Phytotaxa 220 (1): 043–053
www.mapress.com/phytotaxa/

Article

ISSN 1179-3155 (print edition)
PHYTOTAXA
ISSN 1179-3163 (online edition)

http://dx.doi.org/10.11646/phytotaxa.220.1.3

Sisymbrium isatidifolium (Brassicaceae): a new species from southern Spain, and the identity of *S. hispanicum* Jacq.

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Abstract

A new species of the genus *Sisymbrium* is described, illustrated, and compared with the most closely related ones of the genus, *S. chrysanthum*, *S. hispanicum*, *S. crassifolium*, and *S. assoanum*, and the identity of *S. hispanicum* is discussed. The new species occurs on gypsiferous marls, forming part of the esparto grasslands and cultivated fields in the provinces of Albacete, Jaén, Granada, and Almería (southern Spain). In addition, a distribution map, illustrations, and a description of the habitat of the new species are presented.

Key words: Cruciferae, Iberian Peninsula, taxonomy

Introduction

The genus *Sisymbrium* Linnaeus (1753: 657), in its more classic conception, includes between 77 and 100 species (Schulz 1924, Romanczuk 1982, Warwick *et al.* 2002), distributed in the Old World (c. 40 spp.) and the New World (c. 50 spp.). More recently, based on molecular (Warwick *et al.* 2002, 2006) and morphological (Warwick & Al-Shehbaz 2003, Al-Shehbaz 2006) phylogenetic studies, *Sisymbrium* consists of only 41 species, all native of the Old World, except *S. linifolium* Nutt. (1834: 12) of North America (Al-Shehbaz 2006, 2012), plus one more recently described from Turkey (Mutlu & Karakuş 2015). The rest of the New World species have been separated into other independent genera (Al-Shehbaz 2006).

The genus *Sisymbrium* (tribe Sisymbrieae De Candolle 1821a: 237) includes annual, biennial to perennial herbs, with simple or no trichomes, more rarely with branched trichomes (only in South African *Sisymbrium burchellii* De Candolle 1821b: 472); leaves entire to pinnatisect, the cauline ones never auriculate or amplexicaul at the base; flowers arranged in ebracteate racemes or sometimes foliose; sepals erect to erecto-patent, oblong, the lateral ones slightly gibbose at the base; petals yellow, with blade obovate and attenuated into a claw; lateral nectaries annular, confluent with the middle ones in a ring; androecium tetradynamous; style short and strongly 2–lobed stigmas; fruits linear siliques, valves with 3 veins visible at maturity; seeds uniseriate, with incumbent cotyledons.

In the Iberian Peninsula, the genus *Sisymbrium* is represented by 11–12 species (Ball 1964, Pujadas Salvá 1993). More specifically, the Sect. *Irio* De Candolle (1821a: 238), includes 4 species: *S. irio* Linnaeus (1753: 659), *S. assoanum* Loscos & Pardo (1863: 6), *S. austriacum* Jacquin (1775: 35), and *S. crassifolium* Cavanilles (1802: 437), the last two highly variable and polymorphic. *S. irio* is one of the species that can be easily distinguished from the others by having flowers with very small petals overreached by the young fruits.

Three Iberian Peninsula species are often treated as subspecies of *S. austriacum*: *S. hispanicum* Jacquin (1784: 12, tab. 124), which is also found in North Africa (Quézel & Santa 1962, Maire 1977), *S. contortum* Cavanilles (1802: 436) and *S. chrysanthum* Jordan (1861: 141), which have been distinguished by the size of the silique (shorter, wider in *S. chrysanthum*) and by the indumentums at the base of the stem, glabrous in *S. hispanicum* and hirsute in *S. contortum* (Pujadas Salvá 1993).

Accepted by Karol Marhold: 7 Jul. 2015; published: 16 Jul. 2015

According to our data, *S. contortum* is synonymous of *S. hispanicum*, and the plants of southern Spain constitute a new species, which we describe and illustrate in the present paper, discussing its affinities, distribution, and habitat.

Taxonomy

Sisymbrium isatidifolium Blanca, Cueto & J. Fuentes, **sp. nov.** (Figs. 1 & 2)

Species related to *Sisymbrium hispanicum*. It differs by its lowermost leaves oblong-obovate, obtuse, dentate to subentire, the middle ones oblong-obovate to oblong-linear, smaller flowers [sepals 2.4–3 mm, petals (3.5–)4–5 mm] and fruits generally smaller [(10–)15–25(–30) × 0.6–0.7 mm].

Type:—SPAIN. Granada: Orce, Llano de Almaida, margas yesíferas, 970 m, 30 Mayo 2013, *G. Blanca, M. Cueto & J. Fuentes 61401* (holotype GDA!, isotype HUAL!).

Annual to biennial herb, unicaule, glabrous, and glaucous. Stem (15–)20–70 cm, erect, simple, branched in the upper half, often with reddish tones. Leaves alternate, the lowermost 3–25 × 1–4 cm, rosulate, oblong-obovate, obtuse, dentate to subentire, narrowing progressively towards the base, sometimes with reddish tones in the central nerve and throughout the underside of the blade; the middle ones oblong-obovate to oblong-linear, sessile or subsessile, not amplexicaul at the base, serrate or entire, gradually decreasing in size upwards. Synflorescence ramose, corymbiform, with branches sometimes subpatent; racemes of up to 50–60 flowers, ebracteate. Pedicels (3.5–)4–6 mm, straight at flowering and sharply incurved in the fruit, 0.5–0.6 mm thick in the middle and thickening at the apex (to 0.8 mm). Sepals 2.4–3 mm, erect and very open, incurved at the base, oblong, yellow; the lateral ones slightly gibbose at the base. Petals (3.5–)4–5 mm, with obovate blade and attenuated to a claw. Androecium tetradynamous; lateral stamens (2–)2.5–3 mm, the middle ones (3–)3.5–4 mm; anthers 0.7–0.9(–1) mm. Siliques (10–)15–25(–30) × 0.6–0.7 mm, densely arranged, linear, slightly torulose, somewhat compressed, and with three veins well marked at maturity; style 1–1.8 mm, initially thicker and at maturity of the same width as the valves; stigma strongly 2-lobed; seeds 10–20, measuring 0.9–1 × 0.5–0.6 mm, uniseried, with incumbent cotyledons.

Etymology:—The specific epithet refers to the similarity of the leaves to those of *Isatis tinctoria* Linnaeus (1753: 670).

Distribution and habitat:—*Sisymbrium isatidifolium* is endemic to southern peninsular Spain, restricted to the provinces of Albacete, Jaén, Granada, and Almería (Fig. 3).

Grows on marly and gypsiferous soils, forming part of the open esparto grasslands or weedy and ruderal communities in the mesomediterranean bioclimatic belt at elevations between 550–1500 m. a.s.l. and in a dry ombrotype climate.

Phenology:—*Sisymbrium isatidifolium* flowers from May to June, and produces fruits from June to July.

Additional specimens examined (paratypes):—SPAIN. Albacete: Balazote y Venta del Conejo, 7–800 m, 17 June 1891, *Porta & Rigo 45437* (MA!); El Salobrar, cerca de Albacete, 740 m, 30SWJ90, 12 June 1986, *J. Molero 428015* (MA!); entre Urbanización Casas Viejas y autovía de Jaén, 686 m, 30SWJ917147, 23 May 2012, *A. Valdés Franzi 59889* (GDA!); La Felipa, 680 m, 30SXJ0318, 10 May 1986, *J.M. Herranz 355668* (MA!); La Pulgosa, 690 m, 30SWJ9813, 29 May 1986, *J.M. Herranz 355667* (MA!); N301, km 264, entre Albacete y Chinchilla de Monte Aragón, 710 m, 25 June 1996, *A. Schinini et al. 632048* (MA!). Almería: María, carretera AL–9102, sobre el Barranco del Saltador, 1095 m, 30 May 2013, *M. Cueto, G. Blanca & J. Fuentes 25586* (HUAL!); María, prox. Cortijo del Ventorrillo, 1015 m, 30 May 2013, *M. Cueto, G. Blanca & J. Fuentes 25587* (HUAL!); Oeste de María, 9 June 1976, *C. Gómez Campo 619991* (MA!). Granada: Entre Puebla de Don Fadrique y Cañadas de Cañepla, 20 June 1989, *G. Blanca & M. Cueto 29584* (GDAC!); Orce, cañada de Don Tomás, 1000 m, 30 May 2013, *M. Cueto, G. Blanca & J. Fuentes 25588* (HUAL!); Orce, Fuente Nueva, entre Cortijo Varela y Cortijo del Ñoño o de la Mojonera, 975 m, 30SWG4976, 23 May 2013, *G. Blanca, M. Cueto & J. Fuentes 61402* (GDA!). Jaén: Barranco del río Segura, 1500 m, June 1906, *E. Reverchon 45469* (MA!); Le Pozo, 1500 m, May 1905, *E. Reverchon 45470* (MA!); Le Pozo, 1500 m, June 1905, *E. Reverchon 45466 & 45467* (MA!); Sierra de Cazorla, 1500 m, June 1901, *E. Reverchon 45468* (MA!).

Comparison and discussion:—The identity of *Sisymbrium hispanicum* is controversial. In the original description of this species, Jacquin (1784: 12) indicated that it had "…*foliis lanceolatis, serratis, sessilibus*", as can be clearly appreciated in the detailed plate of the species (Tab. 124). This same characteristic also appears in the complete description of the species that this same author included in the what must have been an earlier work, but which appeared two years later (Jacquin, 1786: 69): "*...caulem…erectum & ex omnium fere foliorum axillis ramosum. Haec sunt lanceolata, acutiuscula, rariter serrata, sessilia & glaucescentia*". These same characteristics were mentioned by

later authors such as Willdenow (1801: 507), De Candolle (1821b: 463) and even Willkomm (1880: 799). Nevertheless, this latter author, pointing out the distribution of this species, included the exsiccata collected by Bourgeau in southern Spain (between Albacete and Chinchilla, Albacete Province, and near María, Almería Province), which correspond to a completely different plant (which we propose as *Sisymbrium isatidifolium*, sp. nov.), characterized by its lowermost leaves oblong-obovate, obtuse, dentate to subentire, the middle ones oblong-obovate to oblong-linear. Since Jacquin (1786) had not indicated a precise location for his species (only the specific epithet make reference to Spain), the details from Willkomm (*l.c.*) prompted a change in the conception of *S. hispanicum*, which has been assumed by later authors (Schulz 1924, Guinea 1970, Pujadas Salvá 1993, among others).

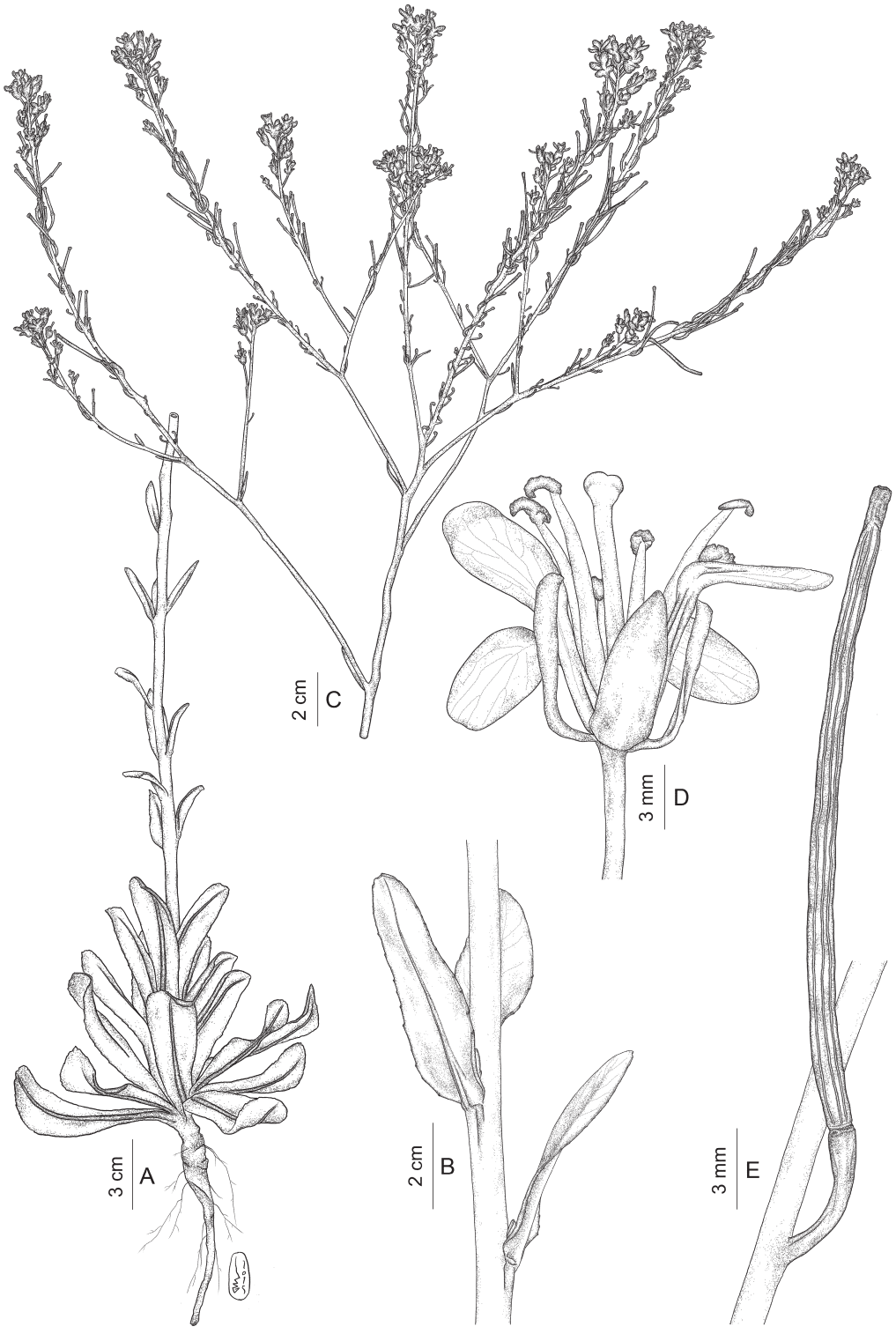

FIGURE 1. A–D *Sisymbrium isatidifolium* (from the holotype). **A**, Lower part; **B**, middle leaves; **C**, detail of the synflorescence; **D**, flower; **E**, silique.

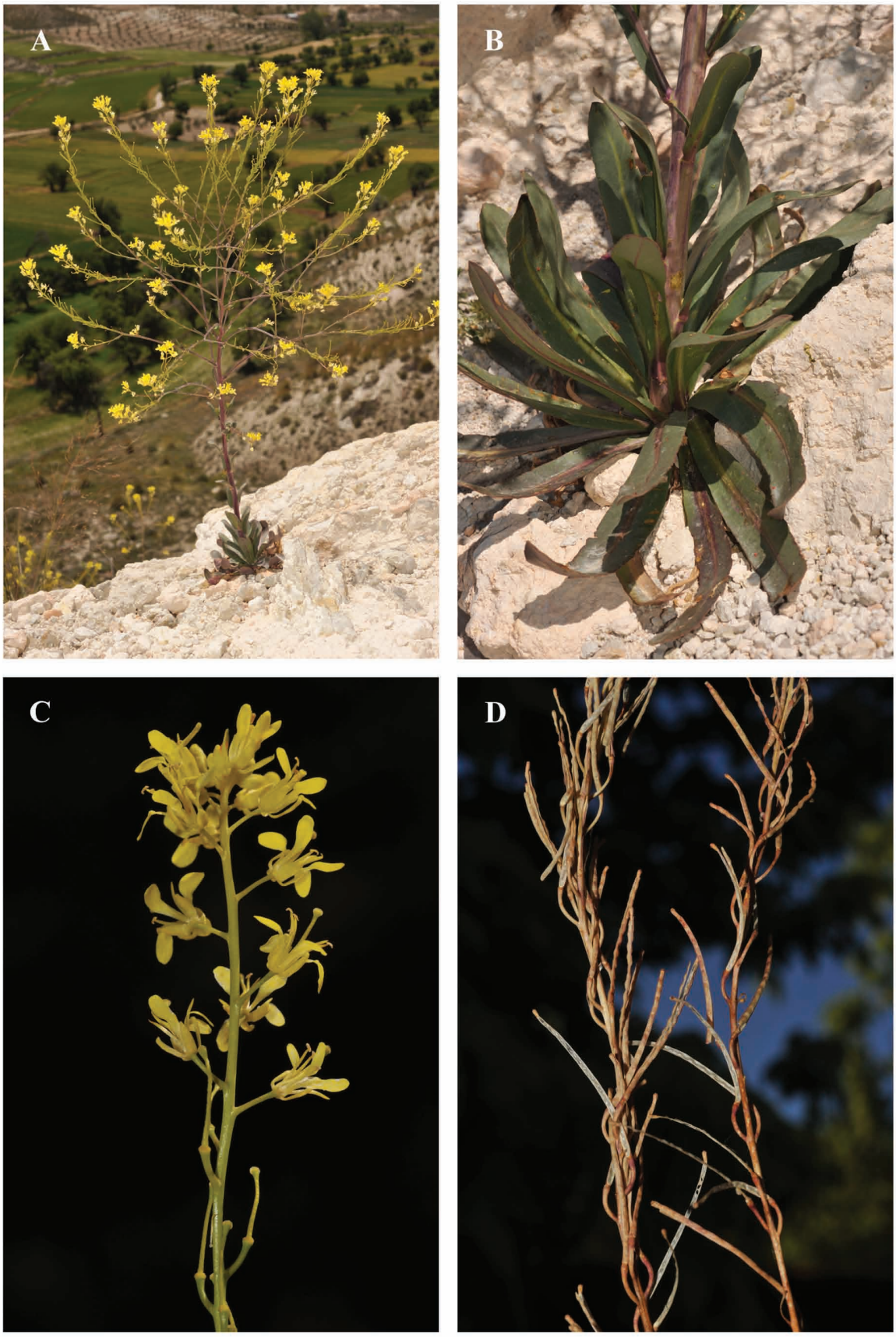

FIGURE 2. A–D Photographs of *Sisymbrium isatidifolium*: **A**, Habit; **B**, detail of the basal leaves; **C**, detail of the raceme; **D**, siliques.

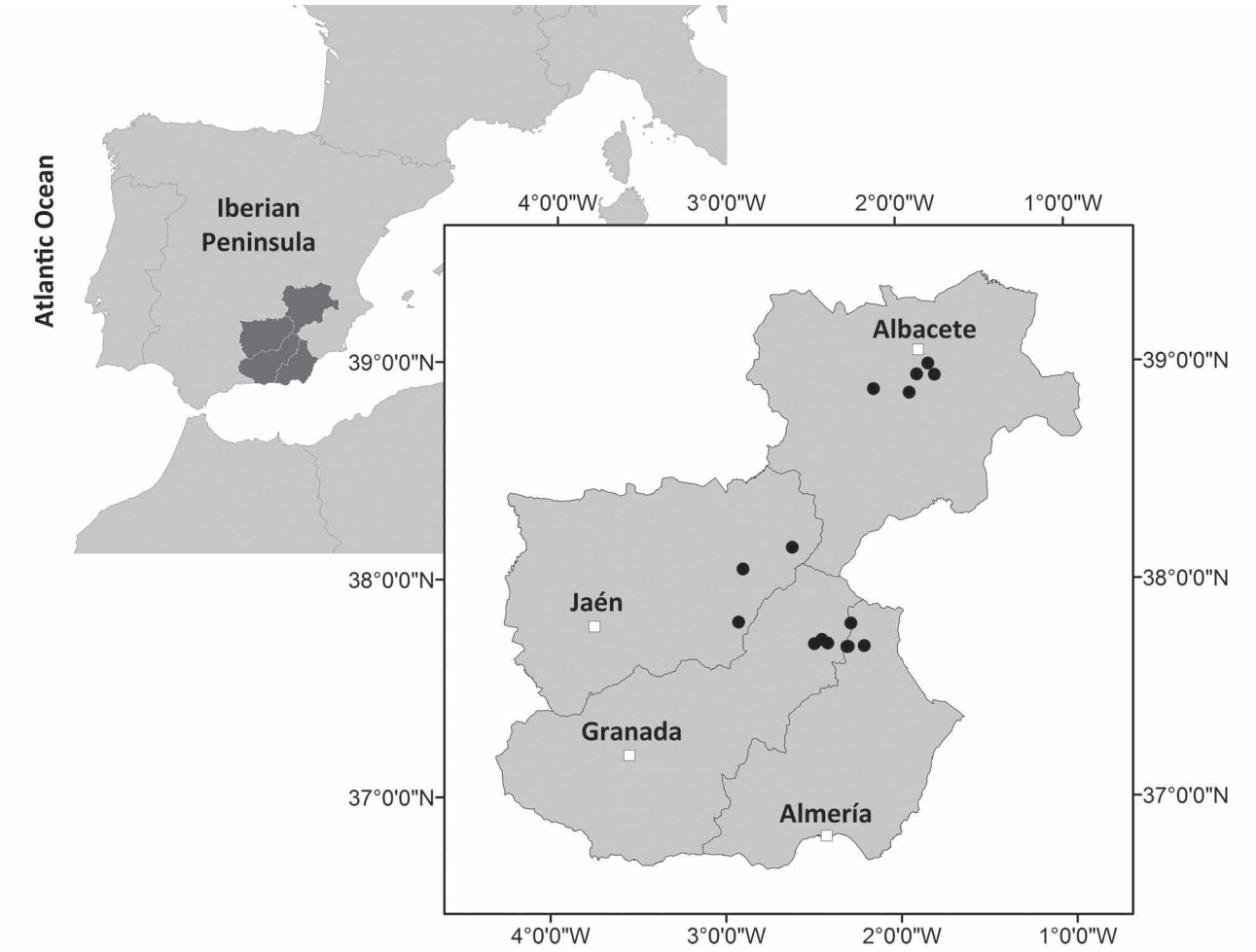

FIGURE 3. Map of the known populations of *Sisymbrium isatidifolium*.

Although, as stated above, a colour plate illustrates the identity of *S. hispanicum* (Jacquin 1784: tab. 124), where further details can be seen, we undertook a search for the specimens used at the time by Jacquin. As D'Arcy (1970) commented, there is no single "Jacquin Herbarium", but rather the material is scattered throughout several European herbaria. Specifically in the Hamburg Herbarium (HBG), the specimen numbered 506246! was chosen as the typus by O.E. Schulz (*in sched.*), from the herbarium of Willdenow. In this specimen, the leaves are lanceolate and the siliques are up to 27 mm (still immature) with strongly incurvate pedicels.

Other characters that have been used to differentiate a *S. hispanicum* from other closely related species are the undivided leaves and the lack of indument, especially at the base of the stem. These two characteristics are of only limited use, as some specimens exist in the most closely related species with at least the middle leaves undivided and linear lanceolate (Table 1). Regarding the indument, in the same species and in the same population, specimens can be completely glabrous together with others having hirsute stems, especially towards the base; this character has been used especially to distinguish *S. contortum*, which we consider synonymous of *S. hispanicum* after a detailed study of the data on the protologue and the typus deposited in the Herbarium del Jardín Botánico de Madrid (MA 476339!).

Table 1 lists the main differences between *Sisymbrium isatidifolium* and the other more closely related species. It is distinguished from the others by the type of basal and middle leaves. Also, *S. chrysanthum* is distinguishable by its very short siliques and, especially, for being wider, more or less appressed and parallel to the axis, with similarly appressed pedicels, much thinner than the silique; *S. hispanicum* has larger flowers and fruits; *S. crassifolium* bears much larger flowers and fruits, while *S. assoanum* has lax racemes, the fruits do not overlap, and the fruiting pedicels are generally longer, straight, and far thinner than the silique.

TABLE 1. Comparison of *Sisymbrium isatidifolium* with the more related species of the genus

	S. chrysanthum	***S. hispanicum***	***S. isatidifolium***	***S. crassifolium***	***S. assoanum***
Basal leaves	sinuate to runcinate-pinnatifid, sometimes hastate at the base, petiolate	lobed-pinnatisect to lirate-pinnatifid, sometimes hastate at the base, petiolate	oblong-obovate, dentate to subentire, gradually narrowed toward the base	sinuate to runcinate-pinnatifid, sometimes hastate at the base, petiolate	lobed-pinnatisect to lirate-pinnatifid, hastate at the base, petiolate
Middle leaves	pinnatifid to pinnatisect, sometimes hastate at the base, rarely linear-lanceolate	lirate-pinnatisect and petiolate to linear-lanceolate and sessile	oblong-obovate to oblong-linear	lirate-pinnatifid and petiolate to linear-lanceolate and sessile	lirate-pinnatifid and petiolate to linear-lanceolate and sessile
Racemes (fruiting)	dense, the fruits overlapping	dense, the fruits overlapping	dense, the fruits overlapping	lax or ± dense	lax, the fruits not overlapping
Sepals	2–3 mm	3–5 mm	2.4–3 mm	(3.5–)4–6.5 mm	2.5–3(–3.5) mm
Petals	3.5–5.5(–6) mm	(5–)6–7.5 mm	(3.5–)4–5 mm	7–12 mm	3.5–5(–6) mm
Siliques					
-length	(6–)10–17(–19) mm	(15–)20–45(–50) mm	(10–)15–25(–30) mm	(37–)45–82 mm	(10–)12–35(–42) mm
-width	1–1.3 mm	0.7–0.8	0.6–0.7 mm	1.2–1.4 mm	0.6–0.7(–1) mm
Pedicels (fruiting)	5–8 × 0.3–0.6 mm straight to slightly incurvate, relatively appressed, much thinner than the silique	4.5–8(–11) × 0.6–0.8 mm strongly incurvate, almost as wide as silique	4.5–6 × 0.5–0.7 mm strongly incurvate, almost as wide as silique	3–8 × 0.6–1 mm ± incurvate, slightly thinner than the silique	5–12 × c. 0.2 mm subpatent, straight, filiform, much thinner than the silique

List of related recognized species:

Sisymbrium chrysanthum Jordan (1861: 141)

Ind. loc.: "Hab. in Pyrenaeis…. Cette plante que j'ai reçu du Jardin Botanique de Lyon…"

Typus: BM 522261!

Distribution: Pyrenees and northern third of the Iberian Peninsula

Synonyms:

S. austriacum subsp. *chrysanthum* (Jord.) Rouy & Foucaud (1895: 17)

S. pyrenaicum (L.) Villars (1788: 341), non Linnaeus (1763: 916)

S. austriacum sensu Willkomm (1880: 798), non Jacquin (1775: 35)

Sisymbrium hispanicum Jacquin (1784: 12, tab. 124)

Ind. loc.: [Not mentioned explicitly]

Typus: HBG 506246!

Distribution: Northern, central and eastern Iberian Peninsula, and North Africa

Synonyms:

S. austriacum subsp. *hispanicum* (Jacq.) P.W. Ball & Heywood in Ball (1961: 17)

S. contortum Cavanilles (1802: 436)

S. austriacum subsp. *contortum* (Cav.) Rouy & Foucaud (1895: 19)

Sisymbrium crassifolium Cavanilles (1802: 437)

Ind. loc.: "….común en el Real Retiro y Casa de Campo…. Se cultiva en nuestro Jardín" [Madrid]

Typus: MA 476341!

Distribution: Iberian Peninsula and North Africa

Synonyms:

S. laxiflorum Boissier (1838: 9)

S. crassifolium subsp. *laxiflorum* (Boiss.) O. Bolòs & Vigo (1974: 73)

S. arundanum Boissier (1839: 30)

S. crassifolium subsp. *arundanum* (Boiss.) O. Bolòs & Vigo (1974: 73)

S. granatense Boissier (1854: 24)

S. mariolense (Pau) Cámara & Pau ex Cámara (1942: 334)

Sisymbrium assoanum Loscos & Pardo (1863: 6)

Ind. loc.: "Provenit in parte Aragoniae centralis, circa Zaragoza, Caspe…."

Distribution: Center and East of the Iberian Peninsula

Key for the Iberian Peninsula species:

1 Flowers axillary (racemes bracteate)..... 2
1 Flowers in terminal and ebracteate racemes 3

2 Flowers fasciculate, (1–)2–3(–4) in the axil of the leaves; petals c. 1.5 mm long..... ***S. polyceratium***
2 Flowers solitary in the axil of the leaves; petals 2.5–3 mm long ..... ***S. runcinatum***

3 Siliques 0.6–1.7 cm long, subulate-linear; fruiting pedicels appressed to rachis..... 4
3 Siliques 2–20 cm long, linear to subulate-linear; fruiting pedicels suberect to patent, not appressed to rachis .. 5

4 Siliques 1.3–1.7 cm long; petals 3–4.2 mm long ..... ***S. officinale***
4 Siliques 0.6–1.1 cm long; petals 1.3–2.2 mm long ..... ***S. cavanillesianum***

5 Fruiting pedicels nearly as wide as fruit..... 6
5 Fruiting pedicels narrower than fruit..... 11

6 Siliques subulate-linear, attenuate from the base up to the apex; petals 1.8–2.5 mm long..... ***S. erysimoides***
6 Siliques linear; petals longer than 2.5 mm 7

7 Distal cauline leaf blades divided into linear of filiform lobes; sepals cucullate ..... ***S. altissimum***
7 Distal cauline leaf blades not divided into linear or filiform lobes; sepals not cucullate 8

8 Siliques 5–20 cm long; racemes with less than 30 flowers..... 9
8 Siliques (1–)1.5–4.5 cm long; racemes 30–60 flowered..... 10

9 Plants annual; siliques 5–10 cm long, straight or slightly arched, of villose to glabrescent..... ***S. orientale***
9 Plants biennal to perennial; siliques 14–20 cm long, markedly arched, glabrous or glabrescent... ***S. macroloma***

10 Basal leaves lobed-pinnatisect to lyrate-pinnatifid, petiolate; petals (5–)6–7.5 mm long; siliques (15–)20–45(–50) mm long ..... ***S. hispanicum***
10 Basal leaves oblong-obovate, dentate to subentire, gradually narrowed toward the base; petals (3.5–)4–5 mm long; siliques (10–)15–25(–30) mm long..... ***S. isatidifolium***

11 Young siliques overtopping flowers; petals 2.5–3.5 mm long..... ***S. irio***
11 Young siliques not overtopping flowers; petals 3.5–12 mm long..... 12

12 Petals 7–12 mm long; fruiting pedicels 0.6–1 mm wide..... ***S. crassifolium***
12 Petals 3.5–5.5(–6) mm long; fruiting pedicels 0.2–0.6 mm wide..... 13

13 Siliques 1–1.3 mm wide; pedicels 0.3–0.6 mm wide, relatively appressed ..... ***S. chrysanthum***
13 Siliques 0.6–0.7 mm wide; pedicels c. 0.2 mm wide, subpatent..... ***S. assoanum***

Additional material studied (selection):—*Sisymbrium assoanum.* SPAIN. Albacete: Entre Jorquera y La Requeja, 580 m, 30SXJ2937, 10 May 1986, *J.M. Herranz 355666* (MA!); Peñas de San Pedro, 650 m, 29 April 1977, *Fernández Casas et al. 394741* (MA!). Cuenca: Tinajas, 780 m, 25 May 1996, *V.J. Arán & M.J. Tohá 573013* (MA!). Granada: Hoya de Baza, Galera, carretera A–330, 860 m, 30SWF3978, 1 April 2014, *G. Blanca & J. Fuentes 61204* (GDA!).

Huesca: Vedad de Fraga, 200 m, 13 June 1985, *A. Charpin et al. 371427* (MA!). Madrid: Rivas de Jarama, 28 April 1918, *C. Vicioso 45399* (MA!). Teruel: Castelserás, 29 May 1872, *F. Loscos y Bernal 202578* (MA!). Toledo: Soto de Oreja, 30TVK5833, 10 March 1977, *E. Valdés-Bermejo 315311* (MA!). Zaragoza: Calatayud, 550 m, 26 April 1986, *A. Segura Zubizarreta 497049* (MA!); Calatayud, 530 m, 30TXL1378, 7 May 1998, *J.M. Pisco García 638902* (MA!). ***Sisymbrium chrysanthum.*** SPAIN. Álava: Agiñiga, Sierra de Salvada, 900 m, 30TVN9164, 21 June 1980, *P. Heras et al. 315366* (MA!); Nanclares, 28 July 1909, *Hno. Elías 45481* (MA!). Burgos: Espinosa de los Monteros, Castros del Horno, 1350 m, 30TVN4272, 5 August 1987, *J.A. Alejandre 422804* (MA!); Robredo-Temiño a Tobes, Valle de las Navas, 940–970 m, 30TVN5205, 2 June 1988, *M.B. Fernández de Betoño & J.A. Alejandre 468524* (MA!). Cantabria: Espinama, subida al refugio de Aliva, 1450 m, 30TUN5479, 19 August 1976, *Castroviejo & E. Valdés 321656* (MA!); Picos de Europa, Peña Vieja, 4 September 1944, *C. Vicioso 45490* (MA!). Gerona: Caralps, Collado de Fontalba, 2137 m, 31TDG2991, 10 July 1988, *J. Paiva & A. Izuzquiza 456476* (MA!); Cerdaña, August 1849, *C. Costa 45500* (MA!). Güipuzcoa: Oñate, Sierra de Aloña, Botreaitz, 1250 m, 30TWN4960, 14 July 1985, *B. Fernández de Betoño & J.A. Alejandre 339687* (MA!); Zaldibia, Sierra de Aralar, 1300 m, 30TWN7661, 4 September 1986, *J.A. Alejandre 365026* (MA!). Huesca: Formigal de Sallent, 11 July 1906, *C. Pau 45486* (MA!); Valle de Benasque, Pista a la Renclusa, 1800 m, 31TCH0728, 12 July 1988, *J. Paiva & A. Izuzquiza 456476* (MA!). La Coruña: Fisterra, Sardiñeiro, 5 m, 29TMH8153, 20 August 1996, *J. Amigo 581362* (MA!); Malpica, Playa de Barizo, 29TNH1098, 12 July 1987, *E. Lago et al. 469775* (MA!). León: Ponferrada, Los Alperrhecianos, La Guiana, 1500 m, 15 June 1933, *W. Rothmaler 45492* (MA!); Sena de Luna, Collada de Arralla a Alto del Castro, 1600 m, 29 July 1998, *Martín-Blanco 641652* (MA!). Lérida: Bausén, Pontant, 660 m, 31TCH1445, 8 July 1992, *C. Aedo et al. 511635* (MA!). Logroño: San Millán de la Cogolla, 1200 m, 3 July 1985, *J.A. Alejandre 339685* (MA!). Navarra: Isaba, Monte Lakartxela, 1700–1900 m, 30TXN7257, 5 August 1987, *Uribe-Echebarría 465433* (MA!); Ochagavía, Bosque de Irati, 1300 m, 30TXN6158, 13 July 1994, *C. Aedo et al. 545707* (MA!). Pontevedra: Bueu, Menduiña, 22 July 1971, *S. Castroviejo 198108* (MA!); Moaña, Tirán, 14 July 1970, *S. Castroviejo 198114* (MA!). Santander: Sierra de Beger, bajo Potes, Desfiladero de Urdon, 14 July 1976, *M. Ladero & G. López 6296* (GDA!). Vizcaya: Aldamin, 1300 m, 30TWN1864, 9 July 1981, *B. Fernández de Betoño et al. 315337* (MA!); Orozco, Macizo de Gorbeia, Itxina, 1050 m, 30TWN1469, 3 August 1986, *B. Fernández de Betoño & J.A. Alejandre 365972* (MA!). ***Sisymbrium crassifolium.*** MOROCCO. Ksar es Souk, Atlas Mig, coll de Tanout-ou-Fillali, pr. Arbalou, Erms, 2000 m, 1 June 1991, *J. Molero & J. Vicens 51033* (GDA !); Moyen Atlas, Bekrit, 2000 m, 2 June 1924, *E. Jahandiez 45424* (MA!). PORTUGAL. Alto Alentejo: Campo Maior, Torre do Gaia, 17 April 1971, *Malato-Béliz & J.A. Guerra 268341* (MA!). SPAIN. Albacete: Sierra de Alcaraz, 1400 m, 30SWH57, 28 May 1976, *J. Fernández Casas 349636* (MA!). Alicante: Castells de Castells, Sierra de Aixorta, 1000 m, 30SYH48, 1 May 1994, *J.X. Soler 547317* (MA!); Serra de Mariola, Mola de Serelles, 900 m, 30SYH18, 15 May 1988, *J.R. Nebot 541662* (MA!); Sierra Aitana, Alcoleja, Pto. Tudons, 1020 m, 30SYH3381, 15 April 1995, *V.J. Arán & M.J. Tohá 556593* (MA!); Tibi, base del Maigmó, 11 May 1963, *A. Rigual 369449* (MA!). Almería: Sierra de los Filabres, 18 June 1929, *Gros 45422* (MA!); Sierra de María, tajos subiendo al Peñón de las Cucalas, 1850 m, 29 June 1985, *G. Blanca et al. 33519* (GDAC!). Badajoz: Bienvenida, Sierra de Bienvenida, 700–750 m, 29SQC4840, 21 April 1994, *E. Rico et al. 718895* (MA!); entre Maguilla y Casas de Pila, 30 May 1984, *P. Gómez 428315* (MA!). Cádiz: Grazalema, Loma de la Mojonera, 1300 m, TF8773, 26 March 1983, *A. Aparicio & J.G. Rowe 34793* (GDAC!); Grazalema, Puerto de las Palomas, 1100 m, 30STF8770, 29 April 1984, *A. Aparicio & S. Silvestre 438026* (MA!); Grazalema, San Cristóbal, September 1972, *C. Gómez-Campo & E. Hernández-Bermejo 619990* (MA!). Córdoba: Priego, Sierra Halconera, June 1960, *J. Borja 192180* (MA!); Sierra de Cabra, 5 May 1918, *C. Vicioso 45425* (MA!). Cuenca: Campillo de Altobuey, 25 May 1974, *A. González & G. López 315120* (MA!); Huelves, Estrecho de Paredes, 830 m, 30TWK1034, 21 March 1998, *V.J. Arán & M.J. Tohá 629648* (MA!); Pantano de Contreras, 16 May 1976, *J.A. Jiménez & G. López 556136* (MA!); Río Escabas, Boca del Infierno, Cañamares, 30TWK6277, 19 March 1977, *J.A. Jiménez & G. López 556137* (MA!). Granada: Alamedilla, 850 m, 30SVG8260, 16 May 2003, *C. Morales et al. 48281* (GDA!); Alfacar, pr. al Sanatorio, 1500 m, 30SVG52, 18 May 1979, *F. Pérez Raya 342667* (MA!); Alhama de Granada, Sierra Tejeda, camino hacia la Maroma, 1500 m, 30SVF0985, 15 June 2000, *C. Morales et al. 43762* (GDA!); Huéscar, La Sagra, El Canuto, 1800 m, 30SWH3801, 16 June 2002, *F.B. Navarro 48707* (GDA!); Puebla de Don Fadrique, Collado Blanco, 1290 m, 30 May 2013, *M. Cueto, G. Blanca & J. Fuentes 25585* (HUAL!); Sierra de Alfacar, cruce de las minas y Fuente de la Teja, 3 May 1983, *J. Guirado 15786* (GDAC!); Sierra de Baza, subiendo al Calar de Santa Bárbara, WG14, 29 June 1984, *J. Torres et al. 28940* (GDAC!); Sierra de Madrid, 1250 m, 30SVG2230, 11 May 1984, *P. Aroza & O. Socorro 16963* (GDA!); Sierra Nevada, Prado Llano, 2000 m, 15 July 1972, *J. Varo 28535* (GDA!); Sierra Nevada, San Jerónimo, 9 July 1971, *J. Fernández Casas 425617* (MA!); Sierra de Parapanda, 1200 m, 30SVG1830, 28 April 1983, *Aroza, Socorro & Negrillo 16671* (GDA!). Guadalajara: Alcorlo, Congosto de Cogolludo, 900 m, 27 May 1995, *V.J. Arán & M.J. Tohá 558637* (MA!); Candelera a Sacedón, 9 May 1974, *A. González & E. Valdés-Bermejo 335479*

(MA!); La Cabrera, 1120 m, 30TWL25, 23 April 1996, *Martín-Blanco 582376* (MA!). Huesca: Hecho, Embún, 800 m, 30TXN8727, 18 May 1969, *P. Montserrat 227550* (MA!); Sariñena, 290 m, 30TYM3828, 21 May 1975, *P. Montserrat 227551* (MA!). Jaén: Entre Cambil y Huelma, Sierra de Mágina, 1500 m, 30SVG57, 15 June 1982, *Molero Mesa et al. 315382* (MA!); Jabalcuz, 900 m, 30SVG2678, 8 May 1987, *J.M. Cejudo 26877* (GDA!); Jabalcuz, 1000 m, 30SVG2776, 19 May 1985, *C. Fernández 315368* (MA!); Sierra de Cazorla, Cerrados de Utrero, 8 May 1977, *G. Blanca 3443* (GDAC!); Sierra de Cazorla, subida al Parador, 1100 m, 30SWG09, 3 May 1975, *G. López* 321509 (MA!); Sierra de Cazorla, Valle del Guadalentín, 1500 m, 20 June 1990, *G. Blanca et al. 32868* (GDAC!); Sierra de la Cabrilla, Poyo Maguillo a Picón del Buitre, 1540 m, 30SWG1397, 25 June 2014, *J. Fuentes 61403* (GDA!); Santiago de la Espada, Sierra de Segura, Campos de Hernán Perea, Cañada Humosa, 1720 m, 30SWH2503, 25 June 2014, *J. Fuentes 61404* (GDA!). Lérida: Cubells, 450 m, 31TCG3036, 30 April 1983, *J. Pedrol 321123* (MA!). Madrid: Arganda, May 1960, *J. Borja 178361* (MA!); Cerro de los Ángeles, 6 May 1963, *E.F. Galiano 178252* (MA!); Cerro Negro, 21 May 1924, *Font Quer & Gros 45408* (MA!); entre Valdemoro y Aranjuez, 1 May 1969, *Demetrio & E. Valdés-Bermejo 335457* (MA!). Málaga: Ronda, Tajo de Ronda, 25 March 1970, *J. Fernández Casas 425592* (MA!); Torcal de Antequera, 1140 m, 30SUF6190, 27 May 1983, *E. Bayón et al. 321707* (MA!). Murcia: Sierra de Espuña, Morrón de Espuña, 23 June 1947, *C. Vicioso 315369* (MA!). Navarra: Caparroso, 350 m, 18 May 1975, *A. Segura Zubizarreta 299802* (MA!). Palencia: Laguna de la Nava, 30 April 1949, *F. Bellot & B. Casaseca 28547* (GDA!), *178247* (MA!). Segovia: Arévalo, Martín Muñoz de la Dehesa, 30TUL5848, 30 May 1984, *P. Galán et al. 315394* (MA!). Sevilla: Morón de la Frontera, Cerro Espartero, 29 March 1980, *Ladero et al. 12997*(GDA!), *225789* (MA!). Soria: Fuencaliente de Medinaceli, 1100 m, 19 May 1990, *A. Segura Zubizarreta 570222* (MA!); Renieblas, 1100 m, 10 June 1972, *A. Segura Zubizarreta 299791* (MA!). Teruel: Azaila, 280 m, 11 May 1974, *A. Segura Zubizarreta 299771* (MA!); Javalambre, 1800 m, 4 July 1975, *A. Segura Zubizarreta 299772* (MA!). Toledo: Añover del Tajo, 28 April 1974, *J. Gómez et al. 342662* (MA!); Mora, Montes de Toledo, 700 m, 30SVJ3489, 30 April 1984, *N. Marcos 338530* (MA!); Seseña, 28 April 1965, *F. Bellot 335431* (MA!). Valencia: Las Nogueras, XJ79, 900 m, 16 May 1984, *G. Mateo & R. Figuerola 335445* (MA!). Valladolid: Cigales, 740 m, 30TUM5823, 14 May 2007, *J.A. Lázaro Bello 798797* (MA!); Encinas de Esgueva, 27 April 1984, *J.L. Fernández Alonso 349449* (MA!); Quintanilla de Trigueros, June 1963, *G. Cruz 178359* (MA!). Zaragoza: Tauste, subida a la ermita de Sancho Abarca, 300–350 m, 2 May 1988, *J. Pedrol 494955* (MA!). ***Sisymbrium hispanicum.*** SPAIN. Albacete: Aldea de San Pedro, Lagunas de Ruidera, 29 May 1934, *J. González Albo 45419* (MA!); El Cascajal, 24 May 1933, *J. González Albo 94089* (MA!). Ávila: El Barco, 10 August 1974, *A. González 724913* (MA!); El Barco, Sierra del Barco, 1650 m, 30TTK7761, 27 July 1982, *R. Calvo et al. 321342* (MA!); Navacepeda de Tormes, 1500 m, 30TUK1170, 21 May 1992, *S. Sardinero 588476* (MA!); Sierra de la Paramera, Mengamuñoz, 1480 m, 26 July 1982, *J. Baranda et al. 335467* (MA!). Burgos: Ameyugo, June 1910, *Hno. Elías 45444* (MA!); Pradoluengo, 25 June 1979, *J. Varo et al. 5711* (GDAC!); Sotresgudo, peña Amaya, 1270 m, 19 July 1987, *M.L. Gil Zúñiga & J.A. Alejandre 424332* (MA!); Ubierna, 30TVN4304, 31 May 1984, *Galán Cela & G. López 640034* (MA!); Valle del Sol, Sierra Mencilla, 12 July 1997, *E. Fuentes 520554* (MA!). Cantabria: Camaleño, 1800 m, August 1987, *Moreno 685416* (MA!). Castellón: Begís, Barranco del Rasinero, 1450 m, 30SXK8817, 26 May 1996, *C. Fabregat & S. López Udías 598790* (MA!). Cuenca: Puente Vadillos, 17 May 1933, *A. Caballero 45438* (MA!). Guadalajara: Las Inviernas, 3 July 1970, *Bellot et al. 193490* (MA!). La Rioja: Antoñanzas, 800 m, 10 June 1978, *A. Segura Zubizarreta 299783* (MA!); Brieva de Cameros, 1480–1580 m, 30TWM1966, 11 July 1991, *M.L. Gil Zúñiga & J.A. Alejandre 533456* (MA!). Lérida: Boca de Huérgano, macizo de Peña Prieta, Hoyo de Vargas, 30TUN5664, 15 July 1990, *M.L. Gil Zúñiga & J.A. Alejandre 493427* (MA!). Madrid: Boadilla del Monte, 24 April 1994, *E. Sobrino Vesperinas 565952* (MA!); Chamartin, 2 May to July 1854, *E. Bourgeau 721198* (MA!); El Escorial, 920 m, 18 May 1976, *A. Crespo et al. 275482* (MA!); La Moncloa, May 1959, *J. Borja 202581* (MA!); Navalcarnero, 650 m, 30TVK1260, 19 April 2001, *R. Morales et al. 729139* (MA!). Navarra: Peña Otxanda, 800 m, 30TWN4819, 14 July 1986, *B.F. Betoño & J.A. Alejandre 365971* (MA!). Orense: Fonte de Coba, Casayo, Carballeda de Valdeorras, 1775 m, 29TPG88, 11 August 1984, *V.R. Gracia 517214* (MA!). Segovia: El Espinar, 4 August 1973, *E. Hernández Bermejo 619992* (MA!); San Rafael, 5 June 1972, *J. Gómez & E. Valdés-Bermejo 335461* (MA!). Soria: Riba de Escalote, 8 August 1963, *A. Segura Zubizarreta 299781* (MA!); Valloria, 1250 m, 27 May 1990, *A. Segura Zubizarreta 580685* (MA!); Villaciervos, 1240 m, 11 June 1988, *M.L. Gil Zúñiga & J.A. Alejandre 468786* (MA!). Teruel: Monreal del Campo, 28 August 1909, *Sennen 45416* (MA!). Toledo: Cerro Pelado, carretera a Puebla de Montalbán, 500 m, 30SVK0713, 11 April 1982, *P. Egido 448694* (MA!). Valencia: Cigales, 850 m, 30TUM5430, 6 June 2008, *J.A. Lázaro Bello 798801* (MA!). Valladolid: Casas Nuevas, June 1963, *G. Cruz 192191* (MA!); Quintanilla de Trigueros, June 1963, *G. Cruz 178358* (MA!). Vizcaya: Valdegovía, Ribera, 850 m, 30TVN8045, 24 May 1987, *B.F. Betoño & J.A. Alejandre 422794* (MA!). 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Acknowledgements

The authors would like to thank D. Belchí for providing the illustration of the new species, two anonymous reviewers for comments, and to David Nesbitt for the language editing. We are also grateful to the herbaria of the Real Jardín Botánico de Madrid (MA), University of Almería (HUAL), University of Granada (GDA and GDAC), and Institüt für Allgemeine Botanik (HBG).

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