

Typification and synonymy of names in *Santolina* (Asteraceae: Anthemideae) published by Hoffmannsegg and Link

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During recent studies in the *Santolina rosmarinifolia* L. aggregate, nomenclatural problems with the the names *S. impressa* and *S. semidentata* published by Hoffmannsegg and Link were revealed. Here, both names are neotypified and *S. rosmarinifolia* var. *cinerea* Pau & Merino and *S. zamorana* Losa are lectotypified. The criteria used to recognise *S. impressa* and *S. semidentata* and their diagnostic characters are discussed. Revision of the lectotypes of *S. rosmarinifolia* var. *cinerea* Pau & Merino and of *S. zamorana* Losa suggests that both names are synonyms of *S. semidentata*. The full synonymy of *S. impressa* and *S. semidentata* is provided.

Recent studies in Anthemideae (Compositae) have focused on reconstructing phylogeny and interpreting the biogeography (Francisco-Ortega et al. 1997, Oberprieler and Vogt 2000, Watson et al. 2000, 2002, Oberprieler 2002, 2004a, 2004b, 2005, Oberprieler et al. 2009). In the course of these evolutionary studies, it has also been found helpful to revise certain taxa of the tribe. One example is *Santolina*, a genus endemic to the Mediterranean Region. Recent studies based on cytogenetics, morphology and ecogeography, Rivero-Guerra (2008a, 2008b, 2008c, 2009, 2010a, 2010b) demonstrated that the *S. rosmarinifolia* aggregate consist of 11 taxa. The pattern of morphological variation indicate a recent diversification process and as a consequence the included taxa are poorly differentiated (Rivero-Guerra 2010b). During these studies, nomenclatural problems with the names *S. impressa* and *S. semidentata* published by Hoffmannsegg and Link (1820) were revealed. The main objects of this study are: 1) to designate a neotype of *S. impressa* and of *S. semidentata*, 2) to designate lectotypes of *S. rosmarinifolia* L. var. *cinerea* and *S. zamorana*, and 3) to treat all the names available as synonyms of *S. impressa* and *S. semidentata*.

Taxonomic background

Santolina impressa, a diploid species with $2n = 2x = 18$ (Fernández and Queirós 1971, Rivero-Guerra 2010a), is endemic to Portugal with a restricted geographical distribution; its habitat is the dunes (composed of gravel, sand, clay and mud) from the mouth of the Sado River to Cape Sines. It is found at altitudes between 8 and 34 m a.s.l. (Rivero-Guerra 2008a).

Nyman (1854–1855), Franco (1984), Greuter (2008) and Rivero-Guerra (2010a, 2010b) all accepted this species. In contrast, Coutinho (1913) reduced *S. impressa* to a variety of *S. rosmarinifolia*, but Guinea (1970) did not include this work in his review. Guinea and Tutin (1976), Rodríguez-Oubiña and Ortiz (1993) and López Udías et al. (1997) did not recognise *S. impressa* as a species. In addition, Greuter (2008) cited *S. rosmarinifolia* var. *canescens* sensu Sampaio as a synonym of *S. impressa*, although Sampaio (1946) applied this name to plants from Bragança (*S. semidentata*).

Santolina semidentata, a diploid species with $2n = 2x = 18$ (Valdés-Bermejo and Antúnez 1981, Franco 1984, Rivero-Guerra 2009), is endemic to the northwestern Iberian Peninsula (León, south of Lugo, northeastern portion of Ourense, north of Zamora and Tras-os-Montes provinces, and the Brezo massif [Palencia]). It is found at altitudes of 400–1400 m a.s.l., usually on slates and quartzite or schist (Rivero-Guerra 2009).

The ample morphological variability of *S. semidentata* led to a much broader original species concept. Coutinho (1913) assigned the specimens from “arred. de Bragança” to *S. rosmarinifolia* L. var. *pectinata* (Lag.) Cout. Greuter (2008) cited it as a synonym of *S. semidentata*. Sampaio (1946) accepted *S. semidentata* as “*S. rosmarinifolia* var. *semidentata* (Hoff. & Link)”. He reported this variety together with “*S. rosmarinifolia* var. *canescens* (Lag.)” (non *S. canescens* Lag.) from the locus classicus of *S. semidentata* (Bragança). The variety *canescens* was previously described by Boissier (1841) for plants from the southern Iberian Peninsula. However, Guinea (1970) did not cite Sampaio’s and Coutinho’s works in his review. Silva-Pando et al.

(1984) ascribed the name *S. rosmarinifolia* var. *semidentata* to Guinea.

Santolina semidentata Hoffmanns. & Link was accepted as *S. rosmarinifolia* L. subsp. *semidentata* (Hoffmanns. & Link) Valdés-Bermejo by Valdés-Bermejo and Antunez (1981). Llamas García (1984), Silva-Pando et al. (1984), Rodríguez-Oubiña and Ortiz (1993) and Rivero-Guerra (2010b) all recognised this subspecies. However, López Udías et al. (1997), Rodríguez-Oubiña and Ortiz (1998) and Greuter (2008) recognised *S. semidentata* as a separate species. Close affinity was observed between this taxon and *S. rosmarinifolia* subsp. *melidensis* by Rivero-Guerra (2010b).

Furthermore, Losa España (1949) and Pau and Merino in Merino (1906) established a new species "*S. zamorana*" and a variety "*S. rosmarinifolia* L. var. *cinerea*", respectively within the geographical range of *S. semidentata*. Silva Pando et al. (1984) and López Udías et al. (1997) cited these two names as synonyms of *S. rosmarinifolia* subsp. *semidentata* and *S. semidentata*, respectively. However, Greuter (2008) did not include *S. rosmarinifolia* L. var. *cinerea* in the list of synonyms of *S. semidentata*.

Taxonomic history and circumscription of *S. impressa*

Hoffmannsegg and Link (1820) included "*Santolina rosmarinifolia*. Brot. lusit. I. p. 352" in the circumscription of *S. impressa*. The same did Nyman (1879). Brotero (1804), with respect to *S. rosmarinifolia* L., wrote: "*S. pedunculis unifloris: foliis linearibus, margine tuberculatis. Linn.*" // *Hab. Prope Setubal. // Folia in caule florescente linearia, integerrima, ad apicem verò utrinque denticulate, inferiora tuberculata*".

Brotero (1804) wrote "... *ad apicem verò utrinque denticulate, inferiora tuberculata*", whereas Hoffmannsegg and Link (1820) described it as: "*foliis linearibus obtusiusculis versus marginem impressis. ... // ... serie duplici dispositis, unde margo subcrenatus videtur ...*". Unfortunately, Brotero's herbarium was destroyed and the relevant specimen may be irremediably lost. No duplicates of the original material were distributed to other herbaria, and consequently, no known duplicate material exists. Therefore the taxonomic identity of Brotero's material can not be ascertained by examination of the original specimens. However, his diagnosis matches *S. rosmarinifolia* subsp. *arrabidensis*. Furthermore, the diagnostic characters published by Hoffmannsegg and Link (1820) match the plants that inhabit dunes, indicating that the morphological characters of these plants differ from those of *S. rosmarinifolia*.

Colmeiro (1887) suggested that the plants of Brotero from Setúbal are *S. rosmarinifolia* L., whereas the plants from "frente a Lisboa, allende del Tajo" collected by Link are *S. impressa*. He included "*S. rosmarinifolia* Brot." pro parte into the circumscription of *S. impressa*.

This species is closely related to *S. rosmarinifolia* subsp. *arrabidensis* Rivero-Guerra ($2n = 4x = 36$), endemic to Sierra de Arrábida, Portugal (Rivero-Guerra 2008c). However, they are morphologically differentiated (Rivero-Guerra 2010b) and probably not sympatric at present. The voucher specimen (BM 909648) collected by Welwitsch in 1840 on "*declives calcaires sinistram Tagi*

prope Aldea dos Irmãos" is the only evidence that these two taxa coexist. Specimens from the same locality were found in P (3 sheets) and MPU, all of them belong to *S. rosmarinifolia* subsp. *arrabidensis* s.s. The specimens ISAL-24989 (Vila Nogueira de Azeitão: Alto de la Magdalena on limestone substrate, without collector, 1987) and L 0653128 (S. de Arrábida. Gándoger, V-1905) indicate that *S. impressa* inhabits the Sierra de Arrábida, too. Gandoger (1917) have already reported *S. impressa* from Sierra de Arrábida. However, specimens from the following localities show a combination of the characters found in *S. impressa* and *S. rosmarinifolia* subsp. *arrabidensis*: 1) Serra da Arrábida: Valle de Xixaleiro, collected by Deveau in 1881 (COI), 2) Setúbal: "colinas" (COI) and in "nos Montes", collected by Luisier in 1900 (Herb. Colegio de S. Francisco: 7402) under the names *S. rosmarinifolia* L. var. *vulgaris* 2 and *S. rosmarinifolia* L. var. *genuina* f. 2. *impressa*, respectively, and 3) in *Palmela* on limestone substrate, collected by Carriso and Mendoza in 1925. Rivero-Guerra (2010b) suggested that *S. impressa* probably arose from *S. rosmarinifolia* subsp. *arrabidensis* prior to the polyploidisation process in the latter.

Another problem is the subjective delimitation of some populations of *S. impressa*, in particular the plants that occur between Alcácer do Sal and Troia. For example, Mariz (1894) distinguished two subvarieties of *S. rosmarinifolia* L. var. *vulgaris* Boiss.: "1. *folii viridibus*", and "2. *foliis tomentellis*". He included specimens from Valbom (Casimiro: COI), Troia (Brot., Daveau: COI, G), Azeitão (Moller), and Beira, Abrantes (R. da Cunha) in *S. rosmarinifolia* L. var. *vulgaris* Boiss. subv. 1. Furthermore, he included specimens from Valle de Xixaleiro in Sierra de Arrábida (Daveau: COI), "in front of Lisboa, on sand" (Hoffegg. & Link); Moita (R. da Cunha), Troia (Daveau: COI, G, R. da Cunha), Alcácer do Sal (R. da Cunha), and between S. Thiago de Cacem e Sines (Daveau) in *S. rosmarinifolia* L. var. *vulgaris* Boiss. subv. 2. This indicate that: 1) Mariz accepted a broader concept of Boissiers taxon, 2) he did not distinguish between the plants that live on sand and the plants from Sierra de Arrábida, 3) he treated the infrapopulational variation of the Troia population as different taxa, and 4) he distinguished the plants from Azeitão and Sierra de Arrábida as different taxa.

Considering *S. rosmarinifolia* L., Persoon (1797) and Link (1822) wrote "*peduc. unifloris, fol. linearibus margini tuberculatis*" and "*folia impressa*", respectively, but they reported no localities associated with this name. Furthermore, the specimens from Setúbal (MANCH and W) and Troia (BM 000909711), collected by R. P. Murray in May 1888 and labelled "*Santolina rosmarinifolia*", actually belong to *S. impressa*. Gandoger (1917) included the plants from Troia in the circumscription of *S. rosmarinifolia* L. Carvalho e Vasconcellos (1974) attributed the specimens that live on dunes from Tejo, Alentejo litoral and from Sines (ISAL s/n, 71056) to *S. rosmarinifolia* L.

Taxonomic history and circumscription of *S. semidentata*

Hoffmannsegg and Link (1820), wrote about the locus classicus of *S. semidentata*: "Fréquente aux environs de

Bragance". Brotero (1804) stated that *S. rosmarinifolia* L. "occurrit etiam circa Bragantiam varietas minor foliis linearibus confertis, obtusis; floribus minoribus". However, Hoffmannsegg and Link (1820) did not mention the comments of Brotero about the plants from Bragança.

Nyman (1854–1855), Colmeiro (1887), Franco (1984), López Udías et al. (1997), and Jeanmonod (2000) recognised *S. semidentata* as a distinct species. Lange (1861) attributed the plants occurring "in rupibus collibusque siccis: Villafranca at Carucedo (Vierzo), Valcabado de Páramo (León), Encinillas, in mont. Carpetanis frequens!" to *S. rosmarinifolia* Mill., whereas Willkomm and Lange (1865) attributed these populations to *S. rosmarinifolia* L. var. *vulgaris* Boiss. Our revision of Lange's collection in C revealed that these specimens belong to *S. semidentata*. Colmeiro (1887) considered that these specimens belong to *S. rosmarinifolia* L. However, Colmeiro (1887) included the plants from "... las cercanías de Bragança ..." into the circumscription of *S. semidentata*. Amo y Mora (1872) accepted that the plants from León province are *S. rosmarinifolia* L. var. *vulgaris* Boiss. On the other hand, Pau (1893) included the specimens collected "in ripis fluvii, prope urbem León" in *S. rosmarinifolia* L. (The specimen collected by Lomax in 1892 in "León, in ripis fluvii, prope urbem" shows that it is *S. semidentata*).

Mariz (1894) recognized two subvarieties of *S. rosmarinifolia* L. var. *heterophylla* Willk.: "1. *calathiis majoribus*", and "2. *calathiis minoribus*". He cited *S. semidentata* and *S. pectinata* Lag. as synonyms of *S. rosmarinifolia* L. var. *heterophylla* Willk. subv. 1, and *S. rosmarinifolia* and *S. rosmarinifolia* var. *minor* Mill. as synonyms of *S. rosmarinifolia* L. var. *heterophylla* Willk. subv. 2. He attributed the specimens from Bragança of Hoffmannsegg and Link, and those of Ferreira (G), to *S. rosmarinifolia* L. var. *heterophylla* Willk. subv. 1, and the specimen from "Bragança: monte S. Bartholomeu" (COI) collected by Moller to *S. rosmarinifolia* L. var. *heterophylla* Willk. subv. 2.

Gandoger (1917) considered that the specimens from León province (Cistróna, León (W), Peña Conada, Pte. de Castro, Riaño, and Villafranca) are *S. canescens* Lag., whereas the plants from Bragança and Regoa are *S. rosmarinifolia* L. Rozeira (1944) suggested that the specimens from Bragança, collected by Hoffmannsegg and Link and by Ferreira (COI), are *S. chamaecyparissus*, whereas the specimens from the same locality and from Vale de Ricafé (COI, G, MPU, P), collected by Sampaio and Mariz, are *S. rosmarinifolia* L.

Material examined

Link's personal herbarium was acquired by Berlin-Dahlem (B) after his death (Stafleu and Cowan 1981). The herbaria reported by Stafleu and Cowan (1981) to contain material of Link (i.e. B, BR, C, COI, FI, H, LIV, P, PH, and W) have been studied, as well as all Spanish herbaria that contain collections of *Santolina*. The greater part of Link's collections was destroyed during the Second World War. The type specimens of the two taxa considered here seem to have been lost or destroyed and duplicates of the original material were not distributed. Consequently, no duplicate material is known and the application of these names can not be

ascertained by examination of the type specimens, except for the synonyms of *S. semidentata*. The biotopes of the type locality of *S. impressa* have been much damaged through human activity, and no voucher specimens from this locality were found in any of the more than 40 consulted European herbaria. Therefore, in agreement with Articles 9.6, 9.9 and 9.11 of the ICBN (McNeill et al. 2006), neotypes for *S. impressa* and *S. semidentata* are designated here.

Typification

Santolina impressa Hoffmanns. & Link

Based on the same type: *S. rosmarinifolia* L. var. *impressa* (Hoffmanns. & Link) Cout., Fl. Port (1913, p. 740).

Protologue: "Dans les contrées sablonneuses en delà du Tage vis-à-vis de Lisbonne".

Type: Portugal, Setúbal, Troia Peninsula, 38°26'08"N 8°49'51"W, 8 m a.s.l., dunes (gravel, sand, clay, and mud), 7 Jul 1998, A. O. Rivero-Guerra (SEV 227513; neotype, designated here) (Fig. 1).

This specimen shows all the characters listed in the protologue: "*foliis linearibus obtusiusculis versus marginem impressis*."

Santolina rosmarinifolia L. subsp. *semidentata* (Hoffmanns. & Link) Valdés-Bermejo

Based on the same type: *S. semidentata* Hoffmanns. & Link, Fl. Port. 2 (1820, p. 362–363).

– *S. rosmarinifolia* L. var. *semidentata* (Hoffmanns. & Link) Samp., Fl. Port. 3 (1946, p. 570).

Protologue: "Fréquent aux environs de Bragança".

Type: Portugal, Bragança, Gondesende, 41°50'95"N, 6°52'93"W, 749 m a.s.l., schist and metabasic, 7 Aug 2007, A. O. Rivero-Guerra (SEV 227514; neotype, designated here) (Fig. 2).

This specimen displays all the characters listed in the protologue: "*Foliis canescentibus basi integerrimis antice quadrifariam dentatis dentibus acutiusculis, peranthodiis subtomentosis*".

Taxonomic synonyms: *Santolina rosmarinifolia* L. var. *cinerea* Pau & Merino in Merino, Fl. Galicia 2 (1906, p. 363).

Protologue: "Herbar. Num. 1.180 // En Galicia hemos encontrado esta forma, y no abundante, en la ribera pedregosa del Sil frente á la estación de la Rúa, Orense. Fl. desde Junio á fines de Agosto. (V. vivam)".

Type: MA 126695 (lectotype, designated here) (Fig. 3). The lectotype comprises several flowering and sterile stems or fragments of flowering stems. It has four labels to the right of the specimen with the following notation in black ink. Label 1: "N 8 // *Santolina rosmarinifolia* L. // Se me parece. // Rara; yase a orillas del Sil cerca de La Rúa. Lugo [underlined] // Leg. B. Merino 1905 [Merino's handwritten notation]". Label 2: "*S. rosmarinifolia* L. var. / *cinerea* // in Sill/15-11-1906 [Pau's handwritten notation]". Label 3: "126695 // HERBARIO DEL JARDÍN BOTÁNICO DE MADRID [printed notation] // *Santolina rosmarinifolia* L./ var. *cinerea* // Galicia: Orillas del Sil cerca de la Rúa. Lugo // 1905 // Leg Merino/det. Pau [anonymous's handwritten notation of the XX century]". Label 4: "*HORTUS REGIUS*



Figure 1. Neotype of *Santolina impressa* Hoffmanns. & Link.



Figure 2. Neotype of *Santolina semidentata* Hoffmanns. & Link.

MATRITENSIS (MA) — *FLORA HISPANICA/TYPUS* [underlined] // *Santolina rosmarinifolia* [underlined] L. var. *cinerea* [underlined] Pau et Merino // LUGO: *Orillas del Sil, cerca de la Rua* // Año. – 1905 // Leg. Merino // Det. Pau [anonymous’s printed notation of the XX century]”.

This specimen displays all the characters listed in the protologue: “*Rami ramuliqui puerulenti, apice (pedunculi) sicut et squamae anthodii cinereo-pubescentes; calathia e ramis prodeuntia et primum florentia, h.e., mensibus Junio et Julio labentibus magna 1 cm. diam., calathia serotina e ramulis erumpentia et toto mense Augusto florentia duplo minor*”.

– *Santolina zamorana* Losa, Contr. Fl. Zamora (1949, p. 126–127).

Protologue: “Habita en Rivadelago, en la estribaciones de la Sierra Segundera, generalmente rupícola en las zonas bajas y medias”.

Type: MA 174326 (lectotype, designated here) (Fig. 4). The lectotype comprises two plants. The plant on the left ends in a sterile stem and has six flowering stems, whereas the plant on the right has four flowering stems. It has two labels in the lower right-hand corner with the following notation in black ink. Label 1: “174326 // FACULTATIS PHARMACIE UNIVERSITATIS BARCINONENSIS // HERBARIUM [printed] // *Santolina zamorana* nov. [Losa’s handwritten notation] // HABITAT [printed]: *Rivadelago (Zamora) in rupibus et locis glareosis radicibus Sierra Segundera* [Losa’s handwritten notation] // LEGIT [printed] *Losa Julio 1945* [Losa’s handwritten notation]”. The label

shows a rectangular stamp in red ink indicating: “*envenenada*”. Label 2: “*Santolina zamorana* nov. // line // para dibujar // line [Losa’s handwritten notation in black ink]”.

This specimen displays all the characters listed in the protologue: “*A S. chamaecyparissus L. differt; albo canescente, ramis hornotinis foliis tomentosis; annotinus paucis et remotis; calathis squamis exterioribus carinatis, interioribus appendicibus orbicularibus lacero-scariosis; floribus glanduliferis*”.

– *S. rosmarinifolia* L. γ. [var.] *pectinata* sensu Cout., Fl. Port. (1913, p. 740) (non *S. pectinata* Lag. 1816).

– *S. rosmarinifolia* L. var. *canescens* sensu Samp., Fl. Port. Ed. 2 (1946, p. 3: 570) (non *S. canescens* Lag. 1816).

Discussion

Hoffmannsegg and Link (1820) used the leaf characters (leaf shape, leaf incision, leaf apex, and lobe insertion) as diagnostic characters for *S. impressa*. Rivero-Guerra (2010b) demonstrated that these characters, together with the lobe number of the lower and middle leaves of the flowering and sterile stems, well differentiate *S. impressa* from all other taxa of the *S. rosmarinifolia* aggregate.

Hoffmannsegg and Link (1820) considered that plant indument, leaf incision, lobe apex, the presence/absence of the sessile leaf, apex of the involucre bracts, and the indument of the interseminiferous bracts as good diagnostic

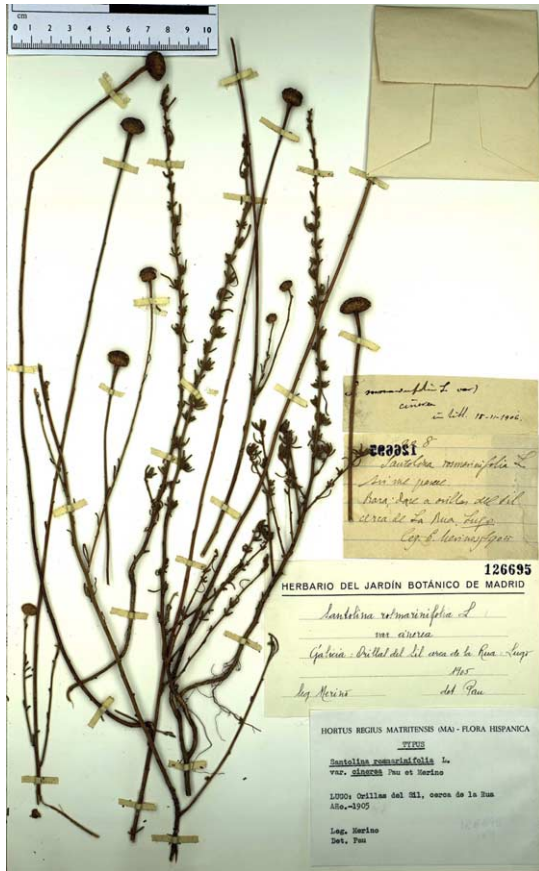


Figure 3. Lectotype of *Santolina rosmarinifolia* L. var. *cinerea* Pau & Merino.

characters for *S. semidentata*. However, Pau and Merino (Merino 1906) used plant indument, capitulum diameter and indument of the involucre bracts as diagnostic characters for their variety. Losa España (1949) used plant indument again, and included shape of the keel and shape of the appendage of the inner bracts as diagnostic characters for *S. zamorana*. Rivero-Guerra (2010b) demonstrated that plant indument, leaf incision, lobe apex, presence/absence of the sessile leaf, keel shape, and the indument of the involucre and interseminiferous bracts are not good taxonomic characters to differentiate *S. semidentata* from other taxa of the *S. rosmarinifolia* aggregate. She demonstrated that *S. semidentata* is ill delimited within this aggregate with respect to quantitative and qualitative characters, but the multivariate combination of all characters allows taxonomic segregation. The characters are: presence/absence of the fragile and not solid flowering stems, basal and fascicular leaf shape, insertion of involucre bract appendage, capitulum diameter, length of the middle leaves of sterile stems, length of the lower leaf of flowering stems, number of lobes of lower and middle leaves of sterile stems, length of lobes of the lower leaf of flowering stems, and width of the middle and first rows of the inner bracts.

Hoffmannsegg and Link (1820) and Losa España (1949) indicated that *S. semidentata* has a close relationship with *S. chamaecyparissus* L., and in the vicinity of Bragança it is possible to find *S. chamaecyparissus*, too. The diagnostic characters and description of *S. semidentata* are applicable to



Figure 4. Lectotype of *Santolina zamorana* Losa.

S. chamaecyparissus as well, except for three characters. The apex of the outer bracts is acute in *S. semidentata* and obtuse in *S. chamaecyparissus*; *S. chamaecyparissus* is a polymorphic species, but the plants of *S. chamaecyparissus* from Bragança do not have sessile leaves, and the fascicular leaves are pinnatisect with imbricate lobes. It is not possible to differentiate *S. zamorana* from *S. chamaecyparissus* with the diagnostic characters suggested by Losa España (1949).

Acknowledgements – This study was subsidised by the funds of Seville Univ. herbarium (SEV), Synthesis Project (AT-TAF-3669), and Portuguese Government (Fundação para a Ciência e a Tecnologia, FCT: SFRH/BPD/65092/2009). I am most grateful to Dr M. Laurin, Dr C. Romero Zarco, and Prof. B. Nordenstam for their helpful comments and suggestions in revising a pre-submission draft of the manuscript, to Dr F. J. Salgueiro, Curator of SEV herbarium, to library staff at the Biology Faculty of the Seville Univ., to Curator of G herbarium for their warm reception, professional conduct and technical assistance, and to J. Cabarga Gómez (Natural History Museum of Madrid) for her cooperation. I also thank the herbaria B, BR, C, COI, FI, H, ISAL, LISE, LISU, LIV, LY, MA, MANCH, P, PH, PO, S, W and San Francisco School herbarium (Portugal) for supplying vouchers via loan.

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