SURVEY ON *BUTIA* (BECC.) BECC. (ARECACEAE) FROM RIO GRANDE DO SUL STATE (BRAZIL)[1]

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SUMMARY

Ten species of *Butia* (Becc.) Becc. were recognized to Rio Grande do Sul State flora: *Butia catarinensis*, *B. eriospatha*, *B. exilata*, *B. lallemantii*, *B. missionera*, *B. odorata*, *B. paraguayensis*, *B. pulposa*, *B. witeckii* and *B. yatay*. Two new species were presently described: *Butia exilata* and *B. missionera*. The natural occurrence of *Butia paraguayensis* is confirmed to the State flora, being defined its extent of occurrence area. *Butia microspadix* is excluded to Rio Grande do Sul State flora. *Butia stolonifera* is defined *species dubia*. A key to the identification of native species is given, as well as illustrations (photos and drawns).

Key words: Arecaceae, *Butia catarinensis*, *Butia eriospatha*, *Butia exilata*, *Butia lallemantii*, *Butia missionera*, *Butia odorata*, *Butia paraguayensis*, *Butia pulposa*, *Butia witeckii*, *Butia yatay*, Palmae, Rio Grande do Sul State, Plant Taxonomy.

RESUMO

[Levantamento do gênero *Butia* (Becc.) Becc. (Arecaceae) no Rio Grande do Sul].

Foram reconhecidas dez espécies de *Butia* (Becc.) Becc. como nativas no Estado do Rio Grande do Sul: *Butia catarinensis*, *B. eriospatha*, *B. exilata*, *B. lallemantii*, *B. missionera*, *B. odorata*, *B. paraguayensis*, *B. pulposa*, *B. witeckii* e *B. yatay*. Duas dessas espécies (*Butia exilata*, *B. missionera*) são presentemente descritas. *Butia paraguayensis* é confirmada para o Estado, sendo definida sua área de ocorrência. *Butia microspadix* é excluída da flora sul-rio-grandense; *Butia stolonifera* é definida como *species dubia*. É fornecida uma chave para identificação das espécies nativas no Estado, bem como ilustrações.

Palavras-chave: Arecaceae, *Butia catarinensis*, *Butia eriospatha*, *Butia exilata*, *Butia lallemantii*, *Butia missionera*, *Butia odorata*, *Butia paraguayensis*, *Butia pulposa*, *Butia witeckii*, *Butia yatay*, Palmae, Rio Grande do Sul, Taxonomia Vegetal.

INTRODUCTION

Butia (Becc.) Becc. is a Palm genus growing mainly on grasslands in central regions of South America, specially in Paraguay, northeast Argentina, center-west and southeast Brazil and Uruguay. In certain areas, some species can form magnificent colonies, as e.g. the "yatay-palm" (*Butia yatay*), in Entre Rios (Argentina), the "butia-palm" (*Butia pulposa*), in Rio Grande do Sul (Brazil) and Uruguay coastlines, and the "palm-dome or dwarf-palm" (*Butia lallemantii*), in southwest Rio Grande do Sul.

Beccari (1887) was the first to use the name *Butia* as a subgenus under *Cocos* L.; subsequently, Barbosa Rodrigues (1903) treated *Butia* in a subsection level within *Cocos* and recognized the following species: *Cocos dyeriana* Barb. Rodr., *C. eriospatha* Mart., *C. odorata* Barb. Rodr., *C. pulposa* Barb. Rodr., *C. schyzophylla* Mart., *C. stolonifera* Barb. Rodr., and *C. yatay* Mart.

In a later paper, Beccari (1916) elevated *Butia* to generic level, accepting seven species: *B. capitata* (Mart.) Becc., *B. eriospatha* (Mart.) Becc., *B. leiospatha*, *B. stolonifera*, *B. yatay*, *B. bonnetii* and *B. pungens*; the last two bynomina was proposed by him. In addition, the author

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included seven varieties under *B. capitata*, and the variety *paraguayensis* to *B. yatay*. Furthermore, Beccari listed three other species of *Cocos*, formerly described by Barbosa Rodrigues into subsection *Hariry*, as possibly belonging to *Butia* (*C. arenicola*, *C. amadelpha*, and *C. wildemaniana*), and also proposed a key to the genus.

Bondar (1964) treated *Butia* as a group under *Cocos*, recognizing seven species: *Cocos capitata* Mart., *C. eriospatha* Mart., *C. leiospatha* Mart., *C. microspadix* Burret, *C. odorata* Barb. Rodr., *C. pulposa* Barb. Rodr. and *C. yatay* Mart.

Glassman (1970) accepted *Butia* as a well defined group under *Syagrus*, with five species: *Syagrus arenicola* (Barb. Rodr.) Frambach ex Dahlgr., *S. capitata* (Mart.) Glassman, *S. eriospatha* (Mart.) Glassman, *S. paraguayensis* (Barb. Rodr.) Glassman and *S. yatay* (Mart.) Glassman; the last four new combinations was created by him. The author also included a key and a list of doubtful species. In a subsequently contribution, Glassman (1979) re-evaluated *Butia* to generic status, recognizing a new species (*B. purpurascens*); *Syagrus archeri* Glassman, on the other hand, was transferred to *Butia*.

In recent years, Noblick (2004) transferred *Cocos campicola* Barb. Rodr. to *Butia* and, in a later paper, Noblick (2006) described two new species from Paraguay, close to Brazilian border (*Butia exospadix* and *B. marmorii*), and also transferred *Syagrus leptospatha* Burret to *Butia*.

Deble & Marchiori (2006) described a new species from Rio Grande do Sul State: *Butia lallemantii*. Subsequently, Brussa & Grela (2007) extended its occurrence to Uruguay; the same authors also cited a natural hybrid with *Syagrus romanzoffiana* (Cham.) Glassman.

In a recent contribution, Noblick (2010) recognized 18 species to the genus, 16 of them occurring in Brazil. In the same paper, the author described four new species: *B. catarinensis* Noblick & Lorenzi, *B. lepidotispatha* Noblick, *B. matogrossensis* Noblick & Lorenzi, and *B. pubispatha* Noblick & Lorenzi. Furthermore, a key from Brazilian species, descriptions, photos and geographic distribution of all species occurring in the country (and also the doubtfully native *B. marmorii* Noblick) were also furnished.

Soares & Longhi (2011) described *Butia witeckii* as endemic in central region of Rio Grande do Sul State (Quevedos municipality). The authors included a key to species that grow in Rio Grande do Sul State, and also add *Butia paraguayensis* in their key, a species considered by several authors as doubtful to Rio Grande do Sul State.

TAXONOMIC TREATMENT

The genus *Butia* comprises 19 species, being 17 native to Brazil. In Rio Grande do Sul State the genus is well represented, being comparable, in number of native species, to the verified in the border of Paraguay and Brazil (Mato Grosso do Sul State).

Butia is most closely related to the genera *Jubaea* Kunth and *Syagrus* Mart., and natural hybrids can be found in sympatric areas of occurrence with the last genus (e.g. *x Butyagrus nabonnandii* (Prosch) Vorster, an hybrid between *B. pulposa* and *Syagrus romanzoffiana* (Cham.) Glassman). *Butia* differs from the sympatric genus *Syagrus* by a combination of the following morphologic features: frequently armed petiole, unclustered plicate pinnae, with oblique, split tips in pairs forming a shape of "V" (vs. not unclustered plicate pinnae, pairs forming a shape of "X" or plane, rarely seemingly a "V"), the multiple-chambered fruit (not multiple-chambered), and germination pores of the endosperm nearly at the base (vs. distributed in the middle portion).

1. *Butia catarinensis* Noblick & Lorenzi, Brazil. Fl. Arec.: 164. 2010. *Typus*: BRAZIL. Santa Catarina, Barra do Sul, 29-X-2009, *H. Lorenzi & K. Soares 6770* (*Holotypus* HPL).

Distribution & habitat: *Butia catarinensis* is endemic in southeast Santa Catarina and

northeast Rio Grande do Sul coastlines, growing on dunes and dune grasslands.

Comments: According to Noblick (2010), the species can be separated from *B. odorata* by the size of trunk (0.8-2 m *vs.* 3-9 m), number of contemporary leaves (more than 40), and size and shape of spathe and flowers.

Representative material examined: BRAZIL. Rio Grande do Sul, Torres, BR 101, "8 km da entrada da cidade, estipe com 1 m, frutos imaturos, apiculados" 18-XII-2009, *L. P. Deble & A. S. de Oliveira-Deble 12162* (CTES). Santa Catarina, "entre Imbituba e Ibiraquera, em campos de paleo-dunas, butiazal com dezenas de indivíduos, alguns acaules, os maiores de até 1.8 m de altura, flores e frutos, bráctea peduncular glabra", 16-XII-2009, *L. P. Deble & A. S. de Oliveira-Deble 12160* (CTES).

2. *Butia eriospatha* (Mart. ex Drude) Becc., Agric. Colon. 10: 496. 1916.
Cocos eriospatha Mart. ex Drude in Fl. Bras. 3(2): 424. 1881. *Calappa eriospatha* (Mart. ex Drude) Kuntze, Revis. Gen. Pl. 2: 982. 1891. *Syagrus eriospatha* (Mart. ex Drude) Glassman, Fieldiana, Bot. 32: 145. 1970. *Typus*: BRAZIL. Rio Grande do Sul, "culta Rio de Janeiro" *Glaziou 8059* (*Lectotypus* K, designated by Glassman 1970: 149).

Distribution & Habitat: *Butia eriospatha* occurs in Rio Grande do Sul, Santa Catarina and Paraná, growing in high grasslands, frequently associated with "Brazilian-pine" (*Araucaria augustifolia*). Recently, it was cited to Misiones province, Argentina (Krapovickas & Dematteis, 2008).

Comments: *Butia eriospatha* is easily distinguished by a combination of following features: solitary, 4-5 m tall of trunk; outside ferruginous pubescent spathe; globose to ovate shape, 3-7 mm long pistillate flowers; and globose fruits.

Representative material examined: BRAZIL. Rio Grande do Sul, Erechim, Campo Erê, "no campo, estipe 4 m, bráctea peduncular densamente pubescente, flores femininas cerca de 5 mm" 13-XII-2009, *L. P. Deble & A. S. de Oliveira-Deble 12854* (CTES).

3. *Butia exilata* Deble & Marchiori, sp. nov.
A Butiae lallemantii, primu aspectu sed spadix linear-oblanceolatis, 40-70 cm longis, 3.5-6.5 cm latis (vs. oblanceolatis, 30-50 cm longis, 4-6 cm latis), dorso ferrugineo-tomentoso (vs. glabro), flores feminei majoribus (12-18 mm vs. 9-11 mm longus) et endocarpio ovato (vs. elliptico), productus bene differt.

TYPUS: BRAZIL. Rio Grande do Sul, Rondinha, "cerca de 2 km do Parque Estadual de Rondinha, em campo e beira de estrada, palmeira cespitosa, copa irregular, caules visíveis na base, cerca de 1-1.5 m de altura, bráctea peduncular coberta por tomento marrom-avermelhado no dorso" 22-XII-2010, *L. P. Deble, A. S. Oliveira-Deble, J. N. C. Marchiori & F. S. Alves 13422* (Holotypus SI!)

Palm cespitose, acaulescent or with very short trunk, 0.8-1.6 m high. Trunks 4-20 (perhaps more), subterranean or up to 50 cm high and 20 cm diameter. Contemporary leaves, 4-12 per trunk, 80-150 cm long, erect-patent or patent, slightly discolorous, ochraceous-green or dark ochraceous-green on both surfaces, and shine adaxially. Petiole 35-45 cm long, and 1-1.4 cm wide, flat adaxially and angulated abaxially, margins mostly with short obtuse spines at the apex, occasionally only fibrous, sheathing at the base up to 15 cm long, 5-8 cm wide. Leaf rachis 45-110 cm long, and 0.9-1.2 cm wide. Pinnae 25-35 pairs, mostly unclustered, middle ones 30-48 cm long, 0.8-1.2 cm wide, mostly with oblique and occasionally split tips. Spathe linear-oblanceolate, up to 70 cm long; expanded part of spathe, 35-45 cm long, and 3.5-6.5 cm wide, ending beaked (beak up to 3 cm), shallow grooved, and greenish-glaucous, covered by reddish-brown indumentum outside, becoming sparse pubescent with age. Spathe sheath fibrous, reddish-brown, up to 11 cm long, and covered by leaf sheath. Inflorescence peduncles white-cream, sericeous, shallow grooved, 19-36

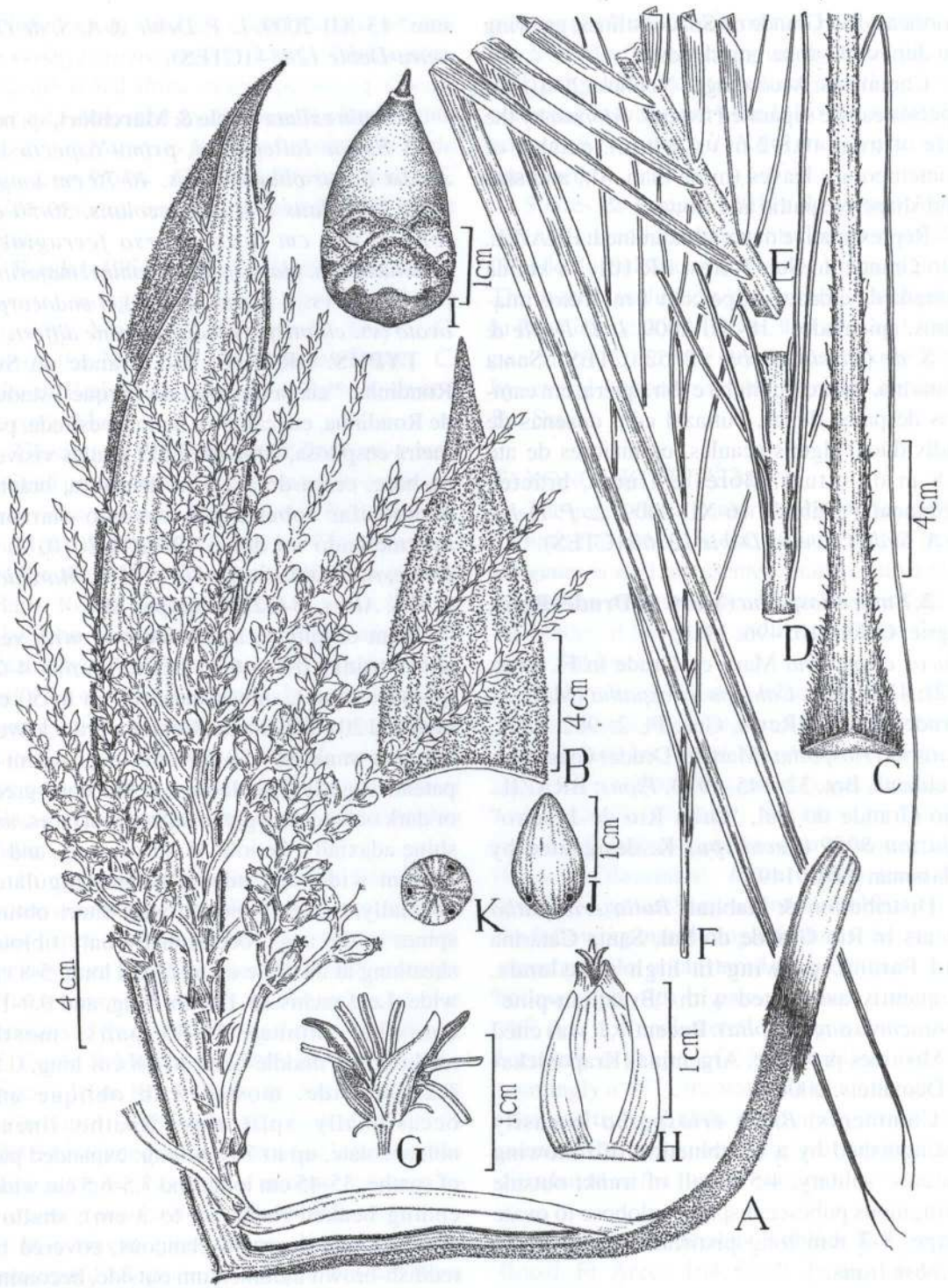


FIGURE 1 – *Butia exilata*. A – Inflorescence. B – Outside view of the Spathe. C – Pseudopetiole. D – Basal portion of leaf. E – Middle portion of leaf. F – Apical portion of leaf. G – Staminate flower. H – Pistillate flower. I – Mature fruit and perianth. J – Endocarp lateral view. K – Endocarp pores view (A-K, from *L. P. Deble, A. S. Oliveira-Deble, J. N. C. Marchiori & F. S. Alves 13422*).



FIGURE 2 – *Butia exilata.* A – Habit. B – Spathe, basal leaf and sheaths. C – Inflorescence in detail, showing rachillae and flowers.



FIGURE 3 – *Butia exilata.* A – Habit, showing basal portion, spathes, inflorescence and fruitage. B – Lateral trunks in detail. C – Fruitage with immature fruits.

cm long. Inflorescence rachis 25-35 cm long, 0.8-1.2 cm diameter, with 22-38 rachillae; rachillae flexuous, white-cream or greenish-cream; the lower, 16-25 cm long; the upper 9-15 cm long. Staminate flowers white-cream; the lower pedunculate, peduncles up to 12 mm; the upper sessile or almost sessile; sepals lanceolate, 1.2-2.5 mm long, 0.5-1 mm wide; petals ovate-elliptic, white-cream or purplish inside, 7-10 mm long, 2.8-4 mm wide. Pistillate flowers predominately white-cream, frequently greenish-purple distally, ovate-turbinate, 12-18 mm long, and 7-8 mm wide at the apiculate apex. Fruit yellow or greenish-yellow, turbinate-ovoid beaked, 3-4 cm long and 1.6-2 cm in diameter, in the proximal third covered by persistent perianth scales; mesocarp sparsely fibrous; endocarp bony, ovate, 10-12 mm long, 7-8 mm wide, with 1-2 seeds (Figures 1-3).

Distribution & habitat: *Butia exilata* is endemic in northwest Rio Grande do Sul State (Figure 12), growing on grasslands. Material with flowers and fruits can be gathered in spring and summer.

Etymology: The Latinized name means insulate, due the isolation status of the populations.

Comments: *Butia exilata* is morphologically similar to *B. lallemantii* Deble & Marchiori; both species display cespitose habit and sparsely fibrous beaked fruits. However, *B. exilata* shows ochraceous-green or dark ochraceous-green leaves (*vs.* grayish-green), linear oblanceolate spathe (*vs.* oblanceolate), covered by reddish-brown indumentum outside (*vs.* glabrous), and bigger pistillate flowers (12-18 mm long *vs.* 9-11 mm long). In addition, the new species differs in the field by asymmetrical shape of the top (*vs.* hemispheric), erect young leaves (vs. erect-patent) and visible trunks at the base (vs. trunk completely covered by leaves). The indumetum and shape of spathe agree *B. exilata* with *B. arenicola*, but the first-one species is easily segregated by robust cespitose habit and female flowers with 12-18 mm long (*vs.* 7-10 mm long in *B. arenicola*). Finally, *B. exilata* differs from *Butia paraguayensis* by cespitose habit (vs. solitary trunk) and pubescent outside spathes.

Conservation status: *Butia exilata* occurs on grasslands in northwest of Rio Grande do Sul, in extent of occurrence with above 750 km^2, and with an area of occupancy smaller than 10 km^2. The populations are few, and contain a reduced number of individuals. In addition, anthropogenic pressures such as agriculture and urban expansion affect directly this area. Due to the observed threats, it is prudent to include *B. exilata* in the Critically Endangered Category of the IUCN Red List of endangered plant species according to the following criteria (IUCN, 2010): CR B2a, b (ii,iii), C2a (i).

Paratypi: BRAZIL. Rio Grande do Sul, Pontão, RS 324, "em direção a Ronda Alta, em campo e beira da estrada, palmeira cespitosa, copa irregular, caules visíveis, cerca de 1 m de altura, bráctea peduncular tomentosa no dorso" 12-XII-2009, *L. P. Deble & A. S. Oliveira-Deble 12333* (CTES). Rondinha, "cerca de 2 km do Parque Estadual de Rondinha, palmeira cespitosa, copa irregular, caules visíveis na base, 1 m de altura, bráctea peduncular tomentosa no dorso" 22-XII-2010, *L. P. Deble, A. S. Oliveira-Deble, J. N. C. Marchiori & F. S. Alves 13423* (CTES, SI).

4. *Butia lallemantii* Deble & Marchiori, Balduinia 9: 2. 2006. *Typus*: BRAZIL. Rio Grande do Sul, São Francisco de Assis, 12-XII-2003, *L. P. Deble, A. S. Oliveira & J. N. C. Marchiori 1514* (*Holotypus* SI).

Distribution & Habitat: *Butia lallemantii* occurs on sandy grasslands and small sandstone mountains in southwest Rio Grande do Sul (Alegrete, São Francisco de Assis, Manoel Viana, Quaraí), and north of Uruguay, department of Rivera (Brussa & Grela, 2007).

Comments: *Butia lallemantii* is characterized by cespitose habit and hemispheric shape. Related with *Butia paraguayensis*, it differs by habit (cespitose *vs.* solitary trunk), smaller staminate flowers (6-9 mm *vs.* 12-16 mm), and

smaller pistillate flowers (9-11 mm *vs.* 12-16 mm). In field, *Butia lallemantii* is easily distinguished by its "palm-dome" shape.

Representative material examined: BRAZIL. Rio Grande do Sul, São Francisco de Assis, "palmeira com copa hemisférica e aparentemente acaule, butiazal de centenas de indivíduos, em campos arenosos" 12-XII-2003, *L. P. Deble, A. S. de Oliveira & J. N. C. Marchiori 1514* (SI, holotype). Quarai, "Fazenda do Jarau, p. Quaraí, *in rupestribus dumetosis*, fr. submaturo", I-1945, *B. Rambo s.n.* (PACA 26090).

5. *Butia missionera* Deble & Marchiori, sp. nov.

A Butiae yatay, primu aspectu sed foliis arcuato-patentibus ad recurvo-patentibus (vs. foliis arcuato-recurvis); caules brevioribus et crassum (3-6 m altum, 50-60 cm crassum vs. 4-12 m altum, 30-40 cm crassum) ad basin incrassatis et drupae late ovatae (vs. drupae ovatae vel turbinatae) differt.

TYPUS: BRAZIL. Rio Grande do Sul, Giruá, Campo do Butiá (28° 04' 19" S and 54° 20' 00" W), "no campo, palmeira com estipe de 4 m, folhas contemporâneas 36, as novas arqueadas, bráctea peduncular glabra, parte expandida com 70 cm de comprimento e 13 cm largura" 22-XII-2010, *L. P. Deble, A. S. Oliveira-Deble, J. N. C. Marchiori & F. S. Alves 13418* (*Holotypus* SI!).

Palm solitary, 5-8 m high. Trunks 3-6 m high and 50-60 cm diameter, at the base thickened, and with the old petiole scars on the trunk. Old leaves, down-revolute, touching the trunk. Contemporary leaves, 25-40, 200-300 cm long, erect or erect-patent, slightly discolorous, grayish-green or green on both surfaces, and shine adaxially. Petiole 45-65 cm long, and 2.5-3 cm wide, flat adaxially and angulated abaxially, margins mostly armed with obtuse or acute spines (spines with 2-6 cm long), sheathing at the base up to 60 cm long, 12-18 cm wide. Leaf rachis 150-215 cm long, and 2-3 cm wide. Pinnae 40-70 pairs, mostly unclustered, middle ones 70-85 cm long, 2-3 cm wide, mostly with oblique and occasionally split tips. Spathe oblanceolate, up to 150 cm long; expanded part of spathe, 70-100 cm long, and 11-14 cm wide, ending beaked (beak up to 3 cm), shallow grooved, and greenish-glaucous, glabrous outside, and greenish-cream inside. Spathe sheath fibrous, reddish-brown, 30-40 cm long, and covered by leaf sheath. Inflorescence peduncles white-cream, sericeous, shallow grooved, 50-60 cm long. Inflorescence rachis 50-70 cm long, 1.8-2.5 cm diameter, with 65-90 rachillae; rachillae flexuous, white-cream or greenish-cream; the lower, 38-65 cm long; the upper 25-45 cm long. Staminate flowers white-cream; the lower pedunculate, peduncles up to 8 mm; the upper sessile or almost sessile; sepals lanceolate, 1.5-2.8 mm long, 0.8-1.3 mm wide; petals ovate-elliptic, white-cream or purplish inside, 8-10 mm long, 3-4 mm wide. Pistillate flowers predominately white-cream, frequently greenish-purple distally, ovate-turbinate, 12-14 mm long, and 7-9mm wide at the apiculate apex. Fruit yellow or orange, broadly ovoid, beaked, 3.5-4.5 cm long and 2.5-3.5 cm in diameter, in the proximal third covered by persistent perianth scales; mesocarp sparsely fibrous; endocarp bony, ovate or broadly elliptic, 18-22 mm long, 14-16 mm diameter, angulated and prolonging in a beak basally, with 2-3 seeds (Figures 4-7).

Distribution & habitat: *Butia missionera* is endemic in northwest Rio Grande do Sul State (Figure 12), growing on grasslands. Material with flowers and fruits can be gathered in the spring and the summer.

Etymology: The Latinized name mentions the Jesuitic Missions, a geographic region in northwest Rio Grande do Sul State.

Comments: *Butia missionera* is morphologically similar to *B. yatay* (Mart.) Becc.; both species display bigger female flowers and scarcely fibrous beaked fruits. However, *B. missionera* shows down-revolute old leaves, touching the trunk (*vs.* only revolute, not touching the trunk), shorter and thickened trunk (3-6 m high, 50-60 cm diameter *vs.* 4-12 m high,

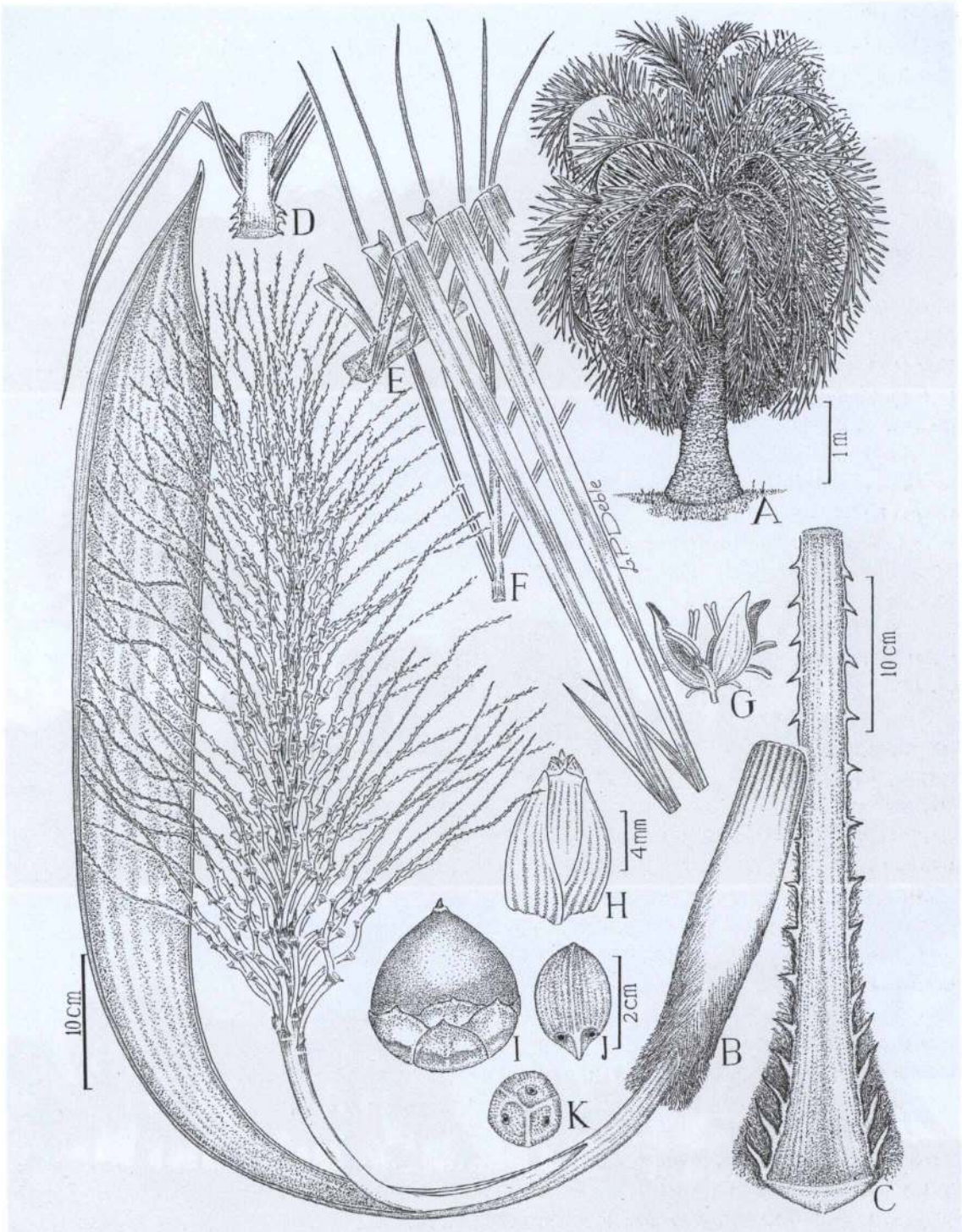


FIGURE 4 – *Butia missionera*. A – Habit. B – Inflorescence. C – Pseudopetiole. D – Basal portion of leaf. E – Middle portion of leaf. F – Apical portion of leaf. G – Staminate flower. H – Pistillate flower. I – Mature fruit and perianth. J – Endocarp lateral view. K – Endocarp pores view (A-K, from *L. P. Deble, A. S. Oliveira-Deble, J. N. C. Marchiori & F. S. Alves 13418*).



FIGURE 5 – Three aspects of a well-preserved *Butia missionera* grove of palm trees (Giruá; 28° 04' 19" S and 54° 20' 00" W).



FIGURE 6 – *Butia missionera.* A – Another aspect of the Giruá grove of palm trees. B – Fruitage with mature fruits.

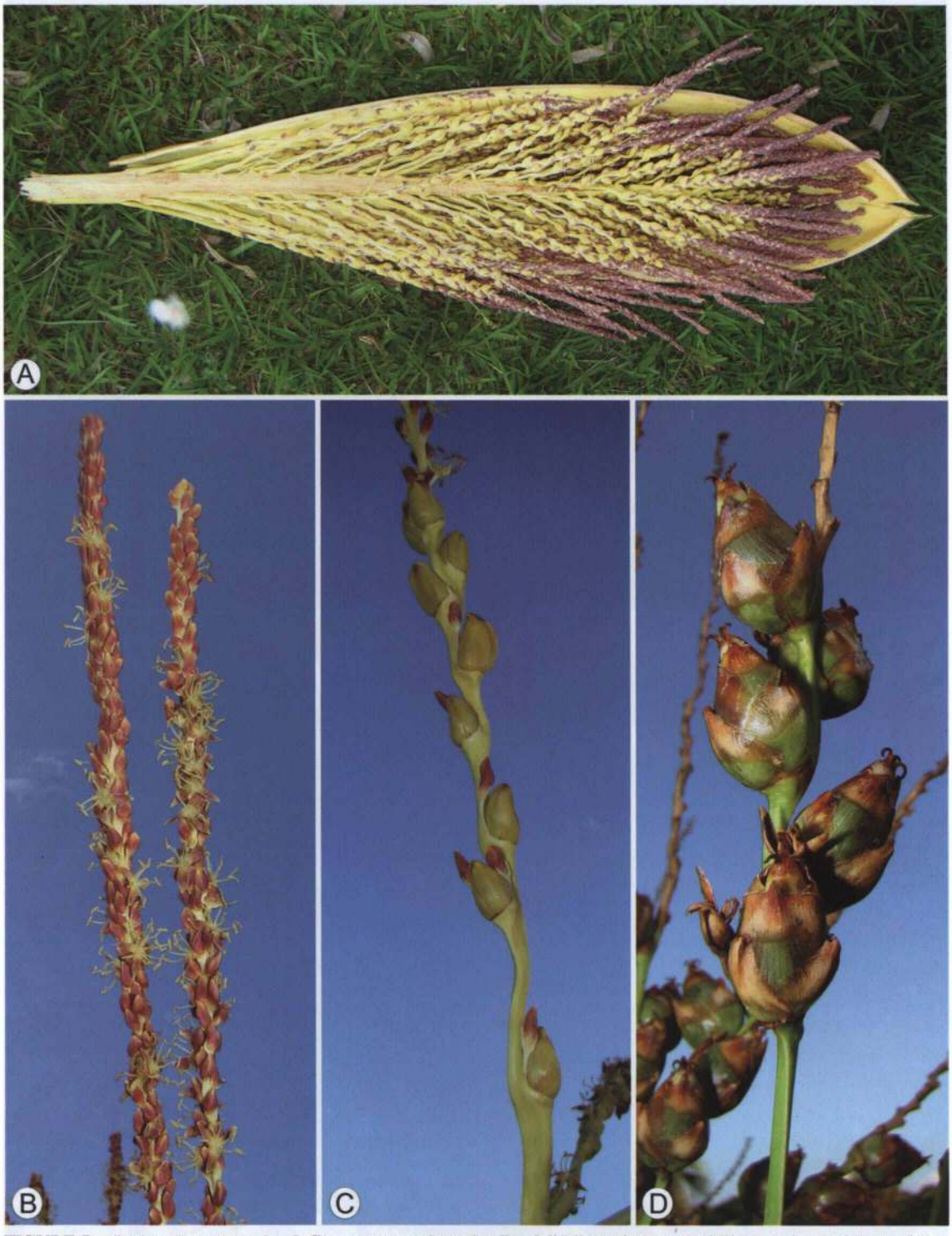


FIGURE 7 – *Butia missionera.* A – Inflorescence and spathe. B – Middle and upper rachillae portions with staminate flowers. C – Basal rachillae portion with central pistilate flowers, surrounded by staminate flowers. D – Rachillae with young fruits.

30-40 cm diameter), which is still more thickened at the base (vs. almost cylindrical), and shape of the fruit (broadly ovate *vs.* ovate or turbinate).

Conservation status: *Butia missionera* occurs on grasslands in northwest Rio Grande do Sul State, in extent of occurrence with above 2,500 km^2, and with an area of occupancy smaller than 100 km^2. The populations are few, and contain reduced number of individuals. In addition, anthropogenic pressures such as agriculture and urban expansion affect directly this area. Due to the observed threats, it is prudent to include *B. missionera* in the Endangered Category of the IUCN Red List of endangered plant species, according to the following criteria (IUCN, 2010): EN B1, 2a, b (i,ii,iii,iv), C2a (i).

Paratypi: BRAZIL. Rio Grande do Sul, Giruá , 6 km de Giruá, 1-II-1973, *B. Irgang & J. Valls s.n.* (ICN 21652); Campo do Butiá (28° 04' 19" S and 54° 20' 00" W), "no campo, palmeira com estipe de 3 m, as novas folhas arqueadas , bráctea peduncular glabra, parte expandida com 70 cm de comprimento e 12-13 cm largura" 22-XII-2010, *L. P. Deble, A. S. Oliveira-Deble, J. N. C. Marchiori & F. S. Alves 13419* (SI).

6. *Butia odorata* (Barb. Rodr.) Noblick, Palms 55 (1): 48. 2011.

Cocos odorata Barb. Rodr., Pl. Jard. Rio de Janeiro 1: 11. 1891. *Butia capitata var. odorata* (Barb.Rodr.) Becc., Agric. Colon. 10: 513. 1916. *Butia odorata* (Barb. Rodr.) Noblick & Lorenzi Braz. Fl.: 178. 2010 [nom. inval.]. *Typus*: not indicated in the protologue (*Epitypus* Barbosa Rodrigues 1891: tab. IV, A et V, fig. C).

Distribution & Habitat: *Butia odorata* occurs in Rio Grande do Sul and Uruguay (Treinta y Tres department), mainly on granitic grasslands, being frequent in Amaral Ferrador, Dom Feliciano and Cristal municipalities, in east of Rio Grande do Sul State; it can be also found as cultivated individuals as well as in mountains near to coastline, but rarely in dunes and sandy grasslands (Figures 8, 9).

Comments: *Butia odorata* is characterized by a combination of the following features: solitary trunk, with 2-8 m high; hemispheric arched top; 25-40 contemporaries leaves; smaller, 3-7 mm long pistillate flowers; ovate fruits and nearly ovate to broadly elliptic endocarp. It is closely related to *B. pulposa* and *B. catarinensis*, differing by the first-one species by grayish-green to green leaves (vs. greenish-blue), ovate-shape fruits (vs. globosely depressed), with 1.5-2.5 cm long, 1.3-2.1 cm diameter (vs. 2.5-4 cm long, 2.5-4.5 cm diameter), and nearly ovoid to broadly elliptic endocarp, 10-15 mm long, 7-10 mm wide (vs. globose, 17-22 mm long and wide). From *Butia catarinensis*, *B. odorata* differs by a bigger trunk (2-8 m vs. acaulescent or up to 2 m), and inflorescence with more than 100 rachillas (vs. less than 100 rachillas).

Obs.: This species was considered during several years as a variety of *B. capitata*. Recently, the bynomina *Butia odorata* was proposed in Lorenzi et al. (2004) as *B. odorata* (Barb. Rodr.) Noblick & Pirani, but without basyonim; subsequently a tentative of a new combination was proposed by Noblick & Lorenzi (2010), but without a clear basyonim reference of the publication (contrary to article 33.7 ICNB), being only recently published in a valid form (Noblick, 2011). The species considered by Noblick (2010, 2011) as *B. odorata* corresponds to *B. pulposa*.

Representative material examined: BRAZIL. Rio Grande do Sul, Amaral Ferrador, "no campo, estipe com 6 m de altura, folhas contemporâneas em número de 28, flores avermelhadas, flores femininas apiculadas, com 5-6 mm, frutos ovóides, cerca de 2 cm" 24-XII-2008 , *L. P. Deble & A. S. de Oliveira-Deble 10466* (CTES).

7. *Butia paraguayensis* (Barb. Rodr.) L. H. Bailey, Gentes Herb. 4: 47. 1936.

Cocos paraguayensis Barb. Rodr., Palm. Nov. Parag. 9, t. 2, 1899. *Syagrus paraguayensis* (Barb.Rodr.) Glassman, Fieldiana, Bot. 32:

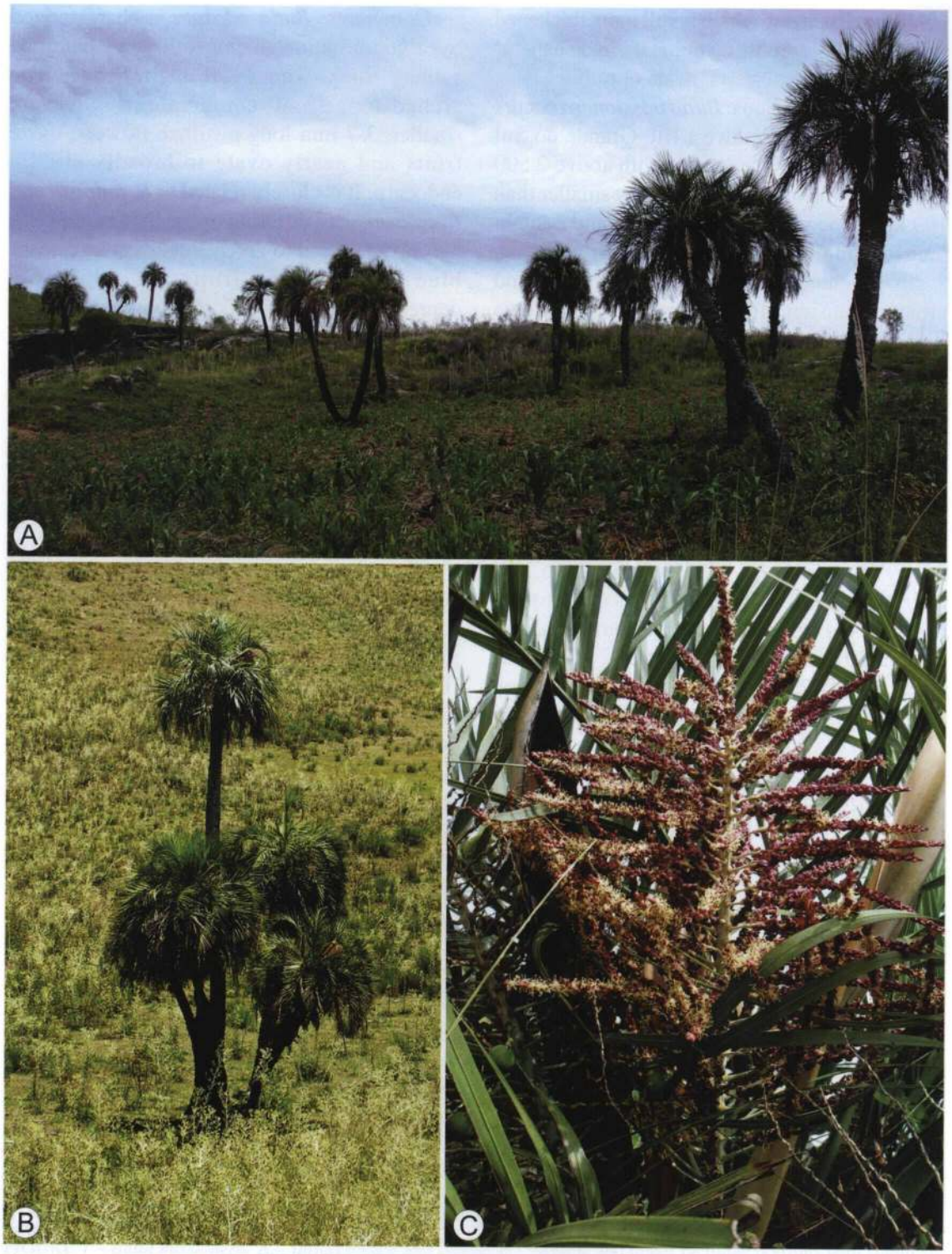


FIGURE 8 – *Butia odorata.* A – A panoramic view of Dom Feliciano grove of palm trees (Rio Grande do Sul State). B – Group of palm trees. C – Inflorescence.



FIGURE 9 – *Butia odorata*. A – Rachillae with staminate flowers. B – Fruitage with immature fruits.

151.1970. *Butia yatay* var. *paraguayensis* (Barb.Rodr.) Becc., Agric. Colon. 10: 503 .1916. *Butia yatay* subsp. *paraguayensis* (Barb.Rodr.) Xifreda & Sanso, Hickenia 2: 207. 1996. *Typus*: PARAGUAY. "ad S. Salvador prope Tagatiyá, et in Cordillera de altos" *Hassler 896* (*Lectotypus* G, designated by Glassman 1970: 151).
= *Cocos wildemaniana* Barb.Rodr., Sert. Palm. Brasil. 1: 101. 1903. *Butia wildemaniana* (Barb.Rodr.) Burret, Notizbl. Bot. Gart. Berlin-Dahlem 10: 1050. 1930. *Syagrus wildemaniana* (Barb.Rodr.) Frambach ex Dahlgren, Publ. Field Mus. Nat. Hist., Bot. Ser. 14: 124. 1936. *Typus*: PARAGUAY. "in campis in regione cursus superioris fluminis Apa" *Hassler 8554* (*Holotypus* G).

Distribution & Habitat: Paraguay, Argentina (Corrientes province), Brazil (Mato Grosso, Mato Grosso do Sul, São Paulo, Minas Gerais, Paraná, Rio Grande do Sul), and Uruguay (cerro Myriñaque). In Rio Grande do Sul, this species is extremely rare, being recently found in the west, in Massambará municipality, close to the border of São Borja and Unistalda municipalities (Figures 10, 11, 12).

Comments: *Butia paraguayensis* is characterized by pistillate flowers with 12-16 mm long, apiculate fruits, and solitary, acaulescent or short trunk (up to 2 m). This species is entirely related with *B. arenicola*, differing by bigger size of flowers and fruits and outside glabrous spathe (vs. sparsely ferruginous pubescent).

Representative material examined: BRAZIL. Rio Grande do Sul, Maçambará (29° 04' 43" S and 55° 18' 09" W), "dois cerros, no campo arenoso, palmeira com estipe robusto, solitário, medindo 1.4 m de altura e 30 cm diâmetro, flores femininas com 14-15 mm, apiculadas" II-2007, *L. P. Deble & A. S. de Oliveira-Deble 7191* (CTES); idem, "frutos imaturos verde-vináceos", 08-III-2007, *L. P. Deble, A. S. de Oliveira & J. N. C. Marchiori 7455* (CTES).

8. *Butia pulposa* (Barb.Rodr.) Nehrl., Amer. Eagle 24(17): 1. 1929.
Cocos pulposa Barb.Rodr., Pl. Jard. Rio de Janeiro 1: 14 1891. *Butia capitata* var. *pulposa* (Barb.Rodr.) Becc., Agric. Colon. 19: 516. 1916. *Typus*: not indicated in the protolgue (*Epitypus* Barbosa Rodrigues 1891: tab. IV, B)

Distribution & habitat: *Butia pulposa* occurs in Rio Grande do Sul and Uruguay coastlines, growing in dunes and grasslands.

Comments: The species can be segregated from other species of the genus by greenish-blue leaves, deppresed globose fruits and endocarp nearly spherical or slightly deppresed.

Representative material examined: BRAZIL. Rio Grande do Sul, Sentinela do Sul, "próximo à entrada de Tapes, estipe solitário 5 m, folhas contemporâneas 22, azuladas" 21-I-2009, *L. P. Deble & A. S. de Oliveira-Deble 10155* (CTES). Rio Grande, "no campo, estipe solitário, 6 m, folhas contemporâneas 34, verde-azuladas, bráctea peduncular glabra, frutos avermelhados, globoso-depressos, paucifibrosos" 21-II-2008, L. P. Deble & A. S. de Oliveira-Deble *9998* (CTES).

Obs. : This species was considered as *Butia odorata* by Noblick (2010, 2011).

9. *Butia witeckii* K. Soares & S. Longhi, Ci. Fl. 21 (2): 204. 2011. *Typus*: BRAZIL. Rio Grande do Sul, Quevedos, "localidade de Quebra Dentes, 2 km a norte da Usina de Quebra Dentes, S 29°22'07,17" W 54°00'45,31", 24-III-2011, *K. P. Soares, C. G. Redin & D. S. Brito s.n.* (*Holotypus* HDCF 6213).

Distribution & habitat: *Butia witeckii* is narrowly endemic in a central area of Rio Grande do Sul State (Quevedos, Júlio de Castilhos, São Pedro do Sul and São Martinho da Serra municipalities), growing on rocky grasslands.

Comments: The species is closely related to *B. yatay*, but according to the original description (Soares & Longhi, 2011) it differs by bigger fruits (3.6-5.6 mm long, 3-4.1 cm

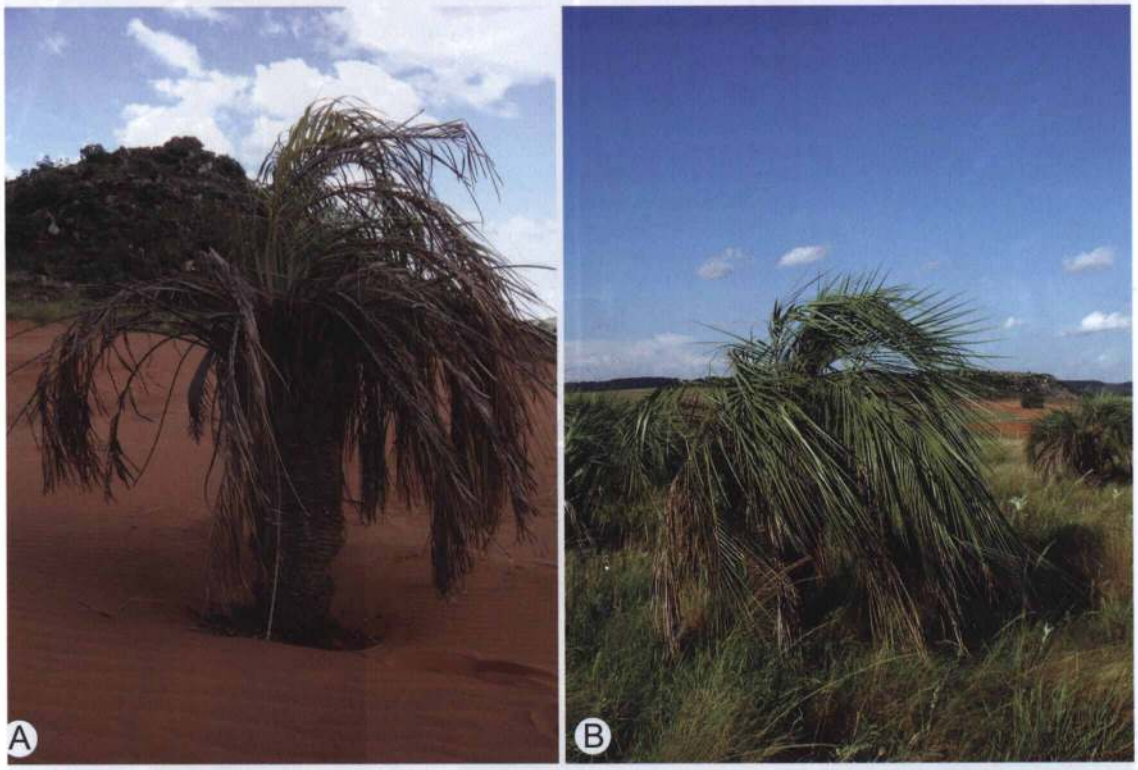


FIGURE 10 – *Butia paraguayensis*. A – An adult palm, growing on a red coarse sand soil. B – An adult palm on native grassland with *Elionurus* sp. (Poaceae).



FIGURE 11 – *Butia paraguayensis*. A – Inflorescence. B – Fruitage with immature fruits. C – Mature fruits, in detail.

diameter), and the following morphologic features of endocarp: size (2.8-3.5 mm long, 1.6-2.3 cm diameter), weight (3.43-10.11 grams) and pyramidal shape near to the germination pore.

Obs.: According to the authors *B. witeckii* is easily recognized by the size and weight of the fruits and the triangular edged shape of endocarp, considered the biggest in the genus. This endocarp shape is of common occurrence among "chaqueñan" species, including *Butia yatay* and the complex *B. paraguayensis*. The comparison between *B. witeckii* and *B. yatay* was made based on the population of "Palmar do Coatepe", Quaraí municipality; about this point, it must be emphasized that the Coatepe palm trees has slightly shorter morphological characters compared with the typical population (Argentinean Mesopotamia). The variation of *Butia yatay* along its large geographical distribution area is well known and documented in the literature.

Representative material examined: BRAZIL. Rio Grande do Sul, Quevedos, "no campo, entre rochas, estipe solitário, 4 m, folhas contemporâneas 18, bráctea peduncular glabra, frutos imaturos" 23-XII-2010, *L. P. Deble, A. S. de Oliveira-Deble, J. N. C. Marchiori & F. S. Alves 13104* (CTES).

10. *Butia yatay* (Mart.) Becc., Agric. Colon. 10: 498 1916. *Cocos yatay* Mart. in A.D.d'Orbigny, Voy. Amér. Mér. 7(3): 93. 1844. *Calappa yatay* (Mart.) Kuntze, Revis. Gen. Pl. 2: 982 1891. *Butia capitata* subsp. *yatay* (Mart.) Herter, Revista Sudamer. Bot. 6: 148. 1940. *Syagrus yatay* (Mart.) Glassman, Fieldiana, Bot. 32: 157. 1970. *Typus*: not indicated in the protologue (*Epitypus* Martius 1844: t. 30B).

Distribution & habitat: *Butia yatay is* found in northeast of Argentina (Entre Ríos and Corrientes provinces), Uruguay (Paysandu and Rio Negro departments) and south of Rio Grande do Sul, Quaraí (Figure 12), growing on stony grasslands.

Comments: *Butia yatay* is distinguished by ovate or fusiform fruits, bigger female flowers (14-16 mm long) and size of trunk (up to 12 m). In Brazil, the trunk is smaller (up to 8 m), compared with the typical population (Entre Rios and Corrientes provinces, Argentina); however, the size of trunk reduces in north direction (in Paso de los Libres e. g., the individuals show trunks with less than 8 m; on the other hand, the form of leaves, size of spathes and fruits are constant in all populations examined).

Representative material examined: BRAZIL. Rio Grande do Sul, Quaraí, Palmar do Coatepe, "no campo, entre rochas, estipe 5 m, bráctea peduncular glabra, frutos apiculados" 9-III-2007, *L. P. Deble, A. S. de Oliveira-Deble & J. N. C. Marchiori 7456* (CTES).

Key to species

1. Cespitose palm (rarely with solitary trunk) 2
1. Palm with solitary trunk 3
2. Grayish-green leaves. Spathes glabrous. Pistillate flowers with 9-11 mm long ..... *B. lallemantii*
2. Ochraceous-green leaves. Spathes covered by reddish-brown indumentum outside, sparse pubescent with age. Pistillate flowers with 12-18 mm long ..... *B. exilata*
3. Spathes pubescent. Trunk 4-5 m high. Pistillate flowers with 4-7 mm long ..... *B. eriospatha*
3. Spathes glabrous 4
4. Pistillate flowers, less than 10 mm long 5
4. Pistillate flowers, more than 10 mm long 7

5. Leaves bluish-green. Fruits globosely depressed, 2.5-3.5 cm long, 2.8-4 cm wide; mesocarp pulpose, scarce fibrous; globosely endocarp, 17-22 mm long and wide ..... *B. pulposa*

5. Leaves grayish-green to green. Fruits ovate, apiculate, 1.5-2.5 cm long, 1.3-2.1 cm wide; mesocarp fibrous; endocarp nearly ovoid to elliptic, 10-15 mm long, 0.7-10 mm wide 6

6. Acaulescent or trunk up to 2 m high. Coastline, from Santa Catarina and northeast Rio Grande do Sul ..... *B. catarinensis*

6. Trunk 2-8 m high. Rio Grande do Sul and Uruguay ..... *B. odorata*

7. Acaulescent or trunk up to 2 m high. Leaves with less than 150 cm long (includes petiole and sheaths). Spathes 25-70 cm long, 3-8 cm wide. Inflorescence with less than 50 rachillas ..... *B. paraguayensis*

7. Trunk 3-10 m high. Leaves with more than 200 cm long (includes petiole and sheaths). Spathes (70) 100-150 cm long, 8-13 cm wide. Inflorescence with more than 70 rachillas 8

8. Mesocarp densely fibrous. Endocarp 2.8-3.5 cm long, 1.6-2.3 cm wide ..... *B. witeckii*

8. Mesocarp scarcely fibrous. Endocarp 1.6-2.8 cm long, 1.2-1.6 cm wide 9

9. Down-revolute old leaves, touching the trunk. Trunk with 3-6 m high, 50-60 cm diameter, thickened at the base. Fruit broadly ovate ..... *B. missionera*

9. Old leaves only revolute, not touching the trunk. Trunk with 4-12 m high, 30-40 cm diameter, almost cylindric from base to top. Fruit ovate or turbinate ..... *B. yatay*

Excluded species

***Butia microspadix* Burret**, Notizbl. Bot. Gart. Berlin-Dahlem 10: 1050. 1930. *Typus*: BRAZIL. São Paulo, "staat S. Paulo (Sellow s.n.)" *Holotypus* B destroyed. Additional material cited in the protologue: "Brasilia Campos-palmae..." (J. Keller s.n.), not localized. São Paulo, "S. Paulo, Raiz da Serra (Luederwaldt – com. F. C. Hoehne n. 12267)". *Luederwaldt s.n.*, *lectotypus* SP (the material at SP Herbarium mean in the label "R. G. do Sul") = *Syagrus hatschbachii* Glassman, Fieldiana, Bot. 31: 240, fig. 3. 1967. *Typus*: BRAZIL. Paraná, Castro, Carambeí, "campo seco", *G. Hatschbach 11668* (*Holotypus* F).

The geographic distribution of *Butia microspadix* includes the north of Paraná and south of São Paulo State, in "campos gerais" and "cerrados", being easily distinguished from all species by reduced size of fruits, leaves and the all plant, as well as by a densely ferruginous pubescent spathe. The citations from Rio Grande do Sul made by Glassman (1970), Lorenzi et al. (2004) and Noblick (2010) are probably based in exsiccate at SP herbarium (*Luederwaldt s.n.*), which mean in label "R. G. do Sul". However, in the protologue Burret mentioned "S. Paulo, Raiz da Serra"; furthermore, this species was never found in Rio Grande do Sul State, and we believe that is a result of changed labels.

Doubtful species

***Butia stolonifera* Barb. Rodr.** Barb. Rodr., Contr. Jard. Bot. Rio 2: 40, t. 4, fig. A. 1901; Sert. Palm. Bras. 1: 89, t. 62A. 1903. *Butia stolonifera* (Barb. Rodr.) Becc., L'Agric. Colon. 10: 492. 1916. *Typus*: no mentioned in the protologue, but Barbosa Rodrigues mentioned the following: "Uruguay. Pan d' Azucar, pr. Montevideo (cult. Jard. Bot. Rio no. 2259)".

The original description of Barbosa Rodrigues is incomplete. According with the protologue, the original individual was collected by Arechavaleta in "Pan de Azucar" (Uruguay),

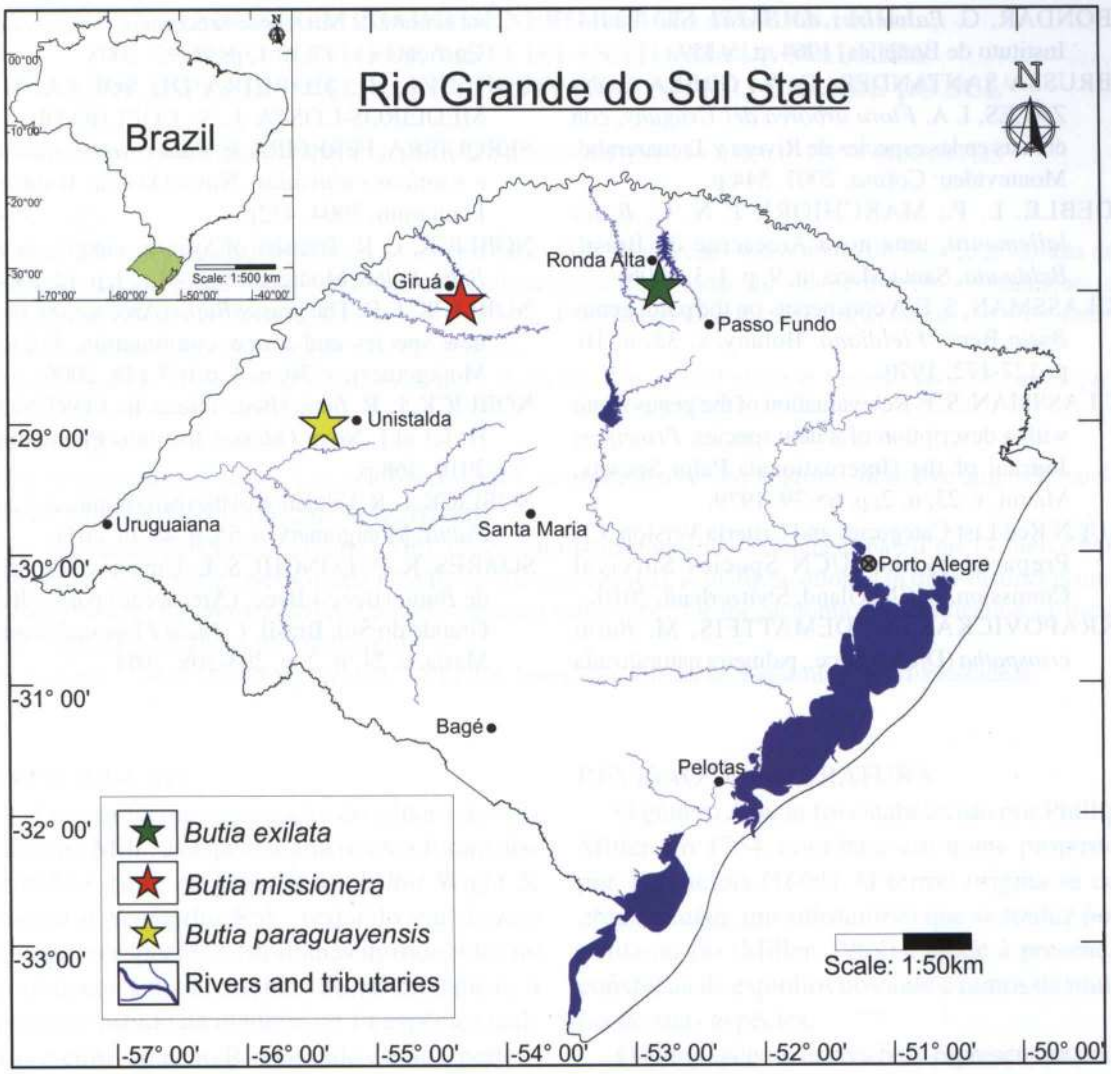


FIGURE 12 – Occurrence areas of *Butia exilata*, *B. missionera* and *B. paraguayensis* in Rio Grande do Sul State.

being divided in two parts, one of which was cultivated in Botanic Garden of Rio de Janeiro and the other in the cemetery of Montevideo; unfortunately, both collections were lost and apparently no exsiccates were made. The species was never found again, and the original illustration shows an individual with erect leaves and long rhizomes that not agree with any known species.

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