



**UNIVERSIDADE DE BRASÍLIA**  
**INSTITUTO DE CIÊNCIAS BIOLÓGICAS**  
**DEPARTAMENTO DE BOTÂNICA**  
**PROGRAMA DE PÓS-GRADUAÇÃO EM BOTÂNICA**

**FLORA DE GOIÁS E DO DISTRITO FEDERAL: CACTACEAE**

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**Brasília – DF**

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Dissertação apresentada ao Programa de Pós-Graduação em Botânica do Departamento de Botânica, Instituto de Ciências Biológicas da Universidade de Brasília (UnB) como parte dos requisitos necessários para obtenção do título de Mestre em Botânica

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**Brasília, DF**  
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Trabalho realizado junto ao Programa de Pós-Graduação em Botânica da Universidade de Brasília, como requisito parcial para a obtenção do título de mestre em Botânica.

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## Resumo expandido

### Introdução

A família Cactaceae Juss. compreende 128 gêneros e 1450 espécies de plantas geralmente suculentas e de apelo ornamental. A distribuição das espécies está relacionada quase exclusivamente ao continente americano, com exceção para uma espécie que ocorre na África e Ásia. A família ocorre em todos os seis Domínios Fitogeográficos do Brasil, porém, devido a suas características de tolerância a ambientes áridos, a maior riqueza de espécies está relacionada às áreas do Leste do Brasil, que abriga o terceiro maior centro de endemismo para a família no mundo. No Brasil ocorrem 293 espécies distribuídas em 35 gêneros no país, dos quais 12 gêneros e 222 espécies são endêmicas. Enquanto as áreas de maior diversidade das Cactaceae brasileiras foram estudadas do ponto de vista florístico, a cobertura de estudos de outras regiões do país possui apenas estudos pontuais de florística. No caso dos estados do Centro-Oeste, ainda há carência de estudos florísticos das Cactaceae de Goiás e do Distrito Federal, tendo registro de 25 espécies em 12 gêneros para o Goiás e 3 espécies em 3 gêneros para o DF.

Estudos florísticos são de grande importância, especialmente em áreas onde a flora não é bem conhecida, em áreas protegidas e em hotspots de biodiversidade, porém mesmo em locais mais bem estudados estes estudos continuam a contribuir para o conhecimento e conservação da biodiversidade. Sendo assim, as floras regionais são pontos iniciais para a identificação de plantas, um passo essencial no desenvolvimento de estratégias de conservação e fornecem aos estudantes e pesquisadores de outras áreas informações taxonômicas sobre as plantas que os rodeiam, auxiliando nas identificações e no aprendizado e uso da terminologia botânica. Esses estudos fornecem informações cruciais sobre todos os recursos de que dispomos, em que quantidade e onde. Sendo necessário que esta informação seja continuamente atualizada e, por conseguinte, as propostas de estudos baseados em levantamentos devem ser adequadamente apoiadas. Para isso, deve haver um esforço contínuo por parte dos pesquisadores, estudantes de pós-graduação e graduação, destacando a necessidade de impulsionar as agências de fomento a apoiarem estes estudos. Tendo em vista que, a destruição de habitats devido à mineração, expansão urbana, retirada de areia, plantação extensiva de eucalipto, café e frutíferas, bem como coleta indiscriminada de espécies ornamentais de pequeno porte faz com que grande proporção das espécies esteja em perigo de extinção. No caso particular das Cactaceae, os estudos florísticos dependem de obter material identificável das espécies ocorrentes na região. Quase

sempre deixadas de lado pelos botânicos, as Cactaceae têm um número de espécimes depositados em herbários pouco condizente com a sua diversidade, sendo muitas vezes conhecidas por apenas uma coleta. Devido à dificuldade de preparar espécimes destas plantas suculentas, as exsiccatas, quando preservadas, são pouco informativas para preparar descrições florísticas detalhadas, ou para determinar os limites específicos dos táxons. Os dados de coletores-amadores são extremamente valiosos para obter informações relativas às espécies, sua distribuição e detalhes morfológicos, porém estes utilizam publicações difíceis de obter, e, por vezes, os detalhes da procedência das espécies são mantidos em segredo.

### Materiais e métodos

Iniciamos levantamento e estudo florístico detalhado das espécies nativas de Cactaceae para DF e GO com objetivo de preencher uma lacuna de conhecimento sobre a família no Planalto Central do Brasil. Primeiramente, foram feitas consultas virtuais através dos bancos de dados dos sites Jabot, Specieslink e Re flora: Flora e Funga do Brasil, obtendo a informação de espécimes de Cactaceae nativas com distribuição registrada para Goiás e o Distrito Federal. Os herbários UB e IBGE foram conferidos, acrescentando os registros ao trabalho com as devidas determinações das identificações das exsiccatas. Outra etapa foram as coletas, campos periódicos buscando visitar localidades de coletas registradas em dados de herbários ou de coletores-amadores e locais propícios para a ocorrência de espécies de Cactaceae, como afloramentos rochosos de diversos tipos encontrados nesses estados, que começaram em março de 2024 até janeiro de 2025, com coletas realizadas em matas secas do DF em bordas de cavernas, na Chapada dos Veadeiros em distintos municípios, em campos rupestres e conta com pontos em Cristalina-GO e Pirenópolis-GO.

### Resultados

Sendo assim, as Cactaceae em Goiás e no Distrito Federal compreendem 24 espécies dos seguintes gêneros, sendo os mais ricos em espécies na região *Pilosocereus* (8 spp.), *Cereus* (5 spp.), *Discocactus* (3 spp.), enquanto *Arrojadoa*, *Coleocephalocereus*, *Epiphyllum*, *Melocactus*, *Praecereus*, *Rhipsalis*, *Selenicereus* (todas Cactoideae) e *Tacinga* (o único membro da subfamília Opuntioideae registrado para a área estudada) possuem um representante cada na região. Todas as espécies estudadas ocorrem em GOIÁS, ao passo que três dessas espécies ocorrem também no Distrito Federal (*Cereus pierrebraunianus*, *Epiphyllum phyllanthus* e *Selenicereus setaceus*).

Espécies de Cactaceae de Goiás do DF	
1	<i>Arrojadoa rhodantha</i> (Gürke) Britton & Rose
2	<i>Cereus alex-bragae</i> (P.J.Braun & Esteves) M.Köhler
3	<i>Cereus bicolor</i> Rizzini & A. Mattos
4	<i>Cereus calcirupicola</i> (F. Ritter) Rizzini
5	<i>Cereus mirabella</i> N.P. Taylor
6	<i>Cereus pierrebraunianus</i> Esteves*
7	<i>Coleocephalocereus neoestesvii</i> N. P. Taylor
8	<i>Discocactus catingicola</i> Buining & Brederoo
9	<i>Discocactus diersianus</i> Esteves
10	<i>Discocactus fariae-peresii</i> Braun
11	<i>Epiphyllum phyllanthus</i> (L.) Haw.*
12	<i>Melocactus levitestatus</i> Buining & Brederoo
13	<i>Pilosocereus albissimus</i> P. J. Braun & Esteves
14	<i>Pilosocereus cristalinensis</i> P. J. Braun & Esteves
15	<i>Pilosocereus diersianus</i> (Esteves) P.J. Braun
16	<i>Pilosocereus juaruensis</i> (Buining & Brederoo) P.J.Braun
17	<i>Pilosocereus machrisii</i> (E. Y. Dawson) Backeb.
18	<i>Pilosocereus novaromanus</i> Olsthorn & Oliveira-Pereira
19	<i>Pilosocereus parvus</i> (Diers & Esteves) P. J. Braun
20	<i>Pilosocereus vilaboensis</i> (Diers & Esteves) P. J. Braun
21	<i>Praecereus euchlorus</i> (F. A. C. Weber ex K. Schum.) N.P.Taylor
22	<i>Rhipsalis lindbergiana</i> K.Schum
23	<i>Selenicereus setaceus</i> (Salm-Dyck) A.Berger ex Werdermann*
24	<i>Tacinga saxatilis</i> (F. Ritter) N. P. Taylor & Stuppy

Lista de espécies de Cactaceae nativas de Goiás e do DF. \*indicando as três espécies com ocorrência no DF.

### Considerações finais

Em relação às espécies endêmicas, listamos *Cereus alex-bragae*, *Discocactus fariae-peresii* e cinco das oito espécies de *Pilosocereus* (*P. cristalinensis*, *P. diersianus*, *P. machrisii*, *P. novaromanus*, *P. vilaboensis*) como endêmicas do estado de Goiás. Em termos de litologias, algumas espécies são exclusivas de afloramentos calcários, como *Cereus calcirupicola*, *Cereus pierrebraunianus*, *Coleocephalocereus neoestesvii*, *Melocactus levitestatus*, *Pilosocereus albissimus*, *P. diersianus* e *P. novaromanus*. Também descobrimos que algumas espécies estão associadas a rochas cristalinas, como afloramentos quartzíticos, nomeadamente *Discocactus diersianus*, *Pilosocereus cristalinensis*, *P. machrisii* e *P. vilaboensis*, enquanto algumas espécies ocorrem em rochas ígneas e graníticas, como *Cereus bicolor* e *Praecereus*

*euchlorus*. *Discocactus catingicola* demonstrou ampla preferência, crescendo tanto em fissuras rochosas em afloramentos quartzíticos quanto em solos arenosos profundos de cerrado, e então junto com *Cereus mirabella*. A complexa litologia do estado de Goiás é refletida pela diversidade de cactos no estado. Apesar de estar completamente incluído no Cerrado, o estado de Goiás abriga uma disjunção significativa de Caatinga em Nova Roma, município que inclui afloramentos de calcário e rochas ígneas em seu território, onde florestas secas abrigam *Arrojadoa rhodantha*, uma espécie endêmica da Caatinga, que cresce ao lado de espécies de *Cereus*, *Pilosocereus* e *Melocactus*.

Apesar dos esforços empreendidos para elaboração do presente trabalho, o número de Cactaceae encontrado em Goiás e Distrito Federal (24 espécies distribuídas em 11 gêneros) ainda pode estar subestimado, havendo possibilidade de novas descobertas à medida que os esforços de coleta se intensifiquem, sendo o oeste goiano e também a divisa entre Goiás e Minas Gerais possíveis regiões onde espécies adicionais da flora poderão ser registradas.

## Flora de Goiás e do Distrito Federal: Cactaceae

Cactaceae of Goiás and Distrito Federal, Brazil

Cactaceae de Goiás e Distrito Federal, Brasil

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### Abstract

The taxonomic treatment of the native Cactaceae in the state of Goiás (GO) and Distrito Federal (DF) is presented. Considerable collection effort was performed to ensure that material was preserved in what is a plant family widely known by amateurs and with shortage of herbarium material. Cacti in the Cerrado are more often associated with different lithobiomes in a matrix of cerrado or dry forests. This treatment includes an identification key for genera and species, descriptions, comments on diagnostic and ecological characteristics, species distribution, conservation status, and illustrations. Twenty-four species were recorded in the study area, with a predominance of *Pilosocereus* (8 species), *Cereus* (5 spp.), *Discocactus* (3 spp.) and the remaining 8 genera represented by one species. Of the 24 species, *Cereus alex-bragae*, *Discocactus faria-peresii*, *Pilosocereus cristaliniensis*, *P. machrisii*, *P. novaromanus* and *P. vilaboensis* endemic for Goiás. Three species were found in the Distrito Federal (*Cereus pierrebraunianus*, *Epiphyllum phyllanthus* and *Selenicereus setaceus*) are all represented elsewhere in Goiás.

**Key words:** cacti, Central-Western region, Cerrado, distribution, floristics, taxonomy

## Resumo

O tratamento taxonômico das Cactaceae nativas do estado de Goiás (GO) e do Distrito Federal (DF) é aqui apresentado. Um considerável esforço de coletas foi empregado para assegurar a existência de material preservado para esta família de plantas que é amplamente conhecida por amadores, porém pouco representada em coleções de herbário. No Cerrado, as espécies de Cactaceae estão mais frequentemente associadas com diferentes litobiomas numa matriz de cerrado ou florestas secas. Este tratamento inclui uma chave de identificação para os gêneros e espécies, descrições, comentários diagnósticos e ecológicos, distribuição e estado de conservação das espécies e ilustrações. Vinte e quatro espécies foram registradas na área de estudo, com predomínio de *Pilosocereus* (8 espécies), *Cereus* (5 spp.) e *Discocactus* (3 spp.), das quais *Cereus alex-bragae*, *Discocactus faria-peresii*, *Pilosocereus cristaliniensis*, *P. machrisii*, *P. novaromanus* e *P. vilaboensis* são endêmicas de Goiás. As três espécies encontradas no Distrito Federal (*Cereus pierrebraunianus*, *Epiphyllum phyllanthus* e *Selenicereus setaceus*) estão representadas também em Goiás.

**Palavras-chave:** cactos, Cerrado, distribuição geográfica, florística, região Centro-Oeste, taxonomia

## 1. Introduction

The Cactaceae include mainly succulent plants that may comprise between 128 genera and 1450 species (Hunt *et al.* 2006, 2013) and 150 genera and 1851 species (Korotkova *et al.* 2021), distributed almost exclusively in the Americas, *Rhipsalis baccifera* (Muell.) Stearn, that reaches as far as Madagascar and Sri Lanka (Taylor & Zappi 2004; Goettsch *et al.* 2015). In Brazil there are 293 native species recorded, distributed in 35 genera, with 12 genera and 222 species endemics to this country (Flora e Funga do Brasil 2025). Eastern Brazil includes the third largest endemism centre for the family and has been the subject of comprehensive studies in the last two decades (Taylor & Zappi 2004; Taylor & Zappi 2018; Taylor *et al.* 2022; Taylor *et al.* 2023; Taylor *et al.* 2024) that established the delimitation of genera and species and brought to light taxonomic novelties.

Cacti are perennial plants with stem generally succulent and photosynthetic with diverse shapes and sizes, and has, among its synapomorphies, the presence of axillary meristems represented by areoles that have the potential to produce vegetative or reproductive branches, as well as trichomes, spines and leaves (in some groups), and flowers bearing receptacular

inferior ovaries (Boke 1980; Gibson & Nobel 1986). While the species of subfamily Pereskioideae (incl. *Leuenbergeria* Lodé) have well developed leaves, Maihuenioideae and Opuntioideae have deciduous, succulent leaves and the Cactoideae bear no leaves (Hunt *et al.* 2013). Flowers in this family are showy, originate from areoles that may be modified, many times appear solitary, generally with radial symmetry, the outer pericarpel and flower-tube have may have areoles and bract-scales or may be smooth, the flower-tube varies from short to conspicuous, perianth segments are spirally arranged, transitioning between outer perianth segments that are sepaloïd and inner petaloïd ones, numerous stamens inserted inside the flower-tube, stigma lobes numerous, reflecting the number of carpels fused in the ovary, unilocular ovary with parietal placentation and numerous ovules attached to the ovary wall through well developed funicula. Fruits are baccaceous, dehiscent or indehiscent, rarely dry, with diverse shapes, colour and sizes, and cochleariform seeds (Zappi & Taylor 2017).

Cacti are distributed throughout the phytogeographic domains of Brazil (Zappi & Taylor 2020; Meiado & Almeida 2022) however, due to their tolerance to water shortage and desiccation, the highest diversity is found in arid and semiarid areas, with two diversity centres in Brazil. The first area is in the *campos rupestres* of Minas Gerais and Bahia, in the Espinhaço Sul and Chapada Diamantina Provinces (Colli-Silva *et al.* 2019), with high degree of diversity and endemism, and where the habitat destruction is due to mining, urban expansion, removal of sand, eucalypt, coffee and fruit monocultures, as well as indiscriminate collection of small, ornamental species cause a large proportion of species to be currently threatened. The second diversity centre, found in the Pampa domain, also has high degree of diversity for the family, while the species that occur there are not so expressively endemic to Brazil, as many occur also in bordering areas of Uruguay, Argentina and Paraguay. The constant threats there are extensive cattle ranging and the growth of agribusiness, as well as plant collection, pushing the number of endangered species up in this region (Dias & Teixeira 2021; Goettsch *et al.* 2015).

The use of Cactaceae species by man has been recorded for 57% of its species, mostly as ornamental (674 species), food (154 species) and medicine (64 species) sources, with a large part of the endangered species being collected for ornamental use (Goettsch *et al.* 2015). Cactus uses in Northeastern Brazil were recorded in a rural community of Paraíba state, with animal fodder, followed by human food and building being the major uses for species of the family (Lucena *et al.* 2013). Inhabitants of five municipalities in inner Bahia state recorded diverse uses for Cactaceae in the region, under medical, growth-mass, ludic, aesthetic, economic, mystical, erotic and domestic use categories (Andrade *et al.* 2006).

Floristic studies are of the utmost importance to determine the diversity of areas where the flora is not very well known, in protected areas and in biodiversity hotspots, but also in better known regions where these continue to contribute to the knowledge and conservation of the plant diversity (Wagensommer 2023). Therefore, regional floras are important starting points to identify plants, an essential step in the development of conservation strategies, providing students, researchers and practitioners with valuable information regarding taxonomy and distribution of the plants that surround them, helping them to identify them and also to learn botanical terminology (Barkworth 2020). These studies also include insights on the available resources and their localization, making survey proposals indispensable and worthy of support (Uniyal & Singh 2013). Continuous effort from researchers, post-graduate and graduate students is very important to convince funding agencies to support this type of baseline research (Almeida *et al.*, 2023).

In the particular case of the Cactaceae, as stated more than twenty years ago by Taylor & Zappi (2004), the completion of floristic studies is dependent on obtaining identifiable material of the species occurring in the study region (in that case Eastern Brazil). Almost always left aside by botanists, the biological collections of cacti found in herbaria is often not representative of their diversity, with species often being known from a single collection. Due to their succulence, cactus specimen preparation is deemed difficult and, when the specimens are prepared, these are often incomplete and with poor notes, being of little use to inform floristic descriptions and to determine specific limits of the taxa. For cacti, data from amateur collectors are very valuable to obtain information regarding the species, their distribution, or morphological details, however these information are published in specific, hard to obtain journals, and sometimes the provenance details of the species may be obscured by the authors.

While the areas with highest floristic diversity of Cactaceae in Brazil were studied (Taylor & Zappi 2004, Carneiro *et al.* 2016), other Brazilian regions have not been investigated as a whole, with occasional floristic studies (Soller *et al.* 2014; Peixoto *et al.* 2016; Zappi *et al.* 2018; Zappi & Taylor 2017; Menezes *et al.* 2013). The need to study the Cactaceae in the Central-Western region of Brazil is addressed by the present study of the family in Goiás and Distrito Federal.

## **2. Material and methods**

### **2.1. Study area**

The state of Goiás (Fig. 1) covers an area of 340,242.860 km<sup>2</sup>, varying in altitude between 200 and 1100 m a.s.l., with peaks in the Pirineus (1300 m), Cristalina (1400 m) and

Chapada dos Veadeiros (1800 m) regions. The state includes Am, Aw, Cwa and Cwb climate types, with the northwest of the state being the hottest and with the mildest climate measured between Goiânia and Anápolis; precipitation wise, the central-north of the state and the municipality of Piracanjuba, in the southeast, recorded the highest rain volumes (Cardoso *et al.* 2014). Goiás and the Federal District are found within the Cerrado dominium. The Distrito Federal comprises an area of 5,760.783 km<sup>2</sup>, with altitudes between 750 and 1350 m a.s.l. and Aw climate type (Cardoso *et al.* 2014).

The phytophysionomies found within these two federative units vary between forest types (ciliar and gallery forests, dry forest and *cerradão*), savannic types (dense, typical and sparse cerrado, *cerrado rupestre*, *vereda*), and open vegetation, or *campos* (*campo sujo*, *campo limpo*, *campo rupestre*) (Ribeiro & Walter 2008). Fieldwork was concentrated in cerrado rupestre and campo rupestre areas as these are most promising vegetation types for the establishment of rupicolous or sometimes terrestrial cacti. The dry forests can also harbour terrestrial cactus species, and epiphytic species occur in forest types. The geomorphology and geology of the region are very complex (Lacerda Filho *et al.* 1999), and Cactaceae are almost always associated to limestone rock outcrops (karstic) of the Bambuí group, or with different crystalline or sedimentary rocks that are exposed by erosion in mountain ranges (Taylor & Zappi 2004), orienting the search for cactus species in these areas.

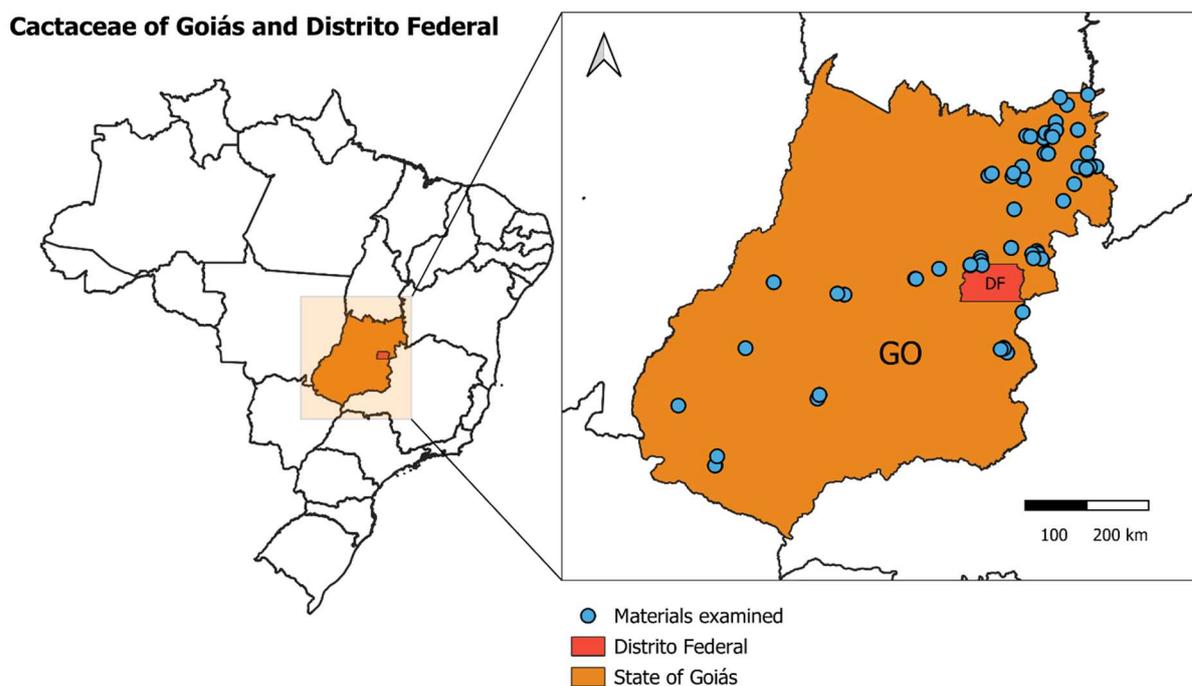


Figure 1. Map of the state of Goiás highlighting points where the materials examined occur.

## 2.2. Plant collections

All native species of Cactaceae within the federative units Goiás and Distrito Federal were contemplated by this study. Periodical fieldwork in previously recorded (herbarium records, cactus amateur information) or new areas likely to harbour cacti, such as rock outcrops dispersed through these areas was carried out. Cactus amateur knowledge and information was very important to direct collecting efforts, as they rarely perform material herborization. Because of their succulent, water-storing nature, cactus specimens have to be prepared according to specific techniques, and we followed Davies *et al.* (2024), collecting whole plants (in the case of *Discocactus* and *Melocactus*) and branches between 20 and 40 cm long for cereoid genera, and performed transversal sections (to preserve the rib number) and longitudinal (to show the disposition of areoles and floriferous regions), elimination a large quantity of the parenchymatic tissues before pressing and drying in appropriate drying stove. In the case of very fleshy plants, 2 minutes exposure of the cut parts to a microwave in full power and drying the liquid that forms on the surfaces prior to placing in the plant press is recommended to speed up the drying process. Delicate parts, as flowers and fruits, can be dried separately. We also preserved flowers and fruits in alcohol 70% to be able to study and measure the structures and, after study, these can be dried and added to the vegetative specimen so that this valuable material is preserved. The specimens, together with a spreadsheet with collection data, were deposited in the Universidade de Brasília herbarium (UB).



Figure 2. Methodology for preserving cacti – a. herbarium sheet. b. field collection. c. preparing material for drying. d. material ready to dry.

### 2.3 Consolidation of the data and preparing descriptions

Considering the dimensions of the state of GOIÁS it was not possible to visit all the places in search of Cactaceae species. In order to prepare this floristic treatment we used new collections referred above as well as specimens previously deposited in herbaria, studied in visits to the herbaria of the Distrito Federal (UB and IBGE) (acronyms according to Thiers 2024, continuously updated) and in online searches of specimens with images in the sites Specieslink (<https://specieslink.net/>), JABOT - Sistema de Gerenciamento de Coleções Botânicas Brasileiro, at the Instituto de Pesquisas Jardim Botânico do Rio de Janeiro (<https://jabot.jbrj.gov.br/v3/consulta.php>) and REFLORA

(<https://floradobrasil.jbrj.gov.br/consulta/>), downloading all information pertinent to Cactaceae specimens recorded for Goiás and Distrito Federal. The geographic distribution of the taxa was established using our collections, herbarium specimens and literature data (Soller *et al.* 2014). Descriptions were prepared using field observations and pressed material, using terminology developed by Zappi (1994), Taylor & Zappi (2004) and other specific literature specific for the family (Santos *et al.* 2015). As the Cactaceae were globally evaluated according to the IUCN criteria (Goettsch *et al.* 2015), the categories found in the IUCN (2024) were used or, in particular cases, bibliographic references were added to support the category attribution.

### 3. Results and discussion

A total of 32 new collections belonging to 17 species were added to the UB herbarium as part of this project. Together with the material found in herbaria, it was possible to establish that there are 11 genera and 24 species of Cactaceae native from Goiás and the Distrito Federal. The most speciose genera found were *Pilosocereus* (8 spp.), *Cereus* (5 spp.) and *Discocactus* (3 spp.). The genus *Tacinga* is the only representative of Subfamily Opuntioideae in the study area, while the remaining genera belong to subfamily Cactoideae, and *Arrojadoa*, *Cereus*, *Coleocephalocereus*, *Pilosocereus* and *Praecereus* have columnar, shrubby or tree-like habit, *Discocactus* and *Melocactus* species are globose to disc-shaped, aggregate or solitary. The two epiphytic cacti found (*Epiphyllum phyllanthus* and *Rhipsalis lindbergiana*) were recorded in forests and a creeping cactus, *Selenicereus setaceus*, was found in forests near rock outcrops. Considering their habitat, rock outcrops in limestone, arenitic or quartzitic rocks were the best places to find cacti in the region. Of the 24 Cactaceae species recorded in Goiás, three occur also in the Distrito Federal, where no exclusive species were recorded.

Therefore, from an initial list of 25 species distributed in 12 genera, with two of them endemic to Goiás, we came to a total of 24 species in 11 genera, of which 6 are considered endemic for the state. The initial list counted with several taxa that were excluded from this work due to lack of records (*Discocactus hartmannii*, *D. heptacanthus*, *Pilosocereus flexibilispinus*, *P. pusillibaccatus* and *R. russellii*). Meanwhile, *Pereskia aculeata* was excluded as all records for Goiás have proven to be from cultivation. The new records were *R. lindbergiana*, as well as the recognition of four endemic species from Goiás (*Cereus alex-bragae*, *D. fariae-peresii*, *P. cristaliniensis* and *P. novaromanus*), For the DF, three species were recorded and *C. mirabella* was excluded due to lack of collections, and *C. pierrebraunianus* was included as new determinations and collections were made.

Among the cultivated species recorded in the region we found *Pereskia aculeata* Mill. (ora-pro-nobis – Burchell 7347 - K) *Opuntia (Nopalea) cochenillifera* (L.) Mill. (palma), *Selenicereus undatus* (Haw.) D.R.Hunt (pitaia), all occurring in disturbed vegetation or city squares and gardens, both in Goiás and Distrito Federal.

### Key for the genera and species of Cactaceae of Goiás and Distrito Federal

- 1. Epiphytic plants ..... 2
- 1'. Terrestrial or rupicolous plants ..... 3
- 2. Branches flattened ..... 5.1. *Epiphyllum phyllanthus*
- 2'. Branches cylindric ..... 9.1. *Rhipsalis lindbergiana*
- 3. Stem globose, pyramidal or disc-shaped, apical cephalium..... 4
- 3'. Shrubs, subshrubs or climbers, cephalium ring-like or lateral when present ..... 7
- 4. Ribs not divided in tubercles, flowers red, shorter than 2 cm, opening in the afternoon ..... 6.1. *Melocactus levitestatus*
- 4'. Ribs divided in tubercles, flowers white or cream, longer than 3 cm, night opening ..... (Discocactus) 5
- 5. Mature individuals globose, 17 cm wide or more when fertile..... 5.3. *D. fariae-peresii*
- 5'. Mature individuals disc-shaped, less than 17 cm wide when fertile..... 6
- 6. Cephalium with densely disposed black, poignant bristles..... 5.2. *D. diersianus*
- 6'. Cephalium without densely disposed bristles, bristles not sharp..... 5.1. *D. catingicola*
- 7. Scrambler or climber with trigonous stems..... 10.1. *Selenicereus setaceus*
- 7'. Erect plants, branches never trigonous (flattened, or 4 or more ribbed)..... 8
- 8. Stems flattened, areoles with glochids, flower-tube short to absent ..... 11.1. *Tacinga saxatilis*
- 8'. Stems cylindric, glochids absent, flower-tube well-developed, always longer than ..... pericarpel..... 9
- 9. Shrubs with ring-cephalium and magenta flowers ..... 1.1. *Arrojadoa rhodantha*
- 9'. Trees or shrubs, cephalium lateral or absent..... 10
- 10. Lateral cephalium lacking, floriferous areoles totally glabrous ..... 11
- 10'. Lateral cephalium or floriferous region differentiated, with hairy areoles ..... 16
- 11. Flowers and fruits with rounded scales, flowers to 8 cm long.....

.....	8.1. <i>Praecereus euchlorus</i>	
11'. Flowers and fruits without rounded scales, flowers 9 cm long or over ....	( <i>Cereus</i> )	12
12. Pericarpel, flower-tube and fruit with conspicuous spinescent areoles .....		
.....	2.1. <i>C. alex-bragae</i>	
12'. Pericarpel, flower-tube and fruit naked or with very occasional areoles.....		13
13. Shrubs with arching branches to 3 cm diam., 4 ribs, perianth segments remaining attached to fruit.....	2.4. <i>C. mirabella</i>	
13'. Shrubs with erect branches with over 5 cm diam., ribs 5-10, rarely less, perianth segments falling early in fruit formation.....		14
14. Cacti forming a distinct trunk, flower over 20 cm long.....	2.3. <i>Cereus calcirupicola</i>	
14'. Cacti not forming a distinct trunk flower up to 18 cm long.....		15
15. Spines pungent, pale brown, fruits ovoid or oblong, pink when ripe ....	2.2. <i>C. bicolor</i>	
15'. Spines soft, not pungent, dark brown, spines not pungent, fruits rounded, green passing to yellow when ripe .....	2.5. <i>C. pierrebraunianus</i>	
16. Plants columnar, unbranched unless harmed, lateral cephalium deeply inserted, branches with around 30 ribs, epidermis blue-green, fruits indehiscent.....		
.....	3.1. <i>Coleocephalocereus neoestesvesii</i>	
16'. Lateral cephalium superficial or absent, branches with 11 to 24 ribs, fruits dehiscent by irregular central slit .....	( <i>Pilosocereus</i> )	17
17. Lateral cephalium present .....	7.3. <i>P. diersianus</i>	
17'. Lateral cephalium absent .....		18
18. Plants reaching 40 cm tall .....	7.7. <i>P. parvus</i>	
18'. Plants over 50 cm tall, often branched above the base .....		19
19. Stem 6-12 ribs, flowers externally olive-green .....		20
19'. Stem 11 or more ribs, flowers externally pinkish-red.....		22
20. Stems with scarce hair, even in flowering areoles .....	7.6. <i>P. novaromanus</i>	
20'. Stems with abundant hair, especially in flowering areoles.....		21
21. Floriferous areoles with bristles to 4 cm long, flower-tube straight	7.1. <i>P. albissumus</i>	
21'. Floriferous areoles without noticeable bristles, clad in golden hair, flower-tube infundibuliform .....	7.4. <i>P. jauruensis</i>	
22. Areoles rounded, raised, golden, epidermis green .....	7.8 <i>P. vilaboensis</i>	
22'. Areoles sunken, elongated, darkened, epidermis glaucous.....		23
23. Shrubs to 1 m tall, funicular pulp magenta .....	7.2. <i>P. cristalinensis</i>	
23'. Shrubs over 1 m tall, funicular pulp white.....	7.5. <i>P. machrisii</i>	

## 1. *Arrojadoa* Britton & Rose

According to the recent circumscription presented by Romeiro-Brito *et al.* (2023b), *Arrojadoa* comprises 13 species, all endemic from Eastern Brazil apart from *A. rhodantha*, that has a wider distribution reaching Goiás (Flora e Funga do Brasil, 2025). The habit of the species of this genus is varied, from globose to shortly cylindrical, branched or not, and some have ring-cephalium. The flowers are small to medium (2–10 cm), tubular, the pericarpel is small and flower-tube smooth or with few inconspicuous scales, perianth segments are relatively small, not very expanded, flowers diurnal or nocturnal, pollinated by hummingbirds or bats. The berries are indehiscent or sometimes present a basal pore (*A. leucostele* (Gürke) N.P.Taylor), and the perianth remains are persistent, blackened. The young seedlings known thus far are initially globose, only later becoming cylindrical.

### 1.1. *Arrojadoa rhodantha* (Gürke) Britton & Rose, Cactaceae 2: 170 (1920). Fig.3

Shrubby, basally branched cactus reaching 1 m tall, articulated stems 30–45 × 2.5–3.5 cm, epidermis pale-green, 9–12 straight ribs, areoles 0.4–1 cm apart, areoles 2 mm diam., with white trichomes, 10(–15) spines 0.5–1 cm long, radial and central very similar, yellowish at base, distally reddish. Cephalium terminal forming rings and terminating stem growth; flowers magenta, tubular, opening in the morning, c. 25 × 7.5 mm; pericarpel c. 10 × 7 mm, flower-tube 8 × 6 mm, without bracts and/or areoles, outer perianth segments 4 × 3 mm, inner c. 3 × 2 mm, nectar chamber c. 6.5 × 4 mm, anthers exerted, yellow, style 19 × 1 mm, stigma c. 2 × 2 mm, 5-lobed. Fruit ovoid, 15 mm long, indehiscent, reddish-green, perianth remains erect; funicular pulp scant, white; seeds c. 1.2 mm, cochleariform, blackish, dull, testa cells convex.

**Specimens examined:** GOIÁS. Mun. Nova Roma, GO 241, 13°36'27"S 47°0'52"W, 25.VII.2024, *A.G. Torres-Cardoso & C.O. Moura 35* (UB). *l.c.* 13°39'S 47°00'W, 31.VII.2000, fl. *R.C. Forzza et al. 1586* (SPF e Kew). *l.c.*, 13° 38' 25" S 47° 1' 0" W, 3.XII.2003, fl. e fr., *R. C. Forzza et al. 2540* (SPF). *l.c.*, Estrada paralela ao rio Paranã, 13°33'42"S 46°58'40"W, 27.VII.2024, *A. G. Torres-Cardoso & C. O. de Moura 39* (UB).

Conservation status (IUCN, 2024): LC

Widely distributed in Northeastern Brazil, *A. rhodantha* has been recorded in the states of Bahia, Ceará, Paraíba, Pernambuco and Piauí, and also in Northern Minas Gerais. In the state of Goiás this species occurs in a single isolated area with small extension of dry, semidecidual

forest together with other Caatinga species (Moro et al. 2024), around small granitic outcrops, in the municipality of Nova Roma.

The closest species to *A. rhodantha* is *A. penicillata* (Gürke) Britton & Rose, differing by its morning opening flowers and generally thicker branches without widened apex (vs. late afternoon anthesis, thinner branches, cephalium widened at the apex of the stems in *A. penicillata*).

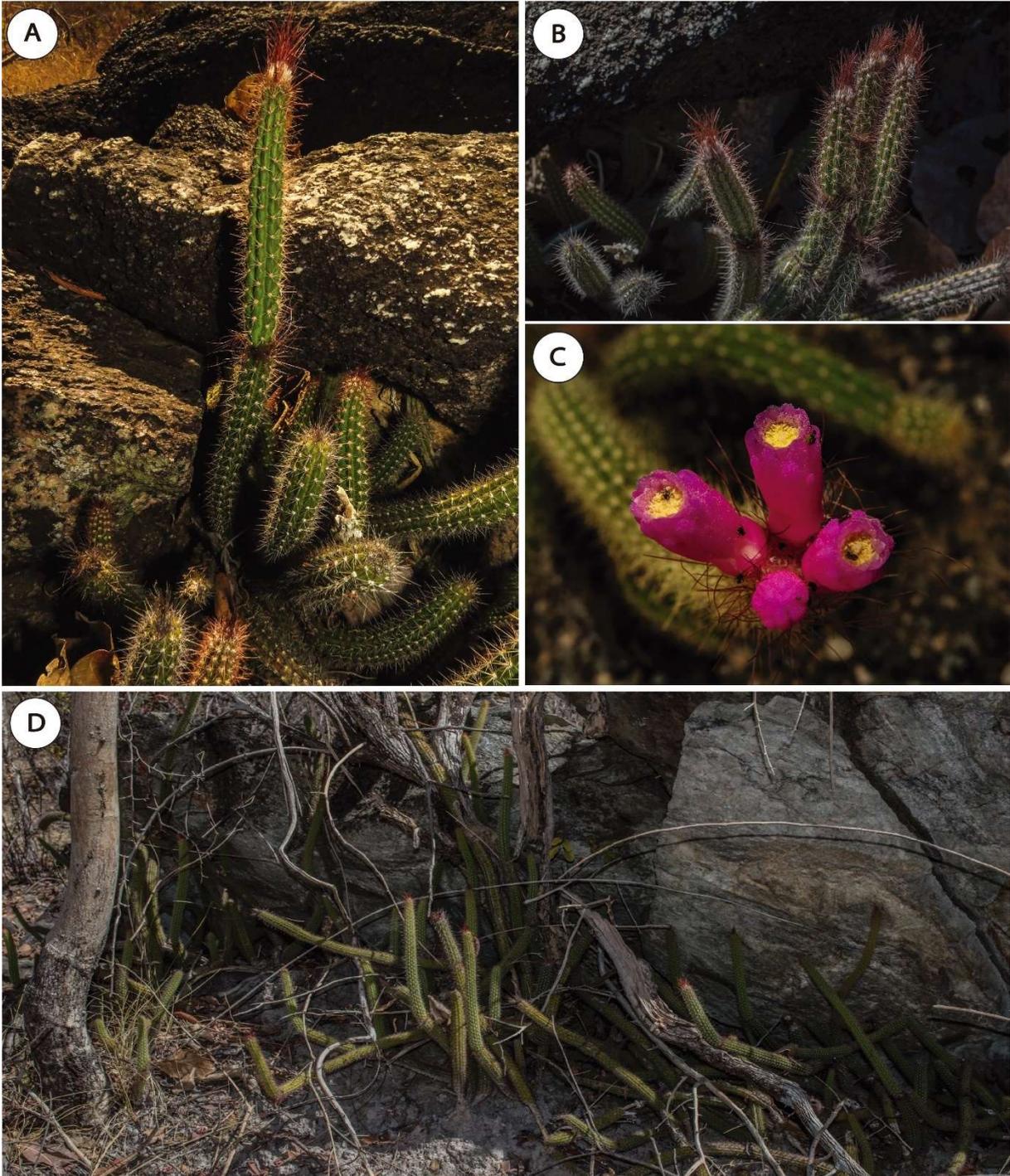


Figure 3. *Arrojadoa rhodantha* – a, d. shrubby habit. b. ring-like cephalium. c. three flowers and a flower-bud. Photos a, c. A.G. Torres-Cardoso; b, d. C.O. Moura.

## 2. *Cereus* Mill.

According to the recently presented phylogeny for this genus (Taylor *et al.* 2023), it comprises 33 species of which 22 occur in Brazil, where 12 are endemic and four occur in Goiás. Our fieldwork has confirmed the distinct identity of *Cereus alex-bragae*, adding another Brazilian species endemic to Goiás to the account. This genus includes tree-like and shrubby cacti that sometimes may be creeping or climb by leaning on surrounding vegetation. Some species have clear annual constrictions, very thick, sometimes glaucous epidermis with dense epicuticular wax (Silva *et al.* in press), while others have thinner, not constricted branches. Rib number varies between 3–14, spines are numerous and acicular, divided between stronger, erect central and shorter, peripheric radials. The floriferous region is not strongly differentiated, lacking hairs and bristles, and flowers are large, infundibuliform, with elongated pericarpel and flower-tube, sometimes presenting areoles in the outside, perianth segments delicate, white, opening at night and pollinated by hawkmoths (Albuquerque-Lima *et al.* 2023). Fruits are globose to ovoid or oblong, generally red, sometimes yellow, dehiscent by longitudinal slits or indehiscent, funicular pulp generally white.

**2.1. *Cereus alex-bragae*** (P.J.Braun & Esteves) M.Köhler, *Phytotaxa* 641 (3): 238–242, 2024.

*Estevesia alex-bragae* P.J.Braun & Esteves, *Kakteen And. Sukk.* 60(3): 64, 2009.

Fig. 4a,b

Shrubby, mostly basally branched cactus reaching 1.7 m tall, articulated stems to 90 × 2.5–4 cm, epidermis dark-green, 8 straight ribs, areoles 1 cm apart, 5 mm diam., with white to grey trichomes, 8(–12) pungent spines, two central to 3 cm long, yellowish, radials to 1.5–2 cm long, dark-brown. Flowers (Braun & Esteves 2009) 13.5–17.0 cm long; pericarpel c. 14 × 16 mm, elongated, blue-green, flower-tube 12.5–15.5 × 1 cm, with spiny areoles 5mm diam., with brown hairs, 6–9 spines to 9mm long, slender, pungent, pale-yellow, and fleshy, narrowly triangular bracts 2.8–16 × 3.5 mm, greenish-brown; perianth segments strongly reflexed, outer perianth segments lanceolate to spatulate, 23–63 × 4–8 mm, greenish or pinkish brown to wine-coloured, inner segments rounded 48–58 × 8.2–13 mm, fimbriate margin, pure white; nectar chamber c. 68 × 4.3 mm, anthers exerted c. 3.2 × 0.8 mm, yellow, style 36 mm long, white, stigma c. 13–18 × 0.7–0.9 mm, 9–11-lobed. Fruit oblong, 6 × 4 cm, dark to bluish green,

ripening yellow and with deciduous areoles, perianth remnants not deciduous in fruit, funicular pulp translucent, whitish; seeds cochleariform  $3.5\text{--}4.2 \times 2\text{--}2.5$  mm.

**Specimens examined:** GOIÁS. Mun. Formosa, Sítio arqueológico do Bisnau,  $15^{\circ}18'33''$  S  $47^{\circ}7'7''$ W, 22.XI.2024, A.G. Torres-Cardoso, B. Schindler & C.O. Moura 58 (UB), fr.

Conservation status (IUCN, 2024): CR

Endemic from the state of Goiás, *Cereus alex-bragae* is known from a single locality in Bisnau (Mun. Formosa). According to Braun & Esteves (2009), the night-blooming flowers have an acidic scent and are pollinated by sphingids and bats, however this has to be verified by pollination biology studies as, thus far, there is no evidence of bat-pollinated *Cereus* in Brazil. Romeiro-Brito *et al.* (2023b) and Taylor *et al.* (2023) have shown that this taxon has strong affinities with two sister taxa, *Cereus mirabella* (see below) and *C. albicaulis* Luetzelb., however the taxon had not been recognized at specific level due to lack of information. Köhler (2024) transferred the name from *Mirabella* to *Cereus*, listing the following differences between the species: branches with more ribs (7–10 in *C. alex-bragae* and 3–5 in *C. mirabella*), smaller distance between areoles (<1 apart in *C. alex-bragae* and 2–3 cm apart in *C. mirabella*) and more spines (6–11(–13) in *C. alex-bragae* and (–2)3(–6) in *C. mirabella*). The presence of denser areoles and spines in the pericarpel and flower-tube of *C. alex-bragae* are distinctive for the species. Meanwhile, Caatinga dwelling *C. albicaulis* has less ribs (4–6), less spines (up to 7) and glaucous epidermis, as well as white wood (vs. yellowish in *C. mirabella*), and subterranean storage structure not developed (vs. taproot in *C. mirabella*).

**2.2. *Cereus bicolor*** Rizzini & A. Mattos, Revista Brasil. Biol. 45: 307 (1985).

Shrubby cactus branched at base and above reaching 3 m tall, stems to  $140 \times 3\text{--}4.5$  cm, articulated every 30 cm or so, epidermis pale-green, glaucous, 7–8 slightly crenate ribs, areoles 0.8–1 cm apart, 4 mm diam., with white trichomes, 10–13 pungent spines, 3 central, 1.5–3.0 cm long, 8–10 radial, 0.7–1.2 cm long, dark-brown. Flowers  $16\text{--}19 \times 4.5\text{--}5$  cm long; pericarpel elongated, c.  $30 \times 15$  mm, flower-tube 9 cm long, smooth, perianth segments erect, forming a cup around stamens and stigma, outer perianth segments spathulated,  $20\text{--}50 \times 10\text{--}12$  mm, greenish, inner segments spathulated, c.  $40\text{--}55 \times 12\text{--}15$  mm, white; nectar chamber, stamens, style and stigma not observed. Fruit ovoid to oblong,  $5 \text{ cm} \times 3.5 \text{ cm}$ , blue-green maturing pinkish-red, perianth remnants early deciduous in forming fruit, dehiscent by abaxial slit, funicular pulp solid, white; seeds black,  $3.5\text{--}4.2 \times 2\text{--}2.5$  mm.

**Specimens examined:** GOIÁS. Mun. Santa Fé, 15°46'09.1"S 51°06'20.2"W, 12.II.2020, *Olsthoorn, G. S162A25* (SORO). Mun. Serranópolis, RPPN Serra das Araras, 18°26'22"S, 51°59'43"W, X.2005, fl. e fr., *L.F. Souza 2675* (HJ). *l.c.*, 18°26'20"S 51°59'20"W, 21.VIII.1998, *M. Aparecida da Silva et al. 3955* (IBGE e KEW). *l.c.*, Aldeia do Guardião, 18°18'22"S 51°57'44"W, 7.XX.2006, fl., *F.A.G. Guilherme & L.F. Souza 452* (HJ).

Conservation status (IUCN, 2024): LC

Occuring in the states of Mato Grosso, Mato Grosso do Sul, Tocantins and Goiás (Flora e Funga do Brasil, 2025), *C. bicolor* grows in granitic rock outcrops associated with dry forests in western Goiás. This species was placed as a sister taxon to *Cereus hildmannianus* K.Schum. and *Cereus stenogonus* K.Schum. (Taylor *et al.* 2023), differing by its pink-red fruits (yellow in *C. hildmannianus*) and totally white flowers (pink-tinged in *C. stenogonus*).

**2.3. *Cereus calcirupicola*** (F. Ritter) Rizzini, Revista Brasil. Biol. 46(4): 782 (1986). Fig. 4c,d

Tree-like, rarely shrubby, much branched cacti reaching 6 m tall, stems 1–2 × 10–16 cm, sometimes procumbent, articulated every 18–30 cm., articles obclavate, grey-green or glaucescent mostly when young, 4–9 strongly crenated ribs, triangular in section, areoles 15–25 mm apart, 0.6 cm diam., with white trichomes, (6–)10(–11) pungent spines, 4–5 central 10–20 mm long, 6 radial-inferior spines, 5–10 mm long, deep reddish in seedlings and young plants, turning brownish-yellow and later grey, blackish at base, old areoles with strong indeterminate growth and spinier than in the young branches. Flowers (Zappi 1990) 21–26 (–31) × 15 cm; pericarpel elongated, 20–28 × 12–18 mm, glaucous-green, flower-tube 14–18 cm long, narrower in the middle, pale-green, with adpressed, yellowish scales, perianth segments erect, forming a cup around stamens and stigma, outer perianth segments fleshy, external layer acute, green with reddish apex, subsequent ones rounded, c. 8 cm × 2.0 cm, greenish white, inner segments spatulate, 5.7–7.5 × 2.7 cm, delicate, white, nectar chamber 12 × 12 mm; anthers inserted, cream, style 15.5–17 cm long, white, stigma 19 mm long, at the same level of anthers, 12–16-lobed, green or pale yellow. Fruit ovoid to elongated, 6–8 × 4–6 cm, smooth, red when ripe, dehiscent by 1–2 longitudinal slits, perianth remnants early deciduous in forming fruit, funicular pulp solid, white; seeds oval, c. 2 × 1.5 mm, shiny, testa with cuticular folds.

**Specimens examined:** GOIÁS. Mun. Nova Roma, margem da GO 114, 14°3'54"S 47°20'38"W, 30.VIII.2024, *A.G. Torres-Cardoso & A.C.S. Coelho 42* (UB). *l.c.*, 14°3'54"S 47°20'38"W,

30.VIII.2024, *A.G. Torres-Cardoso & A.C.S. Coelho 43* (UB). *l.c.*, 13°52'8"S 46°56'54"W,  
30.VIII.2024, *A.G. Torres-Cardoso & A.C.S. Coelho 44* (UB).

Conservation status (Taylor & Zappi, 2004): LC

Occurring in the states of Minas Gerais, Bahia, Tocantins and Goiás, this taxon was initially considered an edaphically differentiated subspecies of *Cereus jamacaru* DC. (Taylor & Zappi 2004) associated with limestone outcrops (hence the epithet '*calcirupicola*'), however, subsequent phylogenetic analyses have shown that it represents a sister species to *C. jamacaru* (Taylor et al. 2023).

*Cereus calcirupicola* stands out by its seedlings with red-brown spination, differing from all other species found in Goiás. When compared with the other limestone dwelling, and sometimes sympatric species, *C. pierrebraunianus*, its strong brown spination and oblong, red fruits (vs. weak, not pungent and almost bristly blackish spines and rounded, green to yellow fruits in *C. pierrebraunianus*) are good characters to distinguish them.

**2.4. *Cereus mirabella*** N.P. Taylor, *Bradleya* 9: 85 (1991).

Shrubby, branched basally and above ground, decumbent cactus reaching 1.6 m alt., branches 40–50 × 3 cm, epidermis grey-green, (3–)4–6 straight or concave ribs, areoles 2–3.5 cm apart, 2–3 mm diam., with white trichomes, 6(–9) pungent spines, central 2.5–3.5 cm, radial 0.5–2.5 cm, yellow-brown turning brownish when old. Flower narrowly infundibuliform to salverform at anthesis, c. 18.5 × 10 cm; pericarpel oblong, 22 × 15 mm, flower-tube 12 × 1.3–1.5 cm, angular, with occasional bracts subtending areoles with trichomes and inconspicuous spines, perianth segments strongly reflexed, outer perianth segments lanceolate-acute, 4–5 × 0.8–1 cm, slightly fleshy, greenish or pinkish, inner segments lanceolate, 5–6 × 1–1.2 cm, delicate, white; stamens exerted at anthesis, style 14 cm, stigma 10-lobes, 9 mm long, creamy-white. Fruit narrowly ovoid to oblong, with inconspicuous scales, pale-green turning pink when ripe, indehiscent, perianth remnants not deciduous in fruit, funicular pulp translucent, whitish; seeds 2.4 × 1.5 mm, blackish, dull.

**Specimens examined:** GOIÁS. Mun. Guarani, Assentamento Belo Horizonte, 13°52'S 46°21'W, 30.VI.2003, *R. C. Martins et al.* 328 (UB). *l.c.*, Fazenda Primavera, 14°03'46"S 46°13'02"W, 24.X.2015, *M. Aparecida da Silva, D. Alvarenga & G. D. Silva 8427* (IBGE e RB).

Conservation status (IUCN, 2024): EN

Recorded in the states of Minas Gerais, Goiás, western Bahia, Tocantins, Piauí and Maranhão, this species occurs in deep sandy soil in the Cerrado, semi-supported by shrubs and trees. It has taxonomic affinities with *C. alex-bragae* (see comments under that species).

**2.5. *Cereus pierrebraunianus*** Esteves, Cact. Succ. J. (US) 75(6): 266 (2003). Fig.4e-i

Tree-like cactus reaching 5–7 m tall, articulated stems 20–40 × 5–6.5 cm, epidermis dark to grey-green, 4–7 straight to crenate ribs, areoles 2 cm apart, 0.5 cm de diam., with grey trichomes, 4–7 flexible and not pungent spines 0.5–1.5 cm, poorly differentiated between central and radial, black to grey or dark-brown. Flower 16–17(–20) × 13 cm, pericarpel oblong, 2.6 cm × 1.4 cm, flower-tube 9.5 × 1 cm; perianth segments erect, forming a cup around stamens and stigma, outer perianth segments lanceolate, 4.5 × 2 cm, greenish, inner segments oblong to spatulate 4.5 cm × 2.4 cm, delicate, fringed at margin, white; anthers yellowish; style 12 cm long, greenish, stigma 10-lobed, 1.3 cm long. Fruits rounded, 4–5 cm diam., glaucous to green turning yellow when ripe (and probably falling to the ground when ripe), perianth remnants early deciduous in forming fruit; seeds not seen.

**Specimens examined:** DISTRITO FEDERAL. Fercal, próximo ao Morro da pedreira, 15° 30' 37.9" S 47° 57' 35.0" W, 15.XI.2024, fl., *A. G. Torres-Cardoso et al 51* (UB). *l.c.*, 15°31'S 47°57'W, 19.XI.1980, *J. H. Kirkbride 3721* (UB). *l.c.*, APA da Cafuringa, 15° 29' 56" S 47° 57' 59" W, 31.X.2011, *M. R. V. Zanatta & J. E. Q. Faria 933* (UB). *l.c.*, 15° 27' 27" S 47° 58' 00" W, 11.X.2006, *A. C. Amaral & G. Pereira-Silva 37* (CEN e UB). GOIÁS. Mun. Cocalzinho GO, Serra dos Pirineus, 15°34'12"S 48°36'0"W, 24.I.1968, fl., *H. S. Irwin, H. Maxwell & D. C. Wasshausen 19110* (NYBG). Mun. Formosa, Bisnau, 15°20'43"S 47°6'18"W, 22.XI.2024, *A. G. Torres-Cardoso; B. Schindler & C.O. Moura 57* (UB). Mun. Monte Alegre de Goiás. próximo ao rio Paranã, 13°31'31"S 46°49'40"W, 13.XII.2024, *A.G. Torres-Cardoso & M.C. Mourão 62* (UB); Mun. Monte Alegre, Fazenda Nica, 13°8'57"S 46°39'40"W, 21.X.2001, fl., *M.L. Fonseca et al. 2991*(CEN, IBGE, RB, UFG). Mun. Planaltina de GOIÁS. 15°24'24"S 47°58'11"W, 4.XI.2008, *T.E.C. Meneguzzo & L.C. Santos 25* (UB). Mun. São Domingos, Fazenda São Vicente, 13°31'11"S 46°29'48"W, 11.XI.2004, *A. C. Sevilha, E. P. Garcia & N. F. Barbosa 4171* (CEN e HURB).

Conservation status (IUCN, 2024): VU

Occurring in the states of Bahia, Goiás and Distrito Federal, this species grows on limestone rocks, often at the top of the outcrops and fully exposed to the sun. Its epidermis has

a large amount of epicuticular wax (Silva et al., in press), that probably is an adaptation to its harsh environment. Its affinities with *C. calcirupicola* are discussed under that species.

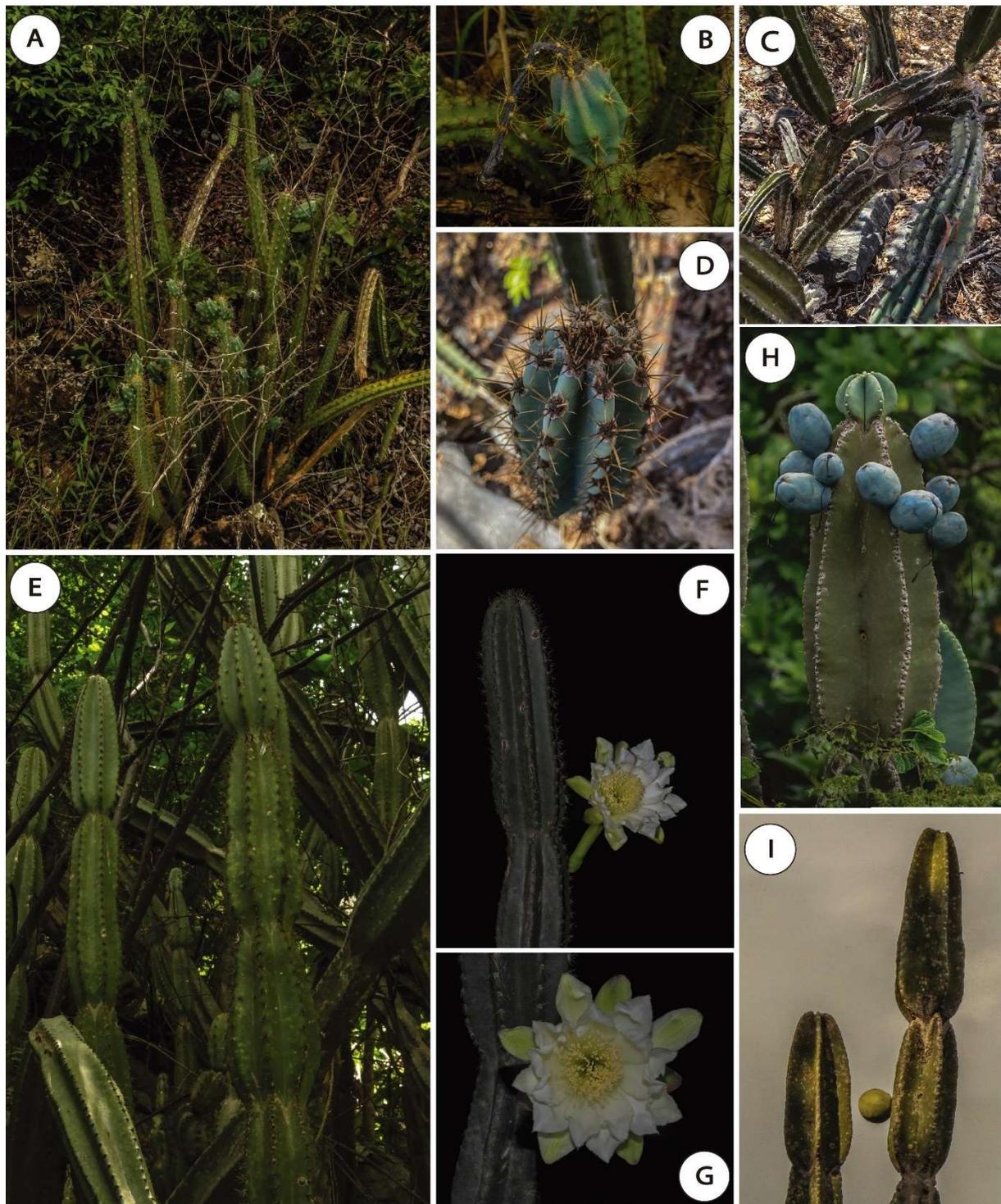


Figure 4. a-b. *Cereus alex-bragae*, a. habit, b. fruiting branch. c-d. *Cereus calcirupicola* – habit, d. stem apex. e-i. *Cereus pierrebraunianus* – e. habit, f. flowering branch, g. flower, h-i. fruits. Photos a-e, i. A.G. Torres-Cardoso; f-g. S. Albuquerque-Lima; h. F.F. Franco.

### 3. *Coleocephalocereus* Backeb.

This genus was part of a recent phylogenetic study of tribe Cereeae (Romeiro-Brito *et al.* 2023b), and currently it includes nine species segregated in four subgenera. A single species of *Coleocephalocereus* subg. *Siccobaccatus* (P.J.Braun & E.Esteves-Pereira) N.P.Taylor, a group that inhabits limestone outcrops, is known for Goiás (Flora e Funga do Brasil, 2025). This genus includes short-cylindric to long, columnar species, unbranched or branched at base, with 9–35 ribs with well-defined areoles, sometimes with basal hypertrophic spines. The flowering areoles are strongly differentiated and form sunken lateral cephalia bearing small to medium sized flowers (2 to 5 cm long), opening during the day or at night, pollinated by bats (Albuquerque-Lima *et al.* 2023) or hummingbirds. The baccaceous fruits are juicy and often with a basal pore, however, in *C.* subg. *Siccobaccatus* these are dry and possibly wind dispersed.

#### 3.1. *Coleocephalocereus neoestesvii* N. P. Taylor, Ann. Bot. 132(5): 1003 (2023). Fig.5

Columnar, unbranched or rarely branched at base cactus reaching 5 m tall, stem not articulated, 5 m × 10-15 cm, epidermis pale to bluish-green, 26–33 straight ribs, areoles 5-7 mm apart, 4 mm de diam., with short white trichomes, 12–20 pungent spines per areole, not clearly differentiated between central and radial, 1.5–3.5 cm, yellow to golden, with hypertrophic spines at base reaching 2–4.5 cm. Lateral cephalium with abundant white to cream wool and golden bristles reaching 4 cm long; flowers (Buining & Brederoo 1975) tubular, c. 3.5 × 3.5 cm, pericarpel turbinated, c. 2.5 × 7 mm, flower-tube with 1 mm long scales, pale yellow; outer perianth segments ovate, 12 × 6 mm, inner segments broadly-ovate c. 11 × 7 mm, nectar chamber c. 8 × 6 mm, stigma 10-lobed, 3mm long. Fruit (Buining & Brederoo 1975) dry flattened, 13 × 9 mm, glaucous, perianth remains erect, pale brown; seeds cochleariform, 1.5-1.7 × 1 mm, brown.

**Specimens examined:** GOIÁS. Mun. Formosa, povoado de Bezerra, 15°25'31"S 47°02'51"W, 7.VIII.2009, fl., *T.E.C. Meneguzzo & J.A.N. Batista* 232 (UB). Mun. Monte Alegre de GOIÁS. próximo ao rio Paranã, 13°31'30"S 46°49'41"W, 13.XII.2024, *A.G. Torres-Cardoso & M.C. Mourão* 64 (UB). *l.c.*, Estrada Campos Belos para Nova Roma, 13°24'10"S 46°49'55"W, 17.X.2016, fl., *G. Olsthoorn & L.D. Alencar* GO633 (UEC). Mun. Nova Roma, GO112, 13°31'32"S 46°49'39"W, 25.VII.2007, fl., *R. C. Forzza et al.* 4670 (SPF). Mun. São Domingos, Fazenda Cedro, após travessia da Balsa, 13°31'41"S 46°49'50"W, 23.IV.2009, fl., *D. Cardoso et al.* 2519 (HUEFS).

Conservation status (IUCN, 2024): LC

*Coleocephalocereus neoestesii* occurs in the states of Tocantins, Goiás and northwestern Minas Gerais, growing in steep rock crevices of limestone outcrops, and its tower-like habit, together with the impressive sunken cephalium, makes it one of the most iconic cacti of Brazil. Its sister species, *Coleocephalocereus dolichospermaticus* (Buining & Brederoo) N.P.Taylor has flattened seeds that are possibly wind dispersed, however *C. neoestesii* has cochleariform, not flattened seeds.

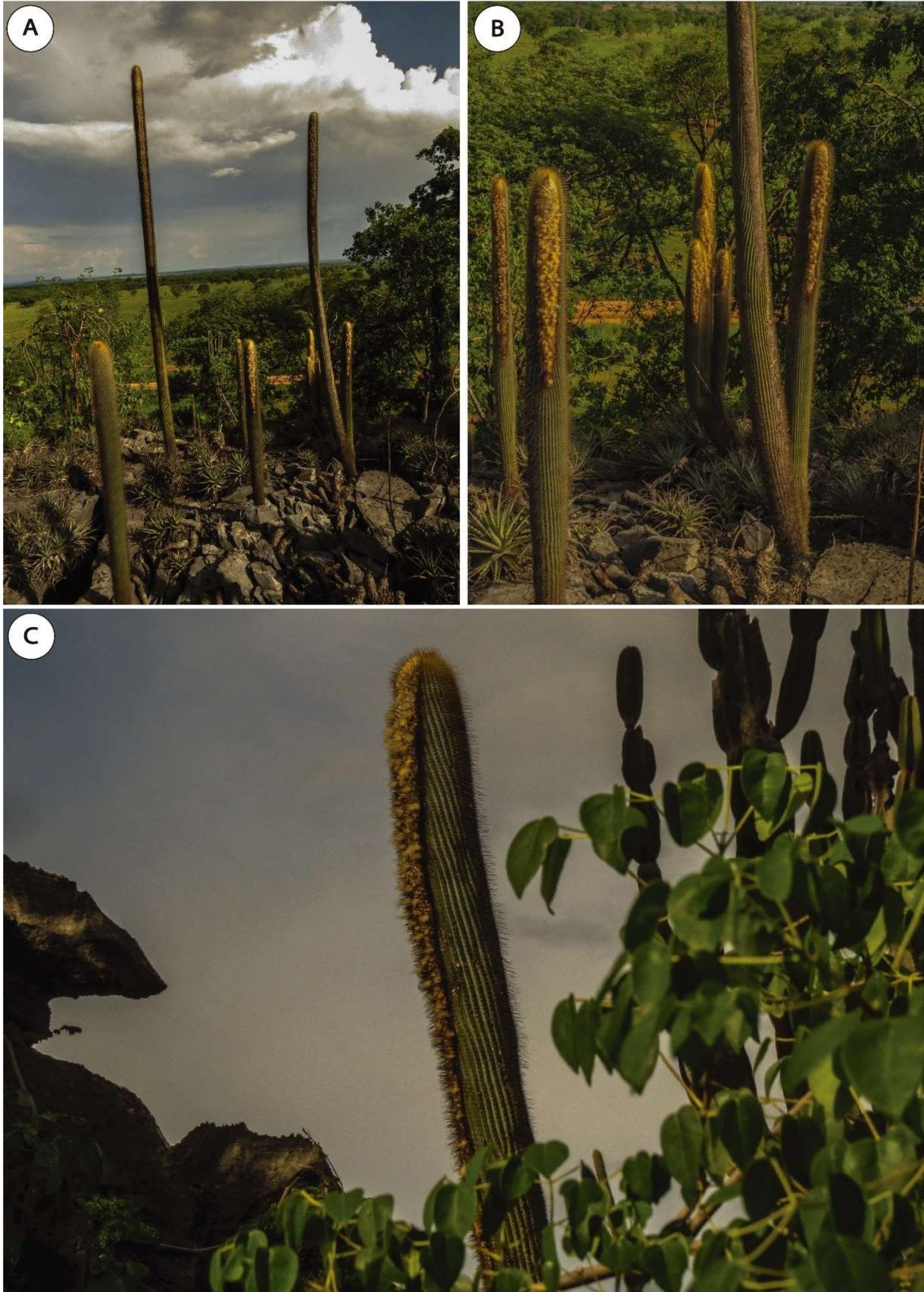


Figure 5. *Coleocephalocereus neoestesvii*. a. habit, b-c. lateral cephalia. Photos A.G. Torres-Cardoso.

#### 4. *Discocactus* Pfeiff.

Including 15 species (Korotkova et al. 2021) of which 14 occur in Brazil and 12 are endemic (Flora e Funga do Brasil, 2025), the distribution of this genus spans from Piauí and Ceará to Mato Grosso do Sul state, with three species recorded for Goiás, including one endemic, *Discocactus fariae-peresii*. These depressed-globose to disc-shaped cacti often grow buried in sand, gravel or in rock crevices, solitary or in groups, and their parenchyma is not mucilaginous. Their ribs may be entire or broken in tubercles, the areoles are set apart, with generally robust spines, often curved downwards. The apical, terminal cephalium has silky wool and sharp bristles, and appears less organized than the one of *Melocactus*, its sister taxon (Romeiro-Brito et al. 2023b). The salverform, cream, greenish or pale-pinkish flowers are protected by the cephalium until the day before anthesis, and open at night releasing a fragrant scent, being pollinated by hawkmoths (Antonini et al. 2020). The clavate to subglobose fruits are immersed in the cephalium until they reach maturity, dehiscing by longitudinal slits, white, green, pink or reddish, with hardly any pulp but attracting ants, possibly their dispersor agent. The seeds are hat-shaped, black and with strongly tuberculated testa-cells. Despite the citation in the Flora e Funga do Brasil (2024), it was not possible to confirm that *Discocactus hartmannii* (K.Schum.) Britton & Rose occurs in the study area as no material of this species surfaced during our searches. Regarding *D. heptacanthus* (Barb. Rodr.) Britton & Rose, Hunt et al. (2006) included *D. squamibaccatus* Buining (Horst 428 – L), based on a specimen collected in Goiás, Mata Azul, as a synonym of the former. However, the image of this specimen is not available on-line and it would be important to access it and also to ascertain exactly where the locality of Mata Azul is, as Hunt et al. (2016) place it in southwestern Goiás, while current maps have two localities with this name, one in northern and other in central Goiás.

##### 4.1. *Discocactus catingicola* Buining & Brederoo, Kakteen And. Sukk. 25(12): 265 (1974).

Fig. 6a

Disc-shaped to turbinate, partially buried, solitary cactus, 6 × 8.5 cm, epidermis grey-green to slightly yellowish-green, 8–11 sinuose ribs 3.5–4–5 mm wide, divided in poorly differentiated tubercles, areoles 3–4 per rib, 3.5–4–5 mm diam., 6(–7) spines, central spine slightly longer, upper spines 3(–4), 3 lower spines, 20–27 mm × 1.1–1.3 mm, mostly recurved, initially horn-coloured turning grey or blackish with age. Cephalium with white to cream wool and a few blackish bristles 1.5–2.5 cm long; flowers (Machado et al., 2005) 5.0–6.0 × 4.0–6.0

cm, externally pale-brown to olive-green when in bud; outer perianth segments narrowly spatulate, 2.2–2.4 × 0.7–0.8 cm, greenish to cream, inner segments long-spatulate, 1.8–2.0 × 0.5–0.7 cm, pure white. Fruit (Machado *et al.*, 2005) subglobose to shortly clavate 4.0–4.5 × 0.8–1.3 cm, white to slightly pink; seeds 1.5–2.0 mm diam., testa cells elongated, sharply tuberculated.

**Specimens examined:** GOIÁS. Mun. Alto Paraíso, povoado de São Jorge, 14°11'54"S 47°51'09"W, 11.III.2024, *B. Schindler & M. Figueira 676* (UB). *l.c.*, 14° 11' 52" S 47° 51' 8" W, 13.IV.2024, *A.G. Torres-Cardoso & J.M. França 29* (UB). *l.c.*, caminho da cachoeira macaquinhos, 14°15'27"S 47°19'8"W, 17.XI.2024, *A. G. Torres-Cardoso et al. 53 e 54* (UB). Mun. Campos Belos, Povoado de Pouso Alto, 12°59'51"S 46°20'33"W, 31.X.2000, fl., *M. Aparecida da Silva et al. 4617* (IBGE). Mun. Nova Roma, Área de expansão do PARNA da Chapada dos Veadeiros, 13°52'13"S 47°00'05"W, 23.X.2018, fl., *L. L. Bergamini et al. 196* (IBGE). Mun. Posse, arredores da cidade, 14°4'20"S 46°18'56"W, 15.I.2004, *M. Machado & M.V.M. Oliveira 131* (HUEFS); *l.c.*, estrada entre Guarani e Posse 14°57'41"S 46°22'12"W, 19.X.2001, *R. C. Mendonça et al. 4509* (IBGE).

Conservation status (IUCN,2024): LC

This widely distributed species spans from Tocantins, Maranhão, Piauí and Bahia to Minas Gerais and Mato Grosso do Sul, and has many populations in Goiás, almost always growing half buried in sand or gravel in sparse cerrado, but also in weathered quartzitic outcrops in campo rupestre. It can be differentiated from *D. diersianus* and *D. fariae-peresii* because of its more or less entire ribs and moderate size, not reaching 9 cm diam. (vs. strongly tuberculate ribs and more than 17 cm diam. in *D. diersianus* and *D. fariae-peresii*).

**4.2. *Discocactus diersianus*** Esteves, Cact. Succ. J. (US) 51: 279 (1979)

Fig.6b,c,d

Disc-shaped to subglobose, cactus, solitary or forming clusters, 13–17 × 17–23 cm, epidermis pale or dark-green, sometimes pinkish, (11–)13(–16) sinuose ribs divided in well defined tubercles; areoles 4–6 per rib, 0.5–0.9 mm diam., 7(–11) espinhos, 1(–2) centrais 2(–3.5) × 0.2 cm, 3(–5) upper spines 15(–40) × 1(–2) mm and 3(–5) lower c. 25(–60) × 1(–2) mm., spines erect to curved, brownish-cream to reddish-brown turning grey or blackish with age, accumulating at the base of the plant forming a ‘spine belt’. Cephalium with cream or grey wool and abundant, thick, sometimes pungent bristles 25(–50) × 2 mm, brown, blackish or grey; flower 4.5 × 4 cm, pericarpel 2 × 4 mm, flower-tube 2.5 × 0.5 cm, outer perianth segments

linear-lanceolate  $2 \times 0.2$  cm, cream, inner segments c.  $3 \times 0.3$  cm, nectar chamber c.  $8 \times 4$  mm, anthers pale yellow, style  $3 \times 0.1$  cm, stigma 4-lobed,  $5 \times 1$  mm. Fruit obovate, elongated, c.  $2.4 \times 0.4$  cm, white with pink apex, dehiscent by lateral slits when ripe; seeds 2 mm diam.

**Specimens examined:** GOIÁS. Mun. Nova Roma, estrada próximo ao rio Paranã,  $13^{\circ} 33' 54''$  S  $46^{\circ} 59' 9''$  W, 27.VII.2024, fl., *A.G. Torres-Cardoso & C.O. Moura 40 e 41*(UB). Mun. Teresina de Goiás, lajedos à beira da estrada,  $13^{\circ}36'28''$ S  $47^{\circ}16'46''$ W, 13.XII.2024, fl. e fr., *A.G. Torres-Cardoso & M.C. Mourão 61* (UB).

Conservation status (IUCN, 2024): EN

This species occurs in Goiás and Tocantins, in quartzitic rock outcrops associated with cerrado or campo rupestre. A hybrid population between *D. diersianus* and *D. catingicola* (see below) have been found nearby Alto Paraíso. This population had many individuals sprouting new plants from the areoles on top of the tubercles. The characteristics of the plants were intermediate between the putative parent species, especially the flowers that had perianth segments intermediate in width between *D. catingicola* and *D. diersianus*.

#### ***D. diersianus* x *D. catingicola***

Fig.6e,f

Globose-depressed cactus, solitary or in clusters,  $5(-9) \times (8-13(-18))$  cm, epidermis grey-green, 10–15 sinuose ribs clearly divided in tubercles; areoles 4(–5) per rib, 4(–8) mm diam., 7(–11), central spine slightly larger, upper spines 4(–7),  $2.5(-4.5) \times 0.1(-0.3)$  cm, lower spines 3(–4),  $3(-5) \times 0.3$  cm, recurved, initially reddish-brown turning grey or blackish when old. Cephalium with white or cream wool turning grey, bristles abundant but not poignant, 2 (–3.5) cm long, reddish. Flower 5 cm long, pericarpel  $2 \times 4.5$  mm, outer perianth segments narrowly lanceolate,  $1.5-2.5 \times 0.3-0.5$  cm, greenish, inner segments lanceolate  $2.5 \times 0.5-0.6$  cm, pure white, flower-tubo  $2.5 \times 0.6$  cm, nectar chamber c.  $8 \times 5$  mm, anthers pale yellow, style  $3.8 \times 0.1$  cm, stigma com 3-lobed,  $5 \times 1$  mm. Fruit not seen.

**Specimens examined:** GOIÁS. Mun. Alto Paraíso,  $14^{\circ}13'19''$ S  $47^{\circ}29'9''$ W, 14.IV.2024, *A.G. Torres-Cardoso & J. M. França 31 e 32* (UB).

#### **4.3. *Discocactus fariae-peresii* Braun, Kakteen And. Sukk. 67(1): 33 (2016).**

Fig.6g,h

Subglobose solitary cactus, starting buried as a seedling and young plant then growing well above the substrate when fertile,  $6.5-15 \times 17-31$  cm, epidermis pale-green, 14–22 sinuose

ribs clearly divided into high, rounded tubercles; areoles 5–6(–7) per rib, c. 0.5 mm diam., 7 spines, radial spines curved, 10–20 × 2 mm, orange-yellow when young, later grey-brown or blackish. Cephalium 4.5 cm diam., with white or cream wool turning grey, bristles c. 5 mm compr., orange-yellow to pale brown; flower (Braun 2016). 8–12 × 6–8 cm, externally pale pink or cream, outer perianth segments narrowly spatulate, inner segments long-spatulate, pure white. Fruit (Braun 2016) 3.5 cm long; seeds black, 2 mm long.

**Specimens examined:** GOIÁS. Formosa, próximo à pista de vôo livre do Borges 15°15'46"S 47°30'29"W, 15.I.2025, *A. G. Torres-Cardoso, D. C. Zappi & N. P. Taylor 66 e 67* (UB). *l.c.*, 15°15'50"S 47°30'27"W, 10.XII.2015, *B. P. Faria & A. Peres s. n.* (UB).

Conservation status (Bachman, 2011): CR

Endemic from the Mun. Formosa in Goiás, *D. fariae-peresii* grows among *Vellozia* in campo rupestre with sandy substrate and weathered quartzitic stones. It differs from all other species in Goiás due to its size (17 to 31 cm diam.) and ribs clearly divided in tubercles.

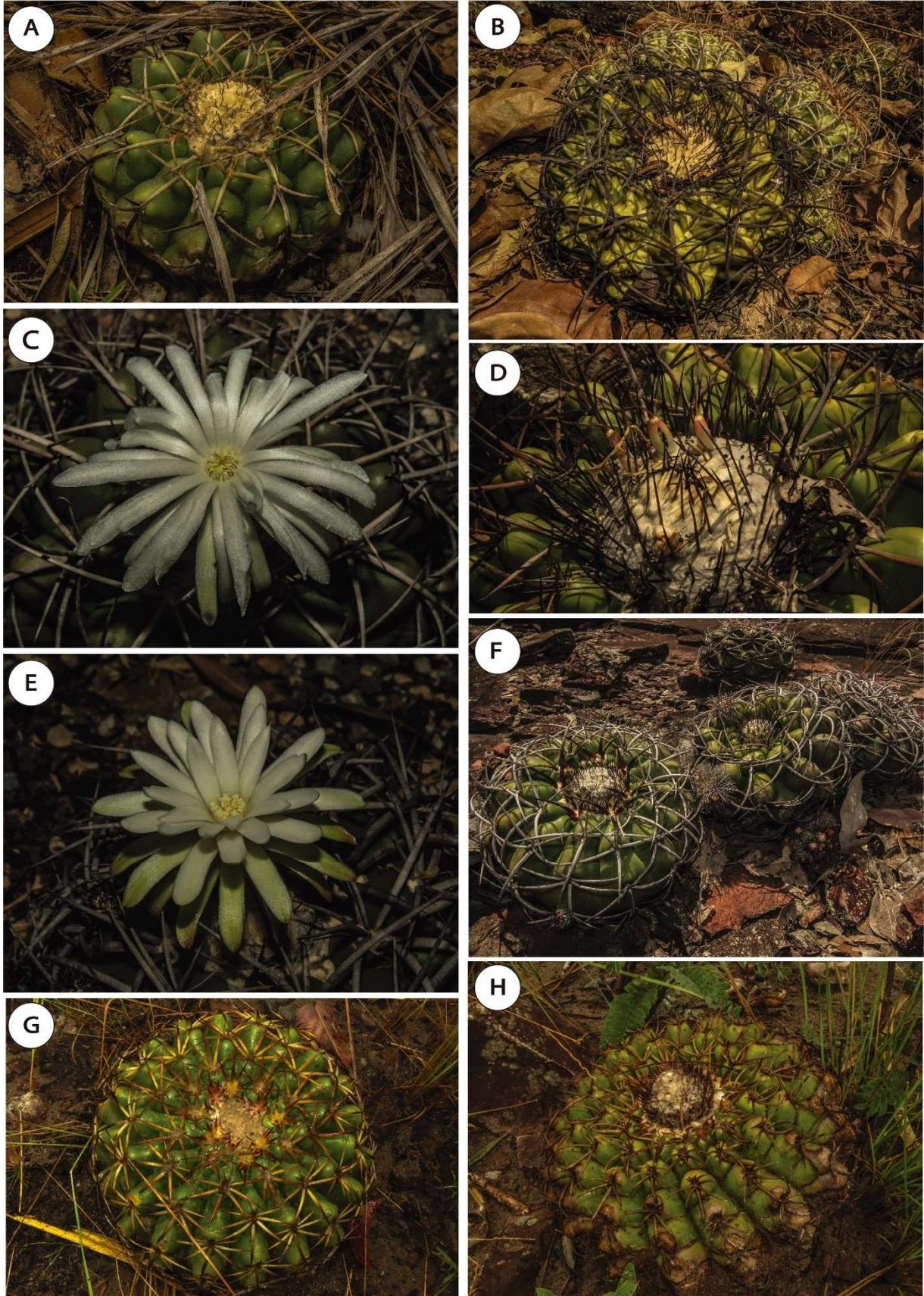


Figure 6. a. *Discocactus catingicola* - b-d. *Discocactus diersianus* b. clustering habit. c. flower. d. fruits. e-f. *D. diersianus* x *D. catingicola* - e. flower. f. habit. g-h. *D. fariae-peresii*. Photos A.G. Torres-Cardoso.

## 5. *Epiphyllum* Haw.

Comprising around 11 species widespread from Mexico, the Caribbean and South America, *Epiphyllum* counts with a single species widely distributed in Brazil (Hunt et al. 2006). The genus includes epiphytic cacti with flattened branches that resemble leaves, stems with crenate, lobed or deeply cleft margin, areoles unarmed or with small bristly spines, infundibuliform flowers with long, narrow flower tubes, generally white to pinkish, with nocturnal anthesis and strong scent, pollinated by hawkmoths. The fruits are ovoid to oblong, sometimes with longitudinal striations, seeds are ovate, dark-brown.

### 5.1. *Epiphyllum phyllanthus* (L.) Haw., Syn. Pl. Succ. 197 (1812).

Fig.7a,b

Epiphytic cactus with flattened branches to 17–45 × 3–5 cm, 0.5 cm thickness, epidermis dark-green, margin crenated, sometimes with axillary areoles with white bristles and hairs, apex obtuse. Flowers appearing in undifferentiated areoles, 16–24 × 4–6 cm, opening at night, sweetly scented, pericarpel greenish with pink, acute spines, flower-tube 14–17 × 2–3 cm, outer perianth segments narrowly lanceolate, 1.2–2 cm long, strongly reflexed, fleshy, pinkish-white, inner segments lanceolate, 1.5–2.5 × 0.3–1 cm long; anthers exerted, linear, style 14–18 cm long, stigma 6–8-lobed. Fruit obovoid, 10 × 3.5 cm, pericarp striated, reddish-green to bright pink in maturity, perianth remnants early deciduous, funicular pulp white; seeds obovate, 4–4.5 mm, blackish, shiny.

**Specimens examined:** DISTRITO FEDERAL. Brasília, Reserva do IBGE, 03.X.77, fl., *E. Heringer et al. 168* (IBGE). Brazlândia, 15°30'26"S 48°2'56"W, 27.III.2024, *A.G. Torres-Cardoso et al. 27* (UB); GOIÁS. Mun. Alto paraíso de GOIÁS. Cachoeira Almécegas I, 14°10'S 47°48'W, 28.I.2016, fr., *M. Aparecida da Silva et al. 8568* (IBGE). Mun. Nova Roma, 13°52'12"S 46°56'53"W, 30.VIII.2024, *A.G. Torres-Cardoso & A.C.S. Coelho 45* (UB).

Conservation status (IUCN, 2024): LC

Widely distributed in Brazil, within the Cerrado of Goiás this species is found in forest formations (dry forests, ciliar and gallery forest and cerradão), and is one of the epiphytic species with the widest environmental tolerance, spanning from the Atlantic Forest to the Cerrado. Monkeys have been observed eating its bright pink fruits.

## 6. *Melocactus* Link & Otto

When monographed by Taylor (1991), *Melocactus* comprised 31 species distributed between México and Brazil, reaching northern Minas Gerais. Studies developed with the Caribbean species have added new taxa and nowadays 42 species are accepted, with 27 known from Brazil, of which the vast majority (25) are endemic to this country (Flora e Funga do Brasil 2024). Globose to conical plants, generally solitary, with vegetative growth terminated by a highly specialized cephalium with packed wool and bristles bearing hummingbird pollinated flowers that emerge from the cephalium in the afternoon, showing only the perianth segments (Bezerra-Silva *et al.* 2023). The clavate fruits vary from white to pink and red, have erect, pale brown perianth remnants on top, and are expelled from the cephalium when ripe, roughly two to three months after pollination, and are sought after by lizards (Gomes *et al.* 2015) and possibly birds.

### 6.1 *Melocactus levitestatus* Buining & Brederoo, Cact. Succ. J. (US) 45: 271 (1973). Fig.7c,d

Pyramidal solitary cactus, 9–25 × 8–13 cm, epidermis pale-green, 9–10 straight ribs; areoles 5–6 per rib, 3.5–5 mm diam., 6(–7) spines, central spines (3–)4, 1–1.5 × 0.1–0.15 cm, erect, 3 radial/inferior 2 × 0.1–0.15 cm, young areoles with white trichomes, spines initially pinkish-brown, turning grey and blackish when old. Cephalium subglobose, 3.5–8 × 8 cm diam., with cream wool and 5 mm long red to pinkish, fine bristles; flower 22 × 6 mm, red, pericarpel turbinate, smooth, flower-tube 1.5 cm × 6 mm, widened at base and smooth, outer perianth segments obovate, 4 mm × 2 mm, patent, inner segments acuminate 5 × 3 mm, patent or innermost ones erect, nectar chamber 7 × 5 mm, style 14 × 1.5 mm, stigma 5-lobed, 2 × <1 mm. Fruit shortly clavate, 12–20 × 7–12 mm, white; seeds cochleariform 1.5 × 1.3 cm, blackish, testa cells flat, smooth.

**Specimens examined:** GOIÁS. Mun. Nova Roma, 13°52'24" S 46°56'59" W, 30.VIII.2024, A.G. Torres-Cardoso & A.C.S. Coelho 46 (UB).

Conservation status (IUCN, 2024): LC

Strongly associated with limestone outcrops, this species of *Melocactus*, spanning from Northwestern Minas Gerais to Bahia, is the only species growing in the Central-Western region, being found in Goiás in Nova Roma and surroundings. This disjunction is about to grant it subspecific level (Taylor *et al.* 2025 in press). It can be distinguished from other species by its red (not magenta) flowers and pure white fruits.

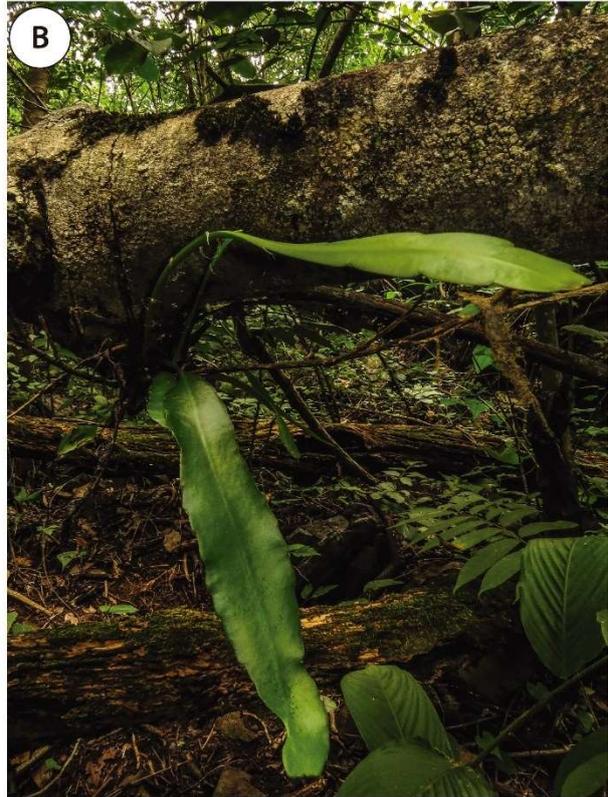
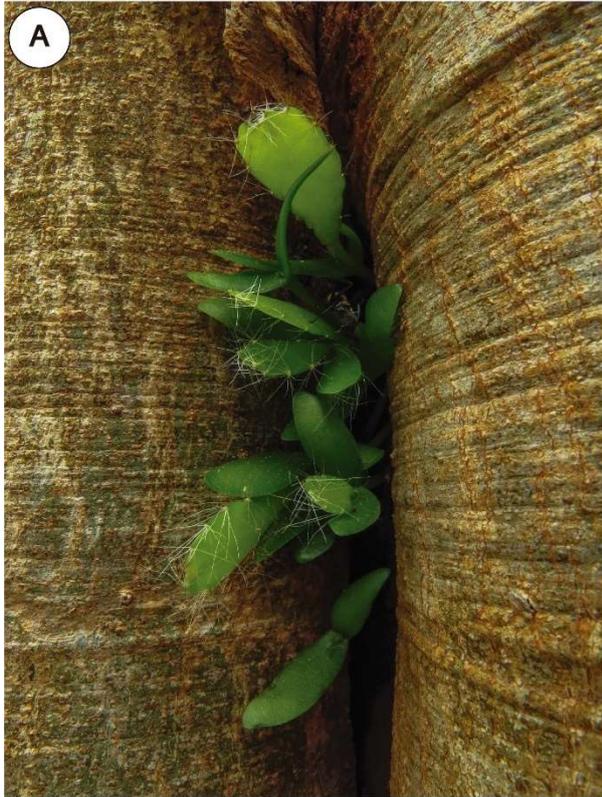


Figure 7. a-b. *Epiphyllum phyllanthus*. a. seedling. b. epiphytic habit. c-d. *Melocactus levitestatus*. c. habit. d. detail of flower. Photos A.G. Torres-Cardoso.

## 7. *Pilosocereus* Byles & G. D. Rowley

The last revision of *Pilosocereus* (Zappi 1994), listed 34 species ranging from México to Paraguay, with higher diversity in Brazil. The number of accepted species has grown due to the discovery of more Caribbean species and new phylogenetic concepts (Romeiro-Brito *et al.* 2023a, Köhler *et al.* in prep.), and nowadays there are around 50 accepted species, with 31 occurring in Brazil and 8 recorded in Goiás (Flora e Funga do Brasil 2024). The genus is represented by shrubby to arborescent cacti branched at ground level and above, sometimes forming considerable trunks, branches never constricted (unlike *Cereus*) with mucilaginous parenchyma and ribs varying between (3–)4–28(–32). The floriferous region varies between poorly to extremely differentiated, with woolly and bristly areas, and sometimes forming a deep lateral cephalium. Flowers vary between 4–9.0 × 3–7 cm, with anthesis starting at dawn, pericarpel and flower-tube naked, fleshy, green or occasionally pinkish or wine-coloured, nectar chamber bearing abundant sweet nectar, perianth segments relatively short and resistant, patent to reflexed in anthesis, white within, anthers grouped in a dense mass at flower throat, filaments short and style and stigma stout, strong scent of rotten cabbage and pollinated generally by bats, having hawkmoths as a secondary pollinator (Rocha *et al.* 2019; Albuquerque-Lima *et al.* 2023). Fruits are depressed-globose, dehiscent by a semicircular or lateral slit surrounding the pendent, blackened perianth remnants, pericarp greenish, wine-coloured or reddish, dull, funicular pulp generally solid, white, red or magenta, seeds cochleariform, black or brown, testa cells smooth, flat or raised, rugose.

### 7.1. *Pilosocereus albisummus* P. J. Braun & Esteves, *Kakteen And. Sukk.* 38(5): 126 (1987).

Shrubby to tree-like cactus branched above base and forming a trunk, reaching 2.8 m tall, branches to 8.5 cm diam., epidermis grey-green; (5–)6–12 ribs; areoles 6–10 mm apart, not raised, 1.8–3.1 mm diam., 14–16 spines, 3–7 central, 5–10 × 0.2–0.3 mm, erect, 11–13 radial, 5–7 × 0.2–0.3 mm, flexible, pale-yellow to reddish when young, turning grey or blackish. Fertile part of the stem strongly differentiated with not sunken areoles bearing abundant wool and bristles, both longer than the spines; flowers c. 4.3 × 3.5 cm; pericarpel 5–6.5 × 10–14 mm, subglobose, reddish-green, flower-tube 40 × 10–13 mm at base, widened to 23 mm at apex, straight, slightly compressed, pale-green, outer perianth segments triangular, 7–8 × 7.5–8 mm, olive-green, apex reddish, inner segments lanceolate, 11.5 × 5.5–6.5 mm, white with purplish tinge; nectar chamber 15 × 7–8 mm; anthers 1.4–1.8 mm; style 34–43 × 1.8–1.5 mm, stigma

10-lobed, 6 mm long. Fruit 25 x 36 mm, pericarp dark-green to purplish, funicular pulp magenta; seeds 2 x 1.1–1.2 mm, dark-brown, testa cells smooth, flat.

**Specimens examined:** GOIÁS. Mun. Posse, fazenda Sabonete, 14°03'53"S 46°29'15"W 03.XI.2000, fl. e fr., *M. Aparecida da Silva et al.* 4651 (IBGE e RB).

Conservation status (IUCN, 2024): DD

Ocurring in Minas Gerais and Goiás, this species occurs exclusively on limestone outcrops. It differs from other species found in Goiás by its lower rib number (6–12), which it shares with *P. jauruensis* and *P. novaromanus*, differing from both due to the white wool in the floriferous region (*P. novaromanus* has hardly any wool) and dark bristles (*P. jauruensis* has golden bristles and wool).

**7.2. *Pilosocereus cristalinensis*** P. J. Braun & Esteves, *Kakt. And. Sukk.* 38(5): 132 (1987).

Fig.8a

Shrubby cactus branching mostly at base, not forming a trunk, reaching 1 m tall (exceptionally 1.8 m), branches to 7.5 cm diam., epidermis grey to bluish-green; 15 ribs; areoles 5–10 mm apart, not raised, 5–9 mm diam., 12–15 spines, 2–4 central to 2.5 cm, erect, 11–13 radial, 5–10 mm, all golden turning slightly grey when old. Floriferous region with differentiated, not sunken areoles bearing abundant white to golden wool shorter than the spines; flowers c. 6.5–7.5 × 4–5 cm; pericarpel 2–2.3 × 1.3–1.5 mm, subglobose, dark red, flower-tube 4–5 × 1.4–1.5 mm at base, much wider at apex, infundibuliform, deep-red, outer perianth segments triangular, 8–10 × 6 mm, deep-red, inner segments lanceolate, 12 x 8 mm, white; nectar chamber 20 × 7–8 mm; anthers and gynoecium not seen. Fruit 35–38 mm diam., deep red to purple, funicular pulp white; seeds 1.6–1.7 × 1.1–1.2 mm, black.

**Specimens examined:** GOIÁS. Mun. Cristalina GO, 16°46'5"S, 47°36'51"W, 01.I.1973, *E. E. Pereira* 73 (UFG). *l.c.*, BR 040, 16°47'54"S 47°34'05" W, 11.X.2023, fl., *M. Kohler & G.V. Lima* 821 (RB). *l.c.*, 16° 43' 39" S 47° 37' 15" W, 30.VI.2024, *A.G. Torres-Cardoso & J.M. França* 33 (UB). *l.c.*, 16°44'20"S 47°37'3"W, 30.VI.2024, *A.G. Torres-Cardoso & J.M. França* 34 (UB); *l.c.*, RPPN Linda Serra dos Topázios, 16°45'00"S 47°40'0"W, 23.II.1998, *C.E.B. Proença, A.P. Silva, J.F. Ribeiro* 1972 (UB).

Conservation status (Bachman, 2011): CR Extent of Occurrence, EN Area of Occupancy

Endemic from Cristalina, in Goiás, *P. cristalinensis* had been placed by Zappi (1994) under de synonymy of *P. machrisii* and has been re-established due to phylogenetic evidence (Romeiro-Brito *et al.* 2023a, Köhler, in prep.). It can be distinguished from other *Pilosocereus* species in Goiás because of its rib-number (11–15 ribs), not sunken cephalium, blue-green epidermis and deep-pink, infundibular flowers.

**7.3. *Pilosocereus diersianus*** (Esteves) P.J. Braun, *Bradleya* 6: 88 (1988). Fig.8b,c

Shrubby cactus branched at base, reaching 2 m tall, branches to 5–9 cm diam., epidermis grey-green; 19–22 ribs; areoles 5–10 mm apart, not raised, 2–4 mm diam., 20–28 spines, 10 central, 5–10 mm, erect, 11–30 radial, 5–8 mm, flexible, pale-yellow to golden, turning grey when old. Floriferous areoles forming sunken cephalium (absent in some populations) with abundant wool and bristles, both longer than the spines; flowers c. 3.5–5 × 3–3.5 cm; pericarpel 4–5 × 14 mm, hemiglobose, pale-green, flower-tube 25–30 × 15 mm at base, widened to 20 mm at apex, straight, pinkish-green, outer perianth segments triangular, 12–16 × 5–5 mm, pinkish-green, inner segments lanceolate, 11–16 × 3–6 mm, white; nectar chamber 7–9 × 7–9 mm; anthers 1.5–2 mm; style 25–35 × 1.5–2 mm, stigma 8–0.12-lobed, 5–7 mm long. Fruit 20 × 30 mm, pericarp olive-green, funicular pulp magenta; seeds 1.9–2.1 × 1.2–1.4 mm, black, testa cells smooth, flat.

**Specimens examined:** GOIÁS. Mun. Campos Belos de GOIÁS. 13°2'12"S 46°46'5"W, 01.I.1973, *E. E. Pereira 18* (UFG). Mun. Nova Roma, estrada que conecta a GO 241 e GO 112, paralelo ao rio Paranã, 13°35'48"S 46°53'40"W, 27.VII.2024, *A.G. Torres-Cardoso & C.O. Moura 38* (UB). Mun. Teresina de Goiás, lajedos à beira da estrada, 13°37'2"S 47°12'55"W, 13.XII.2024, *A. G. Torres-Cardoso & M.C. Mourão 59* (UB).

Conservation status (IUCN, 2024): CR

*Pilosocereus diersianus* is endemic from limestone outcrops in Goiás and may not present the strongly differentiated lateral cephalium in all its populations. As seen in many species of *Pilosocereus* (Romeiro-Brito *et al.* 2023a, Köhler in prep.), a putative hybrid origin could be the case of this species.

**7.4. *Pilosocereus juaruensis*** (Buining & Brederoo) P.J.Braun, *Kakteen And. Sukk.* 35:181 (1984).

Shrubby cactus branched above base but not forming a trunk, reaching 1.75 m; branches 4–8 cm diam., epidermis green, sometimes glaucous at apex; 10–12 ribs; areoles 7 mm apart, not raised, to 5 mm diam., 11–20 spines; 3–6 central to 4 cm long; 9–17 radial to 2.5 cm long, all golden-yellow turning grey with age. Floriferous region strongly differentiated with not sunken areoles bearing abundant golden to brown wool to 3.5 cm long; flower infundibuliform, 4.5–5.5 × 5 cm; pericarpel 12–13 mm, subglobose, reddish-green, flower-tube 4 × 2 cm, widened to 3.5 cm at apex, infundibuliform, dull pink, outer perianth segments ovate, 18 × 8 mm, dull red, inner segments broadly lanceolate, 17 × 6 mm, white, nectar chamber 12 × 6 mm, anthers 4–5 mm, style 40 × 2 mm, stigma 12-lobed, 10 mm long. Fruit 2.2 × 2.8 cm, pericarp green to dull red, funicular pulp white; seeds c. 1.5 mm, blackish, testa cells strongly convexed, striate.

**Specimens examined:** GOIÁS. Mun. Mineiros, 17°34'9.84"S 52°33'3.97"W, 08.IX.2012, *F.F. Franco, E.M. Marsola, M.O. Godoy S101-MIN* (SORO). Mun. Palestina de GOIÁS. 16°43'59.88"S 51°31'57"W, 02.IX.2012, *F. F. Franco, E. M. Marsola, M. O. Godoy SN* (SORO).

Conservation status (IUCN, 2024): LC

Distributed in western Goiás, Mato Grosso do Sul and Rondônia, this taxon was initially considered a synonym of an all-encompassing *P. machrisii* (Zappi 1994) and accepted as a species by Hunt *et al.* (2006), however its circumscription has been further refined by phylogenetic analyses (Romeiro-Brito *et al.* 2023a, Köhler in prep.), by the exclusion of the populations from São Paulo, that will soon be recognized as a new species. It can be distinguished from other species from Goiás by its widely infundibular flowers, resembling the ones of *P. cristalinensis*, however reaching 5–5.5 cm (vs. up to 7 cm in *P. cristalinensis*).

**7.5. *Pilosocereus machrisii*** (E. Y. Dawson) Backeb., *Cactaceae* (Backeberg) 4: 2419 (1960).

Fig. 8d,e

Shrubby cactus branched above base and forming a short trunk, reaching 3.5 m tall, branches 4–8 cm diam., epidermis distally glaucous; 11–15 ribs; areoles 9 mm apart, not raised, 2–4 mm diam., 14–20 spines, 2–6 central up to 2 cm long; 12–16 radial 0.8 cm long, yellow to reddish, turning greyish-yellow when old. Floriferous region with differentiated areoles bearing yellow to brownish wool c. 3 cm long and bristles up to 2.6 cm long; flower 4.8 × 3.0–3.5 cm; pericarpel 7.5 × 15 mm, green to pale red-brown, flower-tube 4.2 × 15 mm, widened to 24 mm

at apex, dull red; outer perianth segments triangular, red, inner segments lanceolate, white; style 2.5–2.8 mm, stigma 7–10-lobed, 8 mm. Fruit 4 cm diam., dull red to brownish, funicular pulp white; seeds c. 1.6 mm, testa cells flat to slightly convex, smooth.

**Specimens examined:** GOIÁS. Mun. Alto Paraíso de Goiás, Rodovia GO 118 a 10 km da cidade de Alto Paraíso, 14°12'38"S 47°29'18"W, 15.X.2024, *A.G. Torres-Cardoso, M.H.S. Guedes 50* (UB). *l.c.*, Serra da Baliza, 14°9'38"S 47°28'7"W, 02.XII.2003, fr., *B.R. Silva et al. 1202* (RB). Mun. Uruaçu, Rodovia ligando Ceres a Porangatu, 14° 31' 28.92" S, 49° 8' 26.88" W, 25.V.1956, *E. Y. Dawson 15110* (R).

Conservation status (IUCN, 2024): LC

According to its new circumscription (Romeiro-Brito 2023a, Köhler in prep.) *P. machrisii* is an endemic species only known from the north of Goiás, around Uruçuca and Alto Paraíso de Goiás, where it grows on crystalline rocks amidst the Cerrado.

**7.6. *Pilosocereus novaromanus*** Olsthoorn & Oliveira-Pereira, *Bradleya* 43 (2025, in press).

Fig. 8f

Shrubby cactus branched at ground level or slightly above, reaching 2.5 m tall, branches 5–6 cm diam., epidermis grey-green; 7–12 ribs, areoles not raised, 1–1.5 cm apart, 3–5 mm diam.; spines 12–13 espinhos, 4 central, 13 nm, 9 radial, 7–9 mm, brownish at base, creamy-white at the tips, grayish when old. Floriferous region poorly differentiated, flower 5–6 × 2.5–3 cm; pericarpel 10 × 12–15 mm, hemiglobose, reddish-green, flower-tube 26–30 × 1 cm, slightly wider at apex, straight, brown to green, outer perianth segments ovate, 12 × 7 mm, green to brown, inner segments broadly lanceolate, 15 × 4–5 mm, white, nectar chamber 12–22 × 4–6 mm, style 32–50, stigma 10-lobed, 5–8 mm long. Fruit 5 cm diam., green, funicular pulp red; seeds 1.7–2.4 × 1.2–1.6 mm, black, testa cells slightly convex, smooth.

**Specimens examined:** GOIÁS. Monte Alegre de Goiás, próximo ao rio Paranã, 13°31'31"S 46°49'41"W, 13.XII.2024, fr., *A. G. Torres-Cardoso & M.C. Mourão 63* (UB)

Conservation status (Olsthoorn et al. 2025, in press): EN.

Endemic from the surroundings of Nova Roma and Monte Alegre de Goiás, this species grows on limestone outcrops scattered in the Cerrado. It differs from all other species from Goiás by having an undifferentiated floriferous region, with a few trichomes at the most.

**7.7. *Pilosocereus parvus*** (Diers & Esteves) P. J. Braun, *Bradleya* 6: 88 (1988).

Subshrubby cactus branched only at base and reaching up to 0.35 m tall, branches 20–30 × 3.5 cm, 9–11 ribs; areoles 4–5 mm apart, not raised, 16–20 spines, 6–8 central, 2–5 cm long; 12–19 radial, 1.4–1.5 cm, pale-yellow to reddish-brown, turning grey with age. Floriferous region differentiated with not sunken areoles bearing wool up to 1 cm long; flower 5–9 × 4.5–4.8 cm, pericarpel 12 × 9 mm, green, tube 4–6 × 1 cm, widened to 1.8 cm at apex, infundibuliform, pale greenish-pink, outer perianth segments obovate 2.2–2.4 × 1–1.1 cm, pinkish-green, inner segments spatulate, 2.2–2.4 × 1.1–1.2 cm, white; style 5.5–6 cm, stigma 7–9-lobed, 11 mm long. Fruit 2–3 cm diam., dull red, funicular pulp red or magenta; seeds c. 1.55 mm, testa cells slightly convex, with sparse cuticular folds.

**Specimens examined:** GOIÁS. Mun. Posse, 14°6'48"S 46°21'53"W, 01.I.1976, *E. E. Pereira 94* (UFG). *l.c.*, 14°5'35.16"S 46°22'9.84"W, 07.I.2011, *E. M. Moraes et al. s.n.* (SORO).

Conservation status (IUCN, 2024): VU

Only known from Bahia and Goiás, this species grows on arenitic cliffs of the Barreiras formation in the ranges that divide the two states. It can be easily distinguished by its small stature and long, infundibuliform flowers.

**7.8. *Pilosocereus vilaboensis*** (Diers & Esteves) P. J. Braun, *Bradleya* 6: 88 (1988).

Shrubby cactus branching at base, reaching 1.2–2 m tall, branches 3.5–10 cm diam., epidermis green, 12–25 ribs; areoles 0.7–1 cm apart, raised, 3–4 mm diam., 12–25 spines of uniform size, 0.7–3 cm long, golden-yellow. Floriferous region poorly differentiated, areoles with moderate white wool and golden bristles, flower 5 × 3–5 cm, pericarpel hemiglobose, 10 × 15 mm, greenish pink, flower-tube 35 × 13 mm at base, widened to 26 mm at apex, straight, reddish to purplish brown, outer perianth segments 11 × 9 mm, greenish-pink, darker at apex, inner segments 12 × 6 mm, white, style 30 × 1.5–2 mm, 14-lobed, 8 mm long. Fruit 3–4 × 3–4 cm, almost globose, reddish to purplish, funicular white pulp; seeds <1.7 mm, testa cells strongly convex with dense cuticular folds.

Conservation status (IUCN, 2024): LC

*Pilosocereus vilaboensis* and all its subspecies are endemic to the state of Goiás, to differentiate them see key for subspecies below.

Key for the subspecies of *Pilosocereus vilaboensis*

1. Stems 7–10 cm diam., ribs (16–)18–26..... *P. vilaboensis* subsp. *pluricostatus*  
1'. Stems to 6 cm diam., ribs 12–16..... 2  
2. Spines of vegetative areoles to 3 cm compr. .... *P. v.* subsp. *vilaboensis*  
2'. Spines of vegetative areoles to 16 mm compr. .... *P. v.* subsp. *rizzoanus*

**7.8.a. *Pilosocereus vilaboensis* subsp. *vilaboensis***

Conservation status (IUCN, 2024): LC

**Specimens examined:** GOIÁS. Mun. GOIÁS. Serra Dourada, 15°56'4"S 50°8'25"W, 18.XII.1968, fl., *G. M. Barroso et al.* 769 (UB). *lc.* 15°57'S 50°02'W, 09.II.1988, fr., *W. W. Thomas et al.* 5791 (SPF).

**7.8.b. *Pilosocereus vilaboensis* subsp. *pluricostatus*** N. P. Taylor, Zappi & P. O. Rosa, *Bradleya* 37: 16 (2019). Fig. 8g

Conservation status (IUCN, 2024): LC

**Specimens examined:** GOIÁS. Mun. Pirenópolis, próximo a Cidade de Pedra e monastério Zen 15°42'57"S 48°57'48"W, 16.XI.2024, *A. G. Torres-Cardoso et al.* 52 (UB). *l.c.*, Mosteiro Zen Horyu-Zan Eisho-Ji, 15°43'05"S 48°56'55"W, 11.I.2019, fl. e fr., *P.O. Rosa, D.C. Zappi & N.P. Taylor* 2260 (UB, RB, HEPH). Mun. Pirenópolis, Parque Estadual dos Pirineus, 15°48'15"S 53°48'36"W, 19.VII. 2007, fl., *R. C. Forzza et al.* 4519 (RB).

**7.8.c. *Pilosocereus vilaboensis* subsp. *rizzoanus*** (P. J. Braun & Esteves) N.P. Taylor & Zappi *Bradleya* 37: 16 (2019). Fig. 8 h,i

Conservation status (IUCN, 2024): LC

**Specimens examined:** GOIÁS. Mun. Nova Roma, riacho temporário em propriedade particular, 13°37'31"S 46°52'51"W, 26.VI.2024, *A.G. Torres-Cardoso & C.O. Moura* 37 (UB). Mun. São João d'Aliança, estrada para Cachoeira Label, 14°41'39"S 47°27'43"W, 12.X.2024, *A. G. Torres-Cardoso & J. M. França* 47 (UB) Mun. Teresina de Goiás, rodovia para Campos Belos, 13°46'25"S 47°16'21"W, 01.I.1975, *E.E. Pereira* 58 (UFG).



Figure 8. a. fruiting *Pilosocereus cristalinensis*. b-c. *Pilosocereus diersianus* - b. habit. c. flowering and fruiting branch. d-e. *Pilosocereus machrisii* - d. flowering and fruiting specimen. e. stem apex with fruits. f. *Pilosocereus novaromanus* showing stem apex and fruit. g. *Pilosocereus vilaboensis* subsp. *pluricostatus* with flowerbud and

apex of stem. h. flowering *Pilosocereus vilaboensis* subsp. *rizzoanus*. i. habit of *Pilosocereus vilaboensis*. Photos a. G. Olsthoorn; b, d, f. A.G. Torres-Cardoso; c, e, h. Bianca Schindler; g. S. Albuquerque-Lima; i. C.O. Moura.

## 8. *Praecereus* Buxb.

With only two species accepted and a single one occurring in Southeastern and Central western Brazil (Hunt *et al.* 2006), *Praecereus* comprises shrubby, erect to decumbent or creeping plants with cylindric, green stems with 4–15 low ribs, areoles set apart and with central spines clearly distinct from radial, flowering region not differentiated, flowers tubular or infundibuliform opening at night, pericarpel, floral tube and exterior of the fruit covered in wide, rounded scales. The flower is externally green and outer perianth segments are green with red tips, inner segments pure white. Fruits ovoid, green, reddish or yellow, dehiscent or not by longitudinal slits, with perianth remains erect, pale brown, seeds widely ovate, dark-brown. According to the latest phylogenetic studies (Romeiro-Brito *et al.* 2023b) this genus was placed in one of the most basal branches of subtribe Cereinae.

**8.1. *Praecereus euchlorus*** (F. A. C. Weber ex K. Schum.) N.P.Taylor, *Cactaceae Consensus Initiatives* 3: 10 (1997).

Shrubby, erect cactus branching at base and above but not forming a distinct trunk, reaching 1.5–2 m tall, branches to 10 cm diam.; 4–15 ribs; areoles 2–3 cm apart, 5–8 mm diam.; 10–21 spines, 1–4 central spines <1–7.5 cm; 8–20 radial 1–2 cm, all greyish-white, darker at tips. Floriferous region not differentiated; flower 6–10 × 4–7 cm; pericarpel 2–2.5 cm diam., flower-tube 3–3.5 × 2 cm, widening to 3 cm at apex, outer perianth segments spatulate, 20 × 10 mm, strongly reflexed, greenish with reddish tips, inner segments spatulate, 24 × 8–10 mm, spreading to patent, white; stamens disposed in a mass at flower throat, style 5–8 cm long, stigma 10–12-lobed, 8 mm long. Fruit ovoid, 5–6 cm long, pericarp green with reddish scales, turning yellow, dehiscent by lateral slit, funicular pulp white, solid; seeds broadly ovoid, 1.7–2.2 mm, dull brown-black, testa cells convex, with cuticular folds.

**Specimens examined:** GOIÁS. Mun. Acreúna, 17°28'8"S 50°26'31"W, 10.X.2012, fr., *J. Larocca, G. Emiliano Ferreira, F. Grala 50, 51 e 52* (HJ).

Conservation status (IUCN, 2024): LC

Widely distributed from São Paulo and Paraná through to Mato Grosso, Mato Grosso do Sul and Goiás in Brazil, this species reaches Argentina, Paraguay, Bolivia, Colombia, Ecuador and Venezuela. It can be distinguished from other cacti in the region by its well spaced regular areoles with poignant central spine and all radials adpressed to the stem, and by the broad scales in the pericarpel, tube and fruit.

## 9. *Rhipsalis* Gaertn.

Comprising 38 species, the vast majority of *Rhipsalis* species are found in Brazil, chiefly in the Atlantic Rainforest, and so far, there is a single occurrence of *R. lindbergiana* in Goiás. *Rhipsalis cereuscula* Haw. was recorded just over the border with Minas Gerais (Pereira-Silva 5967- CEN) and may yet be recorded in the state. This genus includes epiphytic, rarely rupicolous plants with pendulous habit, cylindric, angular or flattened stems with acrotonic branching, generally spineless or with soft bristles in seedlings and some species, such as *Rhipsalis pilocarpa* Loefg. and *R. flagelliformis* N.P.Taylor & Zappi), rotaceous flowers with very short tube and few perianth segments and stamens, generally white, pollinated by small insects (Martins and Freitas et al. 2018; Martins et al. 2022) and sometimes hummingbirds, the berries are globose, juicy and mucilaginous, and the narrowly oblong seeds are dispersed by birds and small monkeys.

### 9.1. *Rhipsalis lindbergiana* K.Schum., Fl. Bras. (Martius) 4(2): 271 (1890).

Pendulous, long stemmed, subacrotonically branching epiphytes forming curtains to 4 m or more, a single stem easily reaching 50 cm long, growth indeterminate, 3–6(–12) mm diam., epidermis grey to dark green, texture rubbery and not brittle, terminal areole not compound, stems with minute scales disposed spirally. Flowers not erumpent, lateral, 9–10 mm diam.; pericarpel hemiglobose, green, 5–9 perianth segments, greenish or cream. Fruits ovoid, 3–5 mm long, greenish, reddish, pink or white, seeds 1.4 mm long, brown, testa cells flat, smooth.

**Specimens examined:** GOIÁS. Mun. Cristalina, margem direita do rio Preto, 16°12'19"S 47°19'59"W, 12-VIII-2002, A.A. Santos, 1368 (CEN).

Conservation status (IUCN, 2024): LC

Ocurring in many states of Brazil, spanning from Paraíba southwards to Paraná, mostly in the Atlantic Rainforest but penetrating into the Cerrado through riverine forests, *R.*

*linbbergiana* is easily distinguished by its long stems with indeterminate growth and lateral, not erumpent flowers.

#### 10. *Selenicereus* (A.Berger) Britton & Rose

Comprising 34 species (WFO 2025), of which only *S. undatus* (cultivated, pitaya) and *S. setaceus* (native and widely distributed in Brazil, reaching the state of Goiás and the Distrito Federal) occur in the country. Species of *Selenicereus* are climbers or large size epiphytes or hemiepiphytes, occurring in forests or rocky habitats, branches reaching 5 m long, often with aerial roots, stems trigonous (rarely ribbed) or flattened, with short or reduced spines, infundibular, large or very large nocturnal flowers (perhaps among the longest Angiosperm flowers (e.g. *S. chrysocardium* (Alex) Kimmach, pericarpel and tube often bearing areoles with spines and bristles or broad scales, perianth segments generally white. The fruit is globose, ovoid or oblong, reaching 10 cm long, fleshy, green, red or yellow, with edible white or magenta pulp and widely oval  $2.2\text{--}3.8 \times 1.2\text{--}2.2$  mm, matt, testa cells flat or slightly convex.

##### 10.1. *Selenicereus setaceus* (Salm-Dyck) A.Berger ex Werdermann, Bras. Säulenakt.: 87 (1933).

Scrambling, climbing or hemiepiphytic cactus forming masses over rocks or trees, branches 2–10 cm diam.; 3(–5) ribs with straight or slightly undulated, not thickened; areoles 2–5 cm apart (closer in juvenile branches), 4–6 mm diam.; 5–8 spines, 3–5 central spines conic, 1–6 mm; radial spines more delicate. Floriferous region not differentiated; flower 20–32 × 22–25 cm; pericarpel 4 × 1.8–2.5 cm diam., covered in bristly and hairy areoles and minute scales, flower-tube 10–13 × 2 cm, widening to 3 cm at apex, with scattered bristly and hairy areoles and triangular scales; outer perianth segments triangular-lanceolate, 8–12 × 2 cm, strongly reflexed, greenish with reddish tips, inner segments spatulate, 9–13 × 4.2 cm, spreading to and forming a cup around stamens and stigma, white; stamens laxly disposed flower throat, style 15–18 cm long, stigma 16–18-lobed, 1.5–1.8 mm long. Fruit ovoid, 8–9 cm long, pericarp greenish, ripening bright red and then areoles deciduous, indehiscent, funicular pulp white, solid; seeds broadly ovoid, 2.5–3 mm, cochleariform, black, shiny, testa cells flat, smooth.

**Specimens examined:** DISTRITO FEDERAL. Brazlândia, Caverna Barriguda, 15°30'45"S, 48°07'27"W, 26.IV.2024, *I.F. Perdigão et al.* 360 (UB). GOIÁS. Mun. Formosa, 15°21'5"S, 47°11'17"W, 18.X.2015, fl., *P. H. A. Melo* 4509 (HRCB). Mun. Posse, BR 020, 14°19'17"S, 46°33'08"W, 03.X.2015, fl., *R.A. Pontes* 1074 (UFRN).

Conservation status (IUCN, 2024): LC

*Selenicereus setaceus* has wide distribution in Bolivia, Paraguay and northeastern Argentina, and in Brazil it has been recorded in most states, excepting Santa Catarina, Rio Grande do Sul, Tocantins, Amapá, Roraima and Acre. It can be distinguished from cultivated *S. undatus* by its straight stems without thickened margin and pericarpel and flower-tube with spinescent areoles and narrow, triangular fleshy-bracts (vs. strongly crenated stems with thick margin, pericarpel and tube covered in broad, fleshy bract-scales in *S. undatus*).

## 11. *Tacinga* Britton & Rose

Comprising eight species (+4 nothospecies) to Brazil and a single species in Venezuela, this genus has a single species recorded in Goiás, *Tacinga* is the only member of subfamily Opuntioideae recorded in the present flora. Shrubs, subshrubs or scandent cacti with flattened, more rarely cylindrical stems covered in areoles with serrate spine and glochids, leaves minute, succulent, early deciduous, flowers solitary borne in undifferentiated areoles, pericarpel globose or turbinate, flower-tube absent or very short, perianth segments orange, red, purple or greenish-cream, stamens erect, sometimes exserted, not sensitive. Fruits are globose, turbinate or clavate, with deep cavity, perianth remains deciduous, funicular pulp translucent, greenish, fibrous or almost absent, seeds globular to reniform, pale, covered in fibrous, bony aril <5 mm.

### 11.1. *Tacinga saxatilis* (F. Ritter) N. P. Taylor & Stuppy, Succulent Pl. Res. 5: 115 (2002).

Shrubby or subshrubby cactus forming clumps <4 m diam., branches articulate, orbicular to ovate stems 10–16 × 5–11 cm, 7–17 mm thick, growth determinate, epidermis grey-green, sometimes glaucous; areoles regularly disposed over the stem, impressed, 1–14 mm apart, with glochids; 0–6 fine spines, <19 mm long, whitish to dark-brown. Floriferous region not modified; flower 3–4 × 2.6–4.2 cm; pericarpel 17–25 × 17 mm, green, covered in regular areoles; outer perianth segments narrowly lanceolate, dark red to orange-yellow, inner segments spatulate, 12–22 × 9–14 cm, yellow to orange; stamens exserted; style 7–20 mm, stigma x-lobed exserted. Fruit globose to depressed-globose, <4 × 3 cm, slightly beaked, brownish-green to wine-red, funicular pulp translucent, greenish; seeds rounded, 4.8 × 3.6 × 2.8 mm., pale-cream.

**Specimens examined:** GOIÁS. Mun. Alvorada do Norte, Fazenda Irmãos Gravia, 14°34'14"S, 46°43'01"W, 06.XII.2003, fl., *G. Pereira-Silva et al.* 8261 (CEN e RB). Mun. Formosa, distrito de Bezerra, 15°24'57"S, 47°10'14"W, 04.II.2023, fr., *D. R. Gonzaga et al.* 1213 (RB). Mun. São

Domingos, Fazenda São Vicente, 13°31'11"S, 46°29'48"W, 11.XI.2004, fl., A. C. Sevilha et al. 4170 (CEN, RB).

Conservation status (IUCN, 2024): LC

*Tacinga saxatilis* occurs in Minas Gerais, Bahia, Tocantins and Goiás, always associated with limestone outcrops. It can be easily distinguished from all species treated here by its rounded, flattened articles with determinate growth, regularly covered in areoles with short spines and glochids.

#### 4. Final considerations

Regarding endemic species, we listed, *Cereus alex-bragae*, *Discocactus fariae-peresii*, and five out of eight *Pilosocereus* species (*P. cristalinensis*, *P. diersianus*, *P. machrisii*, *P. novaromanus*, *P. vilaboensis*) as endemic from the state of Goiás. In terms of lithologies, some species are exclusive of limestone outcrops, such as *Cereus calcirupicola*, *Cereus pierrebraunianus*, *Coleocephalocereus neoestesvii*, *Melocactus levitestatus*, *Pilosocereus albissummus*, *P. diersianus* and *P. novaromanus*. We also found that some species are associated with crystalline rock, such as quartzitic outcrops, namely *Discocactus diersianus*, *Pilosocereus cristalinensis*, *P. machrisii* and *P. vilaboensis*, while some species occur on igneous, granitic rocks, as *Cereus bicolor* and *Praecereus euchlorus*. *Discocactus catingicola* has displayed wide preferences, growing both on rock fissures in quartzitic outcrops, and in deep sandy cerrado soils, and then together with *Cereus mirabella*. The complex lithology of the state of Goiás (Lacerda Filho et al. 1999) is reflected by the cactus diversity in the state. Despite being completely included in the Cerrado, the state of Goiás harbours a significant Caatinga disjunction in Nova Roma, a municipality that includes limestone and igneous rock outcrops in its territory, where dry forests harbour *Arrojadoa rhodantha*, an otherwise Caatinga endemic species, grows alongside *Cereus*, *Pilosocereus* and *Melocactus* species (Moro et al. 2024).

Despite the efforts carried out to prepare the present work, the number of Cactaceae found in Goiás and Distrito Federal (28 species distributed in 11 genera) may still be underestimated, with the possibility of new discoveries as collecting efforts intensify, with the west of Goiás and also the border between Goiás and Minas Gerais being possible regions where additional species for the flora may be recorded.

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