

SHORT COMMUNICATION

A new species of *Passiflora* (subgenus *Passiflora*, Passifloraceae) from Bahia, Brazil

Daniela Cristina Imig^{1,2}, Érika Amano³

¹ Universidade Estadual Paulista “Julio de Mesquita Filho” - UNESP, Campus de Rio Claro, Programa de Pós Graduação em Ciências Biológicas (Biologia Vegetal), Av. 24 A, 1515, Bela Vista, Caixa Postal 199, Phone: 55(019) 3526-4100, Rio Claro, São Paulo, 13506–900, Brazil

² Departamento de Botânica, Centro Universitário Campos de Andrade-UNIANDRADE, Curitiba, Paraná, Brazil

³ Universidade Federal do Paraná - UFPR, Setor de Ciências Biológicas, Departamento de Botânica, Centro Politécnico, Caixa Postal 19031, Curitiba, Paraná, 81531–970, Brazil

A new species of *Passiflora* subgenus *Passiflora* from the Brazilian flora is described and illustrated in this article. *Passiflora faleiroi* was collected in Prado, state of Bahia, and belongs to the supersection *Stipulata*, section *Granadillastrum*. *Passiflora faleiroi* is compared to two similar species, *P. mucronata* Lam. and *P. silvestris* Vell.

Submitted: April 13, 2019

Revised: October 7, 2019

Accepted: October 12, 2019

Keywords:

Section *Granadillastrum*, Passion flowers, *P.* sect. *Stipulata*, taxonomy, vines

Introduction

Passiflora L. has tropical and subtropical distribution and is the largest genus of the family Passifloraceae *sensu stricto*, containing more than 525 species worldwide (MacDougal & Feuillet (2004) in Brazil 145 species are recorded, where 83 species are endemic (Flora do Brasil, 2020 project, in construction). Taxonomically, *Passiflora* has been subdivided into four subgenera: *P.* subg. *Astrophea* (DC) Mast, *P.* subg. *Deidamioides* (Harms) Killip., *P.* subg. *Decaloba* (DC.) Rchb and *P.* subg. *Passiflora*. The subgenus *Passiflora* retains most of the features of the Passifloraceae: presence of tendrils, large and colorful flowers (that can be purple, lilac, blue, violet, red, or mixtures of these colors), a conspicuous calyx tube and a complex corona of filaments, ranging from one to multiple series. Leaves are entire or 3- to 7-lobed, not variegated and petiole glands are usually present (MacDougal & Feuillet 2004). *Passiflora* subg. *Passiflora* is further subdivided into six supersections. Among these, the supersection *Stipulata*, is characterized by the following features: large, subreniform or oblong-ovate stipules, free bracts, entire or 3-lobed

leaves, upright or rarely pendent flowers in humming-bird-pollinated species, generally with a large and complex corona of filaments (Ulmer & MacDougal 2004). The section *Granadillastrum* retains most of the characteristics of the supersection and is the richest and most diverse section (Ulmer & MacDougal 2004). During studies on Brazilian Passifloraceae, a new species was found and is herein described and illustrated. Morphological and anatomical studies were performed based on the material collected. The anatomical study was focused on stem and leaves characteristics. The morphological characteristics, according to the infrageneric classification of Feuillet & MacDougal (2003 [2004]), placed this species in the *Passiflora*, subg. *Passiflora*, supersection *Stipulata*, section *Granadillastrum*.

Material and Methods

Morphological studies performed based on the material of *Passiflora faleiroi* additionally related species of *P. mucronata* (Imig 420, UPCB), and *P. silvestris* (Imig 652, UPCB) collected, fixed and deposited in herbarium, indicate a new species for the Brazilian flora, which is described and illustrated. For light microscope observations, material of *Passiflora faleiroi* fixed in FAA50 (Johansen 1940) was free-hand sectioned. Sections

Correspondence

Daniela Cristina Imig Rua miguel caluf, 1357 2727, Curitiba, Curitiba 81540470, Brazil

E-mail: daniela.imig@gmail.com

were stained with safranin and Astra blue, dehydrated through an alcohol series and mounted in Permount. The anatomical study was focused on stem and leaves characteristics.

Taxonomic treatment

Passiflora faleiroi Imig, sp. nov. (Figure 1, Figure 2)

Type: BRAZIL. Bahia: Prado, Margens da rodovia BA-001, near to Praia da Paixão, 17°15'22"W, 39°13'06"S, 20 June 2017, D.C. Imig 486 (holotype MBM!; isotypes UPCB!)

Etymology: The epithet honors Dr. Fabio Gelape Faleiro, important researcher in Embrapa Cerrados-Planaltina, DF, Brazil.

Passiflora faleiroi is similar to *P. mucronata* Lam. and *P. silvestris* Vell., but *Passiflora faleiroi* possesses oblong leaf blades, margin without glands, apex retuse and base rounded, oval stipules, patelliform calyx tube. The flowers have petals and sepals yellowish-white color, corona of filaments in two series, inner filaments capitate at the apex, yellowish-white color and operculum filamentous.

Vine, herbaceous to sub-woody, glabrous. Cylindrical stem, superficially fluted. Stipules persistent, oval, 2.0–

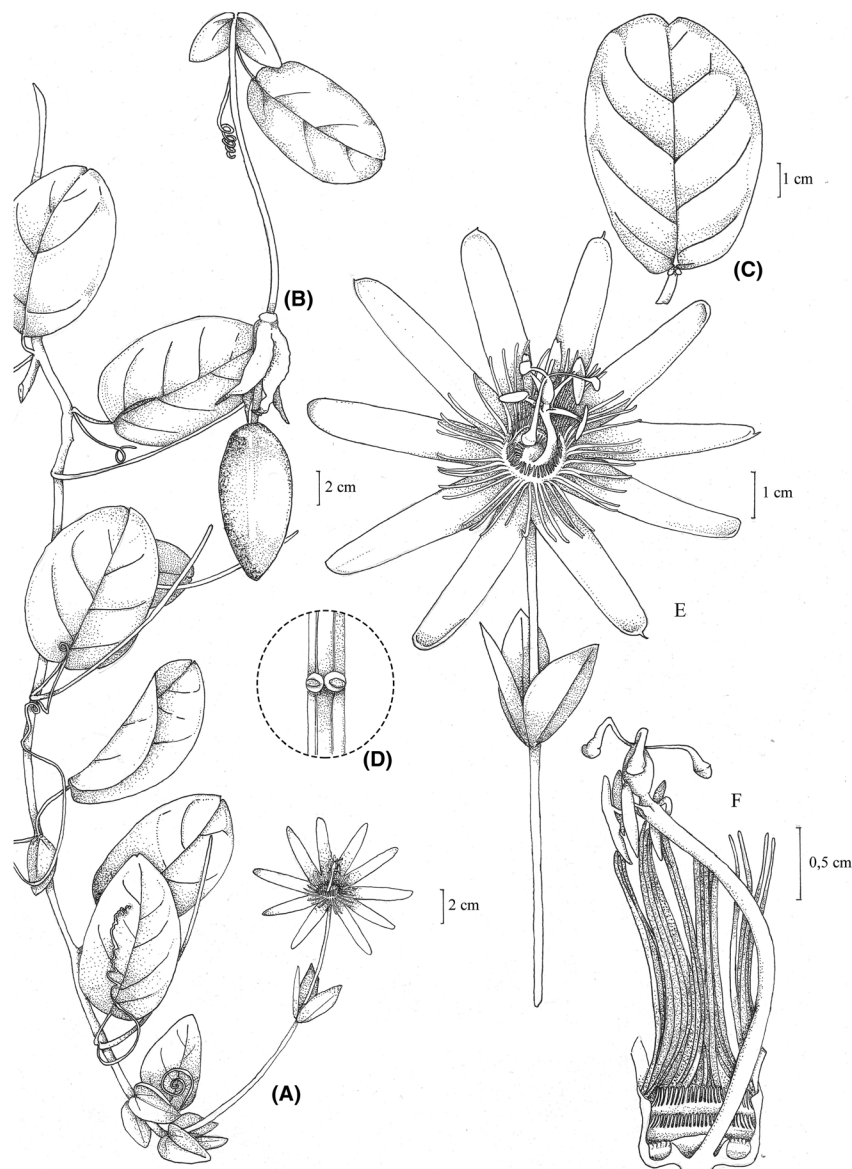


Figure 1. *Passiflora faleiroi*. A. Habit. B. Branch with a fruit. C. Leaf, adaxial view. D. Detail of glands on the petiole. E. Flower, frontal view. F. Flower detail in longitudinal section. (A–F: Imig 486).



Figure 2. *Passiflora faleiroi*. A–B Habit and flower. C. Flower, frontal view. D. Flower detail in longitudinal section. FEDR E. Fruit. (A–E: Imig 419).

2.3×0.8–1.1 cm, apex apiculate, base rounded, margin entire. Leaves with cylindrical petioles, 0.9–1.5 cm, grooved on the adaxial side, usually vinaceous, two

opposite, sessile glands on the adaxial surface of the petiole, near the base of the blade; blades entire, oblong, 4.5–6.2×3.0–3.5 cm, apex retuse, base rounded,

margins entire, main vein evident, glossy on both sides. Tendrils well developed, robust, usually vinaceous. Peduncles solitary, robust, 6.0–8.5 cm, pedicel 3.5–4.8 cm, vinaceous. Bracts oblong 1.3–1.5×0.8–1.2 cm, apex apiculate, base rounded, margins entire, early deciduous. Flowers 7–8.5 cm diam.; calyx tube patelliform, 1.3–1.5×0.5–0.7 cm, glabrous; sepals lanceolate, 3.7–4.1×0.8–1.2 cm, fleshy, apex rounded, dorsal awns with 0.2–0.3 cm, abaxial surface green, adaxial surface white-yellowish; petals lanceolate, 3.4–3.8×0.7–1.0 cm, membranaceous, apex rounded, white to cream on both sides; corona of filaments in 2 uneven series, external series with filiform filaments, 2.0–2.4 cm, radiated, yellowish-white, inner series with filiform filaments, 0.1–0.2 cm, erect, apex capitate, yellowish-white, operculum filamentous, filaments 0.1–0.2 cm, curved to the interior of the calyx tube, yellowish-white; limen patelliform, membranous, 0.1–0.2 cm, placed at the base of the

androgynophore; annular nectariferous ring, placed at the medial portion of the calyx tube; androgynophore 2.1–2.4×0.15–0.2 cm diam.; staminal filaments 0.5–0.7 cm; styles 0.6–0.7 cm, glabrous, light green, ovary ellipsoid, light green, glaucous. Fruits berries, oblong to oblong-elliptical, yellowish-green, seeds with reticulated forehead, light brown, transparent aril and slightly sweet flavor.

Stem and leaf anatomy

The stem of *P. faleiroi* has unistratified epidermis with thick cuticle, cortex is composed by parenchyma cells and perivascular fibers, vascular cylinder shows a secondary growth with continuous secondary xylem and phloem (Figure 3A). The pith has large cells with thin cell wall in the central region (Figure 3B). The stipules

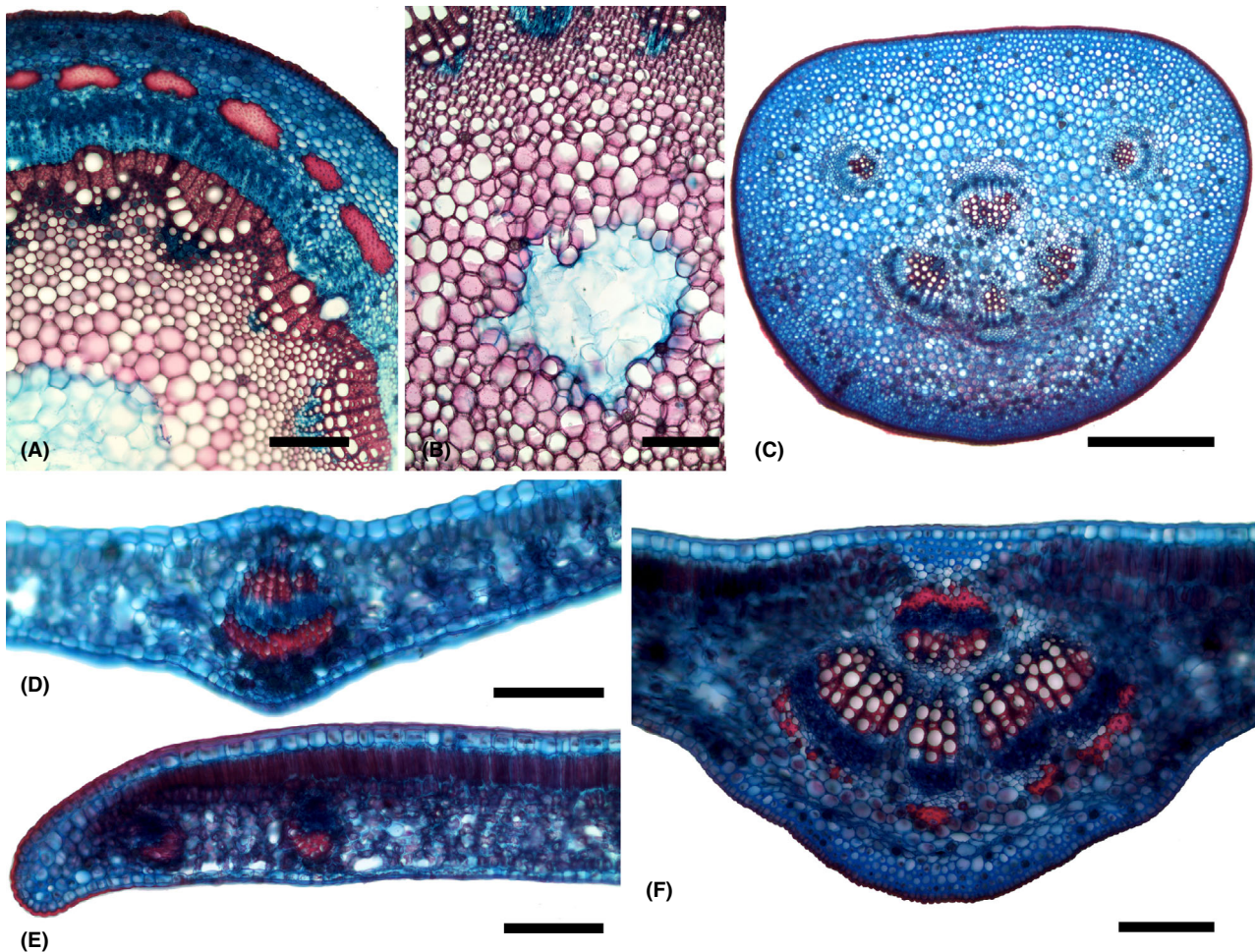


Figure 3. Stem and leaf anatomy of *Passiflora faleiroi*. A. Cross sections of the stem. B. Detail of the pith. C. Cross sections of the petiole. D. Cross section of stipule. E-F. Cross section of leaf blade, detail of the edge (E) and midvein region (F).

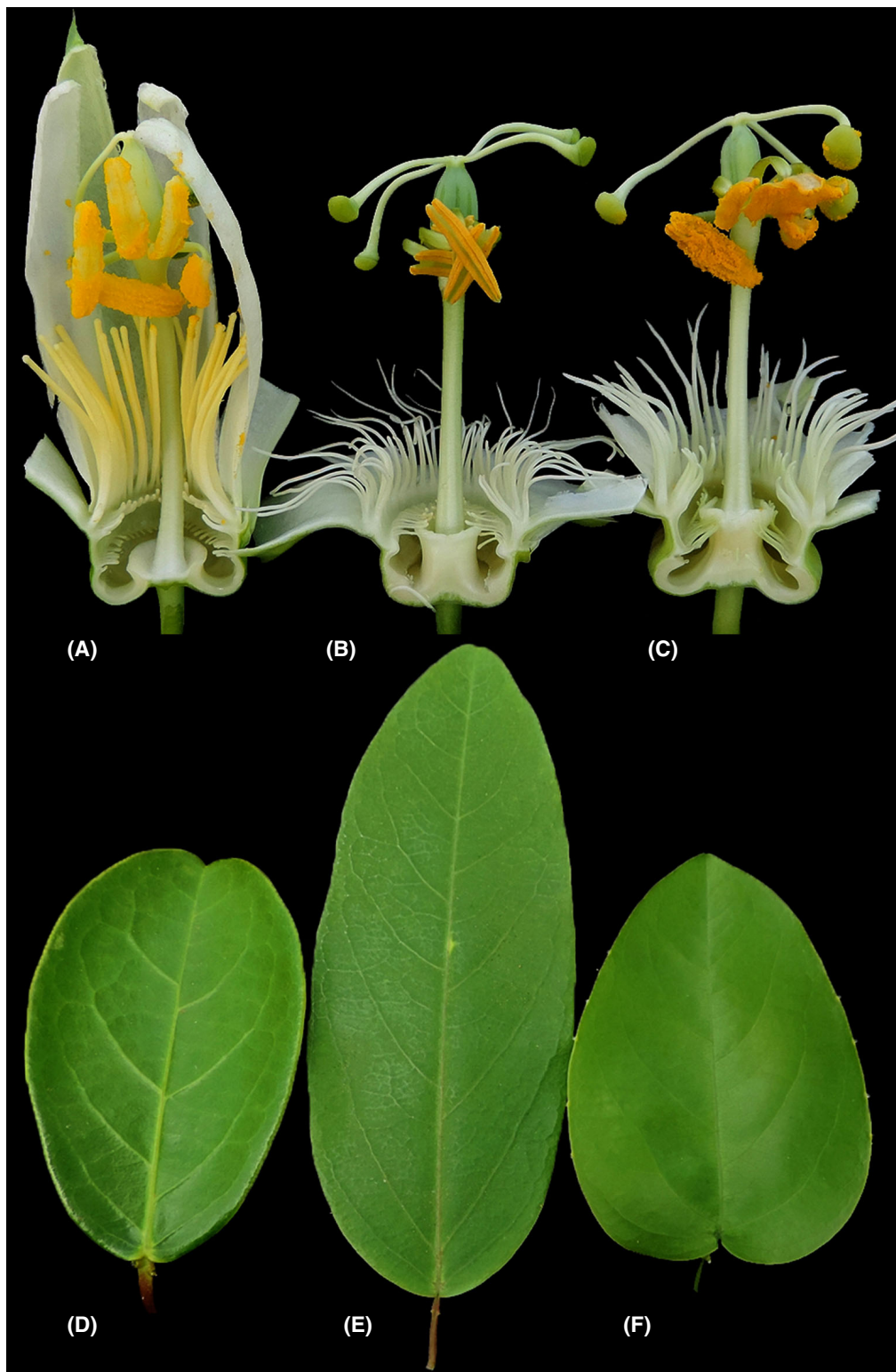


Figure 4. A comparison of flowers and leaves. A, D. *Passiflora faleiroi* (Imig, 419, Imig 486). B, E. *Passiflora silvestris* (Imig, 652, UPCB). C, F. *Passiflora mucronata* (Imig, 420, UPCB).

show thin-walled cells in the epidermis of both sides (Figure 3D). In transversal section, the main vascular unit shows slightly secondary growth and fibers in the abaxial face. The petioles show thin-walled cells in the epidermis of both sides (Figure 3C) and four vascular unit with secondary growth in one ring. Two accessory vascular bundles are arranged adaxially at each side of the main vascular system. The leaf blade is hypostomatic with stomata occurring at the same level of the ordinary epidermal cells (Figure 3E). Epidermal cells are larger on the adaxial face than the abaxial face with thin cuticle. The midrib has collenchyma in adaxial and abaxial face (Figure 3F). The mesophyll is dorsiventral with a double layered palisade parenchyma that extends with one layer to the margin (Figure 3E). The spongy parenchyma is composed of bractiform cells. The midvein shows a secondary growth with perivascular fibers similar to petiole (Figure 3C, F).

Discussion

Passiflora faleiroi is similar to *P. mucronata* Lam. and *P. silvestris* Vell. (synonymous of *Passiflora galbana* Mast.), but some features can easily differentiate them. *P. mucronata* has ovalate leaf blades and mucronate at the apex, usually membranous, petiole with 2-4 glands sessile, below the median portion, rarely 4 glands. Bracts oblong lanceolate of 2.0–2.5 cm, persistent. In the flowers, *P. mucronata* has white petals and sepals, abaxial surface of sepals with corrugated carvings, awns with 0.4–0.6 cm. Corona of filaments in two series, external series 0.8–1.0 cm, inner filaments 0.2–0.4 cm, filiforms, apex attenuated. Operculum filamentous, with the filaments projected into the interior of tube calyx, above the limen apex. Limen cupuliform bordered androgynophore, nectariferous ring located at the base of the tube calyx. Fruits ovalate lanceolate, not costate

(Cervi, 1997). *Passiflora silvestris* has oblong leaf blades, acute apex mucronate, glaucous on both surfaces, petiole with a pair of glands stipitate, below the median portion. Stipules oval to oval lanceolate, apex acute mucronate. Campanulate calyx tube. Flowers button in *P. silvestris* possesses petals and sepals white, abaxial surface with corrugated carvings, awns with 0.3–0.7 cm. Corona of filaments in two series in different sizes, external series 1.0–1.5 cm, inner filaments 0.4–0.5 cm, filiforms, and apex attenuated. Operculum filamentous with the filaments projected into the interior of calyx tube. Limen cupuliform bordered androgynophore, nectariferous ring located below the operculum. Fruits oblong to elliptical, 6-costate (Imig *et al*, 2018). *Passiflora silvestris* does not occur in the state of Bahia (BFG 2015; Flora do Brasil 2020). On the other hand *Passiflora faleiroi* possesses oblong leaf blades, apex retuse and base rounded, coriaceous. Oval stipules, apiculate at the apex. Patelliform calyx tube. The flowers present petals and sepals yellowish-white color, the abaxial surface of the sepals does not present corrugated carvings, awns with 0.2–0.3 cm. Corona of filaments in two series different sizes, external series 2.0–2.4 cm, inner filaments 0.1–0.2 cm, erect, capitate at the apex, yellowish-white color. Operculum filamentous with filaments designed for the interior of the calyx tube, but not above to the limen. Limen patelliform, nectariferous ring located in the middle portion of the calyx tube. Fruits oblong to oblong lanceolate, not costate (See Figure 4).

Additionally, preliminarily studies of reproduction were elaborated in the greenhouse (EMBRAPA CERRADOS), with isolated cultivated species and by hand-pollination (self-pollination) of three accesses of *Passiflora faleiroi*, seven accesses of *P. mucronata* and six accesses of *P. silvestris* it was observed that *P. mucronata* and *P. silvestris* exhibit self-incompatibility and both produced parthenocarpic fruits, whereas *P. faleiroi* exhibits self-compatibility and their fruits produced seeds. This

Table 1. Morphological characteristics comparison between *Passiflora faleiroi*, *P. silvestris* and *P. mucronata*.

Characters	<i>P. faleiroi</i>	<i>P. silvestris</i>	<i>P. mucronata</i>
Leaf blades	Oblong to obovate, apex retuse, margin entire	Oblong, apex mucronate, margin entire	Oval, apex mucronate, margin with glands
Petioles glands	2, sessile, at the base of blades	2, stipitate, at the middle portion	2(4), sessile, at the middle portion
Flowers color	Yellowish-white	White	White
Calyx tube	Patelliform	Campanulate	Patelliform
Limen	Patelliform	Cupuliform	Cupuliform
Corona of filaments	2 series, external series 2.0–2.4 cm, inner filaments 0.1–0.2 cm, apex capitate	2 series, external series 1.0–1.5 cm, inner filaments 0.4–0.5 cm, apex not capitate	2 series, external series 0.8–1.0 cm, inner filaments 0.2–0.4 cm, apex not capitate
Fruits	Not costate	6-costate	Not costate

characteristic could be associated with some specific or preferential pollinator. In natural habitats, where *P. faleiroi* and *P. mucronata* could occur sympatric, this characteristic could maintain the reproductive isolation of the species. (N. Junqueira, personal communication). These studies were carried out preliminarily and not systematized, therefore, thorough studies with systematized repetitions are needed.

Distribution and habitat: *Passiflora faleiroi* is known only from the state of Bahia, Brazil, in resting vegetation near to Praia da Paixão. It has been found at 12 to 14 m elevation.

Conservation status: It is uncertain to assign an IUCN (2017) conservation status category to a species known from a single collection, it is therefore ascribed to the Data Deficient category.

Phenology: *Passiflora faleiroi* was collected with flower in June and October. **Paratypes:** BRAZIL. Bahia, Prado, Margens da rodovia BA-001, near to Praia da Paixão. Cultured stakes at EMBRAPA CERRADOS, Planaltina-DF, 12 October 2015, D. C. Imig & N. T. V. Junqueira 419 (R, CTBA).

Table 1. Morphological characteristics comparison between *Passiflora faleiroi*, *P. silvestris* and *P. mucronata*.

Key to comparative related species

1. Leaf blade oval; apex mucronate; calyx tube campanulate ***P. silvestris***
- 1'. Leaf blade oblong or oblong to obovate; apex retuse or mucronate; calyx tube patelliform 2
2. Leaf margin with glands; apex mucronate; limen cupuliform ***P. mucronata***

- 2'. Leaf margin without glands; apex retuse; limen patelliform ***P. faleiroi***

We would like to thank to EMBRAPA CERRADOS PLANALTINA-DF, especially to Dr. Nilton Tadeu Vilela Junqueira, for always being willing to support new research on Passion flowers, to Duane F. Lima and Nelson F. H. Selesu for their help with corrections.

References

- BFG - Brazil Flora Group. 2015: Growing knowledge: an overview of seed plant diversity in Brazil. – *Rodriguésia*. **66**: 1085–1113.
- Cervi, A. C. 1997: Passifloraceae do Brasil. Estudos do gênero *Passiflora* L., subgênero *Passiflora*. – *Fontqueria*. **45**: 1–92.
- Flora do Brasil. 2020: em construção. Instituto de Pesquisas Jardim Botânico do Rio de Janeiro. Disponível em <<http://floradobrasil.jbrj.gov.br/>>. Last accessed 24 October 2018.
- Imig, D. C.; Milward-de-Azevedo, M. A. & Cervi, A. C. 2018: Passifloraceae *sensu stricto* de Minas Gerais, Brasil. – *Rodriguésia*. **69**: 1701–1735.
- International Union for Conservation of Nature. 2001: IUCN. World Conservation Union. IUCN Red List Categories, IUCN Species Survival Commission, The World Conservation Union.
- Johansen, D. A. 1940: Plant Microtechnique. – McGraw-Hill Book Company, New York, 528 p.
- MacDougal, J. M. & Feuillet, C. 2004: Systematics. – In: Ulmer, T. & MacDougal, J. M. (eds.). *Passiflora: Passionflowers of the world*. – Timber Press, Portland, pp. 23–31.
- Radford, A. E.; Dickison, W. C.; Massey, J. R. & Bell, C. R. 1974: Vascular plant systematic. – Harper & Row, New York, 891 p.
- Ulmer, T. & MacDougal, J. M. 2004: *Passiflora: Passionflowers of the world*. – Timber Press, Portland, 430 p.