



Moquiniastrium (Gochnatieae, Asteraceae): disentangling the paraphyletic *Gochnatia*

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Abstract

The new genus *Moquiniastrium*, the result of recent phylogenetic analyses, is described. Although these analyses are based on cpDNA and nDNA, they also involve documentation of the distinctive morphological characters supporting this new genus. The recognition of *Moquiniastrium* is necessary to accurately reflect the relationships of the taxa found in the tribe Gochnatieae. *Moquiniastrium* includes twenty-one species that are usually gynodioecious and found mainly in Brazil but with some species elsewhere in South America. A description of *Moquiniastrium*, together with the corresponding new combinations, new lectotypifications of three names and one new neotypification is here provided.

Key words: classification, Compositae, nomenclature, taxonomy

Introduction

Moquiniastrium (Asteraceae/Compositae) was originally described by Cabrera (1971: 73) as a section of *Gochnatia* Kunth (1818: 15) which is placed in the tribe Gochnatieae (Panero & Funk 2002, Funk *et al.* 2009, Ortiz *et al.* 2009, Sancho & Freire 2009). Gochnatieae is the sister group of the large majority of the family (including the two largest subfamilies Cichorioideae and Asteroideae). *Moquiniastrium* is a morphologically well-defined genus and one of the results of our nearly completed studies of the tribe Gochnatieae (Funk *et al.*, MS). This new genus of twenty-one, usually gynodioecious species (Fig. 1A–C) includes shrubs, subshrubs and occasionally trees (Fig. 1D–F) mainly from eastern Brazil, but also extending into Argentina, Bolivia, Paraguay, Peru, Uruguay, and Venezuela (Cabrera 1971, Sancho 2000, Hind 2011, Basualdo 2013) (Fig. 2).

At the time of Cabrera *Gochnatia* was a large genus of about 70 species from Asia, southern North America, West Indies, and South America. The original *Gochnatia* sect. *Moquiniastrium* brought together species from several genera, including *Spadonia* Lessing (1832: 99), *Moquinia* Candolle (1838: 22) and *Gochnatia*. Lessing's *Spadonia* was an illegitimate name because of an earlier fungus name by Fries (1829: 203). De Candolle recognized this and proposed *Moquinia* as a new name. According to Cabrera (1950), *Gochnatia* and *Moquinia* were so similar that they needed to be merged, correctly giving priority to *Gochnatia*. Later, *Moquinia* was re-circumscribed (Cabrera 1969) to include only the type species *M. racemosa* (Sprengel 1826: 508) Candolle (1838: 23), whereas the other species were placed in *Gochnatia* (Cabrera 1971). The name *Moquiniastrium* reflects the similarity of this section to the genus *Moquinia*, from which many species were transferred.

Cabrera's treatment of *Gochnatia* (1971) included six sections: *G.* sect. *Discoseris* (Endlicher 1838: 483) Cabrera (1971: 150), *G.* sect. *Gochnatia*, *G.* sect. *Hedraiophyllum* (Lessing 1832: 103) Candolle (1838: 24), *G.* sect. *Leucomeris* (Don 1825: 169) Cabrera (1971: 128), *G.* sect. *Moquiniastrum*, and *G.* sect. *Pentaphorus* (Don 1830: 296) Candolle (1838: 24). Originally, *G.* sect. *Moquiniastrum* contained eighteen South American species. After Cabrera's treatment of 1971 two more species were described in this section (Cabrera 1974, Sancho 1999). Later, Freire *et al.* (2002) grouped together one species from *G.* sect. *Hedraiophyllum*, *G. cordata* Less. (1830: 263), which happened to be the section type, and all the species of *G.* sect. *Moquiniastrum*. Since the name *G.* sect. *Hedraiophyllum* was older than *G.* sect. *Moquiniastrum*, this newly expanded section received the name *Hedraiophyllum*.

Later, *Gochnatia* was modified by several different authors (Roque & Pirani 2001, Hind 2007, Ventosa-Rodriguez & Herrera-Oliver 2011), but it was not until recently that changes in this genus involved its section *Moquiniastrum* (Funk *et al.* MS).

The placement of *Moquiniastrum* in *Gochnatieae*

Moquiniastrum, already as *Gochnatia* sect. *Moquiniastrum*, was morphologically well circumscribed. Its species represented a homogeneous group that bore the main features corresponding to Cabrera's concept (1971) of *Gochnatia* (i.e. deeply lobed actinomorphic corollas, apiculate anther appendages, and dorsally glabrous style branches) but, at the same time, it was separated from the other sections of *Gochnatia* by several unique characters: gynodioecious plants with an indumentum consisting of 2–5-armed trichomes, and usually paniculiform synflorescences (Fig. 1B, C, E, G) vs. monoecious plants with an indumentum consisting of flagellate uniseriate trichomes, and solitary or corymbiform synflorescences found in the other sections of *Gochnatia*.

The complexity and doubtful monophyly of the large genus *Gochnatia*, together with the uncertainty of its generic relationships were the impetus for the phylogenetic studies using molecular data by Funk *et al.* (MS) that are nearing completion. During this broad molecular and morphological study, several changes of taxonomic importance have occurred and now the tribe contains six genera: *Anastrophia* Don (1830: 295), *Cnicothamnus* Grisebach (1874: 196), *Cyclolepis* Don (1832: 392), *Gochnatia*, *Pentaphorus* Don (1830: 296), and *Richterago* Kuntze (1891: 360). Funk *et al.* (MS) demonstrated that *Gochnatieae* (excluding *Cyclolepis*) is a monophyletic tribe but *Gochnatia* is paraphyletic. One of the well-supported clades obtained by these authors corresponded to *G.* section *Moquiniastrum* and included *G. cordata*, thus supporting the close relationship suggested by Sancho (2000) and Freire *et al.* (2002) based on morphology. In addition, pollen traits (i.e. medium size, spheroidal-sub-spheroidal shape and microechinate surface scarcely perforated) also supported this clade as shown in the study of *Gochnatia* s.l. pollen (sensu Cabrera 1971) by Tellería *et al.* (2013). Indeed, these pollen features differ from most species of *Gochnatieae* reinforcing the distinctiveness of *Moquiniastrum*.

According to Sancho (2000) and Sancho & Otegui (2000), the unique sexual complexity of *Moquiniastrum* that is accompanied by changes in the shape of florets within the capitula (e.g. different degrees of zygomorphic corollas and presence of staminodes in marginal florets), could be interpreted as apomorphies in the development of sexual specialization thus confirming its unique combination of morphological characters.

The purpose of the present contribution is to provide the required nomenclatural adjustments to support the segregate genus *Moquiniastrum* proposed by the new classification of *Gochnatieae*, a result of recent phylogenetic analyses (Funk *et al.*, MS).

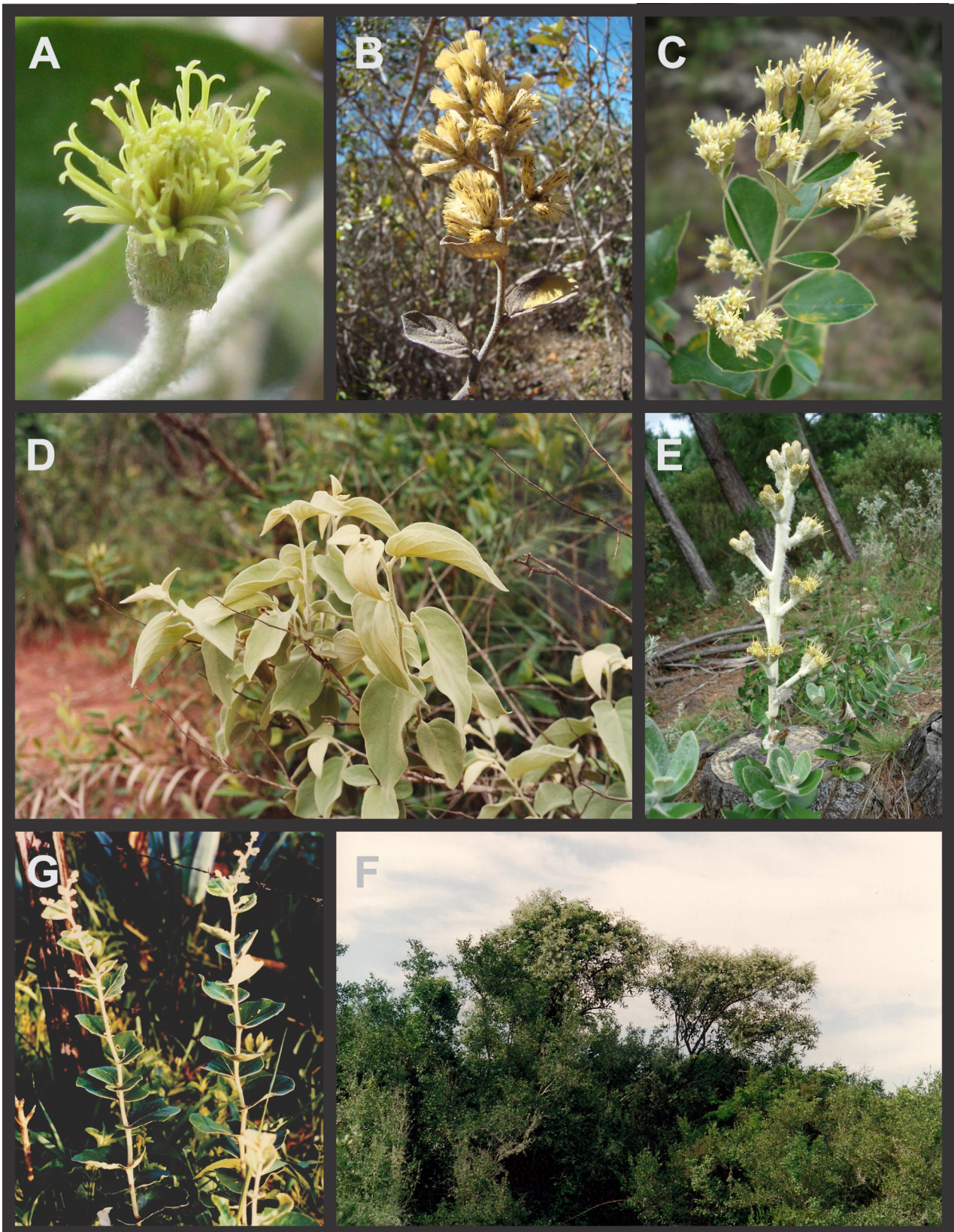


FIGURE 1. A. *Moquiniastrum polymorphum*, capitulum with female florets. B. *M. blanchetianum*, paniculiform synflorescence, capitula with female florets. C. *M. cinereum*, paniculiform synflorescence, capitula with hermaphrodite florets. D. *M. barrosoae*, shrub habit. E. *M. cordatum*, sub-shrub habit. F. *M. haumanianum*, sub-shrub habit. G. *M. polymorphum*, tree habit. Photographs: A, D, G, F by G. Sancho; B, C, E by N. Roque.

Taxonomy

For morphological and anatomical analyses, further discussion about selected characters, full synonymy, full list of isotypes, a key to the species, and current distribution, see Cabrera (1971), Sancho (2000) and Sancho & Freire (2009). For a discussion of the pollen see Tellería *et al.* (2013). Even though the Code (Art. 11.2, McNeill *et al.* 2012) allows assigning a new name for the genus, we prefer to use the section epithet proposed by Cabrera (1971).

Moquiniastrum (Cabrera) G. Sancho, *gen. et stat. nov.*

Basionym: *Gochnatia* sect. *Moquiniastrum* Cabrera (1971: 73). Type:—*Moquiniastrum polymorphum* (Lessing 1832: 101) G. Sancho.

Gochnatia subgen. *Hedraiophyllum* Lessing (1832: 103). Type:—*Gochnatia cordata* Lessing (1830: 263).

Description:—Shrubs, sub-shrubs or trees. Leaves alternate, petiolate to sub-sessile, limb discolor, elliptic or rarely ovate or cordate, pubescent usually on abaxial face (indumentum of 2–5-armed trichomes) or less commonly on both faces, margin entire or serrate. Capitula isomorphic or sub-dimorphic, homogamous (florets female or hermaphrodite) or heterogamous (florets female and hermaphrodite) arranged in usually leafy paniculiform or less commonly corymbiform synflorescences. Involucre campanulate to cylindrical, shorter than the florets; phyllaries (2–)3–6-seriate, graduate, coriaceous or sub-coriaceous, pubescent. Hermaphrodite florets with corollas whitish, whitish-yellow or greenish, actinomorphic, deeply 5-lobed, lobes revolute; anthers with apiculate apical appendages and long, glabrous, lacinate or plumose tails; styles with stylopodium, bilobed, style branches short, dorsally glabrous. Functionally female florets marginal in heterogamous capitula, with corollas whitish, whitish-yellow or greenish, usually sub-zygomorphic or less commonly actinomorphic, deeply 5-lobed, lobes straight to slightly revolute; anthers reduced to staminodes; styles similar to hermaphrodite florets. Cypselas cylindrical to cuneate, costate, sericeous. Pappus of 2–3-seriate scabrous bristles, whitish when live, brownish when dry, equally wide throughout, unequal in length, the longest ones plumose at the apex.

Number of species and distribution:—Twenty-one species from central-eastern Argentina (3 species), eastern Brazil (19 species), Bolivia (3 species), Paraguay (6 species), Peru (1 species), Venezuela (1 species), and Uruguay (1 species). Notes: 1. The number of species per country could potentially rise after a more exhaustive collection in eastern Peru and Bolivia; 2. All Asteraceae types originally housed in Berlin (B) were destroyed in 1943 (for a summary see Hiepko 1987).

1. *Moquiniastrum argentinum* (Cabrera) G. Sancho, *comb. nov.*

Basionym: *Moquinia argentina* Cabrera (1935: 56). Type:—ARGENTINA. Chaco: Colonia Benítez, February 1931, *A.G. Schulz 173* (holotype LP!)

2. *Moquiniastrum argyreum* (Dusén ex Malme) G. Sancho, *comb. nov.*

Basionym: *Moquinia argyrea* Dusén ex Malme (1933: 112). Type:—BRAZIL. Paraná: Villa Velha, 11 March 1904, *P.K.H. Dusén 4035* (lectotype S!, designated by Cabrera 1971: 93, isolectotype LP!).

3. *Moquiniastrum barrosoae* (Cabrera) G. Sancho, *comb. nov.*

Basionym: *Gochnatia barrosoae* Cabrera (1950: 46), as *G. barrosii*. Type:—BRAZIL. Minas Gerais: Ituitaba, 28 July 1948, *A. Macedo 1138* (holotype LP!, isotypes G!, SP!, US!).

4. *Moquiniastrum blanchetianum* (DC.) G. Sancho, *comb. nov.*

Basionym: *Baccharis blanchetiana* Candolle (1838: 281). Type:—BRAZIL. “montibus Jacobinae, propè Bahiam”, no date, *J.S. Blanchet 2569* (holotype G-DC!, isotypes F!, two sheets K!, SP!)

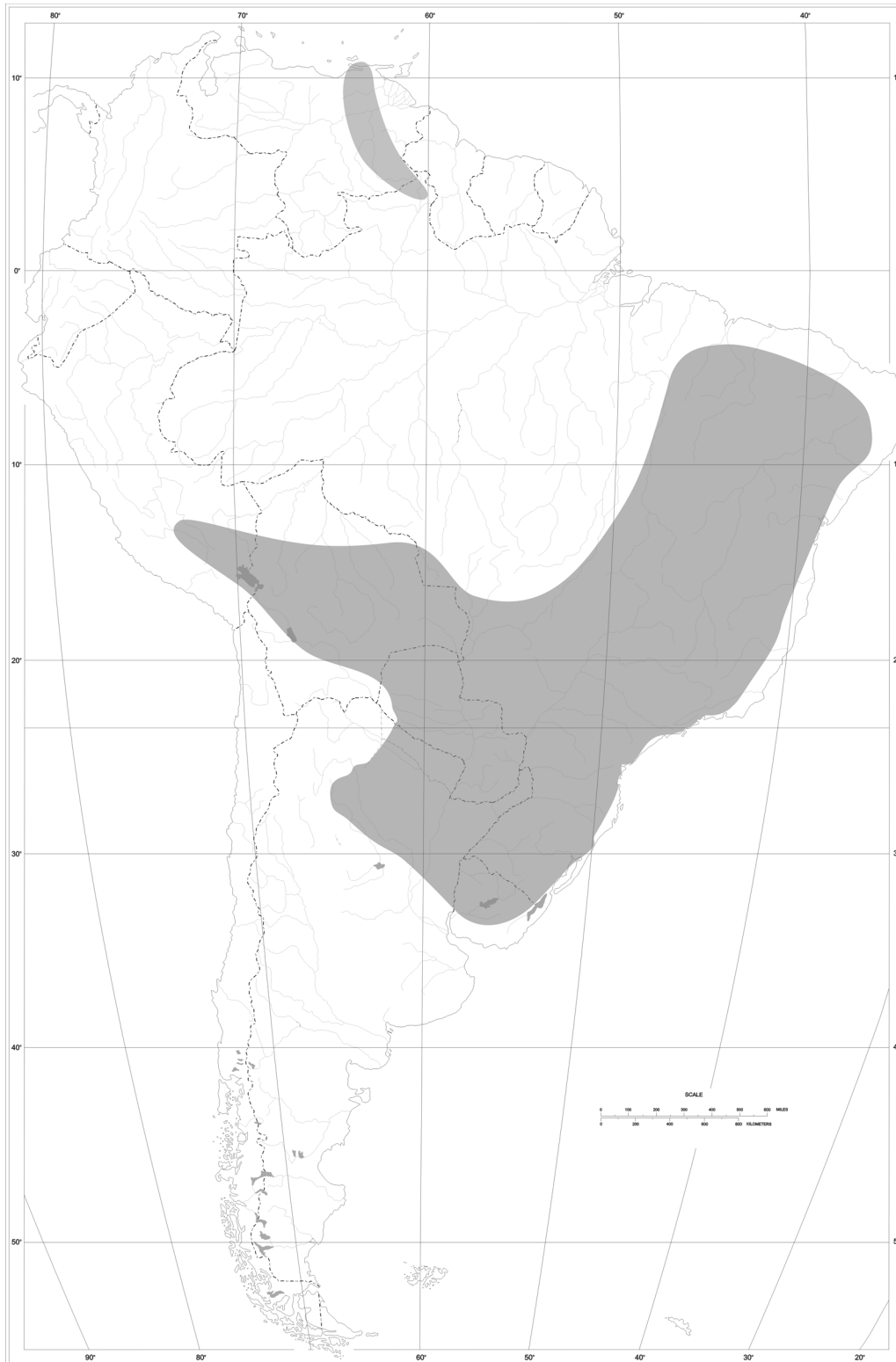


FIGURE 2. Distribution area of *Moquiniastrum*.

5. *Moquiniastrum bolivianum* (Rusby) G. Sancho, comb. nov.

Basionym: *Moquinia boliviana* Rusby (1907: 399). Type:—BOLIVIA. No date, *M. Bang* 2252 (holotype NY, isotypes G!, LP!, MO!).

Homotypic synonym: *Gochnatia rusbyana* Cabrera (1950: 41).

6. *Moquiniastrum cinereum* (Hook. & Arn.) G. Sancho, comb. nov.

Basionym: *Spadonia cinerea* Hooker & Arnott (1835: 109). Type:—BRAZIL. Rio Grande do Sul: no date, *J. Tweedie* 998 (holotype K!).

Synonym: *Gochnatia orbiculata* (Malme) Cabrera (1950: 43).

Basionym: *Moquinia orbiculata* Malme (1933: 113). Type:—BRAZIL. Parana: 24 February 1910, *P. Dusén* 9437 (lectotype S, designated by Cabrera 1971: 105, isolectotype US!).

7. *Moquiniastrum cordatum* (Less.) G. Sancho, comb. nov.

Basionym: *Gochnatia cordata* Lessing (1830: 263). Type:—BRAZIL. No date, *F. Sellow* s.n. (holotype B [destroyed], photo of B sheet at F is available online at Field Museum website 2012). Neotype:—BRAZIL. Rio Grande do Sul: Morro Sta. Teresinha, 1 April 1949, *Irmaõ J. Cristovão* s.n. (ICN 017113! designated here, isoneotypes G, LP 022462!, SPSF 03566!, US!).

7.1. *Moquiniastrum cordatum* var. *mollissimum* (Hassler) Sancho, comb. nov.

Basionym: *Gochnatia cordata* var. *mollissima* Hassler (1919: 27). Type:—PARAGUAY. No date, *E. Hassler* 9327 (holotype G, isotype S 11-28549, photo of S sheet available online at GPI 2003, P!).

8. *Moquiniastrum densicephalum* (Cabrera) G. Sancho, comb. nov.

Basionym: *Gochnatia paniculata* var. *densicephala* Cabrera (1971: 86). Type:—BRAZIL. Near Rio de Janeiro, November 1879, *A.F.M. Glaziou* 11072 (holotype K!).

9. *Moquiniastrum discolor* (Baker) G. Sancho, comb. nov.

Basionym: *Gochnatia discolor* Baker (1884: 350). Type:—BRAZIL. Minas Gerais: 1840, *P. Claussen* s.n. (holotype K!, isotypes K!, G!, P!).

10. *Moquiniastrum floribundum* (Cabrera) G. Sancho, comb. nov.

Basionym: *Gochnatia floribunda* Cabrera (1971: 125). Type:—BRAZIL. Minas Gerais: Cerro do Frio, August 1840, *G. Gardner* 4806 (holotype K!, isotypes G!, S!, US!).

11. *Moquiniastrum gardneri* (Baker) G. Sancho, comb. nov.

Basionym: *Moquinia gardneri* Baker (1884: 348). Type:—BRAZIL. Goyaz: May 1840, *G. Gardner* 4183 (lectotype designated by Cabrera 1971: 109, K!, isolectotypes G!, US!).

12. *Moquiniastrum hatschbachii* (Cabrera) G. Sancho, comb. nov.

Basionym: *Gochnatia hatschbachii* Cabrera (1974: 3). Type:—BRAZIL. Minas Gerais, Serra do Cipó, 6 August 1972, *G. Hatschbach* 29951 (holotype LP!, isotypes SI!, P!).

13. *Moquiniastrum haumanianum* (Cabrera) G. Sancho, comb. nov.

Basionym: *Gochnatia haumaniana* Cabrera (1950: 44). Type:—PARAGUAY. Pedro Juan Caballero: January 1934, *T. Rojas* 6575 (holotype LP!).

14. *Moquiniastrum mollissimum* (Malme) G. Sancho, comb. nov.

Basionym: *Moquinia mollissima* Malme (1899: 76). Type:—BRAZIL. Rio Grande do Sul: 24 February 1893, *G. Malme* 648 (holotype S!, isotype G!).

15. *Moquiniastrum oligocephalum* (Gardner) G. Sancho, comb. nov.

Basionym: *Moquinia oligocephala* Gardner (1847: 457). Type:—BRAZIL. Ceará: 1839, *G. Gardner* 2422 (holotype BM, photo of BM sheet at LP!).

16. *Moquiniastrum paniculatum* (Less.) G. Sancho, comb. nov.

Basionym: *Spadonia paniculata* Lessing (1832: 100). Type:—BRAZIL. São Paulo: Casa Branca, 23 September 1889, *A. Loefgren* 16994 (neotype US!, designated by Sancho 1999: 557, isoneotype NY!).

17. *Moquiniastrum polymorphum* (Less.) G. Sancho, comb. nov.

Basionym: *Spadonia polymorpha* Lessing (1832: 101). Type:—BRAZIL. No date, *F. Sellow* s.n. (holotype B [destroyed], lectotype K 000502518!, designated here).

17.1. *Moquiniastrum polymorphum* subsp. *ceanothifolium* (Less.) G. Sancho, comb. nov.

Basionym: *Spadonia polymorpha* var. *ceanothifolia* Lessing (1832: 102). Type:—BRAZIL. No date, *F. Sellow* s.n. (holotype B [destroyed], lectotype K 000502522!, designated here).

17.2. *Moquiniastrum polymorphum* subsp. *floccosum* (Cabrera) G. Sancho, comb. nov.

Basionym: *Gochnatia polymorpha* subsp. *floccosa* Cabrera (1971: 123). Type:—BRAZIL. Santa Catarina: Campo Novo, 11 December 1962, *R. Klein 3831* (holotype LP!)

18. *Moquiniastrum pulchrum* (Cabrera) G. Sancho, comb. nov.

Basionym: *Gochnatia pulchra* Cabrera (1971: 106). Type:—BRAZIL. São Paulo: 28 April 1923, *G. Gehrt* s.n. (holotype LP!, isotype NY!, SP!).

19. *Moquiniastrum ramboi* (Cabrera) G. Sancho, comb. nov.

Basionym: *Gochnatia ramboi* Cabrera (1971: 98). Type:—BRAZIL. Rio Grande do Sul: 30 January 1952, *B. Rambo 51961* (holotype LP!, isotype S!, US!).

20. *Moquiniastrum sordidum* (Less.) G. Sancho, comb. nov.

Basionym: *Spadonia polymorpha* var. *sordida* Lessing (1832: 102). Type:—BRAZIL. No date, *F. Sellow* s.n. (holotype B [destroyed], lectotype K 000502521!, designated here, isolectotypes P!, three sheets).

21. *Moquiniastrum velutinum* (Bong.) G. Sancho, comb. nov.

Basionym: *Moquinia velutina* Bongard (1839: 41). Type:—BRAZIL. São Paulo: no date, *G.H. von Langsdorff* s.n. (holotype LE, photo of LE sheet at LP!)

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