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Updated checklist of angiosperms in an exceptional area of the Serra do Teixeira National Park (PARNA), Paraíba, Brazil

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ABSTRACT

Exceptional areas in the Caatinga are humid enclaves that stand out in the landscape due to their elevation and distinctive vegetation typical of domains such as the Atlantic Forest and Cerrado. These areas are ecologically and biogeographically significant, marking landscape changes driven by Quaternary climate fluctuations. Floristic inventories are essential for obtaining data to assess conservation status, develop appropriate management plans, and understand the evolutionary history of the landscape. This paper provides an updated checklist of the flora of the Serra do Teixeira National Park (PARNA). Methodologically, field collections were conducted over three years, which were supplemented with a floristic list by Agra et al. (2004) for the area. The study resulted in a record of 220 genera, 70 families, and 335 species, with 179 of these documented by Agra et al. (2004) and 98 recorded exclusively through our fieldwork. Both lists shared 58 species in common. Fabaceae, Malvaceae, and Asteraceae were the most diverse families, aligning with findings from other surveys of montane forest enclaves in the Caatinga. Species richness along the altitudinal gradient increased from the base to 1,100 m, followed by a decline. Significant changes in vegetation structure were observed along the gradient, highlighting the environmental filtering potential of these areas due to their unique edaphoclimatic conditions, which differ markedly from the surrounding Caatinga. The Serra do Teixeira PARNA is an area of high ecological importance in the historical and evolutionary context of the landscape and vascular flora.

Keywords: Conservation. Diversity. Flora. Humid mountain ranges. Exceptional landscape

Checklist atualizada das angiospermas em uma área de exceção do Parque Nacional (PARNA) da Serra do Teixeira, Paraíba, Brasil

RESUMO

Áreas de exceção na Caatinga são enclaves úmidos que sobressaem na paisagem devido a altitude e a composição vegetal típica de domínios como Mata Atlântica e Cerrado. São áreas importantes do ponto de vista ecológico e biogeográfico, marcadoras das mudanças paisagísticas movidas pelas flutuações climáticas do Quaternário. Inventários florísticos são de extrema importância para obter dados e traçar diagnósticos dos *status* de conservação, elaborar planos de manejo adequado e entender a história evolutiva da paisagem. Este artigo busca fornecer um checklist atualizado da

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flora do Parque Nacional (PARNA) da Serra do Teixeira. Como procedimentos metodológicos, coletou-se material em campo durante três anos, este foi acrescido a uma lista florística da área realizada por Agra et al., (2004). O estudo resultou em 220 gêneros, 70 famílias e 335 espécies, sendo 179 destas descritas no estudo de Agra et al. (2004) e 98 documentadas exclusivamente nos trabalhos de campo desta pesquisa. As listas partilharam 58 espécies em comum. Fabaceae, Malvaceae e Asteraceae foram as famílias mais ricas, corroborando com outros levantamentos em brejos de altitude na Caatinga. A riqueza das espécies ao longo do gradiente altitudinal seguiu um aumento da base até 1.100 m, em seguida, houve um declínio. Foram observadas mudanças significativas na fitofisionomia do gradiente. Tais observações destacam o potencial de filtro ambiental destas áreas devido suas condições edafoclimáticas intrínsecas que se distingue totalmente da Caatinga. O PARNA da Serra do Teixeira, é uma área de grande importância ecológica no contexto histórico e evolutivo da paisagem e da flora vascular.

Palavras-chave: Conservação. Diversidade. Flora. Serras úmidas. Paisagem de exceção.

Introduction

Exceptional landscapes, widely found in northeastern Brazil, are disjunct forest remnants of the Atlantic Forest structured across various relief forms, including plateaus, residual massifs, and *inselbergs* (Benício et al., 2023).

These environments are ecologically and biogeographically critical within the Caatinga context, as they harbor species from different phytogeographic domains such as the Atlantic Forest, Amazon Rainforest, and Cerrado (Salvador et al., 2023). The occurrence of these humid areas within a semi-arid climate aligns with the refuge theory, which suggests that humid vegetation retracted to higher areas, while dry forests expanded during quaternary climate fluctuations (Guerra et al., 2020).

These areas act as environmental filters, favoring the selection of highly adapted species and displaying a high level of endemism (Correia et al., 2021). Currently, the humid vegetation within these geoecological refuges is sustained by intrinsic microclimatic conditions, including cooler temperatures and humidity levels atypical for the surrounding semi-arid Caatinga landscape (Lucena et al., 2022).

Floristic species in these exceptional areas serve as vital bioindicators of paleoenvironmental events and the current dynamics of these formations, as species richness and diversity patterns are directly influenced by edaphoclimatic conditions along the altitude gradient (Ramos et al., 2020).

The exceptional areas are extremely sensitive to environmental changes and disturbances, and the ongoing degradation of the Caatinga requires urgent attention from

biodiversity conservation policies (MapBiomas, 2023).

Humid areas like Pico do Jabre (PARNA Serra do Teixeira) host unique local biodiversity and play an important ecological role. As extremely ancient landscapes, they are also priorities for studies that advance understanding of landscape evolution in the Brazilian semi-arid region, contributing valuable insights into earth's geological history (Sampaio-Diogo et al., 2021).

Floristic inventories are crucial for providing data that inform the conservation status of these areas, support the development of appropriate management plans, and enhance the understanding of landscape evolutionary history.

In this context, this study aims to provide an updated checklist of floristic species within the Serra do Teixeira National Park (PARNA), an exceptional area located in the state of Paraíba, northeastern Brazil.

Material and methods

Study Area Characterization

The Serra do Teixeira National Park (PARNA) (-7° 15'11" S, -37° 23'04" W) (Figure 1) was established under Law No. 11,552 on June 5, 2023, and incorporated the Pico do Jabre State Park. The primary goal of defining its boundaries was to promote the preservation and conservation of the area's rich biodiversity. With the change in jurisdiction from state to federal, the park underwent a substantial expansion, increasing its area from 852 ha to a total of 61,095 ha (Superintendência de Administração do Meio Ambiente [SUDEMA], 2014; Law No. 11,552, 2023).

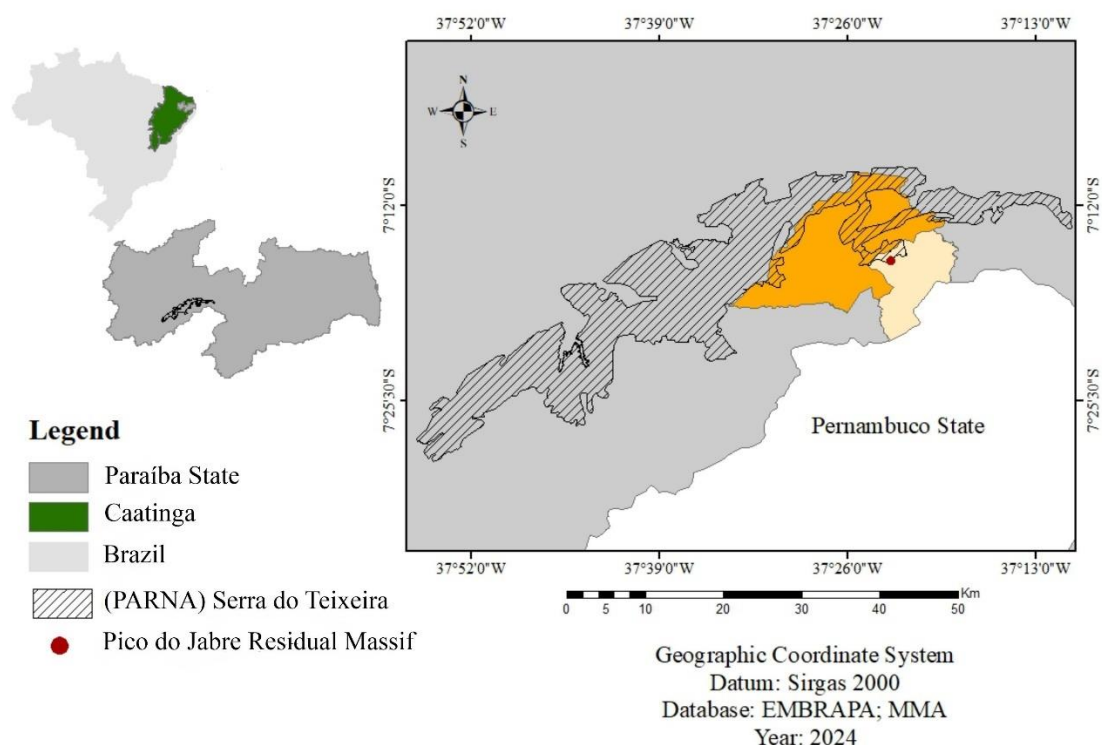


Figure 1. Location map of the Serra do Teixeira National Park, Paraíba, northeastern, Brazil.
Source: The authors (2024)

The Serra do Teixeira National Park (PARNA) consists of a residual massif within the Teixeira geotectonic zone, hosting one of the most important “Brejos de altitude” dating to the Upper Precambrian (Agra et al., 2004). This area represents the highest point in the State of Paraíba, with an altitude of 1,208 meters, located on the border of the municipalities of Maturéia and Mãe d’Água, both within the immediate geographic region of Patos (Instituto Brasileiro de Geografia e Estatística [IBGE], 2017).

According to Cunha and Silva-Júnior (2018) and Gomes et al. (2021), the Pico do Jabre area, where collections were conducted, exhibits specific conditions: a thermal sensation of 21°C, relative humidity around 65%, and well-developed soils rich in organic matter. The observed pedological diversity across different altitudinal levels directly influences vegetation assemblages along the gradient. In the lower areas of Pico do Jabre, typical Caatinga species predominate. As elevation increases, between 900 and 1,208 meters of the massif, species characteristic of the Cerrado and Atlantic Forest phytogeographic domains, as well as species widely distributed across Brazil’s phytogeographic domains, are found (Agra et al., 2004; Re flora - Flora e Funga do Brasil Gomes, A. S., Rodrigues, E. M., Pedro-Silva, L., Melo, J. I. M., Queiroz, R. T., Sousa, G. F., Vieira, C. S., Moura, D. C.

[<https://floradobrasil.jbrj.gov.br/>]). On the plateau, where rock outcrops occur, rupicolous species are present, along with arboreal elements associated with vegetation islands among the outcrops.

Fieldwork

Even today, studies related to the flora of the Serra do Teixeira National Park (PARNA) have been conducted by Rocha and Agra (2002), Agra et al. (2004), Cunha et al. (2013), Cunha and Silva-Junior (2018), and Lopes-Silva et al. (2022), including a local checklist. In this study, we present a supplement based on our own collections conducted between 2018 and 2020, resulting in an updated checklist of angiosperm species for PARNA Serra do Teixeira.

For this supplement, we employed the collection and herbarium techniques recommended by Peixoto & Maia (2013). Given the altitudinal gradient, the terrain was divided into altitudinal sections with 100 m intervals between collection sites (Figure 2). Taxonomic identifications were performed by specialists and through specialized literature, including Rodrigues et al. (2020), Prata et al. (2013), and Figueiredo et al. (2018).

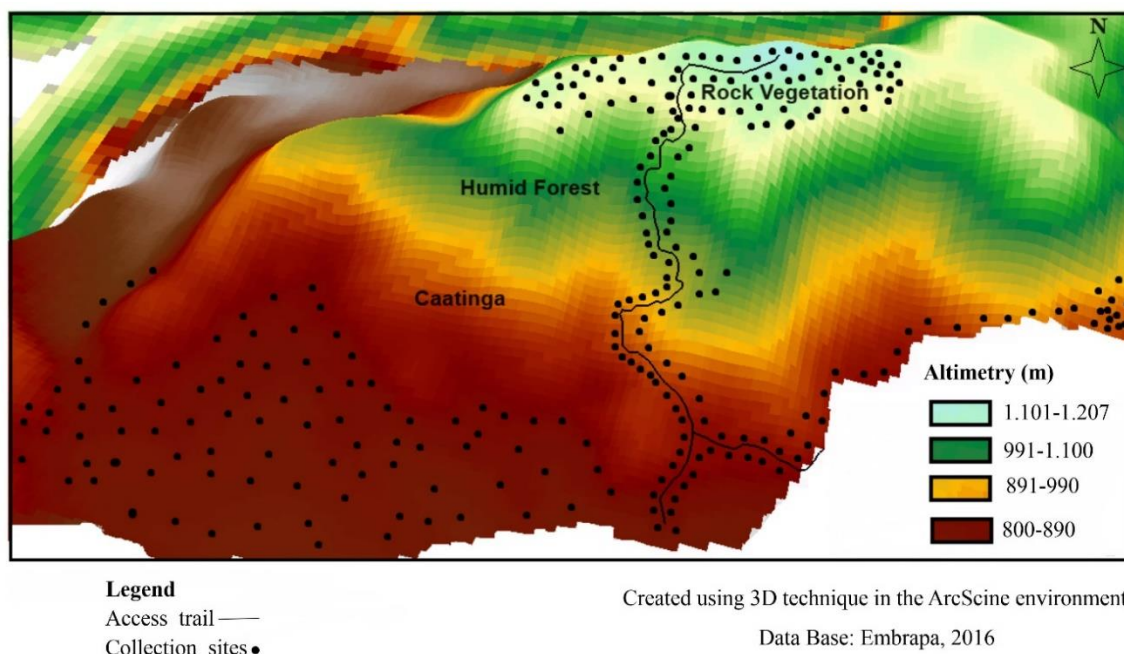


Figure 2. Sample design of the massif delimiting the field collection route.
Source: The authors (2024)

Preparation of the floristic list

The floristic inventory was conducted in two stages. The first stage involved 'in loco' collection of botanical material from 2018 to 2020, totaling three years of collecting. Consultations were also made to the following digitized platforms: Tropicos - Angiosperm Phylogeny Website (Missouri Botanical Garden) (<https://www.tropicos.org/>); INCT - Virtual Herbarium of Flora and Fungi SpeciesLink (<https://specieslink.net/>); and Re flora - Flora and Fungi of Brazil (<https://floradobrasil.jbrj.gov.br/>). The classification of families followed the APG (Angiosperm Phylogeny Group) IV, Chase et al. (2016), and for the order Boraginales, the BWG (2016) (Boraginales Working Group) was used.

The collected specimens were incorporated into the collection of the Herbarium Manuel de Arruda Câmara (HACAM, not indexed in the Index Herbariorum) at the State University of Paraíba (UEPB), Campus I, Campina Grande, Paraíba, Brazil, with duplicates sent to the Lauro Pires-Xavier Herbarium (JPB) at the Federal University of Paraíba (UFPB), Campus I, João Pessoa, Paraíba, Brazil; the João Vasconcelos-Sobrinho Herbarium (PEUFR) at the Federal Rural University of Pernambuco (UFRPE); and the Geraldo Mariz Herbarium (UFP) at the Federal University of

Pernambuco (UFPE), both located in Recife, Pernambuco, Brazil. The herbarium acronyms followed Thiers et al. (<https://sweetgum.nybg.org/science/ih/>), which is continuously updated. The second stage involved compiling the species present in the floristic list developed by Agra et al. (2004). In this compilation, all morphospecies and species identified only to the genus level were excluded, and all specific epithets were updated according to the Re flora - Flora and Fungi of Brazil platform (<https://floradobrasil.jbrj.gov.br/>). Geographic distribution data for the species were obtained from the Re flora - Flora e Funga do Brasil platform (<https://floradobrasil.jbrj.gov.br/>) (Table 1).

For the preparation of the maps (Figures 1 and 2), ArcGIS Pro 10.8 software was used, employing the Geographic Coordinate System with the DATUM: WGS84. The shapefiles were obtained from official Brazilian and Paraíba government agencies: IBGE (Instituto Brasileiro de Geografia e Estatística) and AESA (Agência Executiva de Gestão das Águas do Estado da Paraíba).

Results

In total, 335 angiosperm species were recorded, distributed across 70 families and 220 genera (Table 1). Of the documented species, 179 were described in the study by Agra et al. (2004),

while 98 were collected and documented exclusively during the fieldwork conducted for this survey between 2018 and 2020. Both studies recorded 58 species in common.

Table 1: Checklist of angiosperm species recorded in the study area, Serra do Teixeira National Park, Maturéia, Paraíba state, Brazil.

Families/Species	Voucher (s)	Phytogeographic domain
Acanthaceae		
<i>Dicliptera ciliaris</i> Juss.	A. Gomes 3039 M. F. Agra et al. 4054	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Justicia strobilacea</i> (Nees) Lindau	M. F. Agra et al. 4025	Caatinga
<i>Ruellia asperula</i> (Mart. ex Nees) Lindau	A. Gomes 3001 M. F. Agra et al. 1993	Caatinga
<i>Ruellia bahiensis</i> (Nees) Morong	A. Gomes 3000	Caatinga
<i>Ruellia paniculata</i> L.	A. Gomes 2023 M. F. Agra et al. 3996	Caatinga, Cerrado, Atlantic Forest
Alstroemeriaceae		
<i>Alstroemeria longistaminea</i> Mart. ex Schult. & Schult.f.	M. F. Agra et al. 2582	Caatinga
<i>Bomarea edulis</i> (Tussac.) Herb.	A. Gomes 3138	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
Amaranthaceae		
<i>Alternanthera tenella</i> Colla	A. Gomes 3096 M. F. Agra et al. 1959	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Amaranthus viridis</i> L.	M. F. Agra et al. 5028	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa
Amaryllidaceae		
<i>Hippeastrum psittacinum</i> Herb.	M. F. Agra et al. 4384	Atlantic Forest
<i>Hippeastrum stylosum</i> Herb.	A. Gomes 3141	Caatinga
Anacardiaceae		
<i>Astronium urundeuva</i> (M.Allemão) Engl.	A. Gomes 3117 M. F. Agra et al. 5402	Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Spondias tuberosa</i> Arruda	A. Gomes 3124	Caatinga, Cerrado
Apiaceae		
<i>Spananthe paniculata</i> Jacq.	M. F. Agra et al. 4027	Caatinga, Cerrado, Atlantic Forest
Apocynaceae		
<i>Allamanda blanchetii</i> A.DC.	M. F. Agra et al. 1932	Caatinga, Cerrado
<i>Ditassa crassifolia</i> Decne.	M. F. Agra et al. 2701	Cerrado, Atlantic Forest
<i>Mandevilla illustris</i> (Vell.) Woodson	M. F. Agra et al. 4408	Caatinga, Cerrado, Atlantic Forest
Araceae		
<i>Anthurium affine</i> Schott	A. Gomes 3150 M. F. Agra et al. 2631	Caatinga, Cerrado, Atlantic Forest
Aristolochiaceae		
<i>Aristolochia birostris</i> Duch.	M. F. Agra et al. 3896	Caatinga, Atlantic Forest
Asteraceae		
<i>Acanthospermum hispidum</i> DC.	M. F. Agra et al. 2764	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Ageratum conyzoides</i> L.	M. F. Agra et al. 4020	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Baccharis trinervis</i> Pers.	M. F. Agra et al. 1950	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa
<i>Bidens alba</i> (L.) DC.	A. Gomes 3095	Cerrado, Atlantic Forest
<i>Bidens pilosa</i> L.	A. Gomes 3100 M. F. Agra et al. 1958	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Blainvillea acmella</i> (L.) Philipson	A. Gomes 3099 M. F. Agra et al. 2765	Caatinga, Cerrado, Atlantic Forest
<i>Centratherum punctatum</i> Cass.	A. Gomes 3035	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Chresta pacourinoides</i> (Mart. ex DC.) Siniscalchi & Loeuille	A. Gomes 2071 M. F. Agra et al. 3975	Caatinga
<i>Conocliniopsis prasiifolia</i> (DC.) R.M.King & H.Rob.	A. Gomes 3097 M. F. Agra et al. 2612	Caatinga, Cerrado
<i>Conyza sumatrensis</i> (Retz.) E.Walker	M. F. Agra et al. 4008	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa

<i>Emilia fosbergii</i> Nicolson	A. Gomes 3098	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Epaltes brasiliensis</i> DC.	A. Gomes 86964	Amazon Forest, Caatinga
<i>Erechtites hieracifolius</i> (L.) Raf. ex DC.	M. F. Agra et al. 5751	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Eremanthus capitatus</i> (Spreng.) MacLeish	M. F. Agra et al. 2612	Caatinga, Cerrado, Atlantic Forest
<i>Lepidaploa chalybaea</i> (Mart. ex DC.) H.Rob.	M. F. Agra et al. 2596	Caatinga, Cerrado
<i>Lepidaploa cotoneaster</i> (Willd. ex Spreng.) H.Rob.	A. Gomes 2083	Cerrado, Atlantic Forest
<i>Melampodium paniculatum</i> Gardner	A. Gomes 86959	Cerrado
<i>Tagetes minuta</i> L.	A. Gomes 2092	Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Tilesia baccata</i> (L.) Pruski	M. F. Agra et al. 5105	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Trixis antimenorrhoea</i> (Schrank) Kuntze subsp. <i>antimenorrhoea</i>	A. Gomes 2076	Cerrado, Atlantic Forest
<i>Verbesina macrophylla</i> (Cass.) S.F.Blake	M. F. Agra et al. 5196	Caatinga, Atlantic Forest
<i>Wedelia bishopii</i> H.Rob.	M. F. Agra et al. 5360	Caatinga, Atlantic Forest
<i>Wedelia goyazensis</i> Gardner	A. Gomes 2040	Cerrado
Begoniaceae	M. F. Agra et al. 1977	Caatinga
<i>Begonia grisea</i> A.DC.	A. Gomes 3135	Caatinga, Cerrado
<i>Begonia lealii</i> Brade		Caatinga
Bigoniaceae		
<i>Anemopaegma citrinum</i> Mart. ex DC.	M. F. Agra et al. 1666	Caatinga, Cerrado
<i>Anemopaegma laeve</i> DC.	A. Gomes 2073	Caatinga, Cerrado
<i>Amphilophium crucigerum</i> (L.) L.G.Lohmann	M. F. Agra et al. 5013	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Amphilophium paniculatum</i> (L.) Kunth	M. F. Agra et al. 1661	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Bignonia binata</i> Thunb.	M. F. Agra et al. 2003	Cerrado, Atlantic Forest, Pampa
<i>Cuspidaria argentea</i> (Wawra) Sandwith	M. F. Agra et al. 5757	Caatinga
<i>Cuspidaria lateriflora</i> (Mart.) DC.	M. F. Agra et al. 3932	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Dolichandra unguis-cati</i> (L.) L.G. Lohmann	A. Gomes 3032	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Fridericia chica</i> (Bonpl.) L.G. Lohmann	M. F. Agra et al. 4113	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Fridericia cinnamomea</i> (DC.) L.G. Lohmann	A. Gomes 3080	Amazon Forest, Cerrado
<i>Handroanthus impetiginosus</i> (Mart. Ex DC.) Mattos	A. Gomes 2045	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Pyrostegia venusta</i> (Ker Gawl.) Miers	A. Gomes 3174	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Stizophyllum perforatum</i> (Cham.) Miers	M. F. Agra et al. 1984	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Tanaecium dichotomum</i> (Jacq.) Kaehler & L.G. Lohmann	A. Gomes 2063	Cerrado, Atlantic Forest
<i>Tanaecium parviflorum</i> (Mart. ex DC.) Kaehler & L.G. Lohmann	M. F. Agra et al. 4840	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
Brassicaceae	A. Gomes 2043	
<i>Lepidium bonariense</i> L.	A. Gomes 55200	Amazon Forest, Caatinga, Cerrado, Pantanal
Bromeliaceae	M. F. Agra et al. 3930	Caatinga, Cerrado
<i>Aechmea chrysocoma</i> Baker		
<i>Aechmea emmerichiae</i> Leme	M. F. Agra et al. 4559	Atlantic Forest
<i>Hohenbergia catingae</i> Ule var. <i>catinae</i>	A. Gomes 2053	Caatinga, Atlantic Forest
<i>Orthophytum disjunctum</i> L.B. Sm.	A. Gomes 2038	Caatinga, Cerrado, Atlantic Forest
<i>Tillandsia dura</i> Baker	M. F. Agra et al. 3910	Caatinga, Atlantic Forest
<i>Tillandsia gardneri</i> Lindl.	A. Gomes 2036	Atlantic Forest
<i>Tillandsia loliacea</i> Mart. ex Schult. & Schult.f.	M. F. Agra et al. 3907	Caatinga, Atlantic Forest, Pampa
<i>Tillandsia polystachia</i> (L.) L.	M. F. Agra et al. 4660	Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
	M. F. Agra et al. 3908	Amazon Forest, Caatinga, Cerrado, Atlantic Forest

<i>Tillandsia recurvata</i> (L.) L.	A. Gomes 2039 M. F. Agra et al. 1956	Caatinga, Cerrado, Atlantic Forest, Pampa
<i>Tillandsia streptocarpa</i> Baker	M. F. Agra et al. 3912	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa
<i>Tillandsia stricta</i> Sol.	M. F. Agra et al. 2601	Caatinga, Cerrado, Atlantic Forest, Pampa
<i>Tillandsia tenuifolia</i> L.	M. F. Agra et al. 2636	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Tillandsia usneoides</i> (L.) L.	A. Gomes 2037 M. F. Agra et al. 4055	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa
Cactaceae		
<i>Cereus jamacaru</i> DC.	M. F. Agra et al. 4424	Caatinga, Cerrado
<i>Melocactus ernestii</i> Vaupel	M. F. Agra et al. 382	Caatinga, Atlantic Forest
<i>Pilosocereus chrysostele</i> (Vaupel) Byles & G. D. Rowley	M. F. Agra et al. 378	Caatinga
<i>Rhipsalis baccifera</i> (J.M.Muell.) Stearn	A. Gomes 2028	Amazon Forest, Cerrado, Atlantic Forest, Pantanal
<i>Xiquexique gounellei</i> (F.A.C.Weber) Lavor & Calvente	M. F. Agra et al. 3906	Caatinga
Cannabaceae		
<i>Trema micranthum</i> (L.) Blume	M. F. Agra et al. 1637	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
Canellaceae		
<i>Cinnamodendron axillare</i> Endl. ex Walp.	A. Gomes 2035	Atlantic Forest
Capparaceae		
<i>Capparidastrum frondosum</i> (Jacq.) Comejo & Iltis	A. Gomes 3122 M. F. Agra et al. 2700	Amazon Forest, Caatinga, Atlantic Forest
<i>Crateva tapia</i> L.	M. F. Agra et al. 4699	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Cynophalla flexuosa</i> (L.) J.Presl	A. Gomes 3068 M. F. Agra et al. 1997	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
Celastraceae		
<i>Monteverdia erythroxylla</i> (Reissek) Biral	M. F. Agra et al. 4517	Caatinga, Cerrado, Atlantic Forest
<i>Monteverdia obtusifolia</i> (Mart.) Biral	M. F. Agra et al. 4486	Amazon Forest, Atlantic Forest
<i>Prionostemma asperum</i> (Lam.) Miers	M. F. Agra et al. 4589	Amazon Forest, Caatinga, Atlantic Forest
Chrysobalanaceae		
<i>Microdesmia rigida</i> (Benth.) Sothers & Prance	M. F. Agra et al. 4813	Caatinga
Cleomaceae		
<i>Tarenaya aculeata</i> (L.) Soares-Neto & Roalson	A. Gomes 3073	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Tarenaya microcarpa</i> (Ule) Soares- Neto & Roalson	M. F. Agra et al. 5450	Caatinga, Cerrado, Atlantic Forest
Combretaceae		
<i>Combretum leprosum</i> Mart.	M. F. Agra et al. 5752	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
Commelinaceae		
<i>Aneilema brasiliense</i> C.B.Clarke	M. F. Agra et al. 4095	Caatinga, Cerrado, Atlantic Forest
<i>Commelina erecta</i> L.	A. Gomes 3060 M. F. Agra et al. 3980	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Dichorisandra hexandra</i> (Aubl.) C.B.Clarke	A. Gomes 3023 M. F. Agra et al. 5099	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Dichorisandra thyrsiflora</i> J.C.Mikan	M. F. Agra et al. 4094	Atlantic Forest
Convolvulaceae		
<i>Cuscuta racemosa</i> Mart.	M. F. Agra et al. 2595	Cerrado, Atlantic Forest, Pampa
<i>Distimake aegyptius</i> (L.) A.R. Simões & Staples	M. F. Agra et al. 5753	Caatinga, Cerrado, Atlantic Forest
<i>Distimake macrocalyx</i> (Ruiz & Pav.) A.R. Simões & Staples	A. Gomes 3118 M. F. Agra et al. 5480	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Evolvulus elegans</i> Moric.	M. F. Agra et al. 3898	Caatinga, Cerrado, Atlantic Forest
<i>Evolvulus glomeratus</i> Nees & Mart.	A. Gomes 87266	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa
<i>Evolvulus linarioides</i> Meisn.	A. Gomes 2070	Caatinga, Cerrado, Atlantic Forest

<i>Ipomoea bahiensis</i> Willd. ex Roem. & Schult.	A. Gomes 3111 M. F. Agra et al. 5234	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Ipomoea longeramosa</i> Choisy	A. Gomes 2049	Amazon Forest, Caatinga, Cerrado
<i>Ipomoea philomega</i> (Vell.) House	M. F. Agra et al. 1662	Amazon Forest, Atlantic Forest
<i>Jacquemontia densiflora</i> (Meisn.) Hallier f.	M. F. Agra et al. 2762	Caatinga, Cerrado, Atlantic Forest
<i>Jacquemontia evolvuloides</i> (Moric.) Meisn.	M. F. Agra et al. 4122	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Jacquemontia nodiflora</i> (Desr.) G. Don	A. Gomes 2041	Caatinga, Cerrado, Atlantic Forest
<i>Operculina macrocarpa</i> (L.) Urb.	A. Gomes 2084	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Turbina cordata</i> (Choisy) D.F. Austin & Staples	A. Gomes 2078 M. F. Agra et al. 1672	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
Cordiaceae		
<i>Cordia trichotoma</i> (Vell.) Arráb. ex Steud.	A. Gomes 2077	Caatinga, Cerrado, Atlantic Forest, Pampa
<i>Varronia globosa</i> Jacq.	M. F. Agra et al. 2669	Caatinga, Atlantic Forest
Cucurbitaceae		
<i>Doyerea emetocathartica</i> Grosourdy	A. Gomes 3125	Caatinga
<i>Gurania bignoniacea</i> (Poepp. & Endl.) C. Jeffrey	M. F. Agra et al. 5051	Amazon Forest, Cerrado, Atlantic Forest
Cyperaceae		
<i>Bulbostylis capillaris</i> (L.) C.B. Clarke	A. Gomes 3074	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Cyperus aggregatus</i> (Willd.) Endl.	M. F. Agra et al. 3922	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Cyperus difformis</i> L.	A. Gomes 3064	Amazon Forest, Atlantic Forest
<i>Cyperus lanceolatus</i> Poir.	A. Gomes 86973	Amazon Forest, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Cyperus pohlii</i> (Nees) Steud.	M. F. Agra et al. 3921	Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
Dioscoreaceae		
<i>Dioscorea coronata</i> Hauman	M. F. Agra et al. 2675	Atlantic Forest, Pampa
Elaeocarpaceae		
<i>Sloanea guianensis</i> (Aubl.) Benth.	M. F. Agra et al. 2744	Amazon Forest, Cerrado, Atlantic Forest
Erythroxylaceae		
<i>Erythroxylum columbinum</i> Mart.	M. F. Agra et al. 4257	Atlantic Forest
<i>Erythroxylum cuspidifolium</i> Mart.	M. F. Agra et al. 4671	Atlantic Forest
<i>Erythroxylum deciduum</i> A.St.-Hil.	M. F. Agra et al. 5181	Amazon Forest, Cerrado, Atlantic Forest
<i>Erythroxylum distortum</i> Mart.	M. F. Agra et al. 2571	Atlantic Forest
<i>Erythroxylum passerinum</i> Mart.	M. F. Agra et al. 4985	Atlantic Forest
<i>Erythroxylum subrotundum</i> A.St.-Hil.	M. F. Agra et al. 4618	Caatinga, Cerrado, Atlantic Forest
Euphorbiaceae		
<i>Acalypha brasiliensis</i> Müll.Arg.	A. Gomes 3050	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Acalypha pruriens</i> Nees & Mart.	M. F. Agra et al. 1632	Caatinga, Cerrado
<i>Bernardia axillaris</i> (Spreng.) Müll.Arg.	M. F. Agra et al. 4127	Atlantic Forest
<i>Croton argyrophyllus</i> Kunth	A. Gomes 2056	Amazon Forest, Caatinga
<i>Croton grewioides</i> Baill.	A. Gomes 3151	Caatinga
<i>Croton heliotropiifolius</i> Kunth	A. Gomes 2055 M. F. Agra et al. 4848	Caatinga, Cerrado, Atlantic Forest
<i>Croton jacobinensis</i> Baill.	M. F. Agra et al. 1935	Caatinga
<i>Croton polyandrus</i> Spreng.	M. F. Agra et al. 1964	Caatinga, Atlantic Forest
<i>Croton tricolor</i> Klotzsch ex Baill.	M. F. Agra et al. 2616	Caatinga, Cerrado, Atlantic Forest
<i>Dalechampia scandens</i> L.	M. F. Agra et al. 2671	Amazon Forest, Cerrado, Atlantic Forest, Pantanal
<i>Euphorbia hyssopifolia</i> L.	M. F. Agra et al. 2723	Amazon Forest, Cerrado, Atlantic Forest, Pampa
<i>Euphorbia ophthalmica</i> Pers.	M. F. Agra et al. 2650	Atlantic Forest
<i>Jatropha mollissima</i> (Pohl) Baill.	A. Gomes 3127 M. F. Agra et al. 2592	Amazon Forest, Caatinga, Cerrado
<i>Manihot anomala</i> Pohl	M. F. Agra et al. 2719	Amazon Forest, Caatinga, Cerrado, Pantanal

<i>Manihot glaziovii</i> Müll.Arg.	A. Gomes 3152	Atlantic Forest
<i>Tragia volubilis</i> L.	M. F. Agra et al. 2651	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
Fabaceae		
<i>Albizia polycephala</i> (Benth.) Killip ex Record	A. Gomes 2020 M. F. Agra et al. 4418	Caatinga, Cerrado, Atlantic Forest
<i>Anadenanthera colubrina</i> (Vell.) Brenan	A. Gomes 3148 M. F. Agra et al. 4556	Caatinga, Cerrado, Atlantic Forest
<i>Ancistrotropis peduncularis</i> (Fawc. & Rendle) A. Delgado	A. Gomes 3014	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Arachis dardani</i> Krapov. & W.C. Greg.	A. Gomes 3004	Caatinga, Cerrado, Atlantic Forest
<i>Bauhinia cheilantha</i> (Bong.) Steud.	A. Gomes 2099 M. F. Agra et al. 1665	Caatinga, Cerrado
<i>Bowdichia virgilioides</i> Kunth	M. F. Agra et al. 4755	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Calliandra aeschynomoides</i> Benth.	M. F. Agra et al. 2568	Caatinga
<i>Calliandra sessilis</i> Benth.	M. F. Agra et al. 3895	Amazon Forest, Caatinga, Cerrado
<i>Calliandra subspicata</i> Benth.	A. Gomes 2021	Caatinga, Atlantic Forest
<i>Canavalia brasiliensis</i> Mart. ex Benth.	A. Gomes 3169	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Canavalia picta</i> Mart. ex Benth.	A. Gomes 3021	Cerrado, Atlantic Forest
<i>Centrosema brasilianum</i> (L.) Benth.	A. Gomes 3126 M. F. Agra et al. 5134	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Centrosema sagittatum</i> (Humb. & Bonpl. ex Willd.) Brandegee	A. Gomes 2096	Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Centrosema virginianum</i> (L.) Benth.	M. F. Agra et al. 4929	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Cenostigma pluviosum</i> var. <i>peltophoroides</i> (Benth.) Gagnon & G.P. Lewis	M. F. Agra et al. 3468	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Cenostigma pyramidale</i> (Tul.) Gagnon & G.P. Lewis	M. F. Agra et al. 4376	Caatinga
<i>Chamaecrista repens</i> (Vogel) H.S. Irwin & Barneby	A. Gomes 3011	Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Chamaecrista rotundifolia</i> (Pers.) Greene	A. Gomes 2098	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Chamaecrista zygophylloides</i> H.S. Irwin & Barneby	A. Gomes 2019	Caatinga, Cerrado, Atlantic Forest
<i>Crotalaria vitellina</i> Ker Gawl.	A. Gomes 2017 M. F. Agra et al. 2622	Caatinga, Cerrado, Atlantic Forest
<i>Ctenodon gracilis</i> (Vogel) D.B.O.S. Cardoso, P.L.R. Moraes & H.C. Lima	M. F. Agra et al. 5124	Cerrado, Atlantic Forest
<i>Desmodium incanum</i> (Sw.) DC.	M. F. Agra et al. 4896	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Hymenaea courbaril</i> L.	M. F. Agra et al. 4401	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Indigofera suffruticosa</i> Mill.	M. F. Agra et al. 1992	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa
<i>Lachesiodendron viridiflorum</i> (Kunth) P.G. Ribeiro, L.P. Queiroz & Luckow	M. F. Agra et al. 1623	Caatinga, Cerrado, Pantanal
<i>Luetzelburgia andrade-limae</i> H.C.Lima	M. F. Agra et al. 4395	Caatinga, Cerrado, Pantanal
<i>Macropsychanthus grandiflorus</i> (Mart. ex Benth.) L.P. Queiroz & Snak	A. Gomes 2052 M. F. Agra et al. 1981	Caatinga
<i>Macroptilium martii</i> (Benth.) Maréchal & Baudet	A. Gomes 3010	Caatinga, Atlantic Forest
<i>Mimosa acutistipula</i> (Mart.) Benth.	M. F. Agra et al. 1623	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Mimosa arenosa</i> (Willd.) Poir.	A. Gomes 3012	Caatinga
<i>Mimosa candollei</i> R. Grether	M. F. Agra et al. 4016	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Mimosa invisa</i> Mart. ex Colla	A. Gomes 2022 M. F. Agra et al. 1624	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Mimosa paraibana</i> Barneby	M. F. Agra et al. 2574	Caatinga, Cerrado

<i>Mimosa tenuiflora</i> (Willd.) Poir.	A. Gomes 3158	Caatinga, Cerrado
<i>Piptadenia adiantoides</i> (Spreng.) J.F. Macbr.	M. F. Agra et al. 2708	Caatinga, Cerrado, Atlantic Forest
<i>Piptadenia retusa</i> (Jacq.) P.G. Ribeiro, Seigler & Ebinger	A. Gomes 3129 M. F. Agra et al. 1989	Caatinga
<i>Poecilanthe grandiflora</i> Benth.	A. Gomes 3112	Caatinga, Atlantic Forest
<i>Platymiscium floribundum</i> Vogel	A. Gomes 2080	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Senna angulata</i> H.S. Irwin & Barneby	A. Gomes 2015	Cerrado, Atlantic Forest
<i>Senna macranthera</i> (DC. ex Collad.) H.S. Irwin & Barneby	A. Gomes 2016 M. F. Agra et al. 5112	Caatinga, Cerrado, Atlantic Forest
<i>Senna macranthera</i> var. <i>nervosa</i> (Vogel) H.S. Irwin & Barneby	M. F. Agra et al. 1630	Cerrado, Atlantic Forest
<i>Senna macranthera</i> var. <i>pubibunda</i> (Benth.) H.S. Irwin & Barneby	M. F. Agra et al. 2753	Caatinga, Cerrado
<i>Senna martiana</i> (Benth.) H.S. Irwin & Barneby	A. Gomes 2031	Caatinga
<i>Senna rizzinii</i> H.S. Irwin & Barneby	A. Gomes 2018	Caatinga, Cerrado
<i>Senna spectabilis</i> var. <i>excelsa</i> (Schrad.) H.S. Irwin & Barneby	M. F. Agra et al. 5142	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Senna splendida</i> (Vogel) H.S. Irwin & Barneby	A. Gomes 3041	Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Senna splendida</i> (Vogel) H.S. Irwin & Barneby var. <i>splendida</i>	M. F. Agra et al. 4318	Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Senna pendula</i> (Humb. & Bonpl. ex Willd.) H.S. Irwin & Barneby	M. F. Agra et al. 4294	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Senegalia langsdorffii</i> (Benth.) Seigler & Ebinger	M. F. Agra et al. 4373	Caatinga, Cerrado, Atlantic Forest
<i>Senegalia polyphylla</i> (DC.) Britton & Rose	A. Gomes 2030	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Senegalia riparia</i> (Kunth) Britton & Rose ex Britton & Killip	M. F. Agra et al. 1990	Amazon Forest, Caatinga, Atlantic Forest
<i>Stylosanthes viscosa</i> (L.) Sw.	A. Gomes 3017	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Zornia brasiliensis</i> Vogel	M. F. Agra et al. 2611	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
Heliotropiaceae		
<i>Euploca procumbens</i> (Mill.) Diane & Hilger	A. Gomes 3160 M. F. Agra et al. 4912	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Heliotropium angiospermum</i> Murray	A. Gomes 3069	Caatinga, Atlantic Forest
<i>Myriopus rubicundus</i> (Salzm. ex DC.) Luebert	A. Gomes 3058	Caatinga, Cerrado, Atlantic Forest
<i>Myriopus salzmännii</i> (DC.) Diane & Hilger	A. Gomes 3155	Caatinga, Atlantic Forest
Lamiaceae		
<i>Hypenia salzmännii</i> (Benth.) Harley	A. Gomes 3173 M. F. Agra et al. 4112	Caatinga, Cerrado, Atlantic Forest
<i>Leptohyptis macrostachys</i> (Benth.) Harley & J.F.B.Pastore	A. Gomes 3107 M. F. Agra et al. 1659	Caatinga, Cerrado
<i>Marsypianthes chamaedrys</i> (Vahl) Kuntze	A. Gomes 3143	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Medusantha martiusii</i> (Benth.) Harley & J.F.B.Pastore	A. Gomes 3034 M. F. Agra et al. 4091	Caatinga, Cerrado
<i>Mesosphaerum pectinatum</i> (L.) Kuntze	A. Gomes 3105 M. F. Agra et al. 4562	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Mesosphaerum sidifolium</i> (L'Hér.) Harley & J.F.B.Pastore	M. F. Agra et al. 1658	Caatinga, Cerrado, Atlantic Forest
<i>Vitex gardneriana</i> Schauer	M. F. Agra et al. 2703	Caatinga
Lauraceae		
<i>Ocotea fasciculata</i> (Nees) Mez	M. F. Agra et al. 1943	Amazon Forest, Cerrado, Atlantic Forest
Loasaceae		
<i>Mentzelia aspera</i> L.	A. Gomes 86904	Amazon Forest, Caatinga, Cerrado, Pantanal
Lythraceae		
<i>Lafoensia glyptocarpa</i> Koehne	M. F. Agra et al. 5910	Cerrado

Malpighiaceae		
<i>Amorimia rigida</i> (A.Juss.) W.R. Anderson	M. F. Agra et al. 2672	Atlantic Forest
<i>Byrsonima gardneriana</i> A.Juss.	A. Gomes 2029 M. F. Agra et al. 4554	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Diplopterys lutea</i> (Griseb.) W.R.Anderson & C.C.Davis	A. Gomes 3003	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Galphimia brasiliensis</i> (L.) A.Juss.	M. F. Agra et al. 1631	Caatinga, Cerrado, Atlantic Forest
<i>Stigmaphyllon paralias</i> A.Juss.	M. F. Agra et al. 1941	Caatinga, Cerrado, Atlantic Forest
<i>Stigmaphyllon tomentosum</i> A.Juss.	M. F. Agra et al. 4706	Cerrado, Atlantic Forest
Malvaceae		
<i>Callianthe pickelii</i> (Monteiro) Donnell	M. F. Agra et al. 4030	Caatinga, Atlantic Forest
<i>Ceiba glaziovii</i> (Kuntze) K.Schum.	A. Gomes 2051 M. F. Agra et al. 4201	Caatinga
<i>Corchorus argutus</i> Kunth	A. Gomes 3052	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Gaya domingensis</i> Urb.	M. F. Agra et al. 2747	Caatinga, Cerrado, Atlantic Forest
<i>Guazuma ulmifolia</i> Lam.	M. F. Agra et al. 4613	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Helicteres baruensis</i> Jacq.	M. F. Agra et al. 2737	Amazon Forest, Caatinga, Cerrado
<i>Helicteres brevispira</i> A.St.-Hil.	A. Gomes 2089	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Helicteres guazumifolia</i> Kunth	M. F. Agra et al. 1995	Amazon Forest, Cerrado, Pantanal
<i>Helicteres heptandra</i> L.B. Sm.	A. Gomes 2079	Caatinga, Cerrado, Atlantic Forest
<i>Helicteres ovata</i> Lam.	M. F. Agra et al. 3407	Caatinga, Cerrado, Atlantic Forest
<i>Herissantia tiubae</i> (K.Schum.) Brizicky	M. F. Agra et al. 4563	Caatinga, Cerrado
<i>Melochia betonicifolia</i> A.St.-Hil.	A. Gomes 3163	Caatinga, Cerrado, Atlantic Forest
<i>Melochia caracasana</i> Jacq.	M. F. Agra et al. 2644	Caatinga
<i>Melochia tomentosa</i> L.	A. Gomes 3078	Caatinga, Cerrado, Atlantic Forest
<i>Pavonia cancellata</i> (L.) Cav	A. Gomes 3116	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Sida cordifolia</i> L.	A. Gomes 3031 M. F. Agra et al. 4007	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Sida galheirensis</i> Ulbr.	M. F. Agra et al. 2771	Caatinga, Cerrado, Atlantic Forest
<i>Sida spinosa</i> L.	M. F. Agra et al. 2739	Caatinga, Cerrado, Atlantic Forest, Pampa
<i>Sidastrum multiflorum</i> (Jacq.) Fryxell	M. F. Agra et al. 2583	Amazon Forest, Caatinga, Atlantic Forest
<i>Triumfetta semitriloba</i> Jacq.	M. F. Agra et al. 4014	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Triumfetta althaeoides</i> Lam.	M. F. Agra et al. 4056	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Waltheria ferruginea</i> A.St.-Hil.	M. F. Agra et al. 5223	Cerrado
<i>Waltheria indica</i> L.	A. Gomes 3044	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
Melastomataceae		
<i>Pleroma gardneri</i> (Naudin) P.J.F. Guim. & Michelang.	A. Gomes 3022 M. F. Agra et al. 2573	Caatinga
<i>Pleroma heteromallum</i> (D.Don) D.Don	A. Gomes 2042	Cerrado, Atlantic Forest
Meliaceae		
<i>Cedrela fissilis</i> Vell.	M. F. Agra et al. 4868	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
Menispermaceae		
<i>Cissampelos pareira</i> L.	M. F. Agra et al. 1996	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
Myrtaceae		
<i>Eugenia punicifolia</i> (Kunth) DC.	M. F. Agra et al. 1583	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Myrcia tomentosa</i> (Aubl.) DC.	A. Gomes 2024	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Psidium firmum</i> O.Berg	A. Gomes 2047	Cerrado, Atlantic Forest
Nyctaginaceae		
<i>Boerhaavia coccinea</i> Mill.	A. Gomes 3132	Caatinga, Cerrado, Atlantic Forest, Pampa

<i>Guapira laxa</i> (Netto) Furlan	A. Gomes 3042	Caatinga
<i>Guapira noxia</i> (Netto) Lundell	M. F. Agra et al. 4387	Cerrado
Ochnaceae		
<i>Ouratea cearensis</i> (Tiegh.) Sastre & Offroy	A. Gomes 3048	Amazon Forest, Atlantic Forest
<i>Ouratea crassifolia</i> (Pohl) Engl.	M. F. Agra et al. 3916	Caatinga, Cerrado
<i>Ouratea hexasperma</i> (A.St.-Hil.) Baill.	M. F. Agra et al. 4214	Cerrado
Onagraceae		
<i>Ludwigia erecta</i> (L.) H. Hara	A. Gomes 3140	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Ludwigia leptocarpa</i> (Nutt.) H. Hara	A. Gomes 3128	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
Orchidaceae		
<i>Gomesa barbata</i> (Lindl.) M.W.Chase & N.H.Williams	M. F. Agra et al. 5395	Caatinga, Cerrado
<i>Sacoila lanceolata</i> (Aubl.) Garay	A. Gomes 3133	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa
Oxalidaceae		
<i>Oxalis frutescens</i> L.	M. F. Agra et al. 2714	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
Passifloraceae		
<i>Passiflora cincinnata</i> Mast.	A. Gomes 3102 M. F. Agra et al. 2005	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Passiflora foetida</i> L.	M. F. Agra et al. 4414	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
Phyllanthaceae		
<i>Phyllanthus acuminatus</i> Vahl	M. F. Agra et al. 2653	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Phyllanthus claussenii</i> Müll.Arg.	A. Gomes 3013	Caatinga, Cerrado, Atlantic Forest
<i>Phyllanthus glaziovii</i> Müll.Arg.	M. F. Agra et al. 2750	Atlantic Forest
Phytolaccaceae		
<i>Rivina humilis</i> L.	A. Gomes 3043 M. F. Agra et al. 4680	Amazon Forest, Caatinga, Pampa
Plantaginaceae		
<i>Angelonia biflora</i> Benth.	M. F. Agra et al. 2610	Caatinga
<i>Scoparia dulcis</i> L.	M. F. Agra et al. 4204	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Stemodia foliosa</i> Benth.	M. F. Agra et al. 1983	Caatinga, Cerrado, Atlantic Forest
Plumbaginaceae		
<i>Plumbago scandens</i> L.	A. Gomes 3054 M. F. Agra et al. 4253	Amazon Forest, Caatinga, Atlantic Forest
Poaceae		
<i>Cenchrus ciliaris</i> L.	A. Gomes 3029	Amazon Forest, Caatinga, Cerrado
<i>Melinis repens</i> (Willd.) Zizka	A. Gomes 3055	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Megathyrsus maximus</i> (Jacq.) B.K. Simon & S.W.L. Jacobs	A. Gomes 2046	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
Polygalaceae		
<i>Acanthocladus brasiliensis</i> (Klotzsch ex A.St.-Hil. & Moq.) Hassk.	A. Gomes 3156	Atlantic Forest
<i>Bredemeyera laurifolia</i> (A.St.-Hil. & Moq.) Klotzsch ex A.W. Benn.	M. F. Agra et al. 4416	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Caamembeca spectabilis</i> (DC.) J.F.B.Pastore	A. Gomes 2072 M. F. Agra et al. 1674	Amazon Forest, Caatinga, Atlantic Forest
<i>Senega paniculata</i> (L.) J.F.B.Pastore & J.R.Abbott	A. Gomes 2025	Caatinga
Portulacaceae		
<i>Portulaca elatior</i> Mart. ex Rohrb.	A. Gomes 3047	Caatinga, Cerrado, Atlantic Forest
Primulaceae		
<i>Myrsine guianensis</i> (Aubl.) Kuntze	M. F. Agra et al. 4271	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa
Proteaceae		
<i>Roupala montana</i> Aubl.	A. Gomes 2044	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Roupala paulensis</i> Sleumer	M. F. Agra et al. 2692	Caatinga, Cerrado, Atlantic Forest
Rhamnaceae		

<i>Gouania blanchetiana</i> Miq.	M. F. Agra et al. 4019	Amazon Forest, Atlantic Forest
<i>Rhamnidium molle</i> Reissek	A. Gomes 3006	Caatinga
<i>Sarcomphalus joazeiro</i> (Mart.) Hauenschild	M. F. Agra et al. 4420	Caatinga, Cerrado, Atlantic Forest
Rubiaceae		
<i>Borreria alata</i> (Aubl.) DC.	M. F. Agra et al. 4021	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Borreria schumannii</i> (Standl. ex Bacigalupo) E.L. Cabral & Sobrado	M. F. Agra et al. 5261	Cerrado, Atlantic Forest, Pampa
<i>Chiococca alba</i> (L.) Hitchc.	A. Gomes 3033 M. F. Agra et al. 4067	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Emmeorrhiza umbellata</i> (Spreng.) K.Schum.	M. F. Agra et al. 4034	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Guettarda sericea</i> Müll.Arg.	M. F. Agra et al. 4704	Caatinga
<i>Manettia cordifolia</i> Mart.	M. F. Agra et al. 3978	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Mitracarpus hirtus</i> (L.) DC.	M. F. Agra et al. 4279	Amazon Forest, Caatinga, Cerrado
<i>Richardia grandiflora</i> (Cham. & Schltdl.) Steud.	A. Gomes 3063 M. F. Agra et al. 4300	Caatinga, Cerrado, Atlantic Forest, Pampa
<i>Rudgea jacobinensis</i> Müll.Arg.	M. F. Agra et al. 4678	Caatinga, Atlantic Forest
<i>Staelia virgata</i> (Link ex Roem. & Schult.) K.Schum.	A. Gomes 2075	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
Rutaceae		
<i>Pilocarpus spicatus</i> A.St.-Hil.	M. F. Agra et al. 4637	Caatinga, Cerrado, Atlantic Forest
<i>Zanthoxylum rhoifolium</i> Lam.	M. F. Agra et al. 1641	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
Salicaceae		
<i>Casearia sylvestris</i> Sw.	M. F. Agra et al. 4477	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Prockia crucis</i> P.Browne ex L.	M. F. Agra et al. 4422	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
Santalaceae		
<i>Phoradendron quadrangulare</i> (Kunth) Griseb.	M. F. Agra et al. 1974	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Phoradendron tunaeforme</i> (DC.) Eichl.	M. F. Agra et al. 2600	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
Sapindaceae		
<i>Allophylus puberulus</i> (Cambess.) Radlk.	M. F. Agra et al. 4893	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Cardiospermum corindum</i> L.	A. Gomes 2095 M. F. Agra et al. 1626	Caatinga, Cerrado, Atlantic Forest
<i>Cupania impressinervia</i> Acev.-Rodr.	M. F. Agra et al. 4323	Atlantic Forest
<i>Serjania caracasana</i> (Jacq.) Willd.	M. F. Agra et al. 4100	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Serjania glabrata</i> Kunth	A. Gomes 2062 M. F. Agra et al. 5396	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Serjania laruotteana</i> Cambess.	A. Gomes 3119	Cerrado, Atlantic Forest
<i>Serjania meridionalis</i> Cambess.	M. F. Agra et al. 4331	Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Paullinia trigonia</i> Vell.	M. F. Agra et al. 4869	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Talisia esculenta</i> (Cambess.) Radlk.	M. F. Agra et al. 4392	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Urvillea laevis</i> Radlk.	M. F. Agra et al. 2705	Caatinga, Cerrado, Atlantic Forest, Pantanal
<i>Urvillea stipitata</i> Radlk.	M. F. Agra et al. 3994	Amazon Forest, Atlantic Forest
Schoepfiaceae		
<i>Schoepfia brasiliensis</i> A.DC.	M. F. Agra et al. 5166	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
Solanaceae		
<i>Brunfelsia uniflora</i> (Pohl) D.Don	M. F. Agra et al. 3876	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
<i>Capsicum parvifolium</i> Sendtn.	M. F. Agra et al. 5171	Caatinga, Atlantic Forest
<i>Cestrum obovatum</i> Sendtn.	M. F. Agra et al. 3901	Caatinga, Cerrado
<i>Iochroma arborescens</i> (L.) J.M.H. Shaw	A. Gomes 2061 M. F. Agra et al. 4980	Atlantic Forest
<i>Nicandra physalodes</i> (L.) Gaertn.	M. F. Agra et al. 5759	Caatinga, Cerrado, Atlantic Forest

<i>Nicotiana glauca</i> Graham	A. Gomes 3076	Caatinga, Cerrado, Atlantic Forest, Pampa
<i>Schwenckia mollissima</i> Nees & Mart.	M. F. Agra et al. 2769	Amazon Forest, Caatinga, Atlantic Forest
<i>Solanum agrarium</i> Sendtn.	M. F. Agra et al. 1863	Caatinga, Cerrado, Atlantic Forest
<i>Solanum americanum</i> Mill.	M. F. Agra et al. 3892	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Solanum melissarum</i> Bohs	M. F. Agra et al. 4096	Atlantic Forest
<i>Solanum stipulaceum</i> Willd. ex Roem. & Schult.	A. Gomes 2067	Caatinga, Cerrado, Atlantic Forest
<i>Solanum jabrense</i> Agra & M. Nee	M. F. Agra et al. 1262	
	A. Gomes 2068	Caatinga, Atlantic Forest
	M. F. Agra et al. 4743	
<i>Solanum paniculatum</i> L.	M. F. Agra et al. 1980	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa
<i>Solanum rhytidandrum</i> Sendtn.	M. F. Agra et al. 1864	Amazon Forest, Caatinga, Cerrado
<i>Physalis angulata</i> L.	A. Gomes 3071	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
Turneraceae		
<i>Piriqueta racemosa</i> (Jacq.) Sweet	A. Gomes 3002	Caatinga, Cerrado, Atlantic Forest
<i>Piriqueta sidifolia</i> var. <i>multiflora</i> Urb.	M. F. Agra et al. 4907	Caatinga, Cerrado
<i>Turnera cearensis</i> Urb.	A. Gomes 2034	Caatinga, Atlantic Forest
	M. F. Agra et al. 1628	
<i>Turnera subulata</i> Sm.	A. Gomes 3090	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
Urticaceae		
<i>Laportea aestuans</i> (L.) Chew	M. F. Agra et al. 5750	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
Verbenaceae		
<i>Lantana camara</i> L.	A. Gomes 2057	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
	M. F. Agra et al. 2576	
<i>Lantana canescens</i> Kunth	A. Gomes 3109	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
	M. F. Agra et al. 1930	
<i>Lantana fucata</i> Lindl.	A. Gomes 3065	Caatinga, Cerrado, Atlantic Forest, Pampa
<i>Lippia alba</i> (Mill.) N.E.Br. ex P. Wilson	A. Gomes 2058	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Lippia grata</i> Schauer	A. Gomes 2064	Amazon Forest, Caatinga, Cerrado, Atlantic Forest
Vitaceae		
<i>Cissus decidua</i> Lombardi	A. Gomes 3146	Caatinga
<i>Cissus verticillata</i> (L.) Nicolson & C.E.Jarvis	M. F. Agra et al. 1633, 4051	Amazon Forest, Caatinga, Cerrado, Atlantic Forest, Pampa, Pantanal
<i>Clematicissus simsiana</i> (Schult. & Schult.f.) Lombardi	M. F. Agra et al. 4335	Caatinga, Cerrado, Atlantic Forest

The flora of the area was characterized by a diversity of species observed from the base to the summit (Figures 3, 4, 5, and 6). Fabaceae, Malvaceae, and Asteraceae were the most taxonomically diverse families. Fabaceae was

represented by 53 species, while Malvaceae and Asteraceae were each represented by 23 species, collectively accounting for approximately 30% of the total species recorded during the study.



Figure 3. Plant species recorded in the Serra do Teixeira National Park: Alstroemeriaceae : a) *Bomarea edulis* Amaryllidaceae ; B) *Hippeastrum stylosum* ; Commelinaceae : c) *Dichorisandra hexandra* ; Convolvulaceae : d) *Ipomoea bahiensis* ; Cucurbitaceae : *Doyerea emetocathartica* ; Fabaceae: e) *Ancistrotropis peduncularis* ; f) *Canavalia brasiliensis* ; g) *Chamaecrista repens* ; H) *Crotalaria vitellina* ; i) *Mimosa invisa* ; j) *Mimosa paraibana* ; k) *Piptadenia retusa* ; l) *Senna macranthera* Lamiaceae: m) *Hyphenia salzmännii* ; Malpighiaceae : n) *Byrsonima gardneriana* ; Turneraceae : o) *Turnera cearensis*. Source: Personal archive: A. GOMES (2018-2020)

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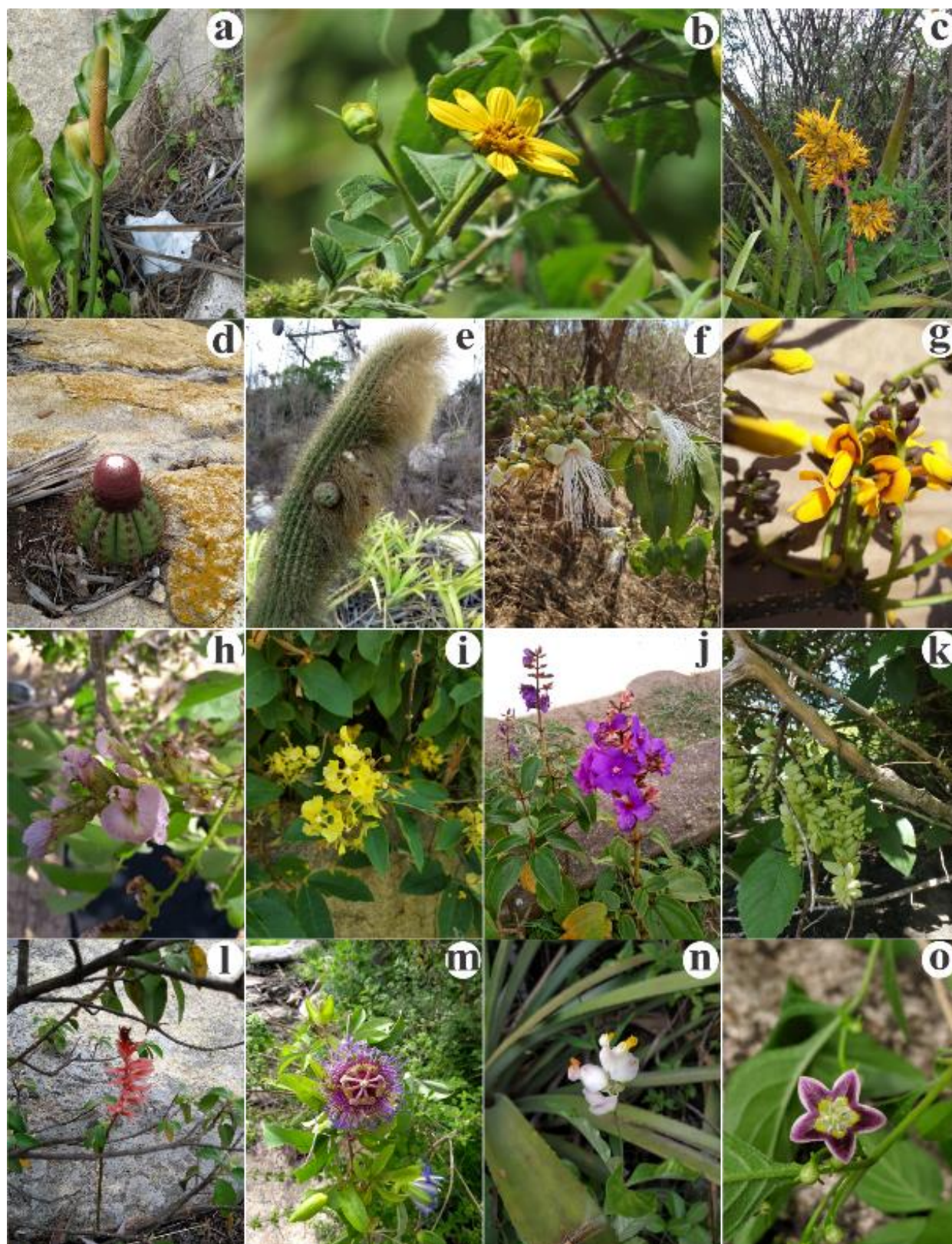


Figure 4. Plant species recorded in the Serra do Teixeira National Park: Araceae: a) *Anthurium affine* ; Asteraceae: b) *Wedelia goyazensis* ; Bromeliaceae: c) *Aechmea emmerichiae* ; Cactaceae: d) *Melocactus ernestii* ; It is) *Pilosocereus chrysostele* ; Capparaceae : f) *Cynophalla flexuosa* ; Fabaceae: g) *Platymiscium floribundum*; *Poecilanthe grandiflora*; Malpighiaceae: h) *Diplopterys lutea* ; Melastomataceae: i) *Pleroma heteromallum* ; Menispermaceae: j) *Cissampelos* L. ; Orchidaceae: k) *Sacoila lanceolata* ; Passifloraceae: l) *Passiflora cincinnata* ; Polygalaceae: m) *Caamembeca spectabilis* ; Solanaceae : n) *Capsicum parvifolium* . Source: Personal archive: A. GOMES (2018-2020)

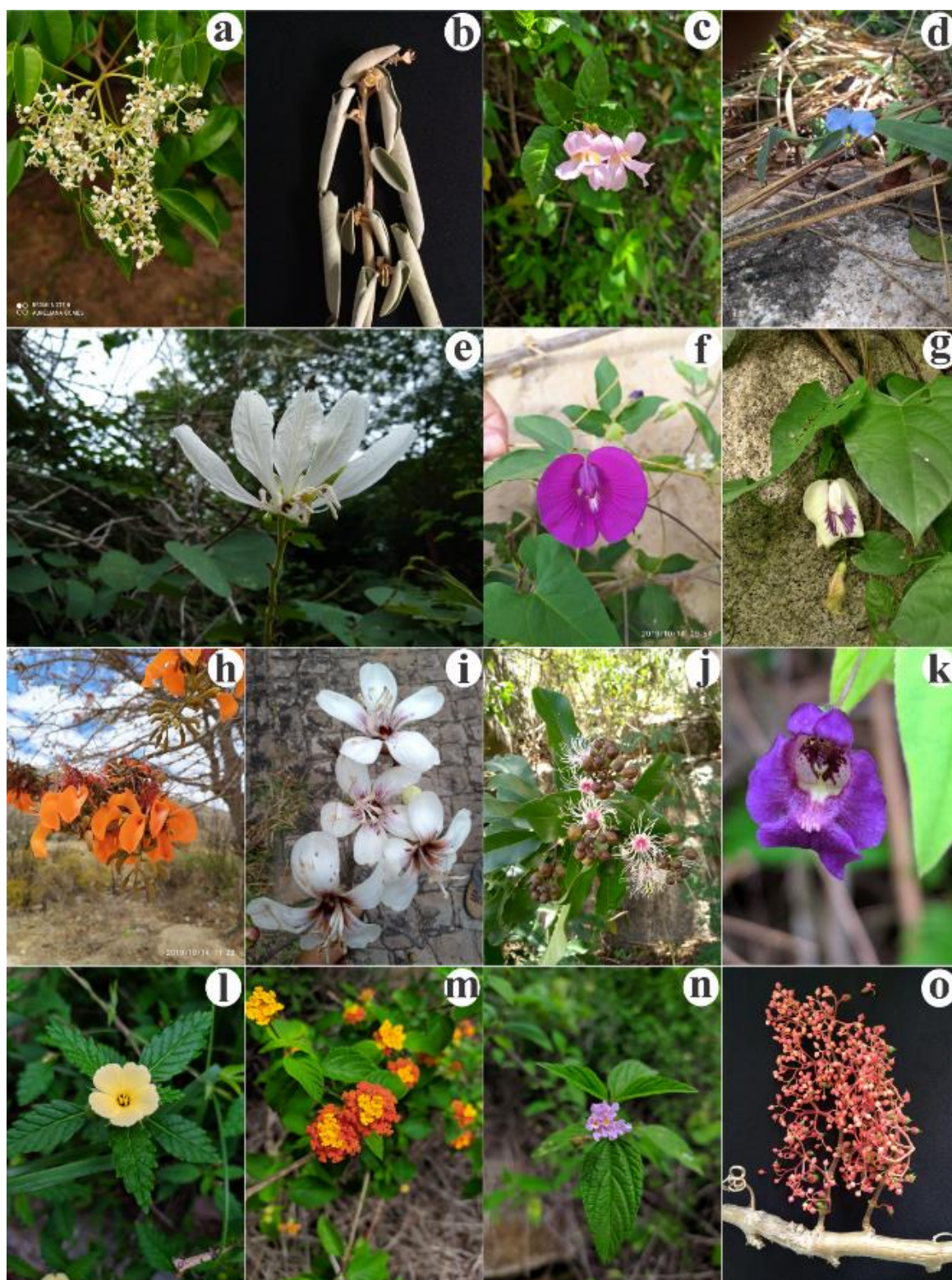


Figure 5. Plant species recorded in the Serra do Teixeira National Park: Anacardiaceae : *Spondias tuberosa* ; Begoniaceae : *Begonia lealii* ; Bignoniaceae : *Stizophyllum perforatum* ; Commelinaceae : *Commelina erecta* ; Fabaceae: *Bauhinia cheilantha* ; *Centrosema brasilianum* ; *Centrosema sagittatum* ; *Erythrina velutina* ; Malvaceae: *Ceiba glaziovii* ; Myrtaceae : *Psidium firmum* ; Plantaginaceae : *Angelonia biflora* ; Turneraceae : *Piriqueta racemosa* ; Verbenaceae : *Lantana camara* ; *Lantana fucata* ; Vitaceae : *Cissus decida* .Source: Personal archive: A. GOMES (2018-2020)

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The geomorphological compartmentalization of the altitudinal gradient and the delimitation of collections by toposequence allowed the perception of changes in phytophysiology within the landscape. At altitudes below 900 m (Figures 6 a, b, c), a typical Caatinga phytophysiology is observed, primarily composed of species belonging to the families Fabaceae, Asteraceae, and Malvaceae, as well as others commonly associated with the flora of the Caatinga.

The altitudinal ranges above 900 m up to approximately 1,200 m support a vegetation type classified as Seasonal Semideciduous Montane Forest (Figures 6 d, e), featuring species characteristic of humid areas such as *Tillandsia usneoides* and *Ouratea cearensis*.

On the plateau of the massif, species were observed rooted in the substrate above the rock, including Cactaceae species and subshrub and shrub elements anchored in fissures within the rocks (Figures 7 f, g). Additionally, on the plateau, soil islands were noted, characterized by grouped arboreal components typical of moist forests and shrub species.



Figure 6. Phytophysiology of environments by altitudinal ranges. a; b) Area corresponding to the massif buffer zone; c) Basal elevations 800 to 900 meters in altitude; d; e) Intermediate quotas - 900 to 1,200 m; f; g) Outcrop plateau - 1,208 m. Source: Personal archive: A. GOMES (2018-2020)

Regarding species richness, it is noteworthy that there was an exponential increase from the base up to the intermediate altitudinal ranges (800-1,100 m). However, at altitudinal levels above

1,100 m, a decline in species richness was observed as one moves toward the summit (Figure 7).

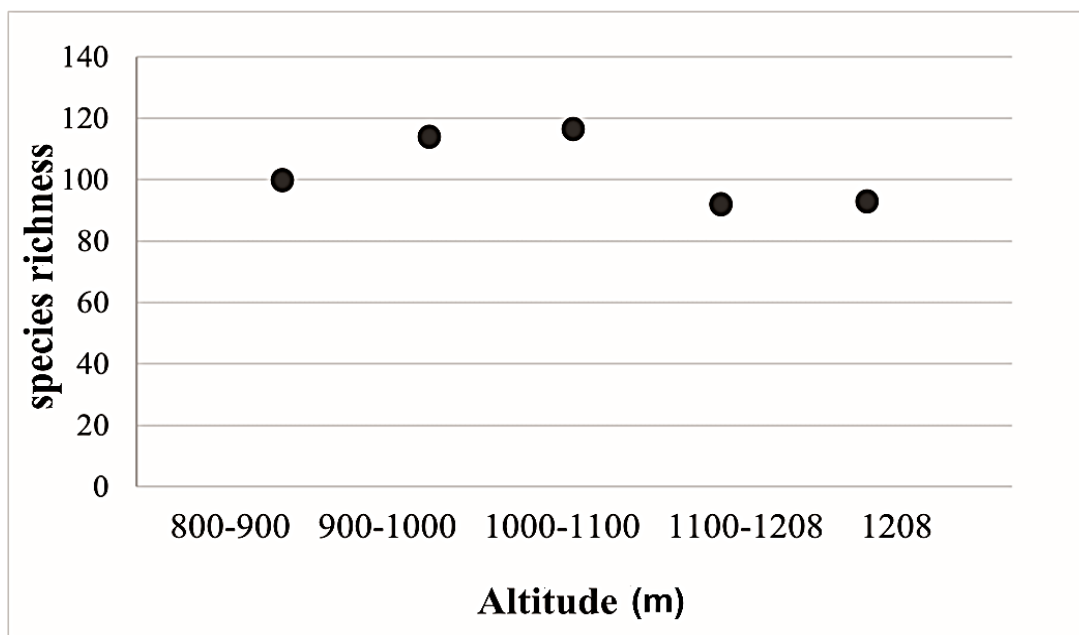


Figure 7. Species richness collected in the field along the altitude gradient.

Source: The authors (2024)

The richness of families based on altitudinal ranges indicated that Fabaceae and Asteraceae were the richest families throughout the entire altitudinal gradient (Figure 8). The family Bignoniaceae Juss. showed its highest richness index at the intermediate elevations between 900 and 1,100 m, where the highest humidity levels and milder temperatures occur (Figure 8). The families Bromeliaceae and Cyperaceae were recorded only on the plateau of the massif.

Regarding the distribution of species among the phytogeographic domains, it was observed that 31 of the recorded species are endemic to the Caatinga domain, seven species are typical of the Cerrado, and 18 belong to the Atlantic Forest (Table 1).

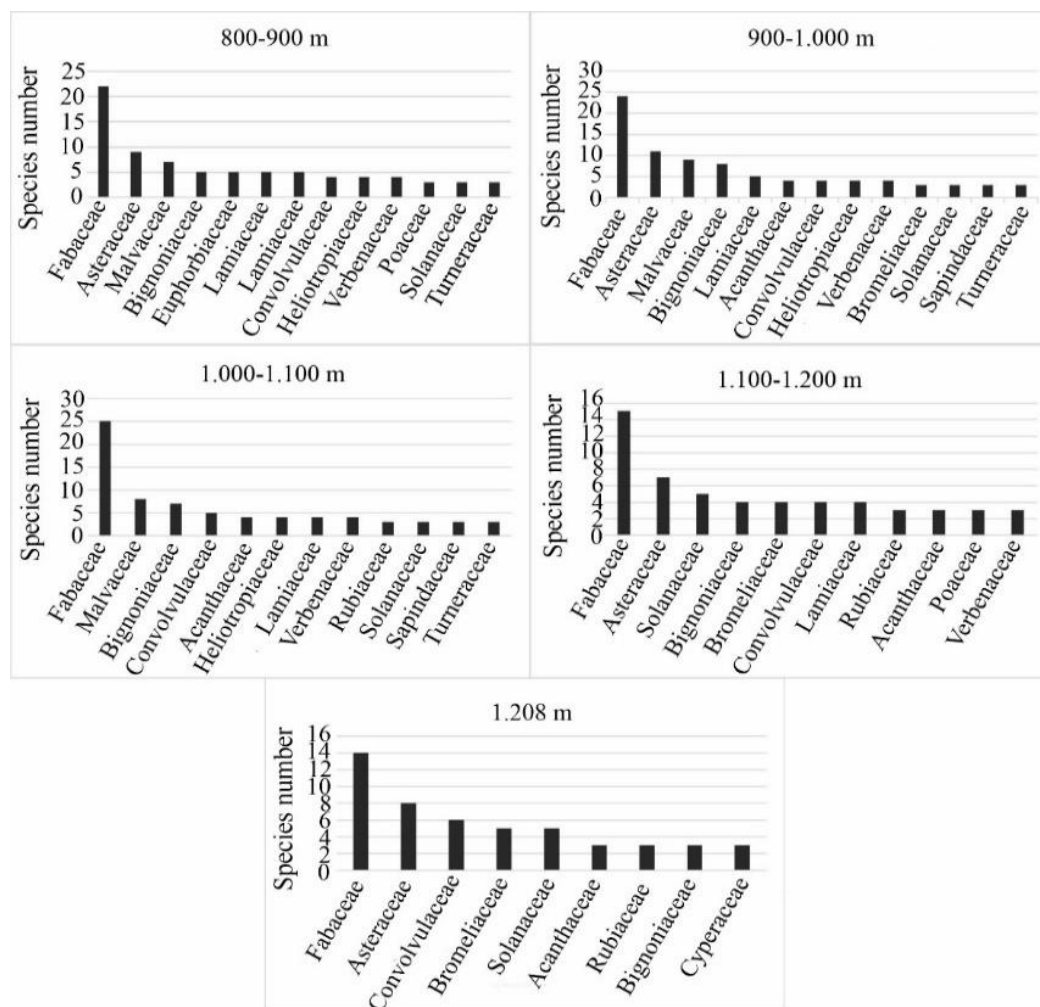


Figure 8. Richness of botanical families by altitude. Source: The authors (2024)

Discussion

The 98 species collected during the surveys from 2018 to 2020, combined with the 179 documented by Agra et al. (2004), highlight the importance of continued floristic surveys in these areas. The 58 species shared between the two databases reflect the conservation status of this area and its resilience to environmental changes and potential anthropogenic impacts.

Fabaceae, Malvaceae, and Asteraceae were also the families with the highest species richness in the studies conducted by Silveira et al. (2020) in the Serra de Ubajara, an altitude wetland located in the state of Ceará, Brazil. These families were among the most diverse in the studies by Moura et al. (2024) on rocky outcrops in the Paraíba Agreste. According to the authors, the predominance of these families is due to their adaptive potential to different edaphoclimatic conditions and their widespread distribution across the tropics.

Fabaceae, Malvaceae, and Asteraceae also comprised a significant portion of the flora surveyed by Fernando et al. (2022) in a fragment of Caatinga in the hinterlands of Paraíba. Based on data from the Brazilian Flora Group (BFG, 2021), Fabaceae, Asteraceae, and Malvaceae are among the largest families of angiosperms in Brazil, justifying their dominance in floristic surveys across different climatic and geomorphological contexts.

Such findings further explain the predominance of Fabaceae and Asteraceae richness within the various altitudinal ranges of the massif (Figure 9).

The phytophysognomic changes along the altitude gradient emphasize the direct influence of microclimatic factors, local geomorphology, soil water availability, and nutrient availability, which directly contribute to the organization of vegetation within the topographic gradients (Maciel et al., 2024). According to Ramos et al. (2020), soils can exhibit physical and chemical changes in composition over short distances, implying a complex and direct relationship that affects the

distribution of plant communities along altitudinal gradients.

As noted by Silveira et al. (2020), this plant diversity in response to edaphoclimatic factors is a pattern commonly observed in “Brejos de altitude”. The occurrence of *Tillandsia usneoides* (L.) L. at specific points situated between 900 and 1,100 m suggests a greater influence of humidity and good air quality, as the extensive presence of trichomes throughout the plant enhances its ability to absorb atmospheric moisture and nutrients (Costa et al., 2019).

The presence of arboreal and shrubby species, including rupicolous and epiphytic elements fixed to substrates and host plants on the massif plateau, contributes to a heterogeneity of species adapted to the diverse microenvironments of the area. Pereira et al. (2019) highlight the morphological patterns and establishment of rupicolous vegetation in this type of environment as reflections of the adaptive process to the exposure conditions of rocky outcrops. According to Silva (2016), this vegetation exists over rocky outcrop areas through the formation of joints in the rocks and small depressions or “islands” of soil, where it is also possible to identify a well-defined arboreal component with species from wet areas gathered in a single spot.

The richness pattern observed in the present study was described by Costa et al. (2023). It consists of a concave pattern, where richness increases with altitude; however, as it approaches plateau areas, there tends to be a reduction in this richness.

This observed pattern of richness reflects the selection of species highly adapted to environmental filters such as microclimatic conditions, soil types, slope geometry, and slope orientation (Sampaio Diogo et al., 2021). Such conditions directly influence distribution and also favor the occurrence of endemic species at higher elevations.

Conclusions

Based on the results obtained, emphasized that the areas of elevation represented by “Brejos de altitude” are extremely relevant in terms of biodiversity, as they are characterized as ecosystems that harbor a plant biota distinct from surrounding areas and exhibit high levels of endemism. These altitudinal gradients present intrinsic environmental, climatic, and pedogenic conditions that act as environmental filters, isolating species and providing a peculiar

vegetation cover. In this context, the altitude wetlands of northeastern Brazil represent a rich source (matrix) of data for the development of biogeographical studies that aid in understanding the patterns and processes related to the establishment of their flora, making it necessary for these refuges of humid forests in the Caatinga to be focal points of studies aimed at conserving their biodiversity on both local and regional scales. Considering that the PARNA of Serra do Teixeira possesses a heterogeneity of phytophysiognomies along its altitudinal gradient, the data collected is of extreme importance for the historical and evolutionary context of the landscape and vascular flora.

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References

- Agra, M.F., Barbosa, M.R.V., & Stevens, W.D. (2004). Levantamento Florístico Preliminar do pico do Jabre, Paraíba, Brasil. In: Porto, K.C, Cabral, J.P, & Tabarelli, M. (Orgs.), *Brejos de altitude de Pernambuco e Paraíba: história natural, ecologia e conservação* (Vol. 1, pp. 123-137). Ministério do Meio Ambiente. <https://parqueserradoscavalos.caruaru.pe.gov.br/wp-content/uploads/2019/12/Srie-Biodiversidade-09-Brejos-de-Altitude-em-Pernambuco-e-Paraba-Histria-Natural-Ecologia-e-Conservao.pdf>
- BFG - Brazilian Flora Group (2021). Leveraging the power of a collaborative scientific network. *Taxon*, 71 (1), 1-21. <https://doi.org/10.1002/tax.12640>
- Benício, R. M. A., Nascimento, A. da S., Morais, S. C. de O., Lisboa, M. A. N., Silva, L. V. A.

Gomes, A. S., Rodrigues, E. M., Pedro-Silva, L., Melo, J. I. M., Queiroz, R. T., Sousa, G. F., Vieira, C. S., Moura, D. C.

- da, Cruz, G. V., Morais, H. N. de, Araújo, I. F., Linhares, K. V., Silva, M. A. P. da, Rocha, L. S. G., Calixto Júnior, J. T. (2023). Um refúgio de Mata Úmida no interior do Nordeste brasileiro: estrutura e diversidades alfa e beta. *Ciência Florestal*, 33(3), 1-25. <https://doi.org/10.5902/1980509869097>
- BWG - Boraginales Working Group (2016). Familial classification of the Boraginales. *Taxon*, 65 (3), 502-522. <https://doi.org/10.12705/653.5>
- Chase, M.W., Christenhusz, M.J.M., Fay, M.F., Byng, J.W., Judd, W.S., Soltis, D.E., Mabberley, D. J., Sennikov A. N., Soltis P.S., Stevens P.F. (2016) Na 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), 1-20. <https://doi.org/10.1111/boj.12385>
- Costa, F.C.B. Chiavegatto, B., Barbosa, D. E. F., Furtado, S. G., Menini Neto, L. (2019). Espécies de *Tillandsia* L. (Tillandsioideae, Bromeliaceae) como bioindicadoras de poluição atmosférica. *Ces Revista*, 33 (1), 235-257.
- Costa, F.V.D., Viana-Júnior, A. B., Aguilar, R., Silveira, F. A. O., Cornelissen, T. G. (2023). Biodiversity and elevation gradients: Insights on sampling biases across worldwide mountains. *Journal of Biogeography*, 50 (11), 1879-1889. <https://doi.org/10.1111/jbi.14696>
- Correia, J. S., Lyra-Lemos, R. P., Ribeiro, R. T. M., M. I. B. (2021). Diversidade Florística dos Afloramentos Rochosos da Reserva Biológica de Pedra Talhada, Quebrangulo, Alagoas. *Revista Brasileira De Geografia Física*, 14 (2), 743-757. <https://doi.org/10.26848/rbgf.v14.2.p743-757>
- Cunha, M.C.L., Silva-Júnior, M. C., Lima, R. B. (2013). A flora lenhosa na Floresta Estacional Semidecídua Montana do Pico do Jabre, PB. *Revista Brasileira de Ciências Agrárias*, 8: (1), 130-136. <https://doi.org/10.5039/agraria.v8i1a2294>
- Cunha, M.C.L., & Silva-Júnior, M.C. (2018). Comunidades de Árvores na Floresta Estacional Semidecidual Montana do Pico do Jabre, Paraíba. *Ciência Florestal*, 28 (4), 1365-1380. <https://doi.org/10.5902/1980509835046>
- Lei nº 11.552 de 05 de junho de 2023. (2023, 05 de junho). Dispõe sobre da criação e delimitação do Parque Nacional da Serra do Teixeira. https://www.planalto.gov.br/ccivil_03/_ato2023-2026/2023/decreto/D11552.htm
- Fernando, E. M. P., Campos, K. G., Mamede, M. L., Lucena, M. F. A. (2022). Floristic survey of a Caatinga area of high biological importance in the Mesoregion of Paraíba backlands, Northeast Brazil. *Hoehnea*, 49, 2022.
- Figueiredo, S.S., Monteiro, F. K. S., Melo, J. I. M. (2020). Flora da Paraíba, Brasil: Bombacoideae Burnett (Malvaceae). *Biota Neotropica*, 20 (2), 2-18. <https://doi.org/10.1590/1676-0611-BN-2019-0837>
- Gomes, A.S., Marques, A. L., Vieira, C. S., Moura, D. C., Rodrigues, E. M., Farias, G. S., Costa, C., R. G. (2021). Genesis and phytodiversity in the enclave Pico do Jabre in the Brazilian semiarid. *Holos Environment*, 21 (2), 173-184. <http://doi.org/10.14295/holos.v21i2.12428>
- Guerra, M. D. F., Souza, M, J. N., Silva, E. D. (2020). Veredas da Chapada do Araripe: subespaços de exceção no semiárido do estado do Ceará, Brasil. *Ateliê Geográfico*, 14 (2), 51-66. <https://doi.org/10.5216/ag.v14i2.62824>
- Instituto Brasileiro de Geografia e Estatística – IBGE. (2017). Divisão regional do Brasil em regiões geográficas imediatas e regiões geográficas intermediárias : 2017. [Recurso eletrônico]. IBGE, Coordenação de Geografia. <https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=detalhes&id=2100600>
- Lopes-Silva, R.F., Cabral, S. C. M., Baracho, G, S., Lohmann, L. G., Agra, M. F. (2022). Bignoniaceae (Bignoniaceae) from the Pico do Jabre, Paraíba, Brazil: Taxonomic diversity and distribution. *Rodriguésia*, 73, 1-24. <https://doi.org/10.1590/21757860202273064>
- Lucena, Rebecca. Luna., Silva, F. E. B., Aprígio, T. R. M., Cabral-Júnior, J. B. (2022). The influence of altitude on the climate of semiarid areas: contributions to conservation. *The International Journal of Climate Change: Impacts and Responses*, 14 (2), 81-93. <https://doi.org/10.18848/18357156/CGP>
- Maciel, M. G. R., Ramos, M. B., Souza, S. M., Cunha, S. S., Lopes, S. F., Sousa, J. J. L. L. (2024). Water and nutrients mediate tree communities in the driest region of Caatinga. *Catena*, 242, 108107. <https://doi.org/10.1016/j.catena.2024.108107>
- Moura, D. C., Souza, B. H., Marques, A. L., Gomes, A. S. (2024). Composição Florística em afloramentos rochosos no Agreste paraibano. *Revista Geotemas*, 14 (1), 02409. <https://doi.org/10.33237/2236255X.2024.5373>

- Peixoto, AL & Maia, LC. (2013). *Manual de Procedimentos para Herbários*. INCT-Herbário virtual para a Flora e os Fungos. Editora Universitária-UFPE.
- Pereira, T.M.S., Moura, D. C., Melo, J. I. M., Silva, J. A. L. (2019). Riqueza e Diversidade Florística em Afloramentos Rochosos no Município de Esperança-Paraíba. *ACTA Geográfica*, 13 (31) 90-103. <https://doi.org/10.18227/21774307.acta.v13i31.3823>
- Prata, A.P.N., Amaral, M. C. E., Farias, M. C. V., Alves, M. V. (Eds.). (2013) Flora de Sergipe V1. [Recurso eletrônico]. Gráfica e Editora Triunfo. https://herbarioase.ufs.br/uploads/content_attachments/path/9484/flose1_final_-_baixa_-_visualizacao.compressed.pdf
- MapBiomias. (2023). Relatório Anual do Desmatamento no Brasil 2023. [Recurso eletrônico]. Brasil-MapBiomias. <http://alerta.mapbiomas.org>.
- Ramos, M.B., Diniz, F. C., Almeida, H. A., Almeida, G. R., Pinto, A. S., Meave, J. A., Lopes, S. F. (2020). The role of edaphic factors on plant species richness and diversity along altitudinal gradients in the Brazilian semi-arid region. *Journal of Tropical Ecology* 36 (5), 199-212. <https://doi.org/10.1017/S0266467420000115>
- Rocha, E. A & Agra, M. F. (2002). Flora do Pico do Jabre, paraíba, brasil: cactaceae juss. *Acta Botânica Brasília*, 16 (1), 15-21. <https://doi.org/10.1590/S01023306200200010004>
- Rodrigues, E. M., Queiroz, R. T., Silva, L. P., Monteiro, F. K. S., Melo, J. I. M. (2020). Fabaceae em um afloramento rochoso no Semiárido brasileiro. *Rodriguésia*, 71, 2-25. <https://doi.org/10.1590/21757860202071025>
- Salvador, M. S. S., Bernardo, I. E. S., Lima, V. R. P., Borges Neto, I. O. (2023). Florística no Lajedo do Bravo, Cariri paraibano. *Revista Geotemas*, 13 (1), 1-21. <https://doi.org/10.33237/2236255X.2023.5137>
- Sampaio-Diogo, I. J., Santos, K., Costa, I. R., Santos, F. A. M. (2021). Effects of topography and climate on Neotropical mountain forests structure in the semiarid region. *Applied vegetation science*, 24 (1), 12527. <https://doi.org/10.1111/avsc.12527>
- Silva, J.B. (2016). Panorama sobre a vegetação em afloramentos rochosos do Brasil. *Oecologia Australis*, 20 (4), 451-463. <https://doi.org/10.4257/oeco.2016.2004.05>
- Silveira, A.P., Menezes, B. S., Loiola, M. I. B., Lima-Verde, L. W., Zanina, DN., Carvalho, E. C. D., Souza, B. C., Costa, R. C., Mantovani, W., Menezes, M. O. T., Flores, L. M. A., Nogueira, F. C. B., Matias, L. Q., Barbosa, L. S., Gomes, F. M., Cordeiro, L. S., Sampaio, V. S., Batista, M. E. P., Soares Neto, R. L., Silva, M. A. P., Campos, N. B., Oliveira, A. A., Araujo, F. S. (2020). Flora and Annual Distribution of Flowers and Fruits in the Ubajara National Park, Ceará, Brazil. *Floresta e Ambiente*, 27 (2), 1-19. <https://doi.org/10.1590/21798087.005819>
- SUDEMA. Superintendência de Administração do Meio Ambiente. (2014). Áreas Protegidas. https://web.archive.org/web/20140203084851/http://www.sudema.pb.gov.br/index.php?option=com_content&view=article&id=724