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Ipomoea buriliae (Convolvulaceae), a new species of morning glory discovered in the Borborema Plateau, northeastern Brazil

Belo D.P.[1,2,3,4]*, Santos E.A.V.[1,3] & E.C. Gasparino[4]

[1]Programa de Pós-Graduação em Biodiversidade, Departamento de Biologia, Universidade Federal Rural de Pernambuco, 52171-900, Recife, Pernambuco, Brazil

[2]Laboratório de Sistemática Integrativa, Departamento de Biologia, Universidade Federal Rural de Pernambuco, 52171-900, Recife, Pernambuco, Brazil

[3]Laboratório de Anatomia Vegetal, Departamento de Botânica, Centro de Biociências, Universidade Federal de Pernambuco, 50740-570, Recife, Pernambuco, Brazil

[4]Laboratório de Morfologia Vegetal e Palinologia, Departamento de Biologia, Faculdade de Ciências Agrárias e Veterinárias, Universidade Estadual Paulista, 14884-900, Jaboticabal, São Paulo, Brazil

*E-mail: deibson.belo@gmail.com

Abstract: *Ipomoea buriliae* Belo (Convolvulaceae) is described and illustrated as a new species. We provide a taxonomic treatment along with anatomical, cytogenetic, and palynological descriptions for this new species. Additionally, we include illustrations, photographs, and details about its geographical distribution and conservation status. A comparative list highlights key morphological characters of *I. buriliae* in relation to closely related species. It shares some morphological similarities with *I. parasitica* (Kunth) G.Don. However, *I. buriliae* is distinguished by its white corolla, spiny projections on the stem, petiole, and peduncle, as well as a campanulate corolla and tector trichomes along the filaments.

Keywords: Brazilian flora, CMA/DAPI banding, Endemism, Leaf anatomy, Palynology, Taxonomy

Introduction

Convolvulaceae comprises about 60 genera and 1,900 species, with a cosmopolitan distribution predominantly found in tropical regions (Staples & Brummitt, 2007; POWO, 2024). In Brazil, the family is represented by 24 genera and around 430 species (including one endemic genus and approximately 200 endemic species), distributed across all phytogeographic domains (Simão-Bianchini, 2024). In recent years, the knowledge of the family in the country has expanded with the publication of several new species (e.g., Wood *et al.*, 2017; Santos *et al.*, 2019, 2020a, 2020b, 2021; Nepomuceno *et al.*, 2022; Belo *et al.*, 2023a, 2024; Pastore *et al.*, 2023; Santos & Buril, 2024).

Ipomoea L. is the most diverse genus of Convolvulaceae, comprising approximately 800 species (Wood *et al.*, 2020; Delgado-Junior *et al.*, 2023). Despite its morphological variability, the genus is easily recognized by several key traits: echinate and pantoporate pollen grains, an entire style, a stigma usually with two globose stigmatic lobes, and 4-valved capsules (Austin & Cavalcante, 1982; Stefanović *et al.*, 2002). The genus has about 160 species in Brazil, of which 65 are endemic (Santos *et al.*, 2021; Simão-Bianchini *et al.*, 2024). Representatives of the genus are characterized by having a climbing, herbaceous, or shrubby habit, simple or compound alternate leaves, absent stipules, cymose inflorescences, funnelform, campanulate, or hypocrateriform corolla (Austin, 2004; Ferreira & Miotto, 2009; Delgado-Junior *et al.*, 2023). The shape, proportion, indumentum, and ornamentation of the sepals are essential taxonomic characters for delimitation for species of the genus, especially when compared with vegetative characters (Wood *et al.*, 2020; Delgado-Junior *et al.*, 2023).

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Anatomical, palynological, and cytogenetic studies have been used to support the morphological delimitations of species in several plant groups, in addition to being used to describe new species (*e.g.*, Smith & Smith, 1942; Gomes *et al.*, 2005; Almeida *et al.*, 2016; Santos *et al.*, 2019, 2020a, 2020b; Nepomuceno *et al.*, 2022; Belo *et al.*, 2023a, 2023b, 2023c, 2024). In Convolvulaceae, anatomical characters such as the shape of the petiole, midrib, and mesophyll are informative for delimiting species of *Argyreia* Lour. (Traiperm *et al.*, 2017), *Camonea* Raf. (Santos *et al.*, 2024), *Daustinia* Buril & A.R. Simões (Alencar *et al.*, 2024), *Evolvulus* L. (Ketjarun *et al.*, 2016; Santos *et al.*, 2020a), and *Jacquemontia* Choisy (Belo *et al.* 2023b, 2023c, 2024).

During field expeditions in the Northeast region of Brazil, we encountered an unfamiliar morphotype of *Ipomoea*, which we studied in detail. One population of this morphotype was identified, and here we describe it as a new *Ipomoea* species, supported by morphological, anatomical, palynological, and cytogenetic analyses.

Materials and Methods

Study area

Field expeditions were carried out in northeastern Brazil, between May 2023 and July 2024. The description of the new species was based on specimens collected from one population in the Areia municipality, Paraíba State, Brazil (Fig. 1). This area is part of the Borborema Plateau (BP), one of the ecoregions within the Caatinga phytogeographic domain. The BP spans an area of 43,460 km², equivalent to 2.61% of Northeastern Brazil (Silva *et al.*, 2003). It extends across the

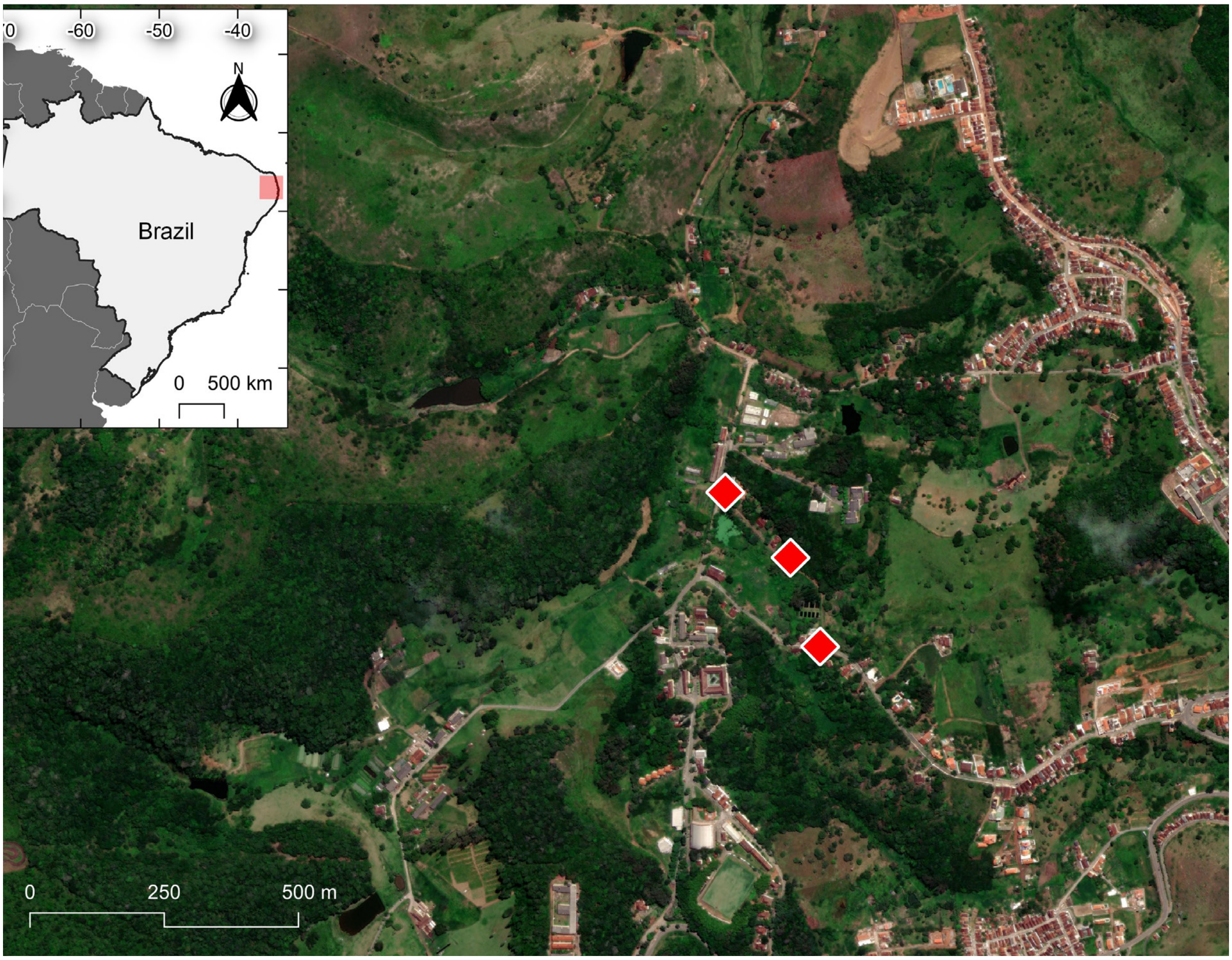

Fig. 1. Distribution of *Ipomoea buriliae* Belo, sp. nov. in Brazil.

states of Alagoas, Pernambuco, Paraíba, and Rio Grande do Norte (Giulietti *et al.*, 2004), with altitudes ranging from 500 to 1200 m (Silva *et al.*, 2003; Morais Neto *et al.* 2009). The predominant vegetation in the BP is hypoxerophilous Caatinga (Silva *et al.*, 2003).

Morphology and conservation status

Specimens of morphologically closely related species were analyzed from the following herbaria: EAC, EAN, HCES, IPA, PEUFR, and UFP (acronyms follow Thiers, 2024). The taxonomic description and terminology follow Meisner (1869), Wood *et al.* (2020), Harris and Harris (2001), and Ellis *et al.* (2009). A preliminary conservation status assessment was performed based on the IUCN Red List Categories and Criteria (IUCN, 2012, 2024). The occurrence map was generated using QGIS software 3.22 Białowieża (https://qgis.org/).

Anatomical analyses of leaves

For comparative anatomical analyses, three leaves from the third node of the stem were obtained from five specimens of the new species and of *I. parasitica* (Kunth) G.Don in the field (Table 1). These leaves were fixed in FAA 50 (formaldehyde, acetic acid, and 50% ethanol) for 48 hours (Johansen, 1940) and subsequently stored in 70% ethanol. Freehand sections were made from the median region of the leaf blade, petiole, and stem. These sections were cleared and stained with safranin-astra blue (Bukatsch, 1972). The slides were prepared following the protocols of Kraus and Arduin (1997), analyzed using a Leica DM500 photomicroscope, and deposited in the Laboratory of Integrative Systematics at the Federal Rural University of Pernambuco, in Recife, Brazil. Samples close to the leaf margins were dehydrated and prepared for scanning electron microscopy (SEM) analysis using a Hitachi SEM, model TM4000 Plus. SEM images were processed using CorelDRAW® 2021 software.

Palynological analyses

For pollen morphology analyses, at least five buds were nearing anthesis collected from three specimens per population to obtain a significant

Table 1. Specimens used in micromorphological analyses.

Taxa	Locality	Voucher	Herbarium	Anatomical analysis	Palynological analysis	Cytogenetic analysis	Geographic coordinates (latitude, longitude)
Ipomoea buriliae Belo, sp. nov.	Areia, Federal University of Paraíba, Paraíba state – Brazil	*D. Belo &E. Barbier* 740	PEUFR	×	×	×	6° 58' 10" S, 35° 42' 50" W
Ipomoea alba L.	Areia, Campus CCA-UFPB, Paraíba state – Brazil	*L.P. Félix & J.P. Dantas* 5000	EAN	–	×	–	6° 58' 08" S, 35° 43' 01" W
Ipomoea marcellia Meisn.	Remígio, Paraíba state – Brazil	*L.P. Félixet al.* 10756	EAN	–	×	–	6° 57' 32" S, 35° 46' 55" W
Ipomoea parasitica (Kunth) G.Don	Cuité, Paraíba state – Brazil	*V. F. Souza s.n.*	HCES 722	×	×	–	6° 29' 36" S, 36° 09' 24" W
Ipomoea parasitica (Kunth) G.Don	Ubajara, Ceará state – Brazil	*J.A.A.M Lourençoet al.* 98	PEUFR	×	×	–	3° 50' 43" S, 40° 54' 24" W

sample of pollen material (Table 1). The pollen grains were acetolyzed following Erdtman (1960), with modifications as described by Melhem *et al.* (2003). Diameter measurements were taken on 25 pollen grains over one week (Salgado-Labouriau *et al.*, 1965). Other measurements (exine thickness and apertures) were taken from ten pollen grains. The slides obtained were incorporated into the Laboratory of Plant Morphology and Palynology pollen collection at the São Paulo State University, *campus* Jaboticabal - UNESP/FCAV, Brazil. The pollen morphology and terminology were based on Punt *et al.* (2007) and Halbritter *et al.* (2018).

Cytogenetic analyses

For cytogenetic analyses, 3 mm flower buds were fixed in Carnoy's solution (3:1 absolute ethanol/glacial acetic acid, v/v) for 2 hours at room temperature. To prepare the slides, the flower buds were washed twice with distilled water for 5 minutes each, and the anthers were digested in an enzymatic solution containing 2% cellulase and 20% pectinase and kept in a humid chamber at 37 °C for 20 minutes. Subsequently, the anthers were fragmented on a slide in a drop of 45% acetic acid, covered with a coverslip, and crushed. The coverslip was then removed after freezing in liquid nitrogen, and the slides were air-dried and stored for three days at room temperature. The slides were stained with 10 µL of Chromomycin A3 (CMA; 0.1 mg/mL) for 1 hour, followed by 10 µL of 4',6-diamidino-2-phenylindole (DAPI; 1 µg/mL) for half an hour, was performed as described by Barros e Silva and Guerra (2010), and Barros e Silva *et al.* (2010). After washing with distilled water, the slides were air-dried and prepared in a

Table 2. Comparison among *Ipomoea buriliae* Belo, sp. nov. (Convolvulaceae) and three morphologically similar species.

Character	*Ipomoea buriliae* Belo, sp. nov.	*Ipomoea alba* L.	*Ipomoea marcellia* Meisn.	*Ipomoea parasitica* (Kunth) G.Don
Stems with spiny projections	Present	Present	Absent	Present
Leaf indumentum	Pubescent	Glabrous	Velutinous to lanate	Sericeous
Leaf apex	Caudate	Acuminate	Acute	Acute
Outer sepal shape	Orbicular	Lanceolate	Ovate to oblong	Elliptic
Outer sepal apex	Retuse	Caudate	Acute	Obtuse and mucronate
Corolla shape and color	Campanulate, white	Hypocrateriform, white	Funnelform, white-yellowish	Funnelform, blue
Color of the abaxial mesopetal region	Yellow	Greenish	Yellow	White
Tector trichomes at the base and along the filaments	Present	Absent	Absent	Absent
Pollen size	Very large ($\bar{x}$ = 110.8 × 109.6 µm)	Large ($\bar{x}$ = 79.2 × 78.8 µm)	Large ($\bar{x}$ = 92 × 91.2 µm)	Very large ($\bar{x}$ = 101.1 × 100.8 µm)
Number of spines	165 spines	42 spines	55 spines	703 spines
Exine thickness	Nexine is thicker than sexine	Nexine is thicker than sexine	Sexine is thicker than nexine	Nexine is thicker than sexine

medium containing glycerol/McIlvaine buffer pH 7.0 (1:1). The slides were then stored for 3 days in a darkroom to stabilize the fluorochromes. The best cells were analyzed using a Zeiss photomicroscope with an Axio Cam MRC5 (Oberkochen, Germany) and Axiovision v.4.8 software, at the Plant Cytogenetics Laboratory at the Federal University of Paraíba, *campus* Areia - UFPB/CAA, Brazil.

Taxonomic treatment

Ipomoea buriliae Belo, **sp. nov.** Figs. 2,3

Ipomoea buriliae is similar to *I. parasitica* in having spiny projections along the stem, petiole, and peduncle, as well as cordate leaves, and prominent veins on the abaxial surface. However, *I. buriliae* can be distinguished by its leaves with pubescent indumentum with caudate apex (*vs.* sericeous with apex acute), the outer sepals orbicular with apex retuse, and the inner sepals reniform with the apex obcordate, glabrous (*vs.* elliptic with apex obtuse and mucronate – the outer sepals, and apex rounded and minutely mucronulate – the inner sepals, puberulent to glabrescent), white campanulate corolla (*vs.* blue funnelform), filaments with tector trichomes at the base and along the structure (*vs.* tector trichomes only at the base) (see Table 2).

Type: BRAZIL, **Paraíba**, Areia, *campus* da Universidade Federal da Paraíba, 6°58’10”S, 35°42’50”W, 550 m, 20.07.2024, *D. Belo & E. Barbier* 740 (holo PEUFR!; iso CSTR!, EAN!, UFP!).

Climbing plants; branches glabrous, striated with spiny projections; internodes 5.5–12.3 cm long. Leaves ovate, 8.5–15 × 6.1–13 cm, base cordate, margins entire, apex caudate, adaxial surface pubescent with tector and sessile peltate glandular trichomes, abaxial surface pubescent to glabrescent with tector and sessile peltate glandular trichomes, peninervea venation, simple brochidodromous type, with eight to ten pairs of secondary veins; petioles 7.2–16 cm long, glabrous to glabrescent with tector and sessile peltate glandular trichomes, striate. Inflorescence cymose, 3–8-flowered; peduncles 9.4–31 cm long, glabrescent, glabrous; bracteoles linear, 0.3–1 cm long, base rounded, apex acute, glabrous; pedicels 1–2 cm long, glabrous, striate. Sepals 5, unequal, the 2 outer ones orbicular, 6.4–6.5 × 5.8–6.2 mm, base oblique, apex retuse, glabrous, the intermediate one reniform, *c.* 11 × *c.* 10 mm, the base oblique, the 2 inner ones reniform, 11.2–12.5 × 11.2–12.6 mm, base cordate, apex obcordate. Corolla campanulate, 5.8–6.2 cm long, white, glabrous, yellow abaxial mesopetal region. Stamens 5; filaments 9.5–17.35 mm long, tector trichomes at the base and along the structure; anthers 5.8–6.9 mm long, oblong, glabrous, pollen grains monads, apolar, very large size, spheroidal, pantoporate. Ovary conical, 1.4–1.5 × 2–2.2 mm, 4-locular; style entire, 30–34.5 mm long, stigmatic lobes 2, 1.4–1.8 mm long, 2-capitate with the surface verrucose. Capsules globose, 1–2 cm long. Seeds 0.6–1 cm long, pubescent.

Flowering & fruiting: Flowering from June to August and fruiting from July to September.

Habitat: The new species occurs in a humid forest enclave in Paraíba state, north of the São Francisco River, Brazil, at an elevation of about 550 m.

Distribution: The known distribution of *I. buriliae* is restricted to the type locality.

Etymology: The specific epithet is named in honor of Dr. Maria Teresa Buril, acknowledging her outstanding contributions to the study of the systematics and taxonomy of Convolvulaceae, as well as to the field of botany. Beyond being a notable researcher, Dr. Buril is an exceptional mentor, committed to fostering the development of new Brazilian scientists.

Additional specimens examined (Paratypes): BRAZIL, **Paraíba**, Areia, *campus* da Universidade Federal da Paraíba, 6°58’02”S, 35°42’56”W, 563 m, 21.07.2024, *D. Belo & E. Barbier* 741 (PEUFR!); *Ibid.,*, 6°58’03”S, 35°42’52”W, 570 m, 24.07.2024, *D. Belo & E. Barbier* 742 (PEUFR!); *Ibid.*, 550 m, 27.08.2024, *R. Silva et al.* 10 (EAN!).

Conservation status: According to IUCN criteria, despite occurring in an anthropic area, we consider the conservation status of *I. buriliae* as Data Deficient (DD) since it is known only from

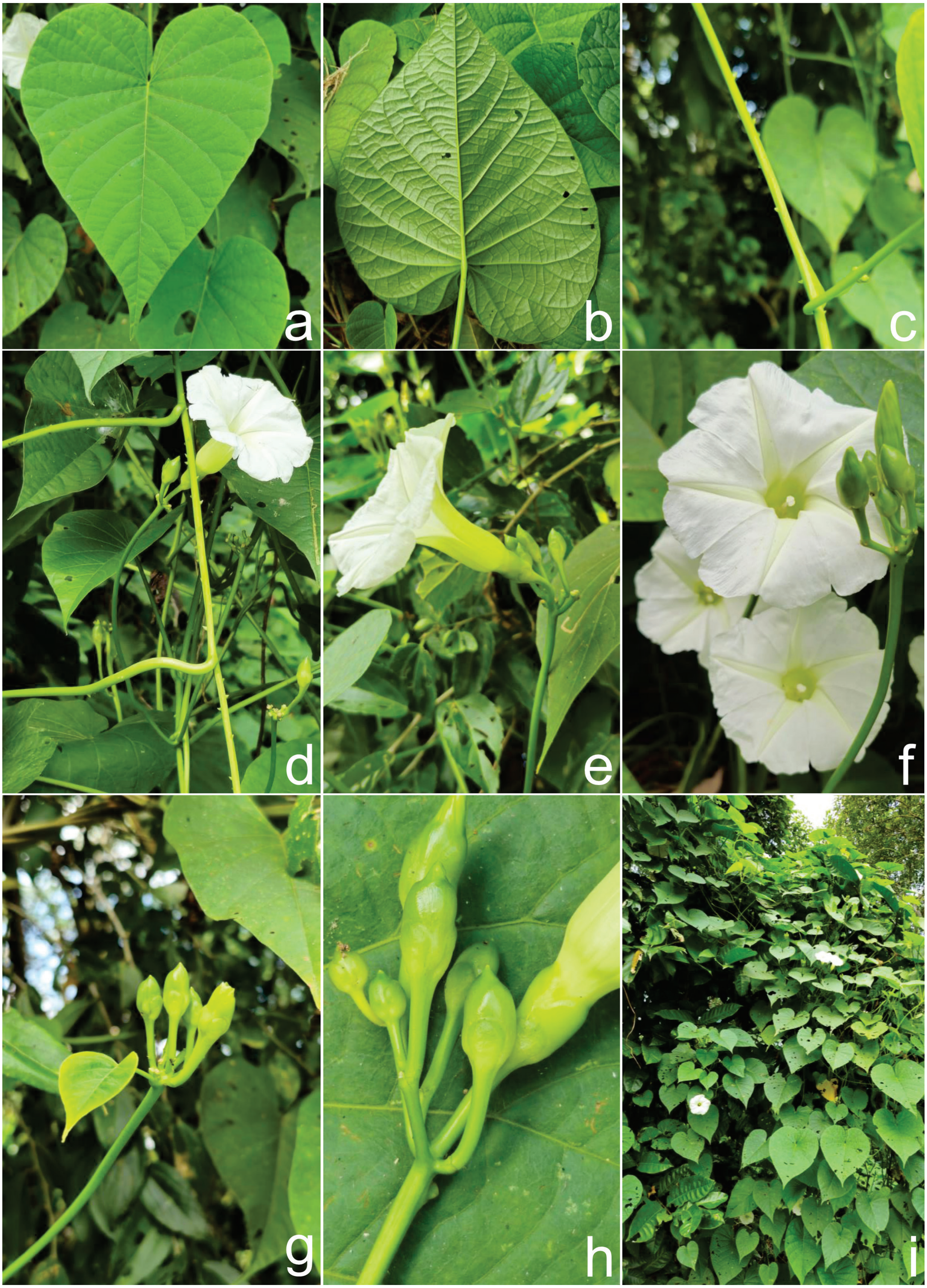

Fig. 2. *Ipomoea buriliae* Belo: **a**. Adaxial surface of the leaf blade. **b**. Abaxial surface of the leaf blade. **c**–**d**. Stems and petioles with spiny projections. **e**. Corolla shape. **f**–**g**. Inflorescence with flowers and buds. **h**. Sepals. **i**. Habit.

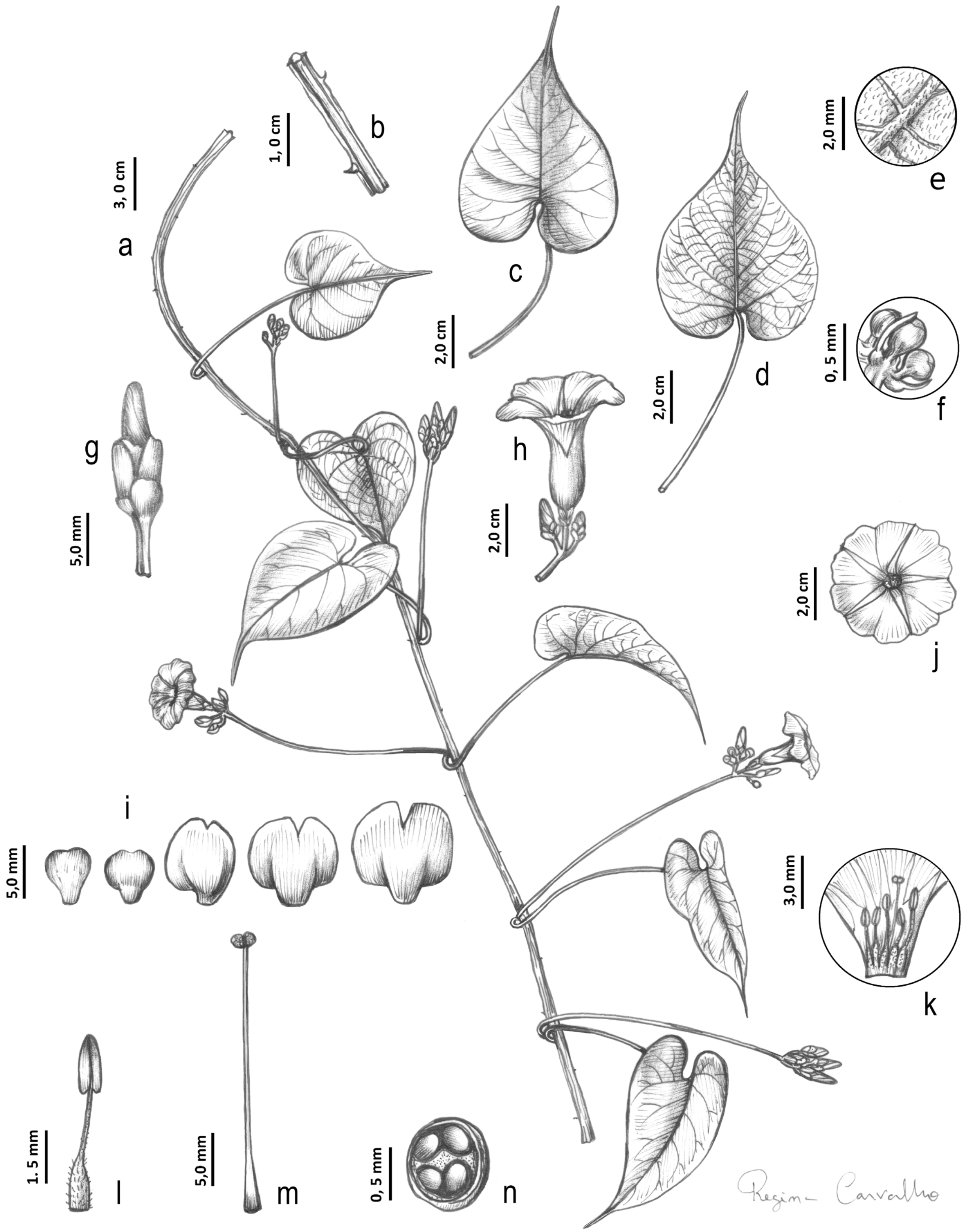

Fig. 3. *Ipomoea buriliae Belo*: **a**. Fowering branch; **b**. Stem with spiny projections; **c**. Adaxial surface of the leaf blade. **d**. Abaxial surface of the leaf blade. **e**. Abaxial surface with trichomes **f**. Bracteole; g. Floral bud. **h**. Flower. **i**. Sepals [left to right - outer (2), middle (1), inner (2)]; **j**. Corolla–top view; **k**. Corolla split open showing stamens and style; **l**. Stamen. **m**. Gynoecium. **n**. Ovary.

the type locality.

Taxonomic notes: *Ipomoea buriliae* resembles several species found in northeastern Brazil, such as *I. alba* L. and *I. marcellia* Meisn., which share characteristics like a white corolla, prominent veins on the leaf blade, and indumentum on the stem, leaves, petiole, and peduncle. However, reproductive characters play a significant role in distinguishing these taxa, particularly corolla shape, the color of the abaxial mesopetal region, and sepal shape (see Table 2).

Anatomical notes: In the paradermic section and the frontal view, the epidermis of *I. buriliae* presents cells with straight anticlinal walls on the adaxial surface (Fig. 4a), and sinuous on the abaxial surface (Fig. 4b), with druses restricted to the adaxial surface (Fig. 4a). The distribution of stomata is amphihypostomatic, with paracytic and anisocytic stomata and stomatal grouping (Fig. 4c). Tector and glandular trichomes occur on both epidermal surfaces (Fig. 4a & b). In cross-section, the epidermis is uniseriate (Fig. 4d), with oval to rectangular cells and external periclinal walls covered by a smooth cuticle. The leaf blade has an asymmetric dorsiventral mesophyll (Fig. 4d), presenting biseriate palisade parenchyma and spongy parenchyma 1-3 stratum seriate. Also in the mesophyll, idioblasts containing druses (Fig. 4e), laticiferous canals (Fig. 4f), and prismatic crystals in the palisade parenchyma were observed (Fig. 4f). The main midrib, in cross-section, exhibits a biconvex contour (Fig. 4g), prominently wider on the abaxial surface. The epidermis is uniseriate, with tector trichomes. Underlying the epidermis is the lacunar collenchyma (Fig. 4h). Further internally, the fundamental parenchyma consists of isodiametric circular cells with laticiferous canals (Fig. 4h). The vascular system is bicollateral, consisting of a single U-shaped central bundle (Fig. 4g & i). The petiole in cross-section presents a concave-convex contour (Fig. 4j). The epidermis is unstratified with nectar trichomes and sessile peltate glandular trichomes. Adjacent to the epidermis, the cortical region consists of layers of angular collenchyma with druses (Fig. 4k), followed by the fundamental parenchyma with laticiferous canals. The vascular system is bicollateral, composed of five bundles – three central ones forming an arch and two adaxial accessories (Fig. 4j). Druses occur abundantly in the internal and external regions of the phloem (Fig. 4l). The leaf anatomy of *I. buriliae* was compared with *I. parasitica*, which is morphologically similar. Both species exhibit distinct vegetative morphoanatomical characters that are crucial for their delimitation. These include differences in the sinuosity of the anticlinal walls on the epidermal surface of the leaf blade, stomatal types, the number of palisade parenchyma layers in the mesophyll, the type of collenchyma in the midrib, and the shape and number of vascular bundles in the petiole (Fig. 5, Table 3).

SEM images of the leaves reveal a diverse array of surface structures. The images of the leaf blade and petiole highlight the abundant presence of tector trichomes (Fig. 4m & n), which appear as thin, elongated projections. Sessile peltate glandular trichomes are distributed across the leaf blade, petiole, and stem (Fig. 4o–q). Spiny projections were observed on the stem (Fig. 4r), characterized by a robust, pointed structure with a broad base that tapers to a sharp tip. SEM images also show the presence of cuticular waxes on the adaxial surface of the leaf blade, appearing as granules (Fig. 4m) and membranous platelets (Fig. 4r).

Palynological notes: The pollen grains of *I. buriliae* are monads, apolar and very large ($\bar{x} = 110.8 \times 109.6$ μm), with a spheroidal shape. They are pantoporate containing approximately 90 circular pores ($\bar{x}$ = 7.1 μm), and lack an annulus. The exine is tectate, echinate, and perforate featuring bulbous spines ($\bar{x}$ = 15 μm), numbering around 165. These spines have a rounded apex, with a wide, polygonal base. The nexine is thicker than the sexine, and the exine is thin (total exine $\bar{x}$ = 7.2 μm; sexine $\bar{x}$ = 3.3 μm; nexine $\bar{x}$ = 3.95 μm) (Fig. 6, Table 2).

Table 3. Anatomical comparison between *Ipomoea buriliae* Belo, sp. nov. and *I. parasitica* (Kunth) G. Don.

Character	*Ipomoea buriliae* Belo, sp. nov.	*Ipomoea parasitica* (Kunth) G. Don
Epidermal cells (adaxial wall)	Straight	Sinuous
Epidermal cells (abaxial wall)	Sinuous	Sinuous
Trichomes on the leaf epidermis	Tector and sessile peltate glandular trichomes	Tector and sessile peltate glandular trichomes
Palisade mesophyll	Biseriate	Uniseriate
Collenchyma cells of the midrib	Lacunar	Angular
Stomata	Paracytic, anisocytic stomata, and stomatal grouping.	Paracytic
Petiole shape	Concave-convex	Semicircular
Vascular bundles of petiole	5, arch-shaped	13, U-shaped

Cytogenetic notes: *Ipomoea buriliae* has a chromosome number of 2n = 30. Distinct GC-rich heterochromatic regions are observed on different chromosomes, forming 14 terminal $CMA^+/DAPI^-$ bands (Fig. 7).

Discussion

Among the *Ipomoea* species with a white corolla found in the Borborema Plateau (BP) of northeastern Brazil, *I. buriliae* is distinguished by its campanulate corolla (*vs.* hypocrateriform in *I. alba*, funnelform in *I. marcellia*, tubular in *I. vespertilia* F.D.Santos, G.C.Delgado-Junior & Buril). In the vegetative stage, the new species may be confused with *I. parasitica*, since they share cordate leaves, spiny projections on the stem, and occasionally on the petiole and peduncle. However, a detailed analysis of the type specimens and protologue of *I. parasitica* shows that the species differ mainly in the leaf apex, corolla color, peduncle size, and the sepals' shape, apex, and indumentum. The comparative anatomical analysis revealed that the morphological delimitation of these species is strongly supported mainly by the shape of the epidermal cell walls of the adaxial surface, type of collenchyma of the midrib, types of stomata, shape of the petiole, distribution, shape, and number of vascular bundles (see Fig. 5, Table 3).

Scanning electron microscopy revealed two types of epicuticular waxes: granules and membranous platelets. There is little information about the types of waxes found in *Ipomoea*. However, in an anatomical study of populations of *Jacquemontia evolvuloides* (Moric.) Meisn., Belo *et al.* (2023c) observed the same types of waxes, leading us to infer that it can be considered a character present in Convolvulaceae. Waxes are taxonomically important in delimitating several plant groups (Barthlott *et al.*, 1998) and play an important functional role in reducing water loss and providing defense against pathogens (Ahmad *et al.*, 2015). The presence of these specific waxes' types in *I. buriliae* highlights the significance of anatomical features in delimiting taxonomic groups within the Convolvulaceae family. This finding provides a valuable tool for systematic studies and the identification of new species.

Epidermal cells and other anatomical characters may vary according to environmental factors (Bone *et al.*, 1985; Alencar *et al.*, 2022). However, when characters are genetically determined and do not vary due to abiotic factors, they can be taxonomically

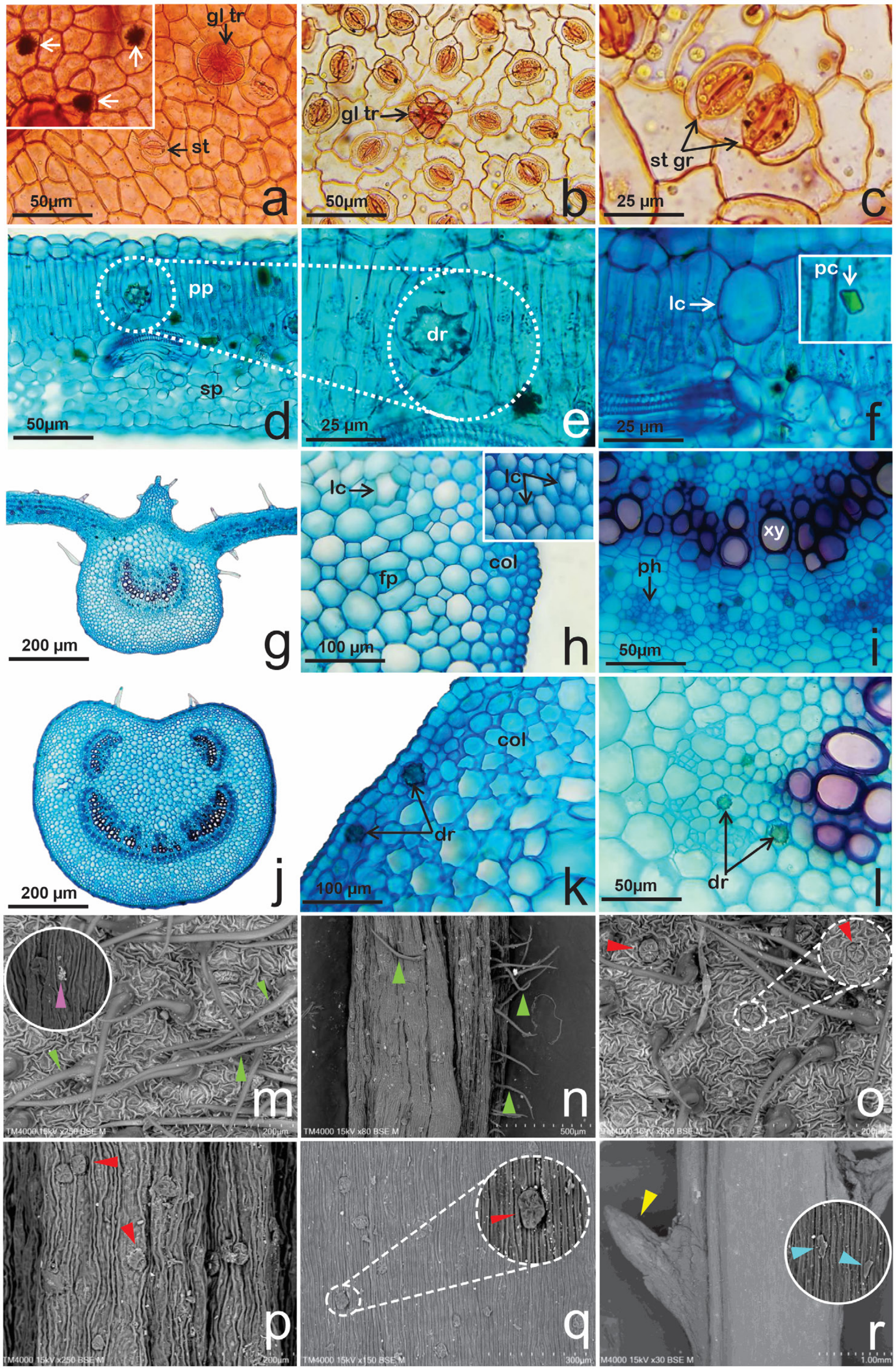

Fig. 4. Paradermic and transverse sections of the leaves of *Ipomoea buriliae* Belo, sp. nov., in light micrographs: **a**. Adaxial surface, epidermal cells with straight walls, paracytic stomata (st), druses (white arrows) and glandular trichome (gl tr). **b**. Abaxial surface, epidermal cells with sinuous walls and glandular trichome (gl tr). **c**. Detail showing stomatal grouping. **d**. Dorsiventral mesophyll. **e**. Detail showing idioblast containing druses (dr). **f**. Section shows laticiferous canals (lc) between palisade cells, and prismatic crystals (pc). **g**. General view of the main vein. **h**. Detail of the vein showing lacunar collenchyma (col) and ground parenchyma (fp). **i**. Section of the vascular system showing external phloem (ph) and xylem (xy). **j**. General view of the petiole. **k**. Detail of the angular collenchyma of the petiole with druses (dr). **l**. Vascular region showing druses (dr). Scanning Electron Microscopy: **m**. Leaf blade surface showing trichomes with detail highlighting granule-type waxes (purple arrow), and tector trichomes (green arrows). **n**. Petiole with tector trichomes (green arrows). **o**. The leaf blade surface shows trichomes glandular sessile peltate (red arrows). **p**. Petiole with trichomes glandular sessile peltate (red arrows). **q**. Stem with trichomes glandular sessile peltate (red arrows). **r**. The stem shows spiny projections (yellow arrow), and the circled highlight shows membranous platelet-type waxes (neon blue arrow).

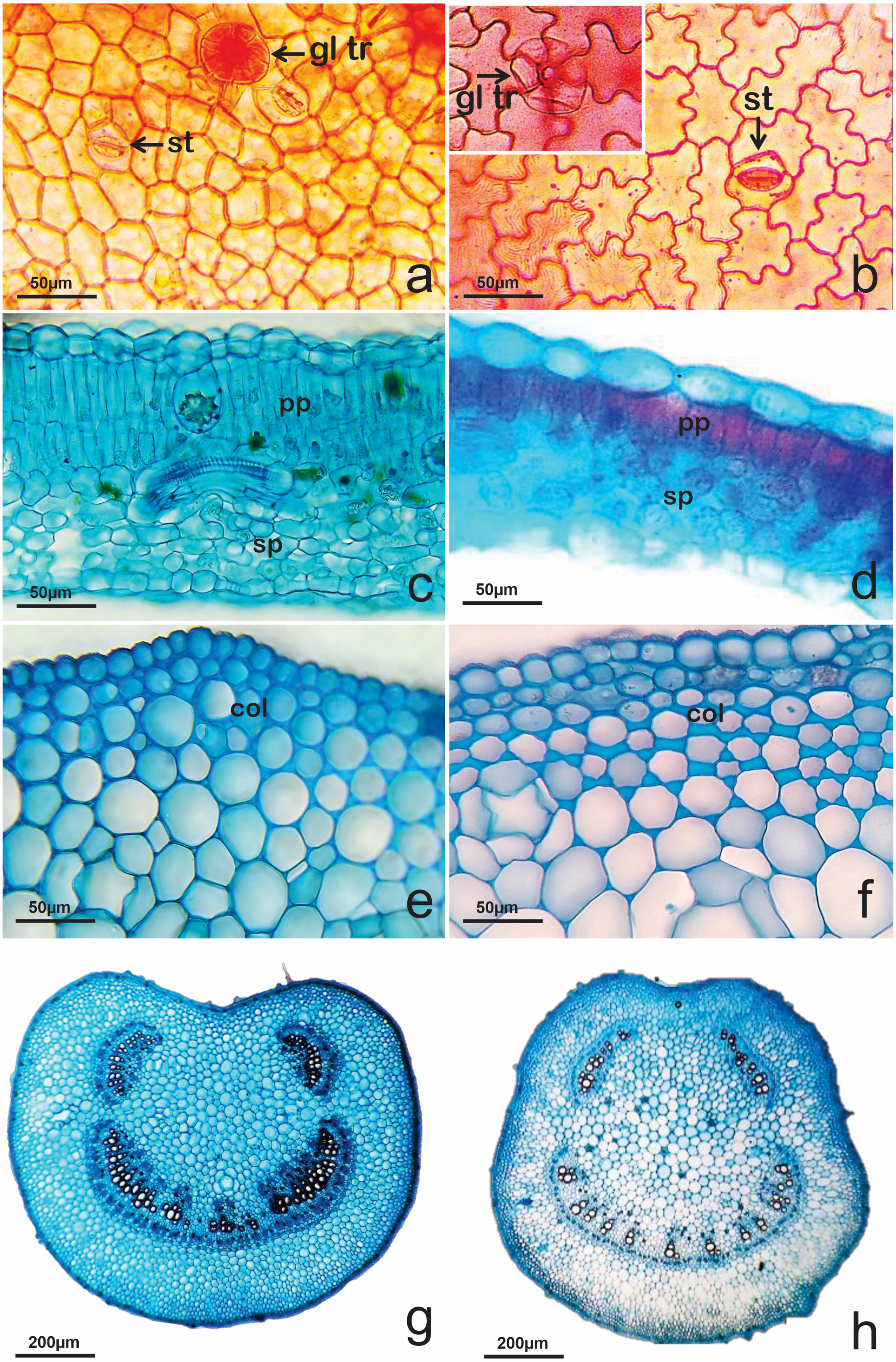

Fig. 5. Comparative leaf anatomy of *Ipomoea buriliae* Belo, sp. nov. and Ipomoea parasitica (Kunth) G.Don in light micrographs. **a**. Adaxial epidermis with straight anticlinal walls in *I. buriliae*. **b**. Adaxial epidermis with sinuous anticlinal walls in *I. parasitica*. **c**. Biseriate mesophyll in *I. buriliae*. **d**. Uniseriate mesophyll in *I. parasitica*. **e**. Lacunar main vein collenchyma in *I. buriliae*. **f**. Angular main vein collenchyma in *I. parasitica*. **g**. Petiole with concavo-convex outline and five vascular bundles in *I. buriliae*. **h**. Petiole with semicircular outline and thirteen vascular bundles in *I. parasitica*.

valuable for species delimitation (Wilkinson, 1979). As observed in *I. buriliae*, other anatomical studies with *Ipomoea* species also showed straight epidermal cells (Arruda *et al.*, 2009; Salamah *et al.*, 2022). The variation in epidermal walls also extends to other genera of Convolvulaceae, as observed in *Daustinia* Buril & AR Simões (Alencar *et al.*, 2022), *Jacquemontia* Choisy (Belo *et al.*, 2023) and *Camonea* (Santos *et al.*, 2024).

Ipomoea buriliae exhibits a greater diversity of stomata types, including paracytic, anisocytic, and stomatal grouping, whereas *I. parasitica* displays only paracytic stomata. Stomatal characteristics have long been recognized as valuable for the taxonomy of various botanical families (Metcalfe & Chalk, 1979; Watson, 1967) and are particularly relevant for species delimitation and differentiation within Convolvulaceae (Belo *et al.*, 2023b, 2023c). The stomatal diversity observed in *I. buriliae* may play a crucial role in defining and identifying this species within the genus *Ipomoea*, underscoring its taxonomic importance

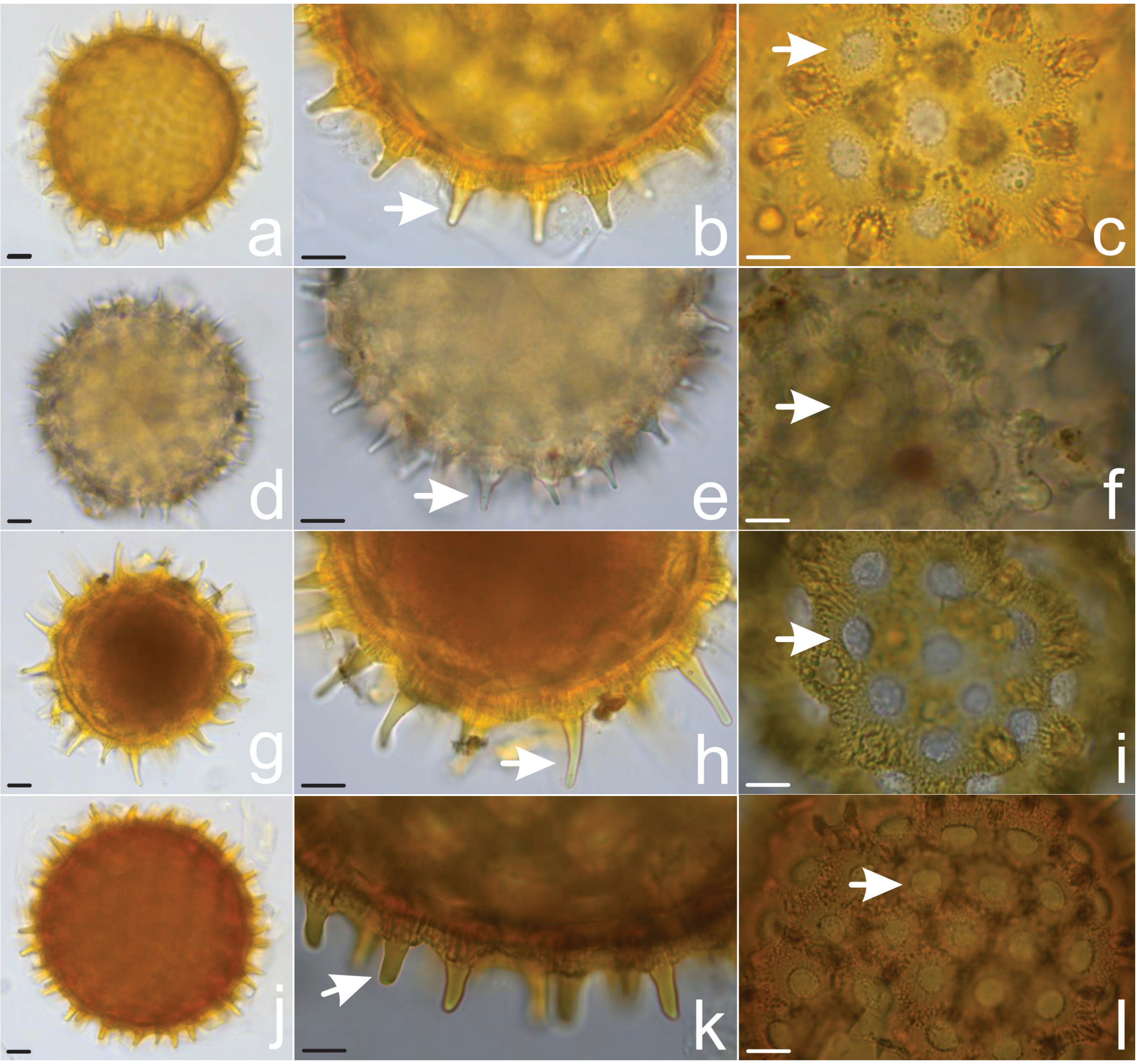

Fig. 6. Comparison of the pollen grains among *Ipomoea buriliae* Belo, sp. nov., Ipomoea alba L., *Ipomoea marcellia* Meisn., and *Ipomoea parasitica* (Kunth) G. Don in light micrographs. **a**. General view of *I. buriliae* pollen grains. **b**. Spines details of *I. buriliae* pollen grains. **c**. Aperture details of *I. buriliae* pollen grains. **d**. General view of *I. alba* pollen grains. **e**. Spines details of *I. alba* pollen grains. **f**. Aperture details of *I. alba* pollen grains. **g**. General view of *I. marcellia* pollen grains. **h**. Spines details of *I. marcellia* pollen grains. **i**. Aperture details of *I. marcellia* pollen grains. **j**. General view of *I. parasitica* pollen grains. **k**. Spines details of *I. parasitica* pollen grains. **l**. Aperture details of *I. parasitica* pollen grains. — Scale bar a,d,g,j = 20 µm; b-c, e-f, h-i, k-l = 10 µm.

and enhancing our understanding of species relationships within Convolvulaceae.

The dorsiventral and asymmetric mesophyll is a shared characteristic of *I. buriliae* and *I. parasitica,* and it has also been reported in other species of the genus, such as *I. pes-tigridis* L. (Babu *et al.,* 2018), *Ipomoea coccinea* L. (Ekeke *et al.,* 2021), and *I. hederifolia* L. (Santos *et al.,* 2023). However, *I. buriliae* and *I. parasitica* differ in the number of palisade parenchyma layers, being biseriate in *I. buriliae* and uniseriate in *I. parasitica.* The organization and number of palisade parenchyma layers are anatomically relevant for the taxonomy and identification of Convolvulaceae species. This relevance has been noted by Belo *et al.* (2023c) in a population study of the *Jacquemontia evolvuloides* complex and in the description of a new *Ipomoea* species (Santos, 2020b).

When comparing the supporting tissues of the midrib, the two species differ in the type of collenchyma: lacunar in *I. buriliae* and angular in *I. parasitica.* The angular collenchyma type is a common feature in other *Ipomoea* species (Martins *et al.,* 2012; Santos *et al.,* 2023), as well as in species of *Jacquemontia* (Belo *et al.,* 2023) and *Camonea* (Santos *et al.,* 2024). Petiole anatomy, particularly traits such as contour, the number of vascular bundles, and their arrangement, is considered taxonomically significant for the delimitation and differentiation of various groups (Anu & Dan, 2020; Noor *et al.,* 2023; Sadia *et al.,* 2024). These traits were also instrumental in distinguishing *I.*

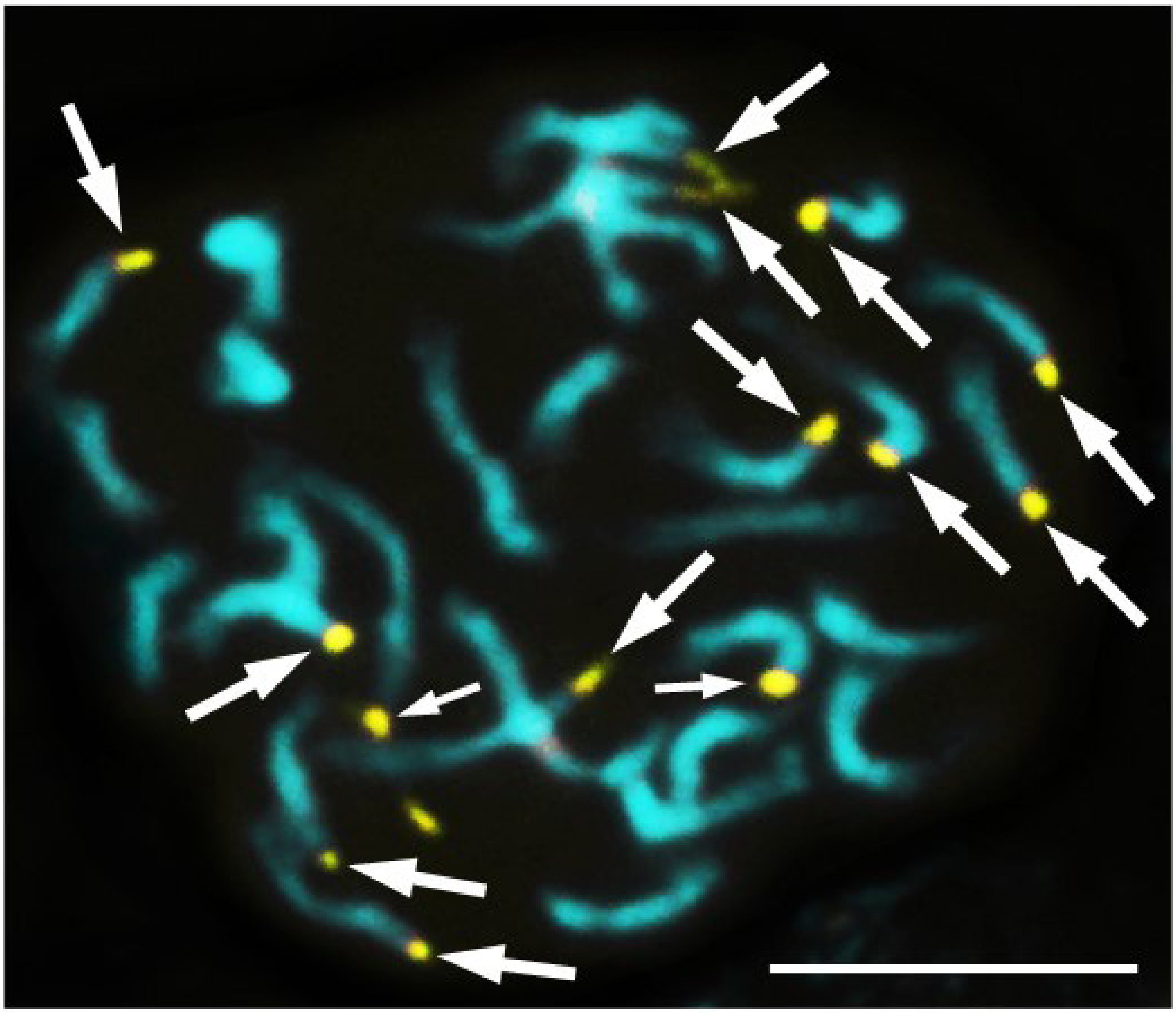

Fig. 7. Mitotic tapetum cell in prometaphase of Ipomoea buriliae Belo, sp. nov. with 2n = 30, stained with the fluorochromes CMA (yellow) and DAPI (blue). White arrows indicate terminal CMA + /DAPI - bands. — Scale bar = 10 µm.

buriliae from *I. parasitica*.

Bulbous spines in pollen grains of the genus *Ipomoea* have also been observed in other studies (Sengupta, 1972; Vasconcelos *et al.*, 2015; Romeiro *et al.*, 2023). In the study of the pollen morphology of Convolvulaceae, Sengupta (1972) mentions that the spines of *Ipomoea* are wide at the base, which gradually tapers towards the apex, characteristics very similar to the spines observed for *I. buriliae*. When compared to related morning glory species occurring in the BP, the pollen grains of *I. buriliae* have approximately 165 spines (vs. 42 spines in *I. alba*, 55 spines in *I. marcellia*, 703 spines in *I. parasitica*), with spines measuring around 15 µm long (vs. 19 µm in *I. alba*, 20 µm in *I. marcellia*, 10 µm in *I. parasitica*), and approximately 75 pores (vs. 92 pores in *I. alba*, 50 pores in *I. marcellia*, 105 pores in *I. parasitica*) (see Table 2, Fig. 6). Regarding the number of pores observed in the pollen grains of *Ipomoea*, in a palynological study carried out in the Caatinga domain, northeastern Brazil, Vital *et al.* (2017) mention that the species analyzed (*I. brasiliana* (Choisy) Meisn., *I. bahiensis* Willd. ex Roem. & Schult., *I. pintoi* O'Donnel, and *I. subincana* (Choisy) Meisn.) have more than 100 pores. Among these species, *I. bahiensis* had the highest number of pores (approximately 165).

The chromosome number of *I. buriliae* is characteristic of the genus, which presents 2n = 30 in 72% of records, despite being partially stable due to neopolyploidy events related to speciation (Dornelas *et al.*, 2023). *Ipomoea buriliae* also present very conspicuous CMA$^+$/DAPI$^-$ bands on terminal chromosomal regions of 14 different chromosomes, a highly distinctive karyotype characteristic from *I. marcellia* and *I. vespertilia*, both of which have only four terminal CMA$^+$/DAPI$^-$ bands (Santos *et al.*, 2019).

Despite recent efforts, our understanding of the true diversity of *Ipomoea* species in Brazil remains limited. The identification of a new *Ipomoea* species (Convolvulaceae) carries significant implications for both conservation and taxonomy. This discovery enhances the taxonomy of the genus, providing deeper insights into its evolution, geographic distribution, and phylogenetic relationships. The recognition of *Ipomoea buriliae* underscores the critical role of ongoing botanical research, not only to prevent irreversible biodiversity loss but also to inform management strategies, conservation efforts, and the development of public policies aimed at safeguarding biodiversity. This study emphasizes the importance of regular botanical expeditions, thorough herbarium specimen reviews, and precise morphological analyses, demonstrating that such initiatives are crucial for addressing taxonomic gaps and advancing our understanding of Brazilian flora.

Considering the morphological similarity between *I. buriliae* and other species of morning glories that have a white or blue corolla occurring in the BP, in northeastern Brazil, an identification key is provided here for the species that share these characteristics.

Identification key for *Ipomoea* species with white or blue corollas from the Borborema Plateau, Brazil

1. Branches, petioles, and peduncles with spine-like projections 2
1. Branches, petioles, and peduncles without spine-like projections 3
2. Leaves with prominent veins on the abaxial surface; corolla white, glabrous 4
2. Leaves without prominent veins on the abaxial surface; corolla blue with sericeous apex .... *I. parasitica*
3. Leaf blade entire; sepals with acute, obtuse to rounded apex; corolla white 5
3. Leaf blade trilobed; sepals with a long, caudate apex, hirsute at the base; corolla blue ..... *I. nil*
4. Corolla hypocrateriform; stamens exserted .. *I. alba*
4. Corolla campanulate; stamens inserted .. *I. buriliae*

5. Leaves pubescent to glabrescent; tubular corolla, white-greenish; stamens inserted .... *I. vespertilia*

5. Leaves velutinous; funnelform corolla, white-yellowish; stamens inserted .... *I. marcellia*

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