Briquetiastrum: a new genus of Malvaceae and the redefinition of Briquetia

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Abstract


A historical overview of the genus Briquetia, with an analysis of its circumscription conflicts and the proposal for a new genus, Briquetiastrum, based on new morphological studies and phytogeographical data were made. A taxonomic treatment and three new combinations from Briquetia to Briquetiastrum (Briquetiastrum inermis, B. spicatum and B. sonorae) are presented and Briquetiastrum sonorae is illustrated for the first time. Descriptions and a key to the treated species are included.

Keywords: nomenclature, taxonomy, neotropics.

INTRODUCTION

The genus Briquetia Hochr., described by Hochreutiner (1902), has still a fragile and inconsistent circumscription. This characteristic is shared with other genera, such as Batesimalva Fryxell, Dirhamphis Krapov., Hochreutinera Krapov., Horsfordia A. Gray, Pseudabutilon R.E. Fries, and Wissadula Medik., which are morphologically very similar to it. A striking feature common to these genera is the fruit, in which the morphology of the calyx and mericarp, the presence or absence of endoglossum, and the number of seeds, frequently combine to define the taxon. Krapovickas (1970), Fryxell (1976, 1997, 2007), and Bovini (2009, 2010), commented on the morphology of some of these genera, analyzed their differences, and proposed new genera and species that are similar to Briquetia.

In spite of their efforts, the generic boundaries in this group are not clearly defined yet, due to the use of diagnostic fruit features that do not seem unambiguously associated to each one. Moreover, Fryxell & Stelly (1993) counted the chromosomes of some Malvaceae and concluded that species of Dirhamphis need to be reevaluated, because their basic chromosome numbers differ and perhaps they may not be congeneric. Later, Tate & al. (2005) made a phylogenetic analysis of the genera of the tribe Malvaeae based on molecular data and concluded that they are geographically, chromosomally, and morphologically divided in several clades, and that the phylogeny with ITS markers with 14 generic alliances proposed initially by Bates (1968; Bates & Blanchard 1970) and later presented by Bayer & Kubitzki (2003) is artificial. This phylogeny identified a series of closely related genera of this tribe. (Batesimalva, Briquetia, Dirhamphis, Hochreutinera, Horsfordia, Pseudabutilon, and Wissadula), among which the results showed a close relationship between Briquetia, Dirhamphis, and Hochreutinera.

Based on the review of specimens from several herbaria, its morphological analysis, and literature review, the present study aims at establishing morphological limits for the genus Briquetia. It also aims at proposing a new genus of Malvaceae, named Briquetiastrum, which includes a group of species described by Fryxell (1976, 1990) under Briquetia due to their floral characters in common, but which differ from those described in the type species of Briquetia.

MATERIAL AND METHODS

The present study was based on the analysis of collections of national and international herbaria: ARIZ, INPA, K, LL, MBM, NY, RB, US, (Thiers 2012), as well as fieldwork carried by the author. The criteria for typification followed McNeill & al. (2012), and morphological analysis under a stereoscopic microscope, and used a caliper to take the measurements.

The species were evaluated in their conservation status following the categories and criteria of IUCN (2001), and provided subsidies for defining species that should be protected.

For pollen analysis, flowers or flower buds from three samples of each species were used, except for Briquetiastrum inermis, whose material was removed from specimens deposited in the herbaria ARIZ, NY, and RB. Pollen grains were observed, analyzed, and photographed in a S.E.M Zeiss EVO-40 microscope, at the Research Institute of the Botanical Gardens of Rio de Janeiro, and the terminology adopted in the morphological description followed Barth & Melhem (1988). The map here presented was designed using the software package ArcGIS 9.3.

Intrageneric relationships

Briquetia was described as a monotypic genus in 1902, based on a specimen from Paraguay, B. ancylocarpa Hoehr., which had one ovule per mericarp and two hook-shaped aristae located at the lower outer part of the mericarp. Later, Hassler

Resumen


Se presenta una síntesis histórica del género Briquetia, documentando sus problemas de circunscripción genérica. Se propone un nuevo género, Briquetiastrum, basado en nuevos estudios morfológicos y análisis fitogeográficos. Se presentan también un estudio taxonómico y tres nuevas combinaciones de Briquetia para Briquetiastrum (Briquetiastrum inermis, B. spicatum e B. sonorae). Briquetiastrum sonorae es ilustrada por primera vez. Se incluyen descripciones y una clave para las especies tratadas.

Palabras clave: nomenclatura, taxonomía, neotrópicos.
(1905) established the combination *Briquetia denudata* (Nees & Mart.) Chodat & Hassl. for a species from Bahia (Brazil) that previously was described as belonging to the genus *Sida* L., and reported the new synonym *B. ancylocarpa*, which was described after *S. denudata*.

Literature reviews brought out many doubts about the true morphology of the genus. When Hochreutiner (1902) described *Briquetia* for the first time, he emphasized the presence of two small hooks in the lower part of the mericarps and the presence of one seed. However, what called the attention is the lack of endoglossum in the original description, which is a characteristic that frequently limits the current characterization of genus.

For decades, there were only a few studies about the genus; only Krapovickas (1970) and Fryxell (1976) provided taxonomic notes or proposed new species. According to Fryxell (1997), *Briquetia* comprised five species, among which only *B. spicata* (Kunth) Fryxell is broadly distributed in the Neotropics, whereas the other four species have a more restricted distribution, and are poorly known in terms of morphology. Fryxell (1997) also reported that the genus needs further studies, because as new species of *Briquetia* were described, their generic characteristics have been suppressed and currently there is no basic set of characters that separates the genus *Briquetia* from similar genera.

The proposal to differentiate the above mentioned genera is presented in Table 1 the morphological characteristics of similar genera, with the new morphological limits for *Briquetia* and the establishment of the new genus *Briquetiasturm*.

**TAXONOMIC TREATMENT**

*Briquetiasturm* Bovini, gen. nov.  

**TYPE:** *Briquetiasturm spicatum* (Kunth) Bovini

**Diagnosis:** Subshrub or shrub. Leaves petiolate. Synflorescence frondose-bracteate or reduced racemes. Ovary 5-13 celled, 2-3 ovules per cell. Fruit in schizocarp with mericarps without projections at the base, with endoglossum. Subshrub or shrubs. Branches erect, rarely terete. Leaves peciolate below, and amplexicaule below the inflorescence; lamina membranaceous, concolor or discolor, cordate, base cordate, apex acute, margin entire, crenate or serrate, both the surfaces pilose. Synflorescence frondose-bracteate, pyramidal, lax or spiciform raceme. Flowers pedicellate; calyx campanulate, sepals cleat up to the half of the calyx length; corolla yellow; ovary 5-13 celled, 2-3 ovules per cell. Schizocarp with 5-13 mericarps, laterally reticulate or entire wall, not perforate, without projections basally, with endoglossum; 2-3 seeds.

**Geographical distribution:** *Briquetiasturm* is a Neotropical genus. It occurs from Mexico to Brazil at the limit of the Tropic of Capricorn. In South America there are no records for Argentina, Chile, Paraguay, and Uruguay (Fig. 1).

**Pollen:** 65-70 µ, large, nonpolar, spheroidal, pentacolporate, echinate-microreticulate-granulate. Spines densely distributed over the microreticulate exine; there are many granules on the tecta. Short spine on tectum elevations, wide on the base, with no basal constriction, gradually sharpening towards a sharp apex, mostly straight (Fig. 2a, b).

| Table 1. Differences among seven genera of the Malvaceae related to *Briquetiasturm* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Batesimalva | *Briquetia* | *Briquetiasturm* | Horsforida | Pseudabutilon | Wissadula |
| **Leaf** | Petiolate | amplexicaule below the inflorescence | petiolate | petiolate | petiolate | petiolate |
| **Inflorescence** | solitary, racemous | frondose-bracteate | solitary or fasciculate | frondose-bracteate or spiciform raceme | solitary or fasciculate | frondose-bracteate or spiciform raceme |
| **Number of mericarps** | 8-16 | 5-9 | 5-13 | 6-11 | 12-17 | 2-3 |
| **Projections at base of mericarps** | Absent | present | Absent | present | present | Absent |
| **Endoglossum** | present | absent | present | absent | present | absent |
| **Seeds** | 1 | 2-3 | 1 | 3 | 2 or 3 | 1 |
| **Distribution** | Mexico to Paraguay | Southern Brazil, Paraguay and northern Argentina | Mexico, Bolivia | Mexico (Sonora), California | USA to Argentina | Neotropical, except Argentina, Chile and Uruguay |
| **Number of species (based Fryxell, 1997, except *Briquetia* and *Briquetiasturm*)** | 4 | 3 | 1 | 19 | 26 | 2 |

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Fig. 1. Distribution map of Briquetia (lines parallel) and Briquetiastrum (grid squares).

Fig. 2. Pollen grain. *Briquetiastrum spicatum*. a, polar view; b, detail of ornamentation. *Briquetia denudata*. c, polar view; d, detail of ornamentation (*Krapovickas 14140*). [a, b] Dorr 7649 (NY); c, d] Krapovickas 14140 (RB)]. Escala: a, c=10 μm; b, d=2 μm.
Etymology: similar to Briquetia.

KEY TO THE SPECIES OF BRIQUETIastrum

1. Synflorescence spiciform raceme. Schizocarp 5-6 mericarps, 3 seeds ......................................................... 1. B. inermis

2. Synflorescence frondose-bracteate, lax. Schizocarp with 7-13 mericarps, 2 or 3 seeds ........................................... 2.

2. Schizocarp 2 seeds ........................................................................................................ 2. Briquetiastrum inermis

3. Schizocarp 3 seeds .......................................................................................................... 1. B. inermis

1. Briquetiastrum inermis (Fryxell) Bovini, comb. nov.

Subshrubs ca. 1 m tall. Branches erect, pubescent, trichomes simple and fasciculate. Stipules ca. 1 mm, filiform, caducous. Leaves petiolate below, and petiole ca. 8 cm long., pubescent, trichomes simple and fasciculate; calyx ca. 4 mm long; sepals free to the middle below to medium portion, tomentose, glabrate, trichomes simple and fasciculate-stipitate, free portion of filaments 1-2 mm long; style ca. 3 mm long. Schizocarp ca. 8 mm diameter; 7-8 mericarps, 7-8×1-2 mm, the cells divided by a simple endo glossum; glabrous, trichomes simple and fasciculate; seeds 2, ca. 2 mm long, glabrate, trichomes simple.


Geographic distribution: Briquetiastrum inermis occurs only in Mexico, where it is found in the Sonora desert in xeric shrubby forests; it is poorly represented in herbaria, probably due to its very restricted distribution. Its sympatric distribution is well delimited, with consistent morphological characteristics.

Conservation status: Occurs in protected areas and there is strong evidence of the rarity for this species. Its extent of occurrence (EOO) is smaller than 5,000 km² and this species can be considered EN B1 (i, ii, iv).

The amplexical leaves, the morphology of the mericarps and the number of seeds help a lot in the characterization of this species. Its mericarps have two seeds, separated by an endo glossum, and the presence of two small basal projections makes distinctive this species.

1. Briquetiastrum spicatum (Kunth in H.B.K.) Bovini, comb. nov.

≡Sida spiciflora DC. Prodr. 1: 468. 1824.


Illustrations: Vellozo (1831); Schumann (1891); Fries (1908); Fryxell (1976, 1988) e Berazain (2007).
Subshrubs or shrubs 1-2 m tall. Branches erect tomentous, trichomes fasciculate and frequently simple and long. Stipules 8-10 mm long, linear to slightly lanceolate, trichomes simple and rarely fasciculate. Leaves petiolate below, and petiole until 20 cm long, vilose, trichomes simple, long, and fasciculate, sometimes towards the apex of the branches, the leaves become sessiles; lamina 4.5-21×4.5-19,5 cm, membranaceous, slightly discolour, sometimes trilobate, base cordate, apex acute to acuminate, margin entire; adaxial surface pubescent or velutinous, trichomes fasciculate; abaxial
surface velutinous, trichomes fasciculate. Synflorescence spiciform raceme, 10-20 cm long.; anthopodium ca. 2 mm long, puberulous. Flowers with pedicel ca. 2 mm long, villose, trichomes fasciculate; calyx ca. 4 mm long; sepal free to the middle below to medium portion, tomentose, trichomes simple and fasciculate; corolla 9 mm diameter, yellow, with margin pubescent at the base; staminal column with few hyaline trichomes, simple and fasciculate-stipitate, free portion of filaments 1-2 mm long; ovary 5-7 celled, 3 ovules per cell; style ca. 3 mm long. Schizocarp ca. 6 mm diameter; 5-(6) mericarps, ca. 5×4 mm, whitout projections, the cells divided by a simple endoglossum; laterally entire wall, glabrate, trichomes simple and fasciculate; seeds 3, ca. 2 mm long, the upper cell with 2 collateral seeds; glabrate, trichomes simple.


Geographic distribution: Neotropical, except for Argentina, Chile, Paraguay, and Uruguay.

Conservation status: Certainly, Briquetiastrum spicatum is the species with the broader distribution in the genus; it occurs in both protected and unprotected areas across the neotropics. Its EOO is larger than 20,000 km², and it can be classified as LC (least concern).

Historically, Briquetiastrum spicatum has always been the subject of taxonomic revision. Originally described in the genus Abutilon, it was placed through decades in other genera, such as Wissadula (Presl, 1835), Pseudobatillon (Frises, 1908), and finally Briquetia (Fryxell 1976).

The presence of an endoglossa in this species, breaks the homogeneity for this character within the genus. As in some of these genera, this trait, as well as the number and arrangement of its seed in the mericarp, exhibit intrageneric variability.

After the analysis leaf variation among B. spicatum specimens, it was found that individuals that occur from Mexico to northern Peru may present their leaf blade with a more or less trilobate morphology.

Fryxell (1990) accepts Briquetia brasiliensis, as a very similar species to B. spicata, but with the inflorescence frondose-bracteate. After the analysis of the type specimen (Teixeira 423), we can describe the inflorescence not frondose-bracteate, but in spiciform raceme. Furthermore, additional material collected in the same area (Teixeira 352) has the more typical inflorescence spiciform raceme of B. spicata. Thus, it is proposed as a new synonym.

B. spicatum is characterized by the synflorescence in contracted raceme, which resembles an ear, and the presence of three seeds characterize the species.


Subshrubs. Branches erect. Leaves petiolate; leaves membranaceous, discolor, base cordate, apex acute, margin crenate, both the surfaces pilose. Synflorescence frondose-bracteate, lax. Flowers pedicellate; calyx campanulate, sepal cleft up to the medial region of the calyx; corolla yellow; ovary 6-8 celled, 1 ovule per cell. Schizocarp 6-8 mericarps, with 2 basal projections hooked, without endoglossum, laterally reticulate wall, perforate; 1 seeded.

Geographic distribution: Currently occurs in Argentina, Paraguay, and Brazil. In the latter, occurs in the states of Bahia, Mato Grosso do Sul, Minas Gerais, and Paraná (Fig. 1).

Pollen: 60-65 μ, large, nonpolar, spheroidal, pentacolporate, echinate-microreticulate-granulate. Spines sparsely distributed over the microreticulate exine; there are sparse granules on the tecta. Short thorns on tectum elevations, wide on the base, no constriction, abruptly sharpening towards a round apex, mostly curved (Fig. 2c, d).

Etymology: Homage to the Swiss botanist J.I. Briquet (1870-1931).

It is characterized by basal projections on the mericarp, lack of endoglossum, and one seed per mericarp.


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**REFERENCES**


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