



Lectotypifications in Uruguayan *Stevia* (Asteraceae, Eupatorieae)

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Abstract

Eleven species of *Stevia* were reported from Uruguay: *S. aristata*, *S. burkartii*, *S. cinerascens*, *S. congesta*, *S. entriensis*, *S. gratioloides*, *S. multiaristata*, *S. ophryodonta*, *S. sabulonis*, *S. satureiifolia*, and *S. selloi*. Seven are shared with Argentina, five with Brazil, four with Paraguay, and two are endemic to Uruguay. During the revision of these species of *Stevia*, we detected names which need lectotypifications. As a result of our analysis four lectotypes are designated for names currently accepted in *Stevia*: *S. congesta*, *S. gratioloides*, *S. polycephala* (= *Stevia aristata*) and *Dissothrix hassleriana* (= *Stevia entriensis*). We also clarified the original localities of type materials of *S. congesta* which occurs in Uruguay and, probably, in Brazil.

Key words: checklist, Compositae, *Dissothrix*, lectotypes, nomenclature, Piqueriinae

Introduction

Stevia Cavanilles (1797: 32) belongs to subtribe Piqueriinae of Eupatorieae (Hind & Robinson 2007, Robinson *et al.* 2009, Tippery *et al.* 2014, Rivera *et al.* 2016). The genus is characterized by the herbaceous to shrubby habit, usually opposite leaves, cylindrical involucre with five phyllaries, five florets with funnelform corollas, pubescent, 5-ribbed cypselae, and pappus of scales, bristles or a variable combination of bristles and scales (Robinson 1930, Bremer *et al.* 1994, Hind & Robinson 2007).

The genus includes up to 235 species (King & Robinson 1987, Soejima *et al.* 2001, Quaresma *et al.* 2013, Turner 2013a, 2013b, 2015), distributed from southern United States to northern Chile and northern Patagonia in Argentina (King & Robinson 1987, Freire & Ariza Espinar 2014, Gutiérrez *et al.* 2016). Mexico is a high species-diverse area with more than 100 species of *Stevia* (Watanabe *et al.* 2001, Turner 2015), along with the Southern Cone of South America, where 65 species of the genus were found: 33 in Argentina, 20 in Paraguay, 17 in southern Brazil (i.e., Paraná, Rio Grande do Sul, Santa Catarina states), 11 in Uruguay, and one in Chile (Freire 2008, Nakajima 2010, Freire & Ariza Espinar 2014, Gutiérrez *et al.* 2016).

Stevia is a difficult genus from a taxonomic point of view, despite the efforts developed in earlier and recent studies in South America (e.g. Robinson 1930, Cabrera *et al.* 1996, Freire & Ariza Espinar 2014), due to the large number of species and the difficulty for establishing infrageneric categories (Hind & Robinson 2007). One way to tackle this issue is to continue taxonomic studies of *Stevia* at the regional level (e.g. Gutiérrez *et al.* 2016). We considered starting with Uruguay because there are no separate and detailed taxonomic treatments of *Stevia* in this country.

Currently, 11 species of *Stevia* have been reported from Uruguay (Freire 2008): *S. aristata* D. Don ex Hooker & Arnott (1835: 238), *S. burkartii* Robinson (1931: 4), *S. cinerascens* Sch. Bip. ex Baker (1876: 209), *S. congesta* Hooker & Arnott (1835: 238), *S. entriensis* Hieronymus (1897: 739), *S. gratioloides* Hooker & Arnott (1835: 238), *S. multiaristata* Sprengel (1826: 449), *S. ophryodonta* Robinson (1934: 7), *S. sabulonis* Robinson (1931: 14), *S. satureiifolia* (Lamarck 1786: 411) Sch. Bip. ex Klotzsch (1852: 291), and *S. selloi* (Sprengel 1826: 438) Robinson (1930: 88). From these species seven are shared with Argentina (Freire & Ariza Espinar 2014), five with Brazil (Nakajima 2010), four with Paraguay (Cabrera *et al.* 1996), and two are endemic to Uruguay (i.e. *S. congesta* and *S. ophryodonta*).

During the revision of the Uruguayan species of *Stevia* (in prep.), we detected names which need lectotypifications in order to assure their correct application in our research. The goal of this work is to settle the status of type material for the names *Dissothrix hassleriana* Chodat (1901: 411), *S. congesta*, *S. gratioloides*, and *S. polycephala* Baker (1876: 207) non Bertoloni (1840: 432).

Materials and methods

Specimens and photographs from the following herbaria were analyzed: BA, BAF, BM, E, G, GH, GOET, K, P and US (Thiers 2016). When physical specimens were not available, their photographs were obtained from JSTOR (2016), virtual herbaria (BM [<http://www.nhm.ac.uk/research-curation/scientific-resources/collections/botanical-collections/index.html>], E [<http://elmer.rbge.org.uk/bgbase/vherb/bgbasevherb.php>], G [<http://www.ville-ge.ch/musinfo/bd/cjb/chg/?lang=en>], K [<http://apps.kew.org/herbcat/navigator.do>], P [<https://science.mnhn.fr/all/search>]), or digital images were requested from curators of the herbaria and then analyzed. All the protologues were cross-checked with the label information of the type materials. Accepted species names are in bold.

Lectotypifications

1. *Stevia polycephala* Baker (1876: 207) non Bertoloni (1840: 432), nom illeg. Type:—BRAZIL. “Brasilia”, *F. Sellow 4382* (lectotype K 000488761, designated here [photo!])

= *Stevia aristata* D. Don ex Hooker & Arnott (1835: 238). Type:—ARGENTINA. Buenos Aires province: “Pampas de Buenos Aires”, *J. Gillies 162* (lectotype K 000488792 [photo!], designated by Freire & Ariza Espinar (2014: 413), isoelectotypes E 00433411 [photo!], GH 00012800 [photo!]).

According to recent studies (Cabrera *et al.* 1996, Freire 2008, Freire & Ariza Espinar 2014), *Stevia polycephala* Baker (1876) non Bertoloni (1840) is a synonym of *Stevia aristata* D. Don ex Hooker & Arnott (1835: 238). This species inhabits central and northeastern Argentina, Paraguay, and Uruguay.

Stevia polycephala Baker, based on specimens collected in eastern and southern Brazil, is an illegitimate later homonym of *S. polycephala* Bertoloni from Guatemala. Baker (1876) cited three specimens: (1) “Habitat prov. Minas Geraës in campis ad Cachoeira do Campo: Claussen”, (2) “luco Brasiliae meridionalis non adnotato: Sello”, and (3) “in ditione Parana: Weir.” In the absence of the indication of a single specimen as the type, all the specimens cited in the protologue are to be treated as syntypes (Art. 9.5 of ICN, McNeill *et al.* 2012).

According to Stafleu & Cowan (1976–1988), the types of the British botanist J. G. Baker are kept mainly at Kew (herbarium K) where he worked. On the other hand, F. Sellow (originally Sello) worked as gardener in Berlin, Paris, and London (Stafleu & Cowan 1976–1988). Sellow collected widely in Brazil and Uruguay from 1814 up to 1831. His main collection of plants and types were deposited in B but were destroyed during the Second World War. However, extant duplicates are in numerous herbaria: A, BM, BR, CGE, DPU, E, F, FI, G, GH, GOET, HAL, K, KIEL, L, LD, LE, LISU, LZ, M, MO, MW, NY, P, PH, POM, R, S, SGO, U, UPS, US, VT, W, WRSL, and WU.

We found materials that fit accurately with the protologue data in K and P. In particular, four specimens collected by Sellow were found: one in K (K 000488761) as “*Sello 4382*” and three in P (P 00704429, P 00704430, and P 00704431) as “*Sellow 93*”. All of them were collected in “Brasilia” actually indicating Brazil. On the other hand, two sheets with plants collected by Claussen in Minas Geraës were found in K: one of them (K 000488756) consists of three plants with the same label, and the other sheet (K 000488757) also contains three plants, but two of them have no collector name or number. Finally, the material gathered by Weir from Brazil is located in K (K 000488758). This last sheet contains two plants and the locality fits accurately the original place of collection: “Sp. from campos of Parana”. In addition, a Schultz-Bipontinus’ handwriting note indicates “*Stevia veronicae* var. *polycephala* Schtz Bip”.

The specimen collected by Sellow and kept at K (K 000488761, Fig. 1.A) is herein designated as lectotype since it is a complete and well-preserved specimen that fits the original description and also shows the basal part of the plant.



FIGURE 1. A. The lectotype of *Stevia polycephala* deposited in K. B. The lectotype of *Stevia congesta* in E. C. Detail of a terminal inflorescence of *S. congesta*.

2. *Stevia congesta* Hooker & Arnott (1835: 238). Type:—URUGUAY. Maldonado department, “Maldonado, Tweedie” s.n. (lectotype E 00322816, designated here [photo!]; isolectotype K 000488777 [photo!])

Hooker & Arnott (1835) cited two localities in which original specimens were collected by J. Tweedie: (1) “Maldonado” and (2) “high grounds of the Rio Jacquery”. Maldonado is an Uruguayan city and department on the shore of Río de la Plata. On the other hand, the Jacquery river could not be found with this spelling and probably it is not known currently with this name. The river with the closest resembling name is Jacuí (Portuguese) or Yacuy (Spanish), which runs in Brazil, in the Uruguay neighboring Brazilian state of Rio Grande do Sul. This river is born in the highlands of Serra Geral and flows southward and eastward for 450 km up to the Patos lagoon throughout the Guaíba lake. In 1832 Tweedie made a long botanical expedition in southeastern South America (e.g. Castellanos 1945). This field trip started in Buenos Aires city (Argentina), throughout Uruguay up to Rio de Janeiro (Brazil). Tweedie sailed by the Río

Uruguay and Río Negro. It is possible that ‘Jacquery river’ was a misspelling of Tweedie, followed by Hooker and Arnott on the name of the Jacuí river. Another river with a similar spelling could be Jaguarão (Portuguese) or Yaguarón (Spanish) which makes the border between Rio Grande do Sul and Uruguay.

According to Stafleu & Cowan (1976–1988), the main collections of Tweedie were kept at K, and secondarily in other European herbaria (e.g. E). On the other hand, Hooker’s personal herbarium was purchased by K, and Arnott personal herbarium was acquired by GL with the phanerogams, currently, on permanent loan at E (Stafleu & Cowan 1976–1988). It is often assumed that when Hooker moved to K, he brought the holotypes of many Hooker & Arnott’s plant names. This is not always the case, and the material kept at K (if it exists) has to be considered along with that at E (N. Hind, pers. comm.; see Grossi *et al.* 2011).

Two sheets with three specimens of the original material of *Stevia congesta* were found. One of them is kept at E (E 00322816) with only one plant and a handwritten note indicating “*Stevia congesta* H&A. Maldonado (Tweedie)” (Fig. 1.B). The other at K has three plants on the same sheet: two collected by Tweedie from Maldonado and “Jacquery” river (K 000488777, K 000488779, respectively), and the third plant representing a non-type material collected by M. Fox (Fox 407, K 000488778) in Maldonado.

In the absence of a designated type, all of Tweedie’s specimens from Maldonado or ‘Rio Jacquery’ are original materials (Art. 40 Note 1 of ICN, McNeill *et al.* 2012; McNeill 2014). For this reason, the specimen from Maldonado at E (E 00322816, Fig. 1.B) is herein designated as lectotype of the name *S. congesta* since it corresponds to one of the localities cited in the protologue (Fig. 1.C) and fits accurately with the original description. The other duplicate at K (K 000488777) is then an isolectotype.

According to Freire (2008), *S. congesta* is endemic to Uruguay. In addition, this species was not reported from Brazil (Nakajima 2010). However, as a result of our analysis of type materials this species occurs in Uruguay and, probably, on the border with Brazil.

3. *Dissothrix hassleriana* Chodat (1901: 411). Type:—PARAGUAY. Central department, “In campo pr. [prope] Tacuaral” [currently Ypacaraí], September, [Hassler] 1034 (lectotype G 00381744, designated here [photo!]; isolectotype G 00381742 [photo!])

= *Stevia entleriensis* Hieronymus (1897: 739). Type:—ARGENTINA. Entre Ríos province, “Concepción del Uruguay, auf Weiden, auf Sandboden”, P.G. Lorentz 952 (lectotype GOET 002054 [photo!], designated by Freire & Ariza Espinar (2014: 418), isolectotypes P 00704288 [photo!], US 00146027 [photo!]).

According to recent studies (Cabrera *et al.* 1996, Freire 2008, Freire & Ariza Espinar 2014), *Stevia entleriensis* Hieronymus (1897: 739) is a species that inhabits northeastern Argentina, Paraguay, and Uruguay. These studies placed *Dissothrix hassleriana* Chodat in the synonymy of this species. *Dissothrix hassleriana* was described on the basis of specimens from two localities in Paraguay. One locality was Tacuaral (“In campo pr. Tacuaral, Sept. 1034”), currently named Ypacaraí, collected by Hassler, and the other was Caaguazú (“Balansa, 754, fleurs blanches, Caaguazu, dans les campos. Avril”) collected by Balansa.

According to Stafleu & Cowan (1976–1988), Chodat deposited his main plant collections in G. There are two sheets at G (G 00381742 and G 00381744), which contain plants labeled as *Hassler 1034*. An additional material of Balansa was found in BAF with a label that matches with the protologue.

Particularly, the sheet G 00381744 (Fig. 2.A, B) was annotated as *S. entleriensis* by the synantherologists A. L. Cabrera, B. M. King and B. L. Robinson. One of the labels indicates that the material is the “Holotype of *Dissothrix hassleriana* Chod. Herb. Boiss. ser. 2, not *Stevia hassleriana* Chod.” Currently *S. hassleriana* Chodat (1902: 305) is a synonym of *S. balansae* Hieronymus (1897: 739) (Cabrera *et al.* 1996, Freire 2008).

The sheet G 00381744 (Fig. 2.A) is designated as the lectotype of the name *Dissothrix hassleriana*. This is the most complete and well-preserved material. The sheet G 00381742 is an isolectotype.

4. *Stevia gratioloides* Hooker & Arnott (1835: 238). Type:—BRAZIL. Rio Grande do Sul state, “Rio Grande, Tweedie” s.n. (lectotype K 000488745, designated here [photo!])

Stevia gratioloides Hooker & Arnott (1835: 238) is a species distributed in southern Brazil and Uruguay (Freire 2008). It was described based on materials collected by Tweedie in Rio Grande do Sul, Brazil. There are differences on the type locality since the protologue cites “Rio Grande do Sul” and the label of the specimens “Rio Grande”. It is not clear if the original locality refers to the city or the state (see Hooker & Arnott 1835).



FIGURE 2. A. The lectotype of *Dissothrix hassleriana* deposited in G. B. Detail of the original label of *D. hassleriana*. C. The lectotype of *Stevia gratioloides* (left) and a material of *Stevia* on the same sheet kept at K. D. Detail of the lectotype of *S. gratioloides*.

As it was mentioned under *S. congesta*, the main collections of Tweedie and the original materials of Hooker and Arnott are kept at K and E (Stafleu & Cowan 1976–1988). We found only two sheets at K: one of them has plants collected by Tweedie in Rio Grande (K 000488747) and plants gathered from Banda Oriental (ancient name of Uruguay, K 000488748). The other sheet includes specimens of *S. gratioloides* collected by Tweedie (K 000488745), but it also contains plants of *S. veronicae* Candolle (1836: 123) collected by Glaziou in Rio de Janeiro (K 000488744) (Fig. 2.C).

The specimen labeled as K 000488745 is designated as the lectotype of the name *S. gratioloides* because the this label fits accurately with the information in the protologue and the specimen has well-preserved leaves and a higher number of capitula (Fig. 2.C, D).

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