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A new species of *Almeidea* (Galipeinae, Galipeeae, Rutaceae) from Eastern Brazil

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Abstract. A new species of *Almeidea* (Rutaceae) belonging to the neotropical tribe Galipeeae (subtribe Galipeinae) is described and illustrated. This new species, **Almeidea albiflora**, is known so far only from a few collections made in small disturbed forest remnants in the vicinity of Cachoeiro de Itapemirim, in the state of Espírito Santo, and by a single collection from northern Rio de Janeiro state, both in the domain of the Atlantic Forest, Eastern Brazil. Diagnostic features, like white petals, sericeous ovary and distal secondary axes as long as the proximal ones are identified. Pollen morphology is also described, and brief discussions of the relationships of the new taxon to other species of *Almeidea*, as well as comments on its conservation status, are provided.

Key Words: *Almeidea*, Galipeeae, Galipeinae, morphology, taxonomy.

Almeidea A.St.-Hil. is a genus from the neotropical tribe Galipeeae (replacing Cusparieae, see Kallunki & Pirani, 1998), subtribe Galipeinae (Rutaceae). The five species treated by Silva (1988) occur in the Atlantic rainforest of coastal Brazil from southern Bahia to Paraná states (Brazil), including the states of Espírito Santo, Rio de Janeiro, São Paulo, and the eastern portion of Minas Gerais. Recent collections of *A. rubra* A. St.-Hil., not seen by Silva, from forested areas in the province of La Paz, Bolivia, have considerably extend the range of the genus. Species of *Almeidea* comprise trees or treelets from forest understories, with 1-foliolate or apparently simple, alternate leaves, a (sub-) terminal thyrsoid or thyrse and pink or lilac, actinomorphic flowers with 5 stamens of which 2 or 3 are sometimes modified into staminodes. The fruit is a schizocarp with 1–5 follicles (mericarps), whose endocarp splits into two valves at maturity, ejecting the reniform seeds.

While carrying out fieldwork in Espírito Santo state (Brazil), a new species of *Almeidea* was found in the understory of a forest remnant near the municipality of Cachoeiro de Itaperimim. This new species could be readily distinguished from other *Almeidea* by its white (rather then pinkish or lilac) flowers, and details of the inflorescence and the ovary. The examination of additional collections of *Almeidea* on loan at SPFR herbarium, especially those identified as *A. lilacina* A.St.-Hil., revealed the existence of other materials with this same set of features, and a new species, *Almeidea albiflora* Bruniera & Groppo, could be recognized.

Herbarium materials of only mature individuals were used for the description. Flowers and fruits were rehydrated before being measured and drawn; material preserved in 70% ethanol was also used for the descriptions and drawings. The terminology adopted for leaf shapes and other organs follows Radford et al. (1974).

For pollen morphology, pollen grains were taken from mature buds of the holotype deposited at SPFR herbarium. Grains were acetolysed according to the methodology

described in Erdtman (1960) and then mounted in glycerine jelly on three glass slides. Images were taken using light microscopy, and diameters of 20 grains were measured. Because the grains are isopolar, polar (P) and equatorial (E) diameters were not distinguished, and a P/E ratio was not calculated.

Scanning electron microscopy (SEM) images of pollen were made using grains collected from dry anthers of the holotype. Grains were subsequently mounted on stubs and sputtered with gold. A Shimadzu scanning microscope (SS-550 model) was used to obtain images in SEM, which were used to define the pattern of ornamentation of exine and the type and number of apertures, according the terminology of Barth & Melhem (1988) and Punt et al. (2007). Characteristics of the pollen grains of *A. albiflora* were compared with those from other species of *Almeidea* and from those of other species of Galipeinae.

Almeidea albiflora Bruniera & Groppo, **sp. nov.** Type: Brazil. Espírito Santo: Cachoeiro de Itapemirim, Rodovia para Jerônimo Monteiro (BR 482), ca. 3 km da saída da cidade, Morro Grande, atrás da Marmoraria Sandrini (antiga Marmoraes), 20°48′26.6″ S, 41°09′26.5″ W, 75 m, 29 Jan 2009 (fl), *M. Groppo, C. P. Bruniera & G. M. Bueno 1851* (holotype: SPFR; isotypes: K, MO, NY, RB, SPF). (Figs. 1, 2, and 3)

Ab omnibus speciebus generis floribus albis (neque purpuris nec lilacinis) ovario sericeo optime distincta.

Treelet 3–4 m tall, branched. Branches cylindrical, brown to grayish, with longitudinal grooves, glabrous. Leaves alternate, 1-foliolate, forming congested groups at the apex of the branches; petioles 0.6–7.0 cm long, cylindrical, thickened at base and apex, glabrous; blades elliptic, narrowly elliptic, lanceolate or oblanceolate, the base abruptly and very narrowly attenuate to the swelling, the apex acute, rounded or acuminate, 10–21×2.7–7.5 cm, chartaceous to slightly coriaceous, glabrous, with sparse pellucid dots (volatile oil glands) visible when against a light; venation brochidodromous, midvein plane to slightly sunken adaxially, prominent abaxially, secondary veins 9–18, alternate to subopposite. Inflorescence an erect, terminal thyrse, 8–19 cm long; peduncle cylindrical or complanate, puberulent; secondary axes up to 9 cm long, usually branched, puberulent; primary and secondary bracts triangular, 1–2 mm long, puberulent abaxially; pedicels 0.5–3 mm long in flower, 3–5 mm long in fruit. Buds oblong at anthesis. Calyx creamy white, shortly campanulate, 1–2 mm long, puberulent mainly at margin, deciduous, the lobes 5 ovate-triangular, ca. 1.5×1.5 mm, each with a globose nectary at the apex. Corolla white with a subtle lilac spot at the tip of the abaxial surface of the petals (only seen in living buds and flowers), the petals 5, free, imbricate, 1.3–1.7×0.2–0.3 cm, spatulate, abaxially swollen, tomentose-villous at both surfaces, the base adaxially glabrous, with many glands abaxially. Androecium of 3 fertile stamens and 2 staminodes; filaments free from each other and free from the corolla, 8–10×1–2 mm, abaxially swollen, tomentose-villous at both surfaces, adaxially with a tuft of trichomes on the median region and glabrous on below half, the staminodes 11–14×0.5–1 mm, tomentose-villous, the median region with a tuft of trichomes adaxially, the apex glandular; anthers linear-oblong, ca. 2.5×1 mm, abaxially villous; disc cupular, ca. 0.5 mm long, glabrous. Pollen in monads, isopolar, of medium size (44.27–52.39 μm, mean 47.70 μm±2.22 μm), with radial symmetry, amb circular, pantocolporate; ectoaperture colpate, endoaperture circular, exine homobrochate, microreticulate (muri and lumina smaller than 1 μm, Fig. 2B). Carpels 5, free; ovary ca. 1 mm long, sericeous, apically tapered into the style; style single, 6–11 mm long, pubescent, glabrous at base; stigma 5-lobed. Fruit a schizocarp of 1–2, rarely 3–5 free mericarps, these subglobose, 0.8–1.2×0.7–1 cm, brown, rugose, sparsely puberulent to glabrescent, with dehiscence along ventral suture; endocarp woody, yellowish, splitting into two valves when mature. Seed 1 per carpel, reniform, ca. 8×6 mm, brown to nigrescent, smooth, glabrous, the testa leathery, hilum oblate. Mature embryo not seen.

Distribution and phenology.—Almeidea albiflora is known from a few collections from disturbed forest remnants near Cachoeiro de Itapemirim, Espírito Santo state, Brazil, in the Atlantic Forest domain. Another collection from Rio de Janeiro state (São João da Barra) is also

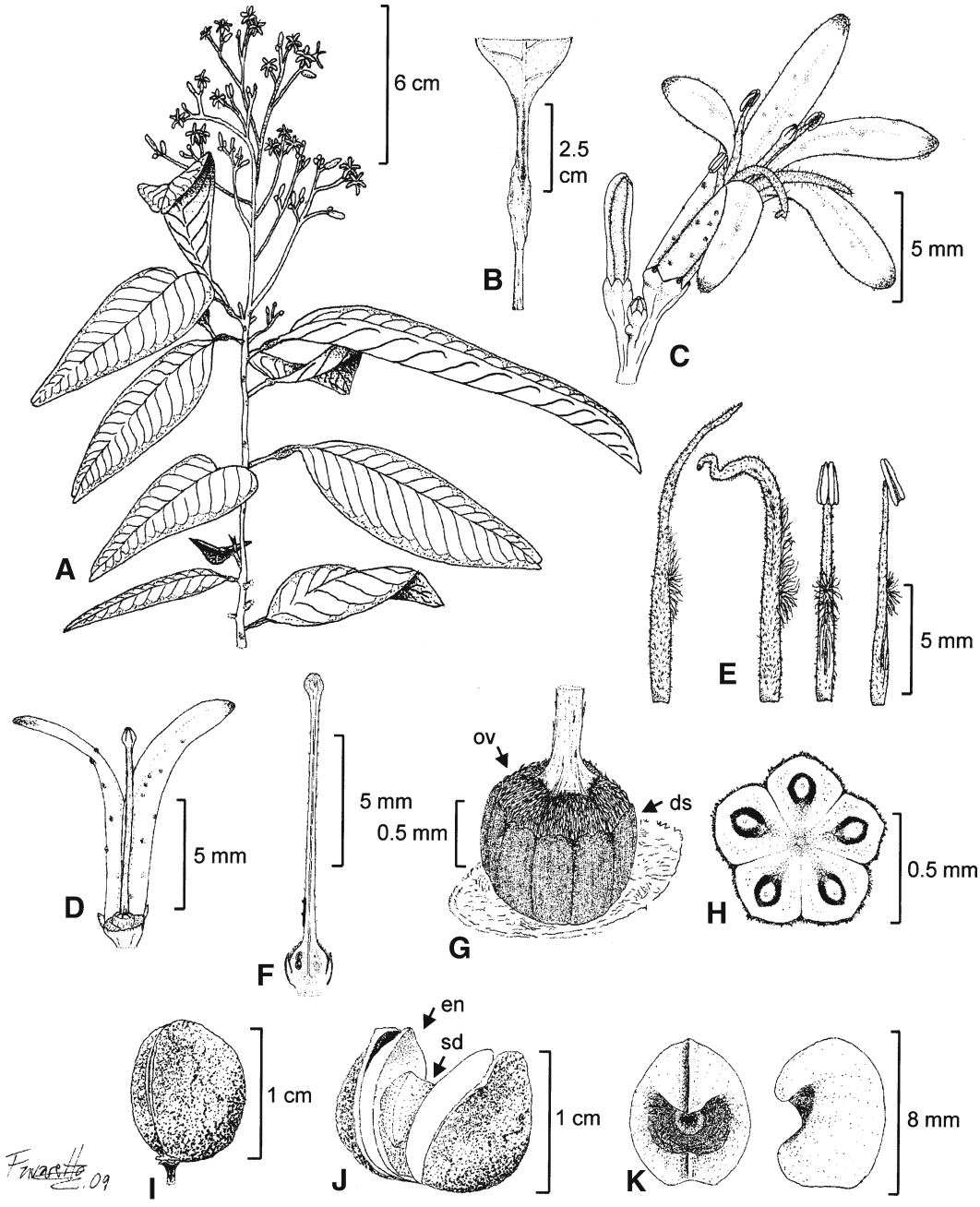

Fig. 1. *Almeidea albiflora.* **A**. Branch with inflorescence. **B**. Detail of the petiole near the apex. **C**. Flower. Note calyx lobes, each with an apical globose nectary. **D**. Open flower showing pistil and two petals (androecium removed). **E**. Stamens (right) and staminodes (left). **F**. Pistil in longitudinal section. **G**. Detail of the ovary (ov) and disc (ds). **H**. Ovary in transverse section. **I**. Fruit. **J**. Open fruit showing detaching endocarp (en) and seed (sd). **K.** Seed, ventral (left) and lateral (right) views. (A–H from *Groppo et al. 1851*, SPFR; I–K from *Groppo et al. 1861*, SPFR).

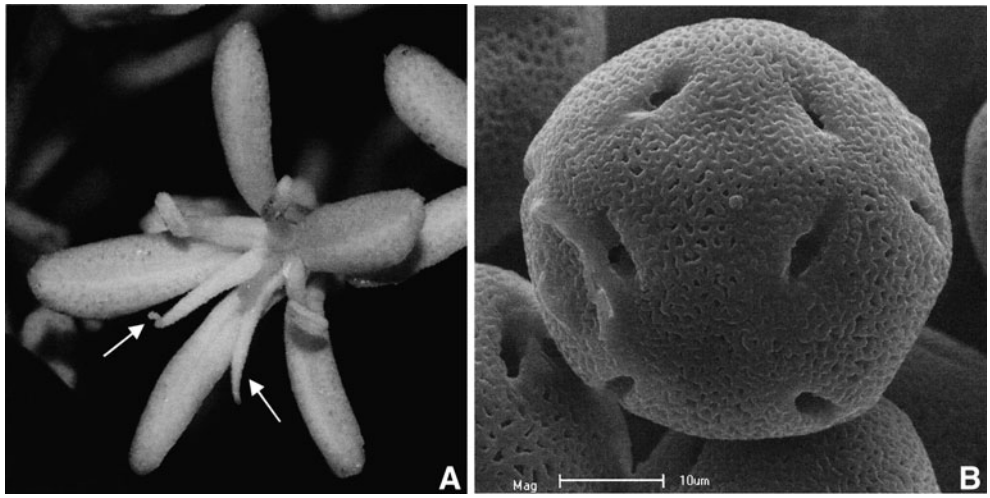

FIG. 2. *Almeidea albiflora* **A**. Flower close-up. Arrows indicate staminodes. **B**. Pollen (From the holotype).

known. *Almeidea albiflora* is very common in the forest remnant where the type was collected, being dominant in the understory. Other Rutaceae are commonly found in the understory of this same remnant, including *Angostura bracteata* (Nees & Mart.) Kallunki, *Conchocarpus macrocarpus* (Engl.) Kallunki & Pirani, *C. macrophyllus* J.C. Mikan, *C. cuneifolius* Nees & Mart., and the sympatric congeners *Almeidea lilacina* and *A. rubra*. Flowering collections of the new species were made in January and fruiting collections in January and February.

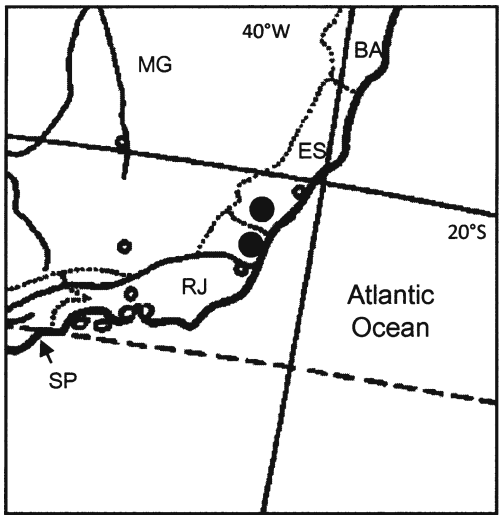

FIG. 3. Distribution of *Almeidea albiflora*. Brazilian states indicated as follows: BA—Bahia, ES—Espírito Santo, MG—Minas Gerais, RJ—Rio de Janeiro, SP—São Paulo (modified from Flora Neotropica Base Map).

Additional specimens examined. BRAZIL. Espírito Santo: Cachoeiro de Itapemirim, Road to Jerônimo Monteiro (BR 482), Morro Grande, behind Marmoraria Sandrini (former Marmoraes), 20°48′26.6″S, 41°09′26.5″ W, 75 m, 29 Jan 2009 (st), *Groppo et al. 1852* (SPFR), *1853* (SPFR); 29 Jan 2009 (fr), *Groppo et al. 1861* (K, MO, NY, RB, SPF, SPFR); NW of Cachoeiro de Itapemirim, Morro Grande, forest remnant behind marble sawmill on S side of road to Jeronimo Monteiro (BR 482) 2 km NW of junction with road to Muqui (BR 393), 20°50′S, 41°10′W, 22 Feb 1994 (fr), *Kallunki et al. 595* (NY); Cachoeiro de Itapemirim, Road to Jerônimo Monteiro, BR 482, ca. 6 km from the city going to Carangola, 14 Jan 1985 (fl, fr), *Pirani & Zappi 1130* (SPF, SPFR). **Rio de Janeiro**: São João da Barra, Mata do Carvão, 21°38′S, 41°03′W, 26 Jan 1984 (fr), *Araujo & Maciel 6012* (GUA, NY).

Almeidea albiflora can be readily distinguished from the other species of the genus by its petals that are mainly white (rather than pink or lilac) with only a subtle lilac spot at the tip of the abaxial surface of each petal, which can be seen only in living buds and flowers. Another remarkable difference is the sericeous ovary, which is sparsely puberulent in *A. coerulea* A. St.-Hil. (endemic to the state of Bahia, Brazil) and glabrous in all other species of the genus. Some reproductive characters of *A. albiflora* are similar to those of *A. lilacina*, such as measurements of flower parts (petals, ovary, and style) and fruits. The presence of thyrses with axes usually branched and with proximal secondary ones up to 9 cm long is also shared between

these two species, unlike those of *A. limae* I. M. Silva and *A. rubra* for example, with inflorescences bearing reduced (up to 1 cm or sometimes lacking) secondary axes. However, while in *A. albiflora* the distal secondary axes tend to be as long as the proximal ones (Fig. 1A), in *A. lilacina* they are shorter towards the inflorescence apex. A vegetative feature that is distinctive for *A. albiflora*, making the identification of sterile materials easier, is the base of the leaf, which is abruptly and very narrowly attenuate to the swelling of petiole (Fig. 1B), while in another species of the genus is usually acute or obtuse.

Pantocolporate pollen grains are encountered in all species of *Almeidea* analyzed so far (see Barth, 1982; Morton & Kallunki, 1993), and this character is a putative synapomorphy for the genus within subtribe Galipeinae, where the pollen are usually 3–6-aperturate and heteropolar (Morton & Kallunki, 1993). However, the microreticulate ornamentation of the sexine in *Almeidea albiflora* contrasts with the foveolate-perforate pattern described for *Almeidea rubra* and *A. limae* (Morton & Kallunki, 1993). Barth (1982) reported a reticulate exine in the pollen of *A. coerulea,* but the figure presented in that article (with no voucher citation) had pollen with small lumina (less than 1 μm in diameter), and not forming a typical reticulate pattern, thus suggesting a perforate sexine ornamentation.

Flowers of *Almeidea albiflora* had a distinct, but subtle scent similar to that of *Citrus* flowers at 5–6 PM when collected, but no insects or other potential pollinators were observed visiting flowers at that time. Further observations are needed to determine whether the scent is produced only near twilight, which would suggest (together with the white flowers) pollination by moths (cf. Faegri & van der Pijl 1979)

Almeidea albiflora can be classified as Endangered (EN) according to the IUCN Redlist Categories and Criteria (IUCN, 2001). This species is known to exist at no more than five locations, with an estimated area of occurrence of less than 5000 km^2 and projected to decrease (criteria Bbi, Bbii and Bbiii), given the rapid destruction of the Brazilian Atlantic Rainforest (Morellato & Haddad, 2000).

No economic uses or common names are reported for the new species.

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