



Flora of Ceará Wetlands, Brazil: Zingiberales

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Key words:

- Cannaceae
- diversity
- Marantaceae
- temporary ponds

Palavras-chave:

- Cannaceae
- diversidade
- Marantaceae
- lagoas temporárias

Abstract

The study aimed to describe the species of Zingiberales in the wetlands of Ceará. Specimens from the herbaria ALCB, EAC, HUVA and HVSF were analyzed. Field work was carried out between 2010 and 2023. As result, we recognize representatives of Cannaceae (*Canna glauca*) and Marantaceae (*Thalia densibracteata* and *Thalia geniculata*) in the Ceará wetlands. The morphological characters that differentiate the three species are the shape of the leaves and the size and color of the flowers. An identification key, morphological descriptions, comments, distribution map, and photographic plates are presented.

Resumo

O estudo objetivou descrever as espécies de Zingiberales das áreas inundadas do Ceará. Para isso, foram analisados espécimes dos herbários ALCB, EAC, HUVA e HVSF, bem como de expedições de campo realizadas entre 2010 e 2023. No Ceará, os representantes de Zingiberales de áreas alagadiças são: Cannaceae (*Canna glauca*) e Marantaceae (*Thalia densibracteata* e *Thalia geniculata*). Os caracteres morfológicos que diferenciam as três espécies são a forma das folhas e o tamanho e a cor das flores. São apresentados chave de identificação, descrições morfológicas, comentários, mapa de distribuição e pranchas fotográficas em campo e de exsicatas.

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Introduction

The state of Ceará, located in the Northeast region of Brazil, has the second-largest expanse of wetlands in the region, supporting a remarkable diversity of aquatic ecosystems (Maltchik & Pedro 2000). It stands out for having the highest number of temporary lagoons (Maltchik *et al.* 1999), as well as watersheds with poor drainage networks and permanent lentic systems associated with coastal formations (Claudino-Sales & Peulvast 2002). In these permanent lagoons, the stability of the water column directly influences the distribution of plant communities, particularly in relation to the depth of the euphotic zone (Wetzel 2001).

Among the aquatic systems that make up the wetlands of the state of Ceará, permanent and temporary lentic environments hold both the highest species richness and the predominant presence of exclusively aquatic plant species (Matias *et al.* 2021). Among the exclusive representatives of the lagoons, species of the order Zingiberales stand out in these environments (Matias *et al.* 2021), mainly due to their large size, with broad leaves that are pseudo-petiolate and have blades with S-shaped lateral veins, as well as inflorescences

with spiral branches supporting large, green bracts and colored flowers (Stevens 2017 onwards).

The order Zingiberales encompasses eight tropical families and approx. 92 genera and 2,500 species (Sass *et al.* 2016). Cannaceae and Marantaceae are monophyletic taxa and sister of another clade formed by Costaceae and Zingiberaceae, with the four families forming a well-supported monophyletic “ginger” clade (APG IV 2016).

Cannaceae comprises only one genus, *Canna* L., with approximately 10 species, distributed in tropical and subtropical regions, characterized by leaves with open sheaths, broad, asymmetrical flowers, and tuberculate capsules (Maas-van de Kamer & Maas 2008). In Brazil, the genus is represented by 4 species, with one endemic, terrestrial species found in the Atlantic Forest (André 2024a).

Marantaceae comprises 31 tropical genera and approximately 550 species, characterized by closed leaf sheaths, and flowers in mirror-image pairs (Andersson 1998). The genera *Phrynium*, *Donax*, and *Thalia* have aquatic representatives, but only *Thalia* is indicated for the Neotropical region (Cook 1996). In Brazil, 4 species of *Thalia* are indicated (André 2024b).

With economic potential, species of Cannaceae and Marantaceae are applied in ornamental activities, such as *Canna glauca* L., which is cultivated along the edges of tanks, lakes, and channels, being resistant to low-humidity areas as well (Lorenzi & Souza 2001). Representatives of *Canna* and *Thalia* have also been reported in traditional medicine for the treatment of wounds and ulcers (Fenner *et al.* 2006). Some species of Marantaceae have lesser-known uses, such as in the food production, with the consumption of the tuberous roots of *Calathea allouia*, or in artisanal activities using the fibers of *Calathea lutea* for basket production (Martin & Cabanillas 1976; Costa *et al.* 2011).

The taxonomy of Cannaceae was addressed in the works of Petersen (1890a) in *Flora brasiliensis*, as well as in Richardson & Smith (1972) for the state of Santa Catarina. In Brazil, studies on the Cannaceae family are scarce. In contrast, for Marantaceae, taxonomic treatments are presented by Petersen (1890b) in *Flora brasiliensis*, along with specific studies in the Northeast (Saka 2013; Yoshida-Arns 2002a,b,c; Luna *et al.* 2020), North (Melo 2008; Forzza 2007; Saka 2017), Central-West (Gomes & Forzza 2007), and Southeast (Vieira *et al.* 2012) regions. More recently, new species of Marantaceae have been described in studies conducted in the North (Fraga *et al.* 2025), Northeast (Saka & Lombardi 2014; Luna *et al.* 2021), Central-West (Fraga 2020), and Southeast (Fraga *et al.* 2022; Fraga 2024; Fraga & Braga 2025) regions of Brazil.

Although aquatic Zingiberales are poorly represented in the wetland areas of Ceará, these ecosystems harbor a diverse and understudied flora that is crucial for biodiversity conservation. Previous studies on the aquatic flora of Ceará have been conducted over the years, particularly for the Flora of Ceará (Matias & Sousa 2011; Sousa & Matias 2013; Matias *et al.* 2017; Sousa *et al.* 2018; Guedes & Matias 2020; Matias 2020; Matias & Nascimento 2021; Nascimento & Matias 2021). However, significant gaps remain in the understanding of this flora. The present study aims to comprehend the flora of Ceará by conducting a taxonomic study of the Zingiberales species found in these environments. We provide an identification key, morphological descriptions, comments, distribution maps, and photographic plates of specimens in situ and from herbarium collections.

Material and Methods

This study was carried out in the state of Ceará, located in the Brazilian Northeast region, with an approximate area of 148,825 km², subdivided into 12 hydrographic basins that encompass a diverse range of aquatic ecosystems, including rivers, streams, lagoons, and reservoirs (IPECE 2011). The state is bordered to the north by the Atlantic Ocean, to the south by Pernambuco, to the east by Rio Grande do Norte and Paraíba, and to the west by Piauí (IPECE 2017).

The following herbaria, were consulted: ALCB, EAC, HUVA and HVASF (acronyms according to Thiers, continuously updated). Fieldwork was conducted during the wet seasons between 2010 and 2023, following Filgueiras *et al.* (1994), and the specimens were deposited in the Herbário Prisco Bezerra (EAC). The aquatic environments of fieldwork were classified as Permanent Lentic, Temporary Lentic, Permanent Lotic, Temporary Lotic, and Artificial Lentic (Matias *et al.* 2021). A Nikon SMZ 1500 stereomicroscope was used for floral morphological analysis of material deposited in the EAC.

For taxonomic treatment of the Cannaceae family, we used Maas-van de Kamer & Maas (2008) and Yu *et al.* (2022). In the case of *Thalia*, Andersson (1976) and Andersson (1998) were consulted. The vernacular names were obtained from Lorenzi & Souza (2001) and the Flora e Funga do Brasil (André 2024a,b).

A geographic distribution map (Fig. 1) was generated using QGIS software, version 3.28.3 (QGIS Development Team 2023) with shapefiles from Instituto Brasileiro de Geografia e Estatística (IBGE 2012a). For the classification of vegetation types, we followed Figueiredo (1997) and the Manual Técnico da Vegetação Brasileira of the

Instituto Brasileiro de Geografia e Estatística (IBGE 2012b).

Results and Discussion

The representative species of Zingiberales occurring in the flooded areas of Ceará belong to the

families Cannaceae and Marantaceae. Cannaceae has one species, *Canna glauca* L., while Marantaceae presents two species of the genus *Thalia*: *Thalia densibracteata* Petersen and *Thalia geniculata* L.

Taxonomic treatment

Identification key for the species of Zingiberales in Ceará Wetlands

- 1. Yellow flowers; 4 staminodes; capsule tuberculate; seeds globose.....1.1. *Canna glauca*
- 1'. Lilac to purple flowers; 3 staminodes; capsule smooth; seeds oblong.
- 2. Blade linear.....2.1. *Thalia densibracteata*
- 2'. Blade oval to oval-lanceolate2.2. *Thalia geniculata*

1. Cannaceae Juss., Gen. Pl. [Jussieu] 62 (1789), nom. cons.

1.1. *Canna glauca* L., Sp. Pl. 1: 1 (1753).

Figs. 1; 2a-b; 3a-d

Rhizomatous herbs, ca. 1 m tall, glaucous. Leaves with sheath ca. 22 cm long; blade 34.9–44 × 10.4–11.8 cm, oval to oval-lanceolate, base cuneate to acute, apex acute, glaucous, glabrous.

Inflorescences in panicles, unbranched, ca. 22.9 cm long; primary bracts 15.3–20.5 × 0.9–1.2 cm, linear to oblong-lanceolate; branch bracts 11.5–16.6 × 1–1.4 cm, linear to oblong-lanceolate; floral bracts ca. 12.7 × 7.4 mm, obovate; bracteoles ca. 7 × 6.2 mm, obovate; 2 flowers in each cincinnus. Flowers 4.5–9.8 cm long, sessile, erect, asymmetric; sepals 3, 0.9–1.3 × 0.3–0.4 cm, oval to elliptic, apex acute,

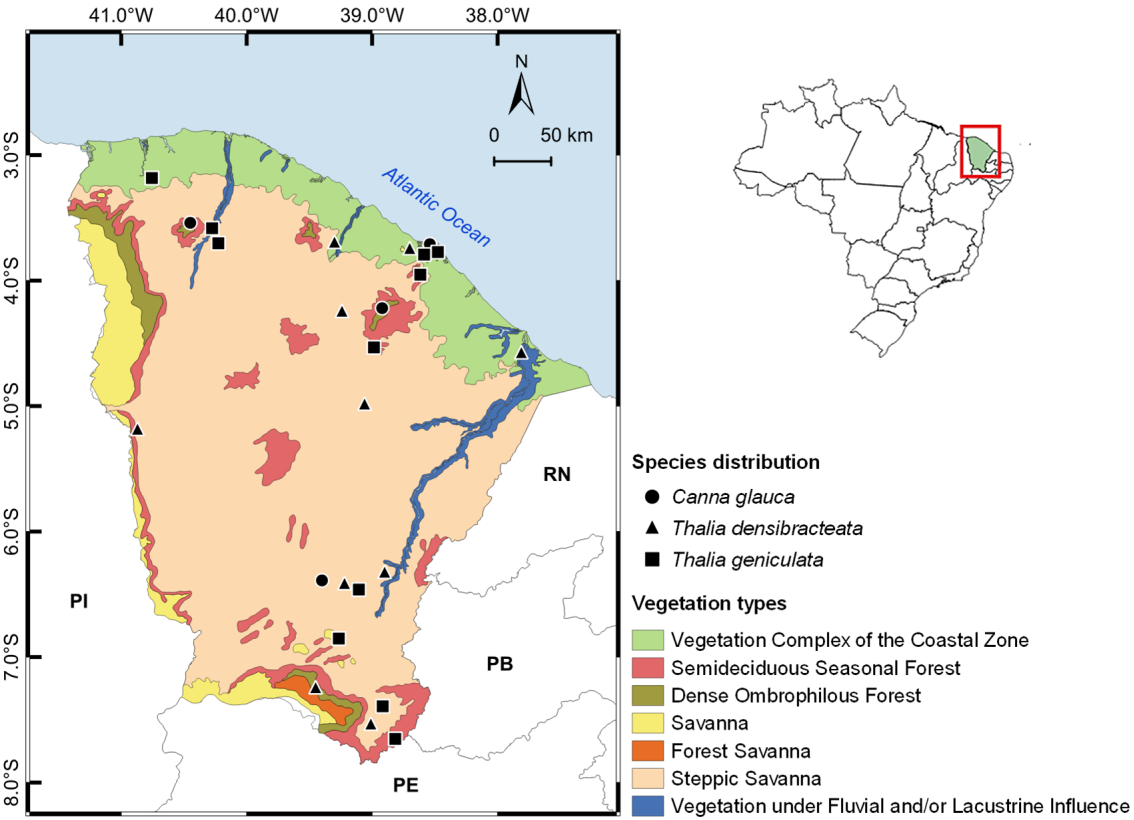


Figure 1 – Distribution of *Canna glauca*, *Thalia densibracteata* and *Thalia geniculata* in Ceará state, Brazil.

green to yellow; petals 3, $2.8\text{--}5.9 \times 0.5\text{--}0.6$ cm, erect, linear to lanceolate, apex acute to acuminate, yellow; staminodes 4; 3 erect staminodes $5.5\text{--}7.6 \times 0.9\text{--}1.8$ cm, free part oboval-lanceolate to obovate, yellow; 1 recurved staminode, ca. 7.2×0.7 cm, free part oboval-lanceolate to obovate, yellow; stamen 1, ca. 5.5 cm long, petaloid appendix ca. 5.4×0.4 cm, asymmetric, yellow, anther $10.6\text{--}11.3$ mm long; ovary inferior, $6.1\text{--}10.2 \times 4.6\text{--}6.2$ mm, orbicular to elliptic; style ca. 7.2×0.1 cm, free part linear, flat, yellow. Capsule $2.6\text{--}2.9 \times 1.9\text{--}2.1$ cm, oval to elliptic, tuberculate, green. Seeds $5.6\text{--}6.3 \times 5.5\text{--}6.2$ mm, globose, brown.

Examined material: Fortaleza, Cidade dos Funcionários, 5.XII.1994, fl., L.W. Lima-Verde (EAC 21502); Seis Bocas, 10.VIII.1995, fl., L.W. Lima-Verde (EAC 23090); trilha do Parque do Cocó, 10.I.2003, fl., L.Q. Matias & H.F. Albuquerque 509 (EAC); Parque do Cocó, 7.VIII.2011, fl., L.Q. Matias 613 (EAC); Campus do Pici - UFC, 11.XII.2015, fl., G.S. Pinto

151 (EAC). Iguatu, Lagoa do Baú, 12.V.2010, fl., L.R.O. Normando et al. 06 (EAC); 11.V.2015, fl., L. Ibiapina-Santos et al. 28 (EAC); Sítio Elson, 16.V.2010, fl., L.R.O. Normando et al. 353 (EAC). Meruoca, Sítio Santo Antônio, 17.VII.1957, fl. and fr., A. Fernandes (EAC 1735). Pacoti, Serra de Baturité, Sítio Batalha, 29.VII.1941, fl. and fr., P. Bezerra 292 (EAC).

Canna glauca is characterized by unbranched panicle inflorescences, each cincinnus containing two flowers, with four yellow staminodes, as well as its oval to oval-lanceolate and glaucous leaves, besides its tuberculate capsules.

In the state of Ceará, it has been recorded in four municipalities: Fortaleza, Iguatu, Meruoca, and Pacoti. Occurring in Dense Ombrophilous Forest vegetation, in permanent lentic and temporary lentic environments in the Steppic Savanna region and in anthropized areas in the Vegetation Complex of the Coastal Zone. It is reported in the conservation unit of the APA of Serra de Baturité.

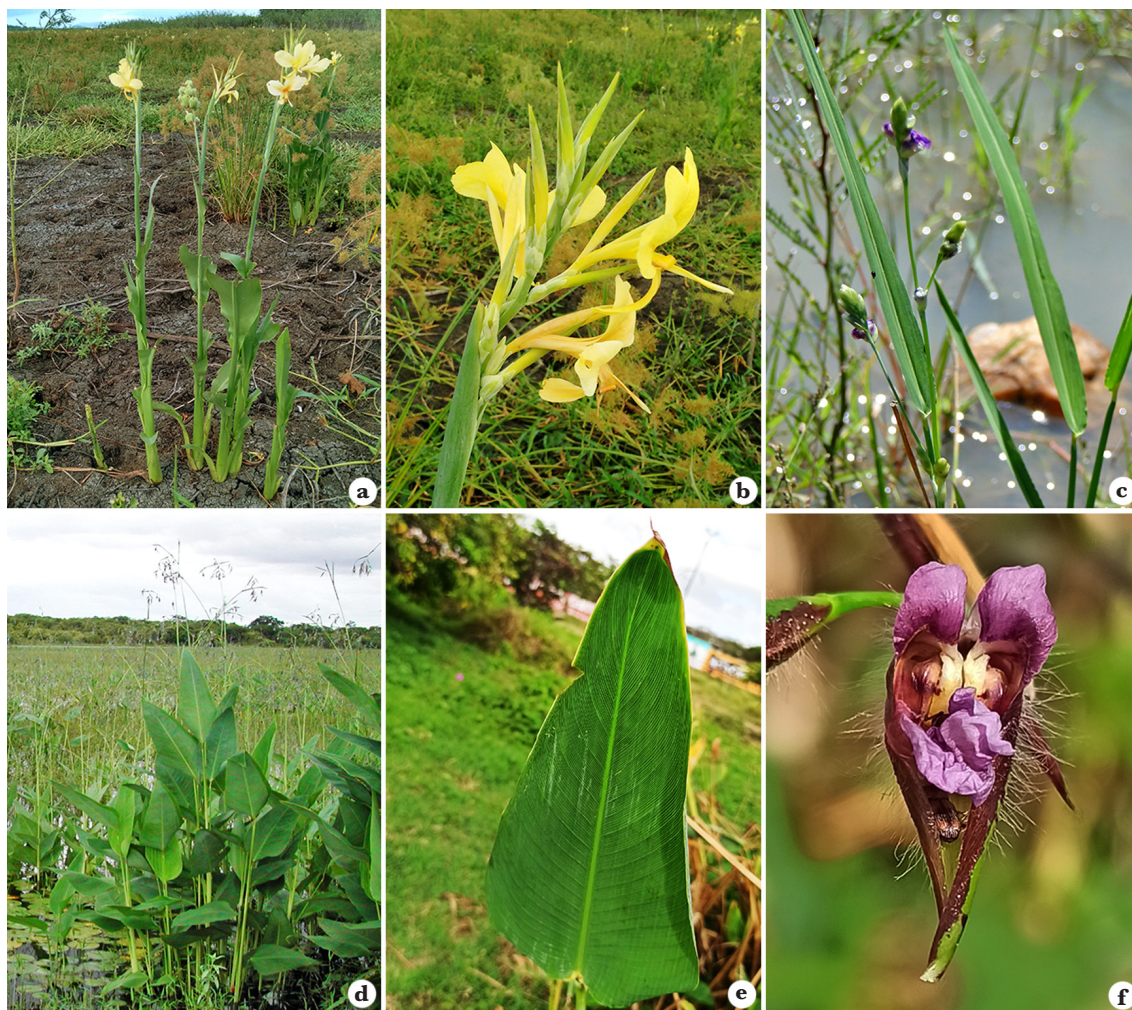


Figure 2 – a-f. Habits, leaves and flowers of Zingiberales of Ceará wetlands – a-b. *Canna glauca*; c. *Thalía densibracteata*; d-f. *Thalía geniculata*.

The species was collected with flowers and fruits from May to December.

The vernacular names for this species are canna-do-brejo-amarela, canna-do-brejo, caetê-imbiri, coquilho, maracá and muru.

2. *Thalia* L., Sp. Pl. 2: 1193 (1753).

Perennial rhizomatous aquatic herbs. Leaves with sheath closed; blade linear or oval or oval-lanceolate, base acute to rounded, apex acute, green, glabrous. Synflorescence terminal, paniculate; peduncle glabrous, green; bracts lanceolate to oval. Florescence component with a single cymule; prophyll lanceolate to oval; interphyll and bracteoles absent. Flowers sessile, erect, asymmetric; sepals 3, oboval, apex rounded, hyaline; petals 3, oboval to elliptic, apex rounded, lilac to purple; staminodes 3; 1 external staminode, unguiculate, apex rounded, lilac to purple; 1 callose staminode, asymmetric, lilac to purple with yellow lateral calli; 1 cucullate staminode, apex rounded, lilac to purple; stamen 1, with petaloid appendix, asymmetric, lilac to purple; ovary inferior, elliptic; style with yellow appendix. Capsule oval to oblong, smooth, green. Seeds oblong, brown, with bilobed aril.

2.1. *Thalia densibracteata* Petersen, *Fl. bras.* (Martius) 3(3): 144 (1890). Figs. 1; 2c; 3e-h

Rhizomatous herbs, ca. 1.5 m tall. Leaves with sheath 14.9–21.2 cm long; blade 17.3–23.5 × 0.8–1.1 cm, linear, base acute, apex acute, green, glabrous. Synflorescence 25–50 cm long, terminal, paniculate; peduncle 25–45 cm long, glabrous, green; bracts 6.7–7.1 × 4.3–4.8 mm, lanceolate to oval. Florescence component with a single cymule; prophyll 6.1–6.2 × 3.0–3.6 mm, lanceolate to oval. Flowers 4.5–7.6 mm long, sessile, erect, asymmetric; sepals 3, 1.2–1.7 × 1–1.4 mm, oboval, apex rounded, hyaline; petals 3, 4.1–4.5 × 2.3–2.9 mm, oboval, apex rounded, lilac to purple; staminodes 3; 1 external staminode, ca. 6.6 × 3.6 mm, unguiculate, apex rounded, lilac to purple; 1 callose staminode, ca. 4.6 × 4.1 mm, asymmetric, lilac to purple with yellow lateral calli; 1 cucullate staminode, ca. 4.1 × 1.1 mm, apex rounded, lilac to purple; stamen 1, ca. 3.5 mm long, petaloid appendix ca. 3.6 × 1 mm, asymmetric, lilac to purple, anther ca. 1.6 mm long; ovary ca. 1 × 0.8 mm, elliptic; style ca. 3.4 × 0.6 mm, appendix ca. 4.5 mm long, yellow. Capsule ca. 6.4 × 3.8 mm, oval to oblong, smooth, green. Seeds ca. 6.3 × 3.7 mm, oblong, brown.

Examined material: Aracati, Alagados no caminho de Aracati para Canoa Quebrada, 9.VI.2000, fr., *R. Amado* 288 (EAC). Brejo Santo, Reservatório Porcos, 379 m, 30.IV.2009, fl. and fr., *J.R. Maciel* 1103 (HVASF). Caridade,

20.VI.2008, fl. and fr., *D.J.L. Sousa et al.* 02 (EAC); Lagoa Contendas, 8.III.2009, fl. and fr., *A.B. Tabosa* 18 (EAC); 24.V.2014, fl., *L. Ibiapina-Santos et al.* 12 (EAC); 5.VIII.2009, fl. and fr., *D.J.L. Sousa* 102 (EAC). Caucaia, Tucunduba, 10.IX.2006, fr., *A.S.F. Castro* 2112F (EAC). Crateús, Xavier - Baixada Serra das Almas, 24.VI.2003, fl. and fr., *L.Q. Matias* 453 (EAC). Crato, 26.VI.1934, fr., *P. Luetzelburg* 23731 (EAC). Icó, margem da estrada de Icó & 3 Bodegas, 120 m, 14.VII.1984, fr., *F.C.F. da Silva* 231 (ALCB). Iguatu, Entrada Alencar, 18.V.2010, fl., *L.R.O. Normando et al.* 483 (EAC); 14.V.2015, fl. and fr., *L. Ibiapina-Santos et al.* 95 (EAC); Cajás, 18.V.2010, fl., *L.R.O. Normando et al.* 508 (EAC). Quixadá, Fazenda Iracema, 5.VI.1982, fr., *E. Nunes* (EAC 11582). São Luís do Curu, 23.VI.2016, fl. and fr., *A.C. Albuquerque & R.C. Pinheiro* S1151 (EAC).

Thalia densibracteata is a rhizomatous herb characterized by flowers with three staminodes, lilac to purple. It differs from *T. geniculata* by having linear leaves (*vs.* ovate to ovate-lanceolate leaves) and flowers measuring 4.5–7.6 mm (*vs.* 10.8–18.5 mm).

In the state of Ceará, it was sampled in 10 municipalities: Aracati, Brejo Santo, Caridade, Caucaia, Crateús, Crato, Icó, Iguatu, Quixadá, and São Luís do Curu. With populations found in temporary lentic environments in Dense Ombrophilous Forest in the Chapada do Araripe. Records of the species were also made in regions of the coastal and metropolitan zones, in the Vegetation Complex of the Coastal Zone, and in Vegetation under Fluvial and/or Lacustrine Influence. It also occurs in the inland areas of the state, near river plains and lagoons in the Steppic Savanna.

The species was collected with flowers and fruits from April to September.

2.2. *Thalia geniculata* L., Sp. Pl. 2: 1193 (1753).

Figs. 1; 2d-f; 3i-l

Rhizomatous herbs, ca. 2 m tall. Leaves with sheath 13.4–28.4 cm long; blade 18.6–40.3 × 7–19.7 cm, oval to oval-lanceolate, base rounded, apex acute, green, glabrous. Synflorescence 27–60 cm long, terminal, paniculate; peduncle 40–70 cm long, glabrous, green; bracts 15.8–33.7 × 8.6–9 mm, lanceolate to oval. Florescence component with a single cymule; prophyll 14.6–15.5 × 5.8–6.4 mm, lanceolate to oval. Flowers 10.8–18.5 mm long, sessile, erect, asymmetric; sepals 3, 0.9–1.8 × 0.4–0.8 mm, oboval, apex rounded, hyaline; petals 3, 8.4–8.9 × 2.2–2.3 mm, elliptic, apex rounded, lilac to purple; staminodes 3; 1 external staminode, ca. 16.1 × 7.8 mm, unguiculate, apex rounded, lilac to purple; 1 callose staminode, ca. 11.7 × 8.82 mm, asymmetric, lilac to purple with yellow lateral calli; 1 cucullate staminode, ca. 9.5 × 5.6 mm, apex rounded, lilac to purple; stamen 1, ca. 6.4 mm long, petaloid appendix ca. 8.8 × 1.1 mm, asymmetric, lilac to purple, anther ca. 2.3 mm long; ovary ca. 2.4 × 1.3 mm, elliptic; style ca. 6.9 × 0.6 mm, appendix



Figure 3 – a-d. *Canna glauca* – a. leaf; b. inflorescence; c. capsule; d. seed. e-h. *Thalia densibracteata* – e. leaf; f. inflorescence; g. capsule; h. seed. i-l. *Thalia geniculata* – i. leaf; j. inflorescence; k. capsule; l. seed. [a-b. L.W. Lima-Verde (EAC 23090); c-d. A. Fernandes (EAC 1735); e-h. D.J.L. Sousa 102; i. J.N. Souza (EAC 62239); j-l. M.I.B. Loiola et al. 2373].

ca. 12.9 mm long, yellow. Capsule ca. 9.8×5.3 mm, oval to oblong, smooth, green. Seeds ca. 9.7×5.2 mm, oblong, brown.

Examined material: Abaiara, estrada para Missão Velha, 406 m, 28.IV.2009, fl., J.R. Maciel 1011 (HVASF). Brejo Santo, propriedade do Lcomeido (Rancharia), 387 m, 5.VI.2012, fl., V.M. Cotarelli 1769 (HVASF). Caucaia, Parque Botânico de Caucaia, 17.IV.1998, fl. and fr., L.Q. Matias (EAC 26999). Fortaleza, Parque Urbano da Lagoa do Mondubim, $03^{\circ}48'16.89''S$, $38^{\circ}35'1.938''W$, 17.XI.2023, fl. and fr., H.P. Nascimento 23 (EAC). Granja, Olho d'Água do Costa, Santa Terezinha, 18.IV.2003, fl. and fr., L.Q. Matias 492 (EAC). Iguatu, CE060, 13.V.2015, fl., L.R.O. Normando et al. 66 (EAC); 13.V.2015, fl., L.R.O. Normando et al. 39 (EAC); Lagoa do Baú, 6.IX.2009, fl., L.Q. Matias et al. 572 (EAC); 12.V.2015, fr., L.R.O. Normando et al. 509 (EAC); Lagoa Paredão, 13.V.2015, fl. and fr., L.R.O. Normando et al. 176 (EAC); Sítio Mosquito, 13.V.2015, fl., L. Ibiapina-Santos et al. 73 (EAC); Sítio Zé-Firino, 14.V.2015, fl., L. Ibiapina-Santos et al. 108 (EAC); Baixo dos Bastos, 15.V.2015, fr., L.R.O. Normando et al. 208 (EAC); Sítio Elson, 16.V.2015, fl., L.R.O. Normando et al. 362 (EAC). Maracanaú, Lagoa do Maracanaú, 6.XII.2018, fl., J.N. Souza (EAC 62239). Maranguape, Amanari, 29.X.1994, fl. and fr., A.S.F. Castro 27 (EAC). Massapê, Distrito Remédios, 8.VIII.2013, fl., E.B. Souza 2843 (HUVA); margem da estrada dentro de um local alagado, 18.VII.2014, fl. and fr., M.I.B. Loiola et al. 2373 (EAC). Sobral, 25.V.2016, fl., A.C. Albuquerque & R.C. Pinheiro 112 (EAC). Várzea Alegre, Lagoa Azul, 10.VI.2015, fl., A.C. Albuquerque et al. 16 (EAC).

Thalia geniculata is a rhizomatous herb characterized by oval to oval-lanceolate glabrous leaves, and two mirrored asymmetrical flowers in each cymule. It differs from *T. densibracteata* by having ovate to ovate-lanceolate leaves (*vs.* linear leaves) and flowers measuring 10.8–18.5 mm (*vs.* 4.5–7.6 mm).

In Ceará, it is reported in 11 municipalities: Abaiara, Brejo Santo, Caucaia, Fortaleza, Granja, Iguatu, Maracanaú, Maranguape, Massapê, Sobral, and Várzea Alegre. With populations found in permanent lentic and temporary lentic environments, in areas of Semideciduous Seasonal Forest, mainly in regions at higher elevation. It also occurs on the banks of water bodies in the coastal region and in urban areas, in the Vegetation Complex of the Coastal Zone, and in Vegetation under Fluvial and/or Lacustrine Influence. It is also reported inland, near river plains in Steppic Savanna. It is reported in the conservation unit of the Parque Estadual Botânico do Ceará.

The species was collected with flowers and fruits from April to November.

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Data Availability Statement

In accordance with Open Science communication practices, the authors inform that all data are available within the manuscript.

References

- Andersson L (1976) The synflorescence of the Marantaceae. *Botaniska Notiser* 129: 39-48.
- Andersson L (1998) Marantaceae. In: Kubitzki K (ed.) The families and genera of vascular plants. IV. Flowering plants: monocotyledons. Alismatanae and Commelinanae (except Gramineae). Springer, Berlin. Pp. 278-293.
- André T (2024a) Cannaceae. In: Flora e Funga do Brasil (continuously updated). Jardim Botânico do Rio de Janeiro. Available at <<https://floradobrasil.jbrj.gov.br/FB110625>>. Access on 13 December 2024.
- André T (2024b) *Thalia*. In: Flora e Funga do Brasil (continuously updated). Jardim Botânico do Rio de Janeiro. Available at <<https://floradobrasil2020.jbrj.gov.br/reflora/floradobrasil/FB9388>>. Access on 13 December 2024.
- APG IV - Angiosperm Phylogeny Group (2016) An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. *Botanical Journal of the Linnean Society* 181: 1-20.
- Claudino-Sales V & Peulvast JP (2002) Dune generation and ponds on the coast of Ceará state (Northeast Brazil). In: Allison RJ (ed.) *Applied geomorphology*. John Wiley & Sons, Chichester. Pp. 443-460.
- Cook CDK (1996) *Aquatic Plant Book*. 2nd ed. SPB Academic Publishing, Amsterdam. Pp. 1-125.
- Costa F, Espinelli FP & Figueiredo FOG (2011) Guia de Zingiberales dos sítios PPBio na Amazônia Ocidental Brasileira. *Áttema Design Editorial*, Manaus. Pp 68-69.
- Fenner R, Betti AH, Mentz LA & Rates SMK (2006) Plantas utilizadas na medicina popular brasileira com potencial atividade antifúngica. *Revista Brasileira de Ciências Farmacêuticas* 42: 369-394. DOI: 10.1590/S1516-93322006000300007
- Figueiredo MA (1997) A cobertura vegetal do Ceará: unidades fitoecológicas. In: Ceará, Atlas do Ceará. Edições IPLANCE, Fortaleza. Pp. 28-29.
- Filgueiras TS, Nogueira PE, Brochado AL & Guala II GF (1994) Caminhamento: um método expedito para levantamentos florísticos qualitativos. *Cadernos de Geociências* 12: 39-43.
- Forzza RC (2007) Flora da Reserva Ducke, Amazonas, Brasil: Marantaceae. *Rodriguésia* 58: 533-543. DOI: 10.1590/2175-7860200758304
- Fraga FRM & Braga JMA (2020) *Maranta nanica* (Marantaceae), a new dwarf species from Central Brazil. *Phytotaxa* 477: 2. DOI: 10.11646/phytotaxa.477.2.14
- Fraga FRM, Amaral FM, Cardoso LJT, Freire TL, Joffily A & Braga JMA (2022) *Maranta pilosissima* (Marantaceae), a new species from Brazilian Atlantic Forest. *Nordic Journal of Botany* 2022: e03704. DOI: 10.1111/njb.03704
- Fraga FRM (2024) *Maranta bambusa*: an endangered new species of Maranta (Marantaceae). *Nordic Journal of Botany* 2024: e04289. DOI: 10.1111/njb.04289

- Fraga FRM & Braga JMA (2025) Two new species of Marantaceae from Reserva Natural Vale, Espírito Santo state, Brazil. *Phytotaxa* 682: 112-20. DOI: 10.11646/phytotaxa.682.1.8
- Fraga FRM, Lacerda MTC, Rondinsky V & Braga JMA (2025) Two new species of *Maranta* (Marantaceae) from the Brazilian Amazon Forest. *Kew Bulletin* 80: 121-130. DOI: 10.1007/s12225-024-10233-0
- Gomes HVM & Forzza RC (2007) Marantaceae. In: Cavalcanti TB (org.) *Flora do Distrito Federal, Brasil*. Vol. 6. Embrapa Recursos Genéticos e Biotecnologia, Brasília. Pp. 41-52.
- Guedes FM & Matias LQ (2020) Flora do Ceará, Brasil: Lentibulariaceae. *Rodriguésia* 71: 1-25. DOI: 10.1590/2175-7860202071140
- IBGE - Instituto Brasileiro de Geografia e Estatística (2012a) Limites territoriais do Brasil. [shapefile] Available at <<https://geoftp.ibge.gov.br/>>. Access on 3 April 2025.
- IBGE - Instituto Brasileiro de Geografia e Estatística (2012b) Manual técnico da vegetação brasileira. 2ª ed. IBGE, Rio de Janeiro. 272p.
- IPECE - Instituto de Pesquisa e Estratégia Econômica do Ceará (2011) Os recursos hídricos do ceará: integração, gestão e potencialidades. Available at <https://www.ipece.ce.gov.br/wp-content/uploads/sites/45/2015/02/Recursos_Hidricos_do_Ceara.pdf>. Access on 26 February 2025.
- IPECE - Instituto de Pesquisa e Estratégia Econômica do Ceará (2017) Ceará em números. Available at <<https://www.ipece.ce.gov.br/ceara-em-numeros/>>. Access on 26 February 2025.
- Lorenzi H & Souza HM (2001) Plantas ornamentais no Brasil: arbustivas, herbáceas e trepadeiras. 3ª ed. Instituto Plantarum, Nova Odessa. Pp. 349-756.
- Luna NKM, Pessoa E & Alves M (2020) Sinopse de Marantaceae no estado de Pernambuco, Brasil. *Rodriguésia* 70: e02682018. DOI: 10.1590/2175-7860202071089
- Luna NKM, Pessoa EM & Alves M (2021) Taxonomic study of the species of *Maranta Plum* ex. L. (Marantaceae) from Northeastern Brazil: a neglected diversity center for the genus with five new species. *Systematic Botany* 46: 582-610. DOI: 10.1600/036364421X16312067913345
- Maas-van de Kamer H & Maas PJM (2008) The Cannaceae of the world. *Blumea* 53: 247-318. DOI: 10.3767/000651908X607945
- Maltchik L, Costa MAJ & Duarte MDC (1999) Inventory of Brazilian semi-arid shallow lakes. *Anais da Academia Brasileira de Ciências* 71: 801-808.
- Maltchik L & Pedro F (2000) Biodiversity influences community stability? Results of semiarid shallow lakes. *Ciência e Cultura* 52: 127-130.
- Martin FW & Cabanillas E (1976) Leren (*Calathea allouia*), a little known tuberous root crop of the Caribbean. *Economic Botany* 30: 249-256. DOI: 10.1007/BF02909733
- Matias LQ & Sousa DJL (2011) A família Alismataceae no estado do Ceará, Brasil. *Rodriguésia* 62: 887-900. DOI: 10.1590/S2175-78602011000400014
- Matias LQ, Gonzalez HHE & Oliveira WR (2017) Flora do Ceará: Hydrocharitaceae e as fanerógamas marinhas: Cymodoceaceae, Ruppiaceae. *Rodriguésia* 68: 1333-1346. DOI: 10.1590/2175-7860201768415
- Matias LQ (2020) Flora do Ceará, Brasil: Potamogetonaceae. *Rodriguésia* 71: e02752018. DOI: 10.1590/2175-7860202071099
- Matias LQ, Guedes FM, Nascimento HP & Sfair JC (2021) Breaking the misconception of a dry and lifeless semiarid region: the diversity and distribution of aquatic flora in wetlands of the Brazilian Northeast. *Acta Botanica Brasilica* 35: 46-61. DOI: 10.1590/0102-33062020abb0236
- Matias LQ & Nascimento HP (2021) Flora of Ceará, Brazil: Cabombaceae. *Rodriguésia* 72: e00592019. DOI: 10.1590/2175-7860202172009
- Melo MR (2008) Marantaceae. In: Daly DC & Silveira M (orgs.) *First catalogue of the flora of Acre, Brazil*. Edufac, Rio Branco. Pp. 250-253.
- Nascimento HP & Matias LQ (2021) Flora of Ceará, Brazil: Onagraceae. *Rodriguésia* 72: e01732019. DOI: 10.1590/2175-7860202172029
- Petersen OG (1890a) Cannaceae. In: Martius CFP von, Eichler AW & Urban I (eds.) *Flora brasiliensis*. Fleischer, Leipzig. Vol. 3, pars 3, pp. 63-80, t.15-17.
- Petersen OG (1890b) Marantaceae. In: Martius CFP von, Eichler AW & Urban I (eds.) *Flora brasiliensis*. Fleischer, Leipzig. Vol. 3, pars 3, pp. 81-172, t.18-50.
- QGIS Development Team (2023) QGIS Geographic Information System. Ver. 3.28.3. Open Source Geospatial Foundation Project. Available at <<http://qgis.osgeo.org>>. Access on 13 December 2024.
- Richardson JW & Smith LB (1972) Canáceas. In: Reitz R (ed.) *Flora Ilustrada Catarinense*. Instituto Brasileiro de Desenvolvimento Florestal, Herbário "Barbosa Rodrigues", Itajaí. 39p.
- Saka MN (2013) Marantaceae. In: Prata AP, Amaral MC, Farias MCV & Alves MV (orgs.) *Flora de Sergipe*. Gráfica e Editora Triunfo, Aracaju. Pp. 337-350.
- Saka MN & Lombardi JA (2014) A new species of *Goeppertia* (Marantaceae) from the northeast Brazil and an identification key for species from the state of Sergipe. *Phytotaxa* 170: 1-19. DOI: 10.11646/phytotaxa.170.1.6
- Saka MN (2017) Flora das cangas da Serra dos Carajás, Pará, Brasil: Marantaceae. *Rodriguésia* 68: 987-990. DOI: 10.1590/2175-7860201768334
- Sass C, Iles WJD, Barret CF, Smith SY & Specht CD (2016) Revisiting the Zingiberales: using multiplexed exon capture to resolve ancient and recent phylogenetic splits in a charismatic plant lineage. *PeerJ* 4: e1584.
- Sousa DJL & Matias LQ (2013) A família Nymphaeaceae no estado do Ceará, Brasil. *Rodriguésia* 64: 49-59. DOI: 10.1590/S2175-78602013000100006
- Sousa DJL, Campelo MJA & Matias LQ (2018) Flora do Ceará: Pontederiaceae. *Rodriguésia* 69: 1641-1657. DOI: 10.1590/2175-7860201869412
- Stevens PF (2017) Angiosperm Phylogeny Website. Version 14, July 2017 [and more or less continuously updated since]. Available at <<http://www.mobot.org/MOBOT/research/APweb/>>. Access on 13 December 2024.
- Thiers B (continuously updated) Index Herbariorum: a global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. Available at <<http://sweetgum.nybg.org/science/ih/>>. Access on 13 December 2024.
- Vieira S, Forzza RC & Wanderley MGL (2012) Marantaceae. In: Wanderley MGL, Martins SE,

- Romanini RP, Melhem TS, Shepherd GJ, Giulietti AM, Pirani JR, Kirizawa M, Melo MMRF, Cordeiro I & Kinoshita LS (eds.) Flora fanerogâmica do estado de São Paulo. Instituto de Botânica, São Paulo. Vol. 7, pp. 205-232.
- Wetzel RG (2001) Limnology: lake and river ecosystems. Academic Press, San Diego. Pp. 985-1006. DOI: 10.1016/C2009-0-02112-6
- Yoshida-Arns KN, Mayo S & Alves MV (2002a) Morfologia de Marantaceae ocorrente no estado de Pernambuco, Brasil. *Iheringia* 57: 3-20.
- Yoshida-Arns KN, Mayo S & Alves MV (2002b) O gênero *Maranta* L. (Marantaceae) no estado de Pernambuco. Nordeste do Brasil. *Insula* 31: 39-57.
- Yoshida-Arns KN, Mayo S & Alves MV (2002c) O Gênero *Stromanthe* Sond. (Marantaceae) no estado de Pernambuco - nordeste do Brasil. *Ernstia* 12: 31-42.
- Yu Q, Zhao T, Zhao H, Specht CD, Tian X & Liao J (2022) Correlation between inflorescence architecture and floral asymmetry - evidence from aberrant flowers in *Canna* L. (Cannaceae). *Plants* 11: 2512. DOI: 10.3390/plants1119251