceae s. str. da Região de Bauru, São Paulo, Brasil. *Acta Bot. Bras.* 13: 61–86. <https://doi.org/10.1590/S0102-33061999000100007>
- KOCH, I., L. S. KINOSHITA, AND V. BITTRICH. 2007. Taxonomic Novelties in *Rauvolfia* (Apocynaceae, Rauvolfioideae) from Brazil. *Novon* 17: 462–471. [https://doi.org/10.3417/1055-3177\(2007\)17\[462:TNIRAR\]2.0.CO;2](https://doi.org/10.3417/1055-3177(2007)17[462:TNIRAR]2.0.CO;2)
- LEEUWENBERG, A. J. M. 1994. A revision of *Tabernaemontana* II. The new world species and *Stemmadenia*. Series of revisions of Apocynaceae: XXXVI. Royal Botanic Gardens, Kew. 2: 1–450.
- LORENZI, H., H. M. SOUZA, M. A. V. TORRES, AND L. B. BACHER. 2003. *Árvores e Arvoretas Exóticas no Brasil: Madeiras, Ornamentais e Aromáticas*. Instituto Plantarum, Nova Odessa.
- MAMEDE, M. L., L. PEDRO-SILVA, AND J. I. M. MELO. 2020. New Records of Rauvolfioideae (Apocynaceae, Gentianales) for Paraíba State, Brazil. *Harv. Pap. Bot.* 25: 95–97. <https://doi.org/10.3100/hpib.v25iss1.2020.n12>
- MATOZINHOS, C. N., AND T. U. P. KONNO. 2008. Apocynaceae s.l. na Reserva Biológica da Represa do Grama, Descoberto, Minas Gerais, Brasil. *Rodriguésia* 59: 87–98. <https://doi.org/10.1590/S2175-78602014000200001>
- . 2011. Diversidade taxonômica de Apocynaceae na Serra Negra, MG, Brasil. *Hoehnea* 38: 569–595.
- MIRANDA, A. L., J. R. SILVA, C. M. REZENDE, J. S. NEVES, S. C. PARRINI, M. L. PINHEIRO, M. C. CORDEIRO, E. TAMBORINI, AND A. C. PINTO. 2000. Anti-inflammatory and analgesic activities of the latex containing triterpenes from *Himatanthus sucuuba*. *Pl. Med.* 66: 284–286. <https://doi.org/10.1055/s-2000-8572>
- MONACHINO, J. 1954. *Rauvolfia serpentina* - Its history, botany and medical use. *Econ. Bot.* 8: 349–365.
- MOROKAWA, R., A. O. SIMÕES, AND L. S. KINOSHITA. 2013. Apocynaceae s. str. do Parque Nacional da Serra da Canastra, Minas Gerais, Brasil. *Rodriguésia* 64: 179–199. <https://doi.org/10.1590/S2175-78602013000100015>
- MORRONE, J. J. 2014. Biogeographical regionalisation of the Neotropical region. *Zootaxa* 3782: 1–110. <https://doi.org/10.11646/zootaxa.3782.1.1>

- . 2015. Biogeographical regionalisation of the Andean region. *Zootaxa* 3936: 207–236. <https://doi.org/10.11646/zootaxa.3936.2.3>
- OLIVEIRA, V. B., M. S. M. FREITAS, L. MATHIAS, R. BRAZ-FILHO, AND I. J. C. VIEIRA. 2009. Atividade biológica e alcalóides indólicos do gênero *Aspidosperma* (Apocynaceae): uma revisão. *Rev. Bras. Pl. Med.* 11 :92–99. <https://doi.org/10.1590/S1516-05722009000100015>
- PEREIRA, A. S. S., A. O. SIMÕES, AND J. U. M. SANTOS. 2016. Taxonomy of *Aspidosperma* Mart. (Apocynaceae, Rauvolfioideae) in the State of Pará, Northern Brazil. *Biota Neotropica* 16: e20150080. <https://10.1590/1676-0611-BN-2015-0080>
- POWO. 2024. Plants of the world online. Kew Botanic Gardens. <https://powo.science.kew.org/> (accessed on January 26, 2024).
- RODRIGUES, E., J. M. DUARTE-ALMEIDA, AND J. M. PIRES. 2010. Perfil farmacológico e fitoquímico de plantas indicadas pelos caboclos do Parque Nacional do Jaú (AM) como potenciais analgésicos. Parte I. *Rev. Bras. Farm.* 20: 981–991. <https://doi.org/10.1590/S0102-695X2010005000008>
- SAKANE, M., AND G. J. SHEPHERD. 1986. Uma revisão do gênero *Allamanda* L. (Apocynaceae). *Rev. Bras. Bot.* 9: 125–149.
- SERVIÇO FLORESTAL BRASILEIRO – SFB. 2019. Sistema Nacional de Informações Florestais – SNIF. <http://snif.florestal.gov.br/pt-br/> (accessed on May 25, 2024).
- SILVA, J. R. A., C. M. REZENDE, A. C. PINTO, M. I. B. PINHEIRO, M. C. CORDEIRO, E. TAMBORINI, C. M. YONG, AND V. S. BOLZANI. 1998. Ésteres triterpênicos de *H. succuba* (Spruce) Woodson. *Quím. Nova* 21: 702–704.
- SIMÕES, A. O., AND L. S. KINOSHITA. 2002. The Apocynaceae *s.str.* of the Carrancas Region, Minas Gerais, Brazil. *Darwiniana* 40: 127–169.
- . 2005. *Allamanda*. Pages 37–39 in M. G. L. WANDERLEY, G. J. SHEPHERD, T. S. MELHEM, S. E. MARTINS, M. KIRIZAWA, AND A. M. GIULIETTI, EDs., *Flora Fanerogâmica do Estado de São Paulo* 4. Instituto de Botânica, São Paulo.
- SPECIESLINK. <http://inct.splink.org.br> (accessed on January 25, 2024).
- SPINA, A. P. 2004. Estudos taxonômico, micro-morfológico e filogenético do gênero *Himatanthus* Willd. ex Schult. (Apocynaceae: Rauvolfioideae - Plumerieae). Ph. D Thesis, Campinas.
- THIERS, B. [continuously updated]. *Index Herbariorum: A global directory of public herbaria and associated staff*. New York Botanical Garden's Virtual Herbarium. <http://sweetgum.nybg.org/science/ih/> (accessed on January 26, 2024).
- TRINDADE, R. C. S., T. Y. S. KIKUCHI, R. J. F. SILVA, V. V. VALE, A. B. OLIVEIRA, M. F. DOLABELA, AND M. R. COELHO-FERREIRA. 2016. Estudo farmacobotânico das folhas de *Aspidosperma excelsum* Benth. (Apocynaceae). *Rev. Fitos* 10: 220–372. <https://doi.org/10.5935/2446-4775.20160019>
- TROPICOS. Missouri Botanical Garden. <http://www.tropicos.org/Name/1800346> (accessed on January 26, 2024).
- VIEIRA-NETO, R. D. 1994. *Cultura da mangabeira*. Aracaju: Embrapa CPATC, p.16. (Circular Técnica, 2).
- VILLEGAS, L. F., I. D. FERNANDEZ, H. MALDONADO, R. TORRES, A. ZAVALA, A. J. VAISBERG, AND G. B. HAMMOND. 1997. Evaluation of the wound-healing activity of selected traditional medicinal plants from Peru. *J. Ethn.* 55: 193–200.