Moquiniastrum (Gochnatieae, Asteraceae): disentangling the paraphyletic Gochnatia

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Abstract

The new genus Moquiniastrum, 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 Moquiniastrum is necessary to accurately reflect the relationships of the taxa found in the tribe Gochnatieae. Moquiniastrum includes twenty-one species that are usually gynodioecious and found mainly in Brazil but with some species elsewhere in South America. A description of Moquiniastrum, 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

Moquiniastrum (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). Moquiniastrum 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. Moquiniastrum 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 Moquiniastrum reflects the similarity of this section to the genus Moquinia, from which many species were transferred.

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: *Anastraphia* 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-subspheroidal 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).
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.

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.

3. Moquiniastrum barrosoae (Cabrera) G. Sancho, comb. nov.
Basionym: Gochnatia barrosoae Cabrera (1950: 46), as G. barrosoi. Type:—BRAZIL. Minas Gerais: Ituiutaba, 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 Jacobinæ, propè Bahiam”, no date, J.S. Blanchet 2569 (holotype G-DC!, isotypes G!, two sheets K!, SP!)
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.
Synonym: *Gochnatia orbiculata* (Malme) Cabrera (1950: 43).

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

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

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

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 G!, P!).

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

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

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.

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

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


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

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

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

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.*

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