

Notes about Cavanilles' names in *Cosmos* (Asteraceae) and the related ones

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Abstract

NOTES ABOUT CAVANILLES' NAMES IN *COSMOS* (ASTERACEAE) AND THE RELATED ONES.— Cavanilles' names *Cosmos bipinnatus* Cav. and *C. sulphureus* Cav. are investigated. *Cosmos bipinnatus* is lectotypified (second-step typification) on a specimen preserved at MA (barcode MA475587). The name *C. sulphureus* is verified to be already and correctly lectotypified by Sheffr in 1932. *Cosmos bipinnatus* is synonymized with *Bidens formosa*, whereas *C. sulphureus* is currently accepted as *B. sulphurea*. For the nomenclatural purpose, both *Coreopsis artemisiifolia* by Sessé & Mocino (later homonym of Jacquin's name), *Coreopsis formosa* Bonato [basionym of *Bidens formosa* (Bonato) Sch.Bip.], and *Coreopsis artemisiifolia* Jacq. are also studied and lectotypified on, respectively, a specimen preserved at MA (MA605709) and illustrations published by Bonato (Tav. II) and Jacquin (Tab. 595). Finally, the Italian distribution of *B. sulphurea* is updated with the addition of a regional record (Veneto region, north-eastern Italy).

Key words: alien species, Compositae, Europe, Italy, new record, typification.

Resumen

NOTAS SOBRE LOS NOMBRES DE CAVANILLES EN *COSMOS* (ASTERACEAE) Y LOS RELACIONADOS.— Los nombres de Cavanilles *Cosmos bipinnatus* Cav. y *C. sulphureus* Cav. son investigados. *Cosmos bipinnatus* es lectotipificado (tipificación de segundo paso) a partir de un espécimen conservado en MA (MA475587). El nombre *C. sulphureus* ha sido verificado como ya lectotipificado correctamente por Sheffr en 1932. *Cosmos bipinnatus* se sinonimiza con *Bidens formosa*, mientras que *C. sulphureus* se acepta actualmente como *B. sulphurea*. A efectos de nomenclatura, se estudian y lectotipifican también *Coreopsis artemisiifolia* de Sessé & Mocino (más tarde homónimo del nombre de Jacquin), *Coreopsis formosa* Bonato [basionimo de *Bidens formosa* (Bonato) Sch.Bip.] y *Coreopsis artemisiifolia* Jacq. a partir de, respectivamente, un espécimen conservado en MA (MA605709) e ilustraciones publicadas por Bonato (Tav. II) y Jacquin (Tab. 595). Finalmente, la distribución en Italia de *B. sulphurea* se actualiza con la adición de un registro regional (región del Véneto, noreste de Italia).

Palabras clave: *Compositae*, especies alóctonas, Europa, Italia, nueva cita, tipificación.

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INTRODUCTION

Cavanilles (1791: 9–10) published the genus *Cosmos* Cav. in the 1st volume of his *Icones et Descriptiones Plantarum*, and provided a detailed description followed by one species (*Cosmos bipinnatus* Cav.) which is the generitype (holotype) according to the Art. 10.1 Note 1 of *Madrid Code* (Turland *et al.*, 2025). A further species (*Cosmos sulphureus* Cav.) was published at page 56 of Cavanilles' *Icones*.

On the basis of the molecular investigations of the tribe Coreopsideae (Less.) Lindl. (e.g. Mort *et al.*, 2008; Crawford *et al.*, 2009) and the considerations by Banfi *et al.* (2018), the genus *Cosmos* should be included in *Bidens* L., the latter having nomenclatural priority (1753 vs. 1791) according to the Art. 11.3 of *Madrid Code* (Turland *et al.*, 2025). Consequently, accepted Cavanilles' binomials in *Bidens* are *Bidens formosa* (Bonato) Sch.Bip. (= *B. bipinnata* Cav.) and *Bidens sulphurea* (Cav.) Sch.Bip. (see e.g. Portal of the Flora of Italy, 2024).

Cavanilles names *Cosmos bipinnatus* and *C. sulphureus* were never investigated from the nomenclatural point of view. With the aim to verify their identity and as part of the ongoing investigations of nomenclature and taxonomy of Asteraceae for the Flora of Italy (e.g. Iamónico, 2013, 2015; Del Guacchio & Iamónico, 2015; Iamónico & Hjiertson, 2015; Iamónico & Managlia, 2015; Del Guacchio *et al.*, 2021, 2022), we here present a paper concerning these two taxa. For nomenclatural purposes, also the names *Coreopsis artemisiifolia* Jacq. and *Coreopsis formosa* Bonato were studied.

MATERIALS AND METHODS

The work is based on field surveys, analysis of relevant literature, and examination of specimens preserved at MA, PAD, and RO (codes according to Thiers, 2025).

Generic concept in the Tribe Coreopsideae follows the phylogenetic studies by several authors (Kim *et al.*, 1999; Crawford *et al.*, 2001, 2009; Kimball & Crawford, 2004; Crawford & Mort, 2005; Mort *et al.*, 2008) who highlighted that several genera (including *Coreopsis* L. and *Cosmos* Cav.) are clearly nested into *Bidens* L., revealing that they cannot be separated.

The articles cited through the text follow the International Code of Nomenclature for algae, fungi, and plants (Turland *et al.*, 2025, hereafter reported as “ICN”).

RESULTS AND DISCUSSION

Coreopsis artemisiifolia Jacq.

Jacquin (1793: 16, as “artemisiaefolia”) published *Coreopsis artemisiifolia* Jacq. providing a short diagnosis (“foliis subbipinnatis; pinnulis lanceolatis”) and a description (“Caulis florentis pars summa. Folium inferius. Flosculos hermaphroditus auctus [probably an orthographic error for “acutum”]. Semen acutum”); a coloured illustration (“Tab. 595”) was also given and it is part of the original material for the name (Art. 9.4 of ICN). Jacquin (1793: 16) reported after the diagnosis “*Jacq. col. vol. 5*” which would refer to his *Collectaneorum* (published later than 1793, i.e. in 1797) where Jacquin (1796: 155–157) included a long and detailed description of the species, as well as the provenance (“cui Mexico patria est”). Likely, Jacquin (1793) would like to anticipate a future publication of a work *Collectaneorum*.

No specimen of original material was traced by us. As a consequence, Jacquin's illustration no. 595 represents the only available element useful for the lectotypification purpose and it is here designated as such. Based on the current concept in *Bidens* (see e.g. Kiger, 2006 sub *Cosmos sulphureus*; Chen & Hind, 2011

sub *C. sulphureus*), the lectotype of *Coreopsis artemisiifolia* is identifiable as *Bidens sulphurea* by showing ray florets orange and achene beaked.

Sessé & Mocino (1890: 148, appendix) published the name *Coreopsis artemisifolia* Sessé & Mocino, which is however illegitimate being a later homonym of Jacquin's one (Art. 52.2 of ICN). These authors provided a short diagnosis ("Coreopsis pinnatifidis, petiolis ciliatis, seminibus muticis") and a detailed description; reference to the unpublished iconography of *Flora Mexicana* (see Germán-Ramírez, 1994) was also reported as "Fl. Mex. Ic. 317". Both the diagnosis and the description given by Sessé & Mocino (1890) match Jacquin's illustration no. 595 (lectotype). Hence, we consider the name *Coreopsis artemisifolia* by Sessé & Mocino to be referred to the same taxon of Jacquin's one. The authors also reported the provenance ("Habitat in Chilapae montibus"). At MA there is a specimen (barcode MA605709) bearing flowered branches of a plant collected in Mexico by Sessé & Mocino (numbered as "4026") which is part of "Plantae Novae Hispaniae" as reported on the label on bottom-right corner of the sheet. This specimen is part of the original material, matches Sessé & Mocino's protologue, and it is here designated as the lectotype of their name. Sessé & Mocino's name is a later heterotypic homonym of Jacquin's *Coreopsis artemisiifolia*.

Coreopsis artemisiifolia Jacq., Icon. Pl. Rar. [Jacquin] 3: 16. 1793 $\equiv$ *Bidens artemisiifolia* (Jacq.) Kunze, Revis. Gen. Pl. 1: 321. 1891, *nom. illeg., later homonym non* Poeppig & Endlicher (1843: 49) (Art. 53.1 of ICN).

Lectotype (**designated here**): [Icon] *Coreopsis artemisaefolia* in Jacquin (1793: Tab. 595, image of the lectotype available at <https://www.biodiversitylibrary.org/item/7563#page/310/mode/1up>).

= *Coreopsis artemisiifolia* Sessé & Mocino, Naturaleza (Mexico City) ser. 2, 1(app.): 148. 1890.

Lectotype (**designated here**): Mexico, *s.d.*, Sessé & Mocino 4026 (MA605709!, image available at <https://plants.jstor.org/stable/viewer/10.5555/al.ap.specimen.ma605709?loggedin=true>).

= *Bidens sulphurea* (Cav.) Sch.Bip., Icon. 1: 56. 1791 $\equiv$ *Cosmos sulphureus* Cav., Icon. 1: 56. 1791 (for the lectotypification see below under the paragraph "*Cosmos sulphureus* Cav.").

Coreopsis formosa Bonato

Bonato (1793: 22–25) validly published the name *Coreopsis formosa* Bonato through a diagnosis ("*foliis connatis, quasi ferulaceis, bi-pinnatis, laciniis linearibus sulcatis, corolla rosea decidua*"), a detailed description (in Italian), and the provenance ("indigena del Perù" = native to Peru); an illustration ("*TAV. II*") was also provided and it is part of the original material for the name (Art. 9.4 of ICN).

No specimen of original material was traced by us at PAD, where Bonato's herbarium and types are preserved (HUH-Index of Botanists, 2013a–). As a consequence, Bonato's illustration no. II represents the only available element useful as lectotype, and it is here designated as such.

Coreopsis formosa was recombined under the genus *Bidens* [as *Bidens formosa* (Bonato) Sch.Bip.] by Schultz-Bipontinus (1856: 307), who also proposed to synonymize this name with Cavanilles' *Cosmos bipinnatus* Cav.; no discussion about the synonymization was given. Currently, POWO (2025) also accept *B. formosa* (and *Coreopsis formosa*) as heterotypic synonym of *Cosmos bipinnatus*. On the basis of the lectotype of *Coreopsis formosa*, as well as the diagnosis by Bonato (1793: 22), *Coreopsis formosa* matches the current concept of *Bidens formosa* by showing ray florets rose ("*corolla rosea*" in the diagnosis) and leaves 2–3-pinnatifid (see e.g. Kiger, 2006 sub *C. bipinnatus*; Pignatti *et al.*, 2018: 803 sub *C. bipinnatus*). So, we accept the synonymization between Cavanilles and Bonato's names and the genus *Bidens* according to Crawford *et al.* (2009), Mort *et al.* (2008) and Banfi *et al.* (2018).

Bidens formosa (Bonato) Sch.Bip., Icon. 1: 56. 1791 $\equiv$ *Coreopsis formosa* Bonato, *Pisaura automorpha* e *Coreopsis formosa*: 22. 1793.

Lectotype (**designated here**): [Icon] *Coreopsis formosa* in Bonato (1793: Tav. II, image of the lectotype available at <https://bibdigital.rjb.csic.es/viewer/14476/?offset=#page=31&viewer=picture&o=bookmark&n=0&q=>).

***Cosmos bipinnatus* Cav.**

Cosmos bipinnatus Cav. was validly published by Cavanilles (1791: 10), who provided a short diagnosis (“*Cosmos foliis connatis bipinnatis; pinnulis lineari-acutis, canaliculatis*”) and a detailed description; the provenance (“Habitat in Mexico”) was also given, as well as the specification that the plant was cultivated at the Botanical Garden of Madrid (“Floruit in Regio horto Matritensi annis 1789 et 1790 mensibus Octob. Novemb. Et Decemb.”; this probably means that Cavanilles received seeds from Mexico); an illustration (“*Tab. 14*”; image available at <https://bibdigital.rjb.csic.es/viewer/9679/?offset=#page=90&viewer=picture&o=bookmark&n=0&q=>) occurs in Cavanilles’ work and it is part of the original material for the name (Art. 9.4 of ICN).

Sherff (1932: 417) stated under *Cosmos bipinnatus* Cav. “Type specimen: No particular specimen is cited. Cavanilles’ (1791: 10) original description was drawn from plants of Mexican origin which flowered at the Royal Garden of Madrid in October, November, and December, in the years 1789 and 1790”. Although the phrase “designated here” was not reported, Sherff’s statement (published in 1932) can be considered as correct lectotypification (see Art. 7.11 of ICN). However, we traced two specimens at MA (where Cavanilles’ herbarium and types are mainly preserved; see HUH-Index of Botanists, 2013b–), i.e. MA475586 and MA475587, each including (at bottom-right corner) a printed label with “Herbarium Horti Botanici Matritensi | Cavanillesii Typi”. Consequently, Art. 9.17 of ICN should be applied making Sherff’s typification as the first-step. We here propose a second-step typification using MA475587, which includes more capitula; MA475586 is the isolectotype. A further specimen (MA475588) exists, but it bears just one printed label reporting the script “Ex antique herbario generali | Herbarium Horti Botanici Matritensi | *Cosmos bipinnatus* Cav.” (see <https://plants.jstor.org/stable/viewer/10.5555/al.ap.specimen.ma475588>); since no further label (e.g. originally handwritten) appears on this sheet, we had doubts about its use as original material and preferred to avoid it as possible lectotype, so contrasting the indication as “type” in the JSTOR website (https://plants.jstor.org/search?si=0&filter=name&so=ps_group_by_genus_species+asc&Query=Cosmos+bipinnatus&limit=100). Both MA475586 and MA475587 (but also MA475588) match the protologue (Cavanilles, 1791: 10) and morphologically agree with the current concept of *Bidens formosa* (Bonato) Sch.Bip. showing ray florets violet (“*Radii violaceo-rubecentes*” in the original description), 20 mm long on average, and leaves 2–3-pinnatifid with ultimate lobes of the leaves about one mm wide (see e.g. Kiger, 2006 sub *C. bipinnatus*; Pignatti *et al.*, 2018: 803 sub *C. bipinnatus*).

***Cosmos bipinnatus* Cav., Icon. 1: 10. 1791.**

Lectotype (**designated by Sheffr, 1932: 417 [first step], and here as second-step typification according to the Art. 9.17 of ICN**): Spain, Regio horto Matritensi (cultivated from seed coming from Mexico), 1789 et 1790, *s.c. s.n.* (MA475587!, image of the lectotype available at <https://imagenes.rjb.csic.es/herbarioV/visorVCat.php?img=MA-01-00475587>); isolectotypes at MA (MA475586!, two sheets, images available at <https://imagenes.rjb.csic.es/herbarioV/visorVCat.php?img=MA-01-00475586> and <https://imagenes.rjb.csic.es/herbarioV/visorVCat.php?img=MA-02-00475586> [MA475586-2]).

***Bidens formosa* (Bonato) Sch.Bip., Icon. 1: 56. 1791 ≡ *Coreopsis formosa* Bonato, *Pisaura automorpha* e *Coreopsis formosa*: 22. 1793 (for the lectotypification see above under the paragraph “*Coreopsis formosa* Bonato”).**

Cosmos sulphureus Cav.

The protologue of *Cosmos sulphureus* (Cavanilles, 1791: 56) consists of a short diagnosis (“*Cosmos foliis connatis, bipinnatis; pinnulis decurrentibus, ovato-acutis, ultima longiore*”), a detailed description, the provenance (“Habitat in Mexico”), and the statement “Floruit in Regio horto mense Novembri”, which likely indicates seeds from Mexico was cultivated at the Botanical Garden of Madrid; an illustration (“*Tab. 79*”; image available at <https://bibdigital.rjb.csic.es/viewer/9679/?offset=#page=155&view=picture&o=bookmark&n=0&q=>) is also given and it is part of the original material for the name (Art. 9.4 of ICN).

Sherff (1932: 409) stated under *Cosmos sulphureus* Cav. “Type specimen: Raised from Mexican seed in the Royal Garden at Madrid, Spain, and flowering in the month of November (represented by Cavanilles’ type plate)”. Although the phrase “designated here” was not reported, Sherff’s statement (published in 1932) can be considered as correct lectotypification (see Art. 7.11 of ICN). Since there is single specimen at MA (MA475589), matching Cavanilles’ and Sherff’s data, we definitively confirm that Sherff (1932: 409) lectotypified the name *Cosmos sulphureus*. It is important to note that, in JSTOR, two exsiccata (MA605709 and MA605710; images, respectively, at <https://imagenes.rjb.csic.es/herbarioV/visorVCat.php?img=-MA-01-00605709> and <https://imagenes.rjb.csic.es/herbarioV/visorVCat.php?img=MA-01-00605710>) are indicated as “Original material”. However, they cannot be original material being part of “*Plantae Novae Hispaniae*” and the “*Herbario Sessé y Mocino*”, as reported on the printed labels placed, respectively, on the bottom-right corner and the right side of these specimens. Therefore, they were never seen by A. J. Cavanilles.

***Bidens sulphurea* (Cav.) Sch.Bip., Icon. 1: 56. 1791 $\equiv$ *Cosmos sulphureus* Cav., Icon. 1: 56. 1791.**

Lectotype (**designated by Sherff, 1932: 409**): Spain, Regio horto Matritensi (seeds from Mexico), *s.d.*, *s.c. s.n.* (MA475589!, image of the lectotype available at <https://imagenes.rjb.csic.es/herbarioV/visorVCat.php?img=MA-01-00475589>).

Distribution: *Bidens sulphurea* is a species native to Mexico and Central America, whereas it is considered alien in the other continents, including North and South America (POWO, 2025). In Europe, it occurs in Belgium (see <https://alienplantsbelgium.myspecies.info/content/cosmos-sulphureus>), Great Britain, Germany (see <https://florenliste-deutschland.de/florenliste/index.htm>), Italy, and Poland according to Greuter (2006–). Note that Verloove & Lambinon (2008: 72) excluded it from the flora of Belgium after reidentifying the two existing specimens as *Coreopsis tinctoria* Nutt. Concerning Italy, according to Portal to the Flora of Italy (2024), the species was discovered for the first time recently (in 2018) in Lombardia region, north-western Italy (see Traini *et al.*, 2020) and it is now recorded also in Trentino-Alto Adige (north-eastern Italy), Basilicata and Calabria regions (southern Italy); in all the Italian regions *B. sulphurea* is considered as a casual alien species. During the field surveys carried out in Treviso Province (Veneto region, north-eastern Italy), we found a small population of *Bidens sulphurea* along a ditch which represents the first one (casual) at regional scale (Fig. 1).

Specimens from Veneto region: Italy, Veneto region, Treviso city, ditch along via di Sant’Angelo, 15 m a.s.l., 18.VII.2024, *Iamónico et Crosato s.n.* (RO); *ibidem* (RO).

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Figure 1. *Bidens sulphurea* in Veneto region (Treviso city, locality Sant'Angelo); photos by D. Iamónico.

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AUTHORSHIP CONTRIBUTION STATEMENT

Duilio Iamónico: Conceptualization, Data curation, Investigation, Methodology, Writing – original draft, Writing – review & editing. **Manuel Crosato:** Investigation, Writing – review & editing

DECLARATION OF COMPETING INTEREST

The authors of this article declare that they have no financial, professional or personal conflicts of interest that could have inappropriately influenced this work

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