

Typification and synonymy of *Santolina ageratifolia* Barnades ex Asso (Asteraceae, Anthemideae), an endemic species of the Iberian Peninsula

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ABSTRACT

Patterns of speciation in the angiosperm genus *Santolina* (Asteraceae, Anthemideae) have recently been intensively studied, but progress is hampered by nomenclatural confusion. In this paper, the species *S. ageratifolia* Barnades ex Asso, *S. pectinata* Lag. var. *paniculata* Loscos & J.Pardo and *S. longidentata* Pau are lectotypified. An invalid name has been found: *S. rosmarinifolia* L. subvar. *virens macrocephala* Pau. The nomenclature of *S. ageratifolia* is provided.

RÉSUMÉ

Typification et synonymie de Santolina ageratifolia Barnades ex Asso (Asteraceae, Anthemideae), une espèce endémique de la péninsule Ibérique.

Les patrons de spéciation dans le genre d'angiospermes *Santolina* (Asteraceae, Anthemideae) ont été récemment étudiés intensivement, mais la progression des connaissances est entravée par la confusion nomenclaturale. Dans cet article, les espèces *S. ageratifolia* Barnades ex Asso, *S. pectinata* Lag. var. *paniculata* Loscos & J.Pardo et *S. longidentata* Pau sont lectotypifiées. Un nom invalide a été découvert : *S. rosmarinifolia* L. subvar. *virens macrocephala* Pau. La nomenclature de *S. ageratifolia* est détaillée.

KEY WORDS

Asteraceae,
Anthemideae,
Santolina ageratifolia,
nomenclature,
taxonomy.

MOTS CLÉS

Asteraceae,
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INTRODUCTION

The genus *Santolina* belongs to the subtribe Santolininae Willk., tribe Anthemideae Cass., family Compositae Giseke, alternatively named Asteraceae Dumort. Recent investigations have focused on reconstructing phylogeny and interpreting biogeography of the tribe Anthemideae (Francisco-Ortega *et al.* 1997; Oberprieler & Vogt 2000; Watson *et al.* 2000, 2002; Oberprieler 2002, 2004a, b, 2005; Oberprieler *et al.* 2009). In the course of these evolutionary studies, it has also been judged helpful to revise certain taxa of this tribe in need of taxonomic attention. Such is the case with *Santolina*, a genus endemic to the Mediterranean Region.

Santolina ageratifolia Barnades ex Asso ($2n = 6x = 54$), a member of the *S. rosmarinifolia* L. aggregate (Rivero-Guerra 2011) with the highest ploidy level, is an endemic species of Teruel Province, Spain, of restricted geographical distribution: Ródenas, Cerro San Ginés, and Cerro del Ardal (Almohaja) (Rivero-Guerra 2008). This species lives on sandstone and red limolite (Ródenas population), and quartzite (Cerro San Ginés).

Pau (1907a) characterised *S. ageratifolia* and cited *S. rosmarinifolia* Asso and *S. longidentata* Pau as its synonyms. The same author in 1895, changed the concept and cited “– *S. rosmarinifolia* b) *heterophylla* subv.) *virens macrocephala* Pau, not bot., fasc. 2, pag. 28. – *S. pectinata* var. *paniculata*? Losc. et Pard.?” as synonyms of *S. longidentata*. Mateo Sanz (1990) suggested that *S. ageratifolia* and *S. longidentata* are synonyms of *S. rosmarinifolia* L.; however, López Udías *et al.* (1997) cited *S. rosmarinifolia* subvar. *virens macrocephala* Pau, *S. longidentata* Pau and *S. rosmarinifolia* auct., non L. as synonyms of *S. ageratifolia*.

This study was undertaken to improve our knowledge of the taxonomy of the genus *Santolina* and to improve its nomenclature. A search for suitable lectotypes of *S. ageratifolia*, *S. pectinata* var. *paniculata* Loscos & J. Pardo, and of *S. longidentata* Pau, as well as the historical background and the nomenclatural discussion of these names, has been conducted in the literature and in relevant herbaria, and these results are presented below.

HISTORICAL BACKGROUND

Asso y del Río (1779) in *Synopsis Stirpium Indigenarum Aragoniae*, p. 116, published *Santolina rosmarinifolia* auct., non L. (1753) with the following notation: “805. *Santolina rosmarinifolia* // *Abrotanum femina, virens, vermiculato, serrato folio* Barrel. Ic. 464. // *Provenit propè Rodenas // Planta suffruticosa, pedalis. Caules virgati, uniflori, supernè nudi. Folia linearia, acuta, carnosa, duplici denticulorum serie utrinque instructa. Flores duplò majores quàm in praecedenti. Paleae concavae*”. This name is the homonym of the validly published *S. rosmarinifolia* L., and is therefore illegitimate and unavailable for use under the Article 53.1 of the International Code of Botanical Nomenclature (McNeill *et al.* 2006). Asso y del Río adopted the Linnaeus’ name “*S. rosmarinifolia*” for a taxon of the same rank, with explicit exclusion of the original type. The same author (1779) mentioned the figure 464 of Barrelier in the protologue of *S. rosmarinifolia sensu* Asso.

Pau (1907b) explained the origin of the name *S. ageratifolia*. Asso (1784) mentioned the *Synopsis Stirpium Indigenarum Aragoniae* in the protologue of *S. ageratifolia*, and changed the number “805” into “850”: “*Santolina rosmarinifolia Syn. n 850 // Species à nobis circa pagum Rodenas observata S. rosmarinifolia varietas videbatur. Eandem in herbario Cl. Barnades nomine Santolina ageratifolia postea invenimus, unde novam speciem esse perspicue apparuit. Caules in nostra, ut in Exemplari Barnadiano, simplices; folia linearia, carnosa, duplici denticulorum serie in utroque margine*”. He attributed the name *S. ageratifolia* to Barnades, apparently because this name was used by Barnades in the label of the voucher specimen of his herbarium. However, there is no indication that Barnades validly published the name. The *nomen novum* and its diagnosis are validly ascribed to Asso y del Río (1784), under the Article 46.4 of the ICBN (McNeill *et al.* 2006). The same author, in *Historia de la Economía política de Aragón* (1798) emphasized that *S. ageratifolia* is a novel taxon “y en Ródenas una especie nueva de *Santolina*, que el difunto D. Miguel Barnades puso en su herbario con el nombre trivial de *ageratifolia*”.

The present study is based on collections from the herbaria reported by Stafleu & Mennega (1992),

where the material used by Asso y del Río (some material in P) and Barnades (BC, BM, C, LINN, MA) are deposited, and on all Spanish herbaria that contain collections of *Santolina*. Specimens of *S. ageratifolia* gathered by Pau (BC 30129, BM 909683, UCLA, JE, W) and by Vicioso (MA 126817) were found. Ibáñez Cortina (2006) showed three specimens of the genus *Santolina* (which classified as *S. chamaecyparissus*) in the collection of Barnades at the BC herbarium. The study of Barnades's collection indicates that these specimens do not fully match the diagnostic characteristics of the genus *Santolina*, and none of them are from the *locus classicus* of *S. ageratifolia*. The same is true of the *S. chamaecyparissus* specimen figured by Barnades showed in his book "*Herbarium pictum hispanicum*" (six volumes). These specimens should be excluded from *Santolina*.

Loscós y Bernal & Pardo y Sastrón (1866-1867) classified as "*S. rosmarinifolia* L. ex Asso" the specimens from "en el soto del Cañar", gathered by Echeandia and indicated in brackets "acaso *S. pectinata*?". De Jaime Lorén (2005) explained that Loscos y Bernal probably studied the Asso y del Río's material in the "*Sociedad Económica Aragonesa*". I could not find the specimens from the *locus classicus* of *S. ageratifolia* in the Echeandia, Schultz, Schule, Vallier and Loscos y Bernal's collections of the private herbarium of the "*Sociedad Económica Aragonesa de Amigos del País, IberCaja, Zaragoza*", and in Loscos y Bernal & Zapater's collections of the herbarium of the "*Instituto de Educación Secundaria "Vega del Turia"*", Teruel".

The main objects of this study are to: 1) designate a lectotype of *S. ageratifolia*, *S. pectinata* var. *paniculata* Loscos & J. Pardo, and of *S. longidentata* Pau, and 2) to determine all the names available as synonyms of *S. ageratifolia*.

TYPIFICATION

1. *Santolina ageratifolia* Barnades ex Asso

Introductio in Oryctographiam, et Zoologiam Aragoniae accedit. Enumeratio stirpium in eadem noviter detectarum, n. 805: 179 (1784).

TYPUS (as given in the protologue). — "circa pagum Rodenas".

LECTOTYPUS (designated here). — fig. 464 (*Abrotanum femina, virens, vermiculato, serrato folio*) of *Plantae per Galliam, Hispaniam et Italiam* of Barrelier (1714: p. 117) / tab. VIII.; fig. 3 of *Osservazione quarantissima prima – L'origine, e prima impressione di alcune piante marine, imperfette, come fuchi, coralline zeophite, fungi terrestri, e simili*" of Schrockius (1697).

EPITYPUS (designated here). — Teruel, Ródenas, 40°38'87"N, 1°31'12"W, 1400 m, conglomerates, sandstone and red limolite, 15.VII.1998, A. O. Rivero-Guerra s.n. (SEV 277730, Fig. 1).

REMARKS

The figure 464 (*Abrotanum femina, virens, vermiculato, serrato folio*) of *Plantae per Galliam, Hispaniam et Italiam* of Barrelier (1714: p. 117; <http://bibdigital.rjb.csic.es/spa/Libro.php?Libro=1394>) shows similar morphological characteristics of *S. ageratifolia*. Barrelier (1714: p. 91) wrote: "1019. *Santolina foliis Rosmarini, major Inst. R. Herb. 461. Abrotanum foemina, virens, vermiculato, serrate folio Barr. Icon. 464 & Bocc. Muss. Part. 1 tab. VIII. Fig. 3. Abrotanum foemina, foliis Rosmarini, majus C.B. Pin. 137*". The author's quotation "Bocc. Muss. Part. 1 tab. VIII. Fig. 3" refers to Schrockius (1697), *Osservazione quarantissima prima – L'origine, e prima impressione di alcune piante marine, imperfette, come fuchi, coralline zeophite, fungi terrestri, e simili*, p. 262-273, pl. V-VIII in Boccone P. *Museo di fisica e di esperienze variato, e decorato di osservazioni naturali*, table VIII (before p. 271: <http://bibdigital.rjb.csic.es/spa/Libro.php?Libro=4631>). The figure 3 of this plate is the counterpart of Barrelier's figure 464. Probably the material used to illustrate this figure is from the south of Italy. However, *S. ageratifolia* is endemic of the Iberian Peninsula. Unfortunately, Asso y del Río's and Barrelier's herbaria have apparently been lost or destroyed, and duplicates of the original material were not distributed to major herbaria; as a consequence, no known duplicate material exists. Furthermore, there is no herbarium known for Schrockius. The lectotype selection is based on Barrelier/Schrockius-Boccone figure, due to the fact that the ICBN does not allow to exclude original material, when no other original material is known.

2. *Santolina pectinata* Lag. var. *paniculata*
Loscos & J. Pardo

Series inconfecta plantarum indigenarum Aragoniae praecipue meridionales: 54 (1863).

TYPUS (as given in the protologue). — “Prope Aranda del Conde hanc formam memorabilem legit cl Calavia”.

LECTOTYPUS (designated here). — Without date, loc., and collector (private herbarium of “*Sociedad Económica Aragonesa de Amigos del País, IberCaja, Zaragoza*”).

ISOLECTOTYPUS (designated here). — “Prope Aranda del Conde in Aragonia, Calavia, without date and collector (COI-WILLK 00035957).”

REMARKS

The lectotype is the sole original material for this name of the private herbarium of “*Sociedad Económica Aragonesa de Amigos del País, IberCaja, Zaragoza*”. It has several depauperate flowering stems. The lectotype has a label with the following handwritten notation by Loscos y Bernal in black ink: “*Santolina / pectinata var. paniculata*”.

The volume I of the book *Francisco Loscos y Bernal (1823-1886). Un Botánico Aragonés* (Muñoz Garmendia & González Bueno 2001) gathers the correspondence between Loscos y Bernal and other botanists, especially with Willkomm. Willkomm (letter date October 20, 1862) and Boissier (letter date September 12, 1863) requested some Spanish plants from Loscos y Bernal, including *S. pectinata* and *S. pectinata* var. *paniculata* respectively. None specimen of *S. pectinata* var. *paniculata* is conserved in G, but one specimen is preserved in COI-WILLK herbarium.

The isolectotype (COI-WILLK 00035957) has a sample with several flowering stems without leaves. The sheet has three labels with the following notations in black ink. Label 1 (in the lower left-hand corner): “Herbarium Willkommi [printed] // *Santolina pectinata* Bth. [underlined] / var.? *paniculata* [underlined] Losc. Pard. // Prope Aranda del Conde in Aragonia [Willkomm’s handwritten notation] // Legit [printed] Calavia [Willkomm’s handwritten notation]. Label 2 (in the lower left-hand corner): “Herb. Univ. Coimbra // *COI 00035957*”. Label 3 (red) [to right of the specimen]: “TYPUS”.

The two specimens display all the characteristics listed in the protologue: “*differ a specie caulibus paniculato-ramosis*”. Furthermore, Willkomm in Willkomm & Lange (1870) with regards of the diagnostic characteristics of this name indicated: “*Rami floriferi paniculato-ramosi polycephali. Pedunculi eximie angulati et incrassati. An species propria?*”

Loscos y Bernal & Pardo y Sastrón (1866-1867: 205-206) wrote: “1041 *S. pectinata* Benth., Lag. forma canescens; cerca de Jaca, Forest. Jul. // b. *paniculata* Losc. Pard. Ser. incof., Wk. Lge. Prodr. (an sp. propria?) Abunda alrededor de Aranda, Calavia”. Willkomm in Willkomm & Lange (1870) cited *S. pectinata* Lag. var. *paniculata* Loscos & J. Pardo as “*S. pectinata* Bth. β. *paniculata* Losc. Pard.”. However, *S. pectinata* Benth. (Bentham 1826) is the homonym of the validly published *S. pectinata* Lag. (Lagasca 1816), and is therefore illegitimate and unavailable for use under the Article 53.1 of the ICBN (McNeill *et al.* 2006).

The lectotype and isolectype of *S. pectinata* var. *paniculata* indicate that this name is a synonym of *S. chamaecyparissus* L. *sensu stricto*. This suggests that Loscos y Bernal and Pardo y Sastrón used the name *S. chamaecyparissus* L. for a more inclusive taxon than recent studies.

3. *Santolina rosmarinifolia* L.
subvar. *virens macrocephala*

Pau, *Notas botánicas de la Flora española* 2: 28 (1888) (*nom. inval.* cf. Art. 23.1 of ICBN).

LECTOTYPUS. — Not cited.

REMARKS

Pau (1888), in the protologue of *S. rosmarinifolia* subvar. *virens macrocephala*, wrote: “Junto á Albaracín y en Griegos (Zapater). // No conozco esta forma, y si *S. canescens* Lag. de Sierra Nevada, de la que se aparta, lo mismo que de *S. rosmarinifolia* L.”. Pau published *S. rosmarinifolia* subvar. *virens macrocephala* on the basis of the specimen collected by Zapater (MA 126816). This name is not a binary combination of the name of the genus followed by a single specific epithet, and the two words of the epithet are not hyphenated (Article



FIG 1. — Epitype of *Santolina ageratifolia* Barnades ex Asso.

23.1 of the ICBN [McNeill *et al.* 2006]). The two subvarietal terms (*virens* and *macrocephala*) are adjectives in the nominative case; such unhyphenated terms, if in adjectives, are not allowed to be hyphenated. *Santolina rosmarinifolia* subvar. *virens macrocephala* Pau has no status under ICBN, however, it has been fully cited as a synonym of *S. ageratifolia* without alterations from the originally published form.

4. *Santolina longidentata* Pau

Notas botánicas de la Flora española 6: 60 (1896).

TYPUS (as given in the protologue). — “Sierra de Albarracín, en Griegos (Zap.)”.

LECTOTYPUS (designated here). — Albarracín, Griegos, Zapater *s.n.* (MA 126816).

REMARKS

The lectotype (MA 126816) has seven fragments of the flowering stems, most of them without leaves. The sheet has three labels in the lower right-hand corner with the following notations in black ink. Label 1: “Caroli Pau Herbarium hispanicum [printed and underlined] // *Santolina longidentata* Pau / (notas bot. fasc. 6) p. 28, n. 103 / (1888) // Albarracín (Griegos) // Zapater legit [Pau’s handwritten notation]. Label 2: *Santolina rosmarinifolia* b) *heterophylla* subv. *virens macrocephala* Pau, *Not. Bot. Fasc.* 2: 28 (1888) = / *S. longidentata* Pau, *Not. Bot. Fl. Esp.* 6: 60 (1895) // Me parece que esta planta, herborizada por Reverchon en Griegos, Hervier se lo comunicó a Rouy, que la dio como especie nueva y le dio la localidad en el Pirineo, al confundir Griegos con Gedre // C. Pau” [Pau’s handwritten notation]. Label 3: Label of determination of E. Guinea: JARDÍN BOTÁNICO DE MADRID [printed] // *Santolina pectinata* [underlined] Lagasca // 3 IX 1966 [E. Guinea’s handwritten notation in rose ink].

This specimen displays all the characteristics listed in the protologue: “Cabezuelas grandes, semiesféricas, no umbilicadas, solitarias, hojas del tallo parecido á la *Achillea microphylla* W.”.

DISCUSSION

Asso y del Río (1779, 1784) considered that plant habit, leaf shape, leaf apex, leaf incision and lobe insertion were good diagnostic characteristics, but in 1784 he included plant colour as a new diagnostic character. In contrast, López Udías *et al.* (1997) used the presence/absence of plant indument, leaf incision, and insertion of the appendage of the outer bracts to differentiate *S. ageratifolia* from the remaining taxa of the *S. rosmarinifolia* aggregate.

Rivero-Guerra (2011) demonstrated that leaf shape, leaf incision, and lobe insertion are variable between individuals of a given population; therefore, they are not good taxonomic characters. The shape of the leaf apex has no taxonomic value except to differentiate *S. impressa*, *S. orocarpetana* (Rivero-Guerra in press) and *S. × oblongifolia* nothosp. from the remaining taxa of *S. rosmarinifolia* aggregate. Plant habit and colour differentiate *S. ageratifolia* from the remaining taxa of the *S. rosmarinifolia* aggregate. The receptacle is conical in *S. rosmarinifolia* subsp. *arrabidensis*, *S. ageratifolia*, and *S. elegans* exclusively. The appendage of the involucre bract is dark copperish and fragile in *S. ageratifolia*, whereas in the remaining taxa, it is hyaline and robust. The plants of *S. rosmarinifolia* subsp. *rosmarinifolia*, *S. ageratifolia*, *S. rosmarinifolia* subsp. *arrabidensis* (69.09% of the individuals), and *S. × oblongifolia* (26.81% of the individuals) are glabrous, whereas the remaining taxa are tomentose, glabrescent, tomentose to glabrescent or sericeous. Finally, *S. ageratifolia* does not have viscose glands, except on the flowers and interseminar bracts, whereas the plants of the remaining taxa have viscose glands.

Study of the morphological variation of the *S. rosmarinifolia* aggregate (Rivero-Guerra 2011) suggests strong relationships between the subspecies of *S. pectinata* (*pectinata* and *montiberica*) and *S. ageratifolia*, but the morphological differences between those three taxa are greater than those within *S. pectinata*. The study also suggests that *S. ageratifolia* probably derived from *S. pectinata*.

This work demonstrated that *S. pectinata* var. *paniculata* Loscos & J. Pardo is not a synonym of *S. longidentata*, as Pau (1895) suggested. It is a synonym of *S. chamaecyparissus* L. *sensu stricto*. The

results indicated that *S. longidentata* Pau is synonym of *S. ageratifolia* as Pau (1907a) and López Udías *et al.* (1997) suggested. The invalid name *S. rosmarinifolia* subvar. *virens macrocephala* Pau has no status under the ICBN; however, it has been cited as synonym of *S. ageratifolia*.

These clarifications can help future studies on speciation patterns and process in *Santolina* and, by extension, in angiosperms in general. The following full synonymy is accepted.

Santolina ageratifolia Barnades ex Asso

Introductio in Oryctographiam, et Zoologiam Aragoniae accedit. Enumeratio stirpium in eadem noviter detectarum n. 805: 179 (1784).

TYPUS (as given in the protologue). — “*circa pagum Rodenas*”.

LECTOTYPUS (designated here). — fig. 464 (*Abrotanum femina, virens, vermiculato, serrato folio*) of *Plantae per Galliam, Hispaniam et Italiam* of Barrelier (1714: p. 117) / tab. Viii. Fig. 3 of *Osservazione quarantissima prima – L'origine, e prima impressione di alcune piante marine, imperfette, come fuchi, coralline zeophite, fungi terrestri, e simili* of Schrockius (1697).

EPITYPUS (designated here). — Teruel, Ródenas, 40°38'87"N, 1°31'12"W, 1400 m, conglomerates, sandstone and red limolite, 15.VII.1998, *A. O. Rivero-Guerra s.n.* (SEV 277730; Fig. 1).

Santolina rosmarinifolia L. subv. *virens macrocephala* Pau, *Notas botánicas de la Flora española* 2: 28. (1888) (*nom. inval.* cf. Art. 23.1 of ICBN). — Lectotype not cited.

Santolina longidentata Pau, *Notas botánicas de la Flora española* 6: 60 (1896). — Type (as given in the protologue): “Sierra de Albarracín, en Griegos (Zap.)”. — Lectotype (designated here): Albarracín, Griegos, *Zapater s.n.* (MA 126816).

Santolina rosmarinifolia sensu Asso, *Synopsis Stirpium Indigenarum Aragoniae* n. 805, 116 (1779), non L., *Species Plantarum* II: 842 (1753).

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