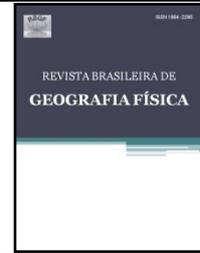




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New records of *Bronwenia megaptera* (B. Gates) W. R. Anderson & C. C. Davis for the State of Piauí, Brazil

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ABSTRACT

This study aimed to record the occurrence of the species *Bronwenia megaptera* (B. Gates) WR Anderson & CC Davis in an area of the territory of the State of Piauí, Brazil. The species was collected in the city of Pedro II, in a tension area that gathers characteristics of Cerrado and Caatinga shrubland. The study provides a brief characterization of the botanical family and descriptions of the genus and species. The species had already been found in the states of Minas Gerais, Rio de Janeiro, Bahia and Ceará. In addition to depicting the geographic occurrence of the plant, a morphological and anatomical characterization of the species was made, with the assembly of a board with images of the most relevant aspects of the morphology and anatomy of the plant.

Keywords: Malpighiaceae, *Bronwenia*, *Bronwenia megaptera*, Ecological Stress Area, Cerrado, Caatinga, Northeast Brazil.

Novo registro de *Bronwenia megaptera* (B. Gates) W. R. Anderson & C. C. Davis para o Estado do Piauí, Brasil

RESUMO

Este trabalho teve como objetivo registrar a ocorrência da espécie *Bronwenia megaptera* (B. Gates) W. R. Anderson & C. C. Davis em área do território do Estado do Piauí, Brasil. A espécie foi coletada na cidade de Pedro II, em área de tensão que reúne características de Campo Cerrado e Caatinga arbustiva. O estudo traz uma breve caracterização da família botânica e descrições sobre o gênero e a espécie. A espécie já tinha sido encontrada nos estados de Minas Gerais, Rio de Janeiro, Bahia e Ceará. Além de retratar ocorrência geográfica da planta foi feita uma caracterização morfológica e anatômica da espécie, com a montagem de uma prancha com imagens dos aspectos mais relevantes da morfologia e da anatomia da planta.

Palavras-chave: Malpighiaceae, *Bronwenia*, *Bronwenia megaptera*, Área de Tensão Ecológica, Cerrado, Caatinga, Nordeste Brasil.

Introdução

The state of Piauí in northeastern Brazil covers an area of 251.616,823 km² (IBGE, 2020), which includes parts of four domains: the Caatinga (28,4%), with many areas especially on the geological formation of Cristalino in the eastern portion of the state, on the border with the states of Ceará and Pernambuco; the Cerrado (12,2%), takes place of several extensions toward the southwest of the State, especially in the region near the border

with the States of Maranhão, Bahia and Tocantins, with areas surrounded by important rivers of the Parnaíba River Basin; Mixed Subcaducifolia Forest areas, known as Babaçus forests (13.5%) (Santos-Filho et al. 2013a), located along the final portion of the Parnaíba River Basin, with a coastal vegetation (4.1%) including many typical elements such as mangroves, restinga vegetation and tablelands, forming the smallest coastline in Brazil

(Santos-Filho et al. 2013b; Santos-Filho et al. 2015); the rest of the State's territory (41.8%) is occupied by a large area of Ecological Tension that spreads both in northern and southern areas, forming places where Cerrado areas are mixed with Caatinga areas (Castro, 2007).

The county of Pedro II is located to the north of Piauí, whose territory is configured as belonging to an area of ecological tension. The relief of this unit is formed by Serra de Matões on the border with the State of Ceará. The region has an average altitude of 603 meters above sea level, which gives it a milder climate with minimum temperatures of 15-20°C. It's classified as a tropical climate according to the Köppen classification (Aw), with six dry months and six rainy months. The mean annual temperature is relatively high, reaching around 22,1 – 24,4°C and with an annual mean temperature of 2,3°C with no significant oscillations. The total annual precipitation varies around to 1137 mm, with the wettest period in January and April (CLIMATEMPO, 2020).

Malpighiaceae is a family of Rosids positioned in Malpiales (APG IV, 2016). The family includes trees, shrubs, lianas and occasionally perennial herbs, and is composed of approximately 77 genera and 1300 species occurring in tropical and subtropical areas in both hemispheres (Anderson, 2001; Davis e Anderson, 2010). In Brazil, according to Barroso et al. (1991) there are 32 genera and more than 300 species distributed in different regions. They have opposite leaves, rarely spiraled or fasciculated at the apex of the branches, with a thick to slightly coriaceous consistency, some membranous, hairy with indications of malpighiaceus hair (single-celled) petiolated with inter or intrapeciolar stipules, free or concrete, small, lance, sometimes reduced to punctiform protrusions, inflorescences are racemous, rarely cytomatic, form racemes or spikes, sometimes reduced to isolated axillary flowers or composed of spiciform, corimbous or umbelates branches. The fruits are schizocarp, forming three samarids or coconuts, drupes or achenes. Samarids can have lateral wings, continuous, entire or marginal or bilobed at the apex (BARROSO et al. 1991).

The genus *Bronwenia* arose from the verification of Anderson and Davis (2007) who Silva, L. N. N. S.; Vilarinho, M. P.; Araújo, J.S.; Santos-Filho, F.S.

realized the species of *Banisteriopsis* Subg. *Banisteriopsis* would not belong to *Banisteriopsis Stricto Sensu* and could fit as a new genus (*Bronwenia*). To the eight species of this subg. treated by Gates (1982) two more species were added, making a total of ten species, in this study by Anderson and Davis (2007). The genus *Bronwenia* alludes to Bronwen Elizabeth Gates who made the preliminary study of these species when they still belong to *Banisteriopsis* Subg. *Banisteriopsis*.

Woody vines or shrubs, when shrubby the branches often twining. Leaves decussate; lamina with glands none or usually marginal, sessile, the distal glands (if present) minute, the 2 most proximal glands usually enlarged; petiole eglandular or biglandular at or somewhat below apex; stipules usually present, interpetiolar, distinct, triangular, minute (0,2 mm long) or small (up to 1,5 mm long). Inflorescence axillary or terminal, paniculate or dichasial, the flowers borne in short, usually dense pseudoracemes of 6-45; bracts and bracteoles eglandular, persistent; pedicels sessile of short-pedunculate. Flowers bilaterally symmetrical in calyx and corolla, and sometimes in androecium. Sepals leaving petals exposed during enlargement of bud, the lateral 4 bearing large paired abaxial glands and the anterior eglandular, the glands attached for most of their length below free part of sepal. Petals yellow glabrous (very rarely sericeous on abaxial midrib), the posterior petal different in size, shape, and stance from the lateral 4, and its margin often more deeply divided with the divisions (especially proximally) ± glandular-thickened. Receptacle glabrous on both sides of filaments. Stamens 10, all fertile, anthers glabrous or pilose, the connective not or hardly exceeding locules at apex. Gynoecium 3-carpellate, the carpels 1 anterior and 2 posteriors, all fertile; styles 3, distinct, mostly ± alike; stigmas terminal, truncate or capitate. Fruit dry, breaking apart at maturity into 3 samaras (or fewer by abortion) separating from a low pyramidal torus; dorsal wing of samara well developed, elongated, thickened on the adaxial edge with the veins bending toward the thinner abaxial edge, a shallow triangular or rounded appendage usually present on adaxial edge at base; nut of samara smooth-sided or bearing a single

ridge or winglet on each side parallel to areole; locule of nut glabrous within; carpophore absent or present but short (up on 1,5 mm long), wide (1-2 mm wide), and non-functional (Anderson and Davis, 2007).

Among the ten species of the genus, eight can be found in Brazil, five of which are endemic. For the Northeast region, three species are distributed in the phytogeographic domains Cerrado and Caatinga, but Piauí has no records of the occurrence of the genus *Bronwenia*. (Flora of Brazil, 2020).

The present study records the first occurrence of the species *Bronwenia megaptera*, collected in the county of Pedro II, Piauí, Northeastern Brazil, in a transition area between Campo Cerrado and Caatinga shrub (Castro, 2007). In addition to the morphological description and illustrations of the species and its location, the study brings a brief anatomical characterization of the studied specie.

Methods

Our study was based on field collections, a literature review (Anderson & Davis, 2007; Flora of Brazil 2020), and reviews of digital collections in Reflora databases (<http://reflora.jbrj.gov.br>; accessed on: 2020-6-4) and SpeciesLink (<http://www.splink.org.br>; accessed on: 2020-6-4). Type specimens were consulted through the digital collections of Reflora database (MO herbarium) and P herbarium (acronyms according to Thiers 2018). Identifications were confirmed by consulting Anderson and Davis (2007) and Gates (1982) monographs of the genus *Banisteriopsis* Subg. *Banisteriopsis*. The descriptions are based on the collected samples, using the terminology

adopted by Anderson and Davis (2007). The exsiccate of the new records were incorporated into São Paulo University Herbarium (SPF).

Using the Quantum Gis 3.0 software, the cartographic base made available by IBGE updated in 2018 and the Coordinate Reference System SIRGAS / UTM, a graphic representation of the collection position of the *Bronwenia megaptera* plant was elaborated.

A fully expanded and well preserved leaf of *Bronwenia megaptera* was removed from the exsiccate (HUEFS 200529; collector - M. Cotarelli - 1771) and subjected to the reversion process of herborization, according to the methodology of Smith and Smith (1942), which consists in boiling the material in distilled water until it is submerged (5 minutes on average), never exceeding 15 min. As soon as the leaves reached room temperature, they were dipped in a 2% KOH solution, to complete the distension (2 hours on average). After washing, the leaves were dehydrated in an ethyl series and stored in 50% ethanol. These samples were used as a comparison parameter with the material collected in the field.

Leaves from the collected material in Pedro II were fixed in 50% FAA and stored in 50% ethanol. Both the material that went through the reversion process of herborization and the samples that were stored in 50% ethanol went through the freehand cutting process, with the aid of a razor blade, to obtain transversal cuts in the median region of the leaf blade and of the petiole. The cuts were clarified in sodium 50% hypochlorite and stained with basic fuchsin and aster blue, mounted in glycerin gelatine and sealed with clear polish (Kraus & Arduin, 1997).

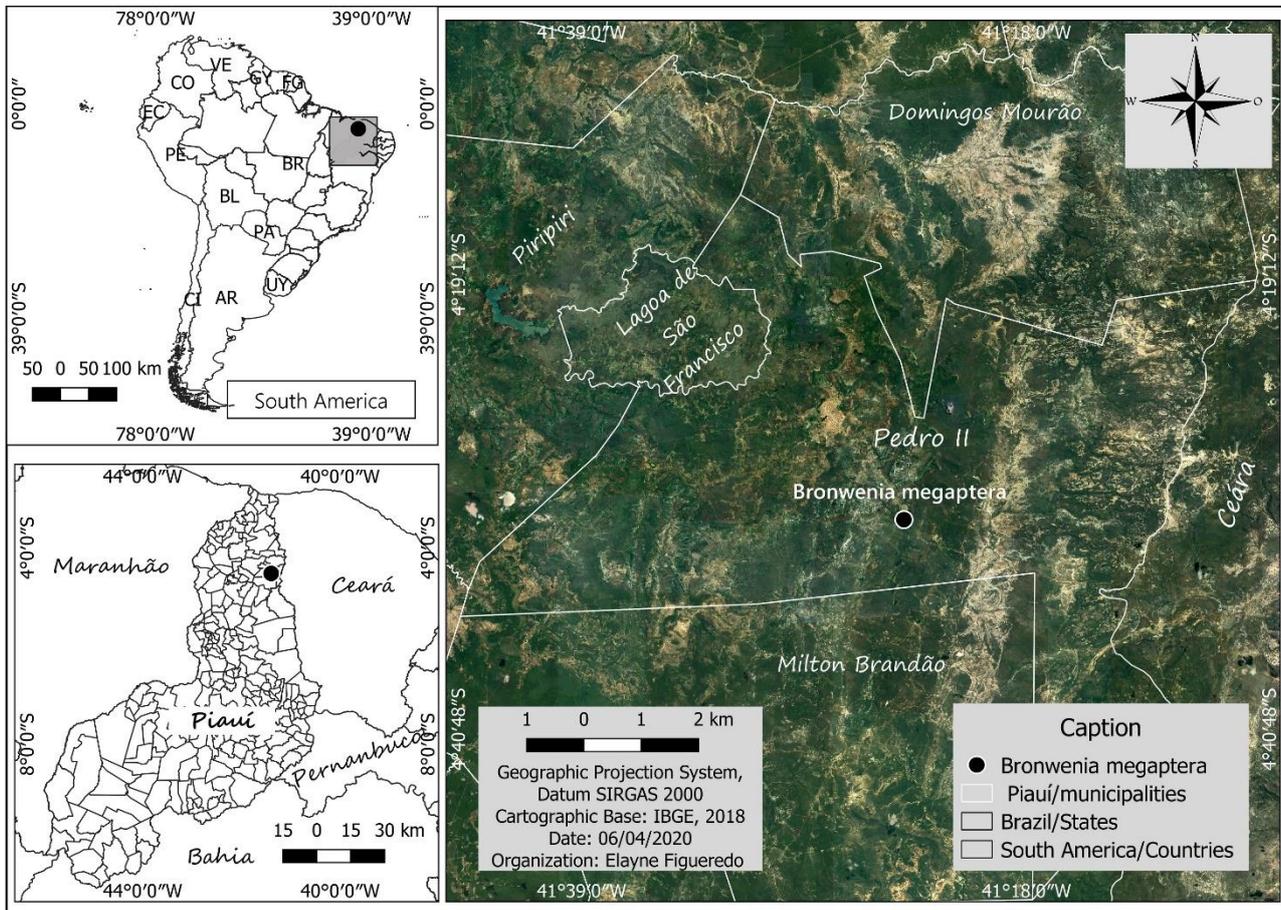


Figure 1. Geographic location of the species *Bronwenia megaptera*, in Pedro II, Piauí, Northeast, Brazil.

Results

Bronwenia megaptera (B.Gates) W. R. Anderson & C. Davis, comb. Nov. *Banisteriopsis megaptera* B. Gates, Fl. Neotrop. Monograph. 30:49, 1982.

Type: Brazil, Minas Gerais: S. of Itaobim, Anderson 11734 (holotype: MBM; isotypes: CAS, CTES, MICH, MO, NY).

New Records. Brazil: Piauí – Pedro II, Povoado Felipe, BR-404, 4°30'50"S, 41°23'47"W, alt.507m asl, 01.I.2019, L.N.N.S. Silva 089 (SPF).

Identification.

Scandant shrub with ca. 80cm long. Branches with sericeum indument, persistent and interpeciolar stipules, tiny (Fig. 2A). Simple leaves with a pair of glands in the petiole (Fig. 2B) and at the base of the blade. Lamina at least initially densely to thinly sericeous below with the hairs straight and strongly appressed, sometimes glabrescent at maturity. Petiole biglandular at or somewhat below apex, the glands sometimes partly on margin of very base of lamina and partly on

adjacent petiole. Limb of lateral petals 2,5-5,5 (7) mm long, 6-11 wide; glands on petiole or base of lamina up to 2 mm long. Inflorescences in flower panicles forming short pseudoracemes (Fig 2C, 2D, 2E), bracts and bracteoles with or without glands. Yellow flowers; pedicels 7-12mm long; styles 1,6-1,8 mm long; Pedicels 7-12mm long; styles 1,6-1,8 mm long; straight and parallel or diverging throughout their length or at apex only; stamens subequal, erect, all their filaments somewhat connate at base. Fruits in hairy samara without side wings, with velvet consistency (Fig. 2F).

Petiole contour in transversal section presented concave-convex (Fig. 2G), with the presence of malpighiaceous trichomes, thick cuticle, uni-stratified epidermis, angular collenchyma, a pair of accessory bundles, druses and conformation of the open bundle vascular bundle. Regarding the midribs contour, it was of the biconvex type (Fig. 2H), with the presence of malpighiaceous trichomes, thick cuticle, bi-stratified epidermis not continuing to the adaxial face and uni-stratified to abaxial with angular collenchyma. The conformation of the vascular bundle was of the open arch type and the dorsiventral mesophyll with the presence of the

parenchymatic sheath extension. The anatomical analysis of the individual collected in Pedro II was compared with the anatomical data of a species of *Bronwenia megaptera* obtained from the

herbarium and it was observed that the characteristics are identical between the two samples.

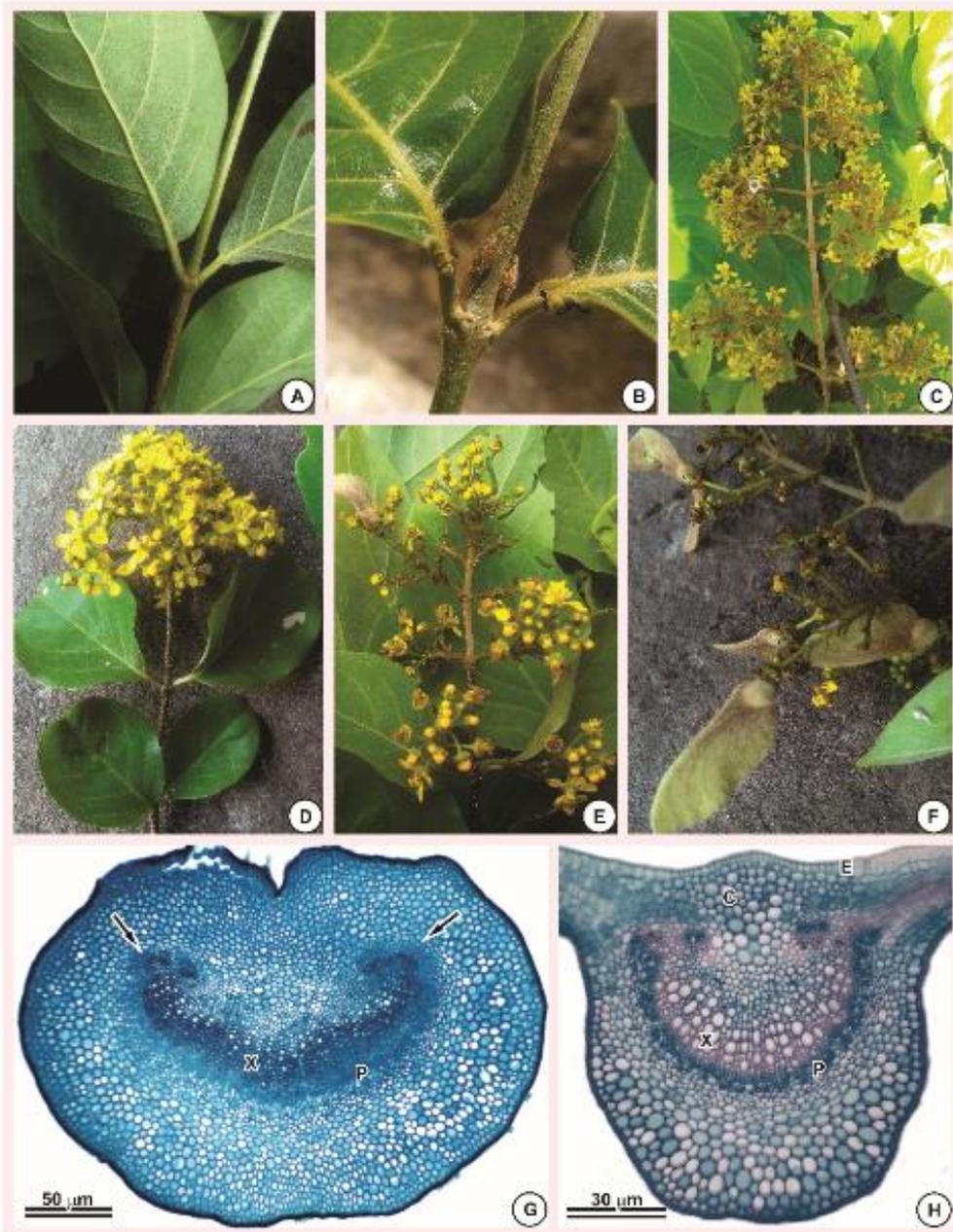


Figure 2. Leaf morphology and anatomy of *Bronwenia megaptera*. **A.** Interpetiolar stipules. **B.** Glands in the petiole. **C.** Inflorescences in flower panicles forming short pseudoracemus. **D.** Overview of the flower. **E.** Side view of the flower. **F.** Detail of the fruit. **G.** cross section of the petiole. **H.** cross section of the main rib. Acronyms: C = collenchyma; E = epidermis; P = phloem; X = xylem and arrow = accessory bundles.

Discussion and Conclusion

Bronwenia megaptera is endemic to Brazil. According to Flora do Brasil (2020), the species occurs in the Caatinga (*Stricto Sensu*), in

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the Cerrado (*Lato Sensu*) and in the Rainforests of the Atlantic Forest Domain, having already been registered in the States of Bahia, Ceará, Minas Gerais and Rio de Janeiro.

Among the 10 species described by Anderson and Davis (2007), *Bronwenia acapulcensis* and *B. cornifolia* are not found in Brazil. *Bronwenia cinerascens*, which occurs in Roraima; *B. mathiasiae*, which occurs in Acre, Amazonas, Roraima and Mato Grosso and *B. wurdackii*, which occurs in Acre, Amazonas, Pará, Rondônia, Maranhão and Mato Grosso are not endemic to Brazil. *Bronwenia brevipedicellata*, which occurs in the Amazon; *B. ferruginea* which occurs in Bahia, Sergipe, Espírito Santo, Minas Gerais and Rio de Janeiro; *B. longipilifera* which occurs in Mato Grosso and Mato Grosso do Sul; *B. peckoltii* which occurs in Rio de Janeiro, in addition to *B. megaptera*, which occurs in Bahia, Ceará, Minas Gerais, Rio de Janeiro and, with this work also occurs in Piauí, they are all endemic species of the Brazilian Flora.

The discovery and registration of *B. megaptera* in the territory of Piauí reinforces the discussion raised by several authors that the region is home to a large ecotonal area, as it brings together species that occur both in characteristic areas of the Caatinga environment and areas with species that can live in environments with higher rainfall, like this species that also occurs in Cerrado areas and in Rainforests.

Plant anatomy applied to taxonomy has been considered an important tool to assist in the identification and distinction of species and its use began in the middle of the 19th century (Solleder 1908, Metcalfe & Chalk 1979). Several authors have used anatomy to help differentiate Malpighiaceae species such as Araújo et al. (2010) who analyzed some species of the genera *Banisteriopsis*, *Byrsonima* and *Heteropterys*. Araújo et al. (2020) in their work they used the technique to characterize and distinguish *Banisteriopsis* species occurring in Brazil. Other works are noteworthy, such as Mamede (1993), which characterized *Camarea* species; Guimarães et al. (2016) performed the anatomical description of three species of *Stigmaphyllon*, Guesdon et al. (2018) with the characterization of the genus *Glandonia* and Almeida et al. (2017) studied *Amorimia* species. In other families, anatomy has also helped in taxonomy, such as Sapotaceae, and it is important to mention the research of Ferreira et al. (2019) who performed a new synonymization of *Micropholis* species using morphoanatomy. Another interesting work is that of Lima et al.

(2019) with the genus *Diploon*. And we also have Almeida-Jr. et al. (2012) with *Manilkara*. The authors mentioned above report the importance of anatomy to assist in the characterization and differentiation of species.

It is believed, therefore, that there is still an exceptionally large gap in relation to the Malpighiaceae genera that actually occur in Piauí and further studies on the state's flora are needed. Morphoanatomy was an especially important tool for the identification of the species *Bronwenia megaptera* in the ecotonal region of Pedro II, Piauí, and consequently to add this new occurrence information to Flora of the state.

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