

## A REVISION OF DESCURAINIA WEBB & BERTH. SECTION SISYMBRIODENDRON (CHRIST) O.E. SCHULZ IN THE CANARY ISLANDS.

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### RESUMEN

La sección *Sisymbriodendron* del género *Descurainia* (*Cruciferae-Sisymbrieae*) es endémica de las islas Canarias. En esta revisión se estima que contiene 7 especies en su mayoría de distribución local limitada. La morfología, citología y sistemas de reproducción del grupo se consideran y las llaves y descripciones para la identificación de las especies presentadas.

### SUMMARY

The section *Sisymbriodendron* of the genus *Descurainia* (*Cruciferae-Sisymbrieae*) is endemic to the Canary Islands. In this revision it is considered to contain 7 species mostly of limited local distribution. The morphology, cytology and breeding systems of the group are considered and keys and descriptions for identification of the species presented.

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### INTRODUCTION

The genus *Descurainia* Webb & Berth. *Cruciferae* (*Sisymbrieae*) occurs through North and South America, Eurasia, the Mediterranean region and Macaronesia. It is closely allied to *Sisymbrium* and *Lycocarpus* but differs from them by the distinct median vein in the siliqua valves and subcapitate stigma.

*Descurainia* with about 50 species has three main centres of diversity, to the South and East of the Great Basin of North America, the Andean highlands, and the Canary Islands in Macaronesia.

The members of the genus found outside the Macaronesian region are all annual or biennial herbs of Section *Descurainia* (Sects. *Sophia* Webb & Berth and *Seriphium* O.E. Schulz) but the Canary Island endemics are all perennial shrubs of the section *Sisymbriodendron* (Christ) O.E. Schulz.

The first description of a species of sect. *Sisymbriodendron* to appear in the literature was published by N.J. von Jacquin in 1787 under the name *Sinapis millefolia* Jacq. Aiton (1789) transferred this species to *Sisymbrium* and in 1836 Webb & Bethelot established the separate genus *Descurainia* with *D. millefolia* (Jacq.) Webb & Berth., *D. sophia* (L.) Webb & Berth. and *D. irio* (L.) Webb & Berth. *D. irio* is, however, generally considered to be a true *Sisymbrium* species.

In 1888 Christ returned *D. millefolia* to *Sisymbrium* in which he established the section *Sisymbriodendron* and added two further species *S. preauxianum* Webb and *S. bourgaeum* Webb ex Christ to it. In his revision of the tribe *Sisymbrieae* in 1924 O.E. Schulz reestablished the genus *Descurainia* and transferred Christ's section *Sisymbriodendron* to it. Since Christ's original publication of the section new species have been added to it by Pitard & Proust (1908), Sventenius (1953) and Bramwell (1973) giving a total of 7 Canarian endemic species.

#### MATERIAL & METHODS

This revision was based on herbarium specimens from the following herbaria: British Museum (Natural History) (BM), Royal Botanic Gardens, Kew (K), University of Reading (RNG), Herbarium Universitatis Florentinae (FI), Jardín de Aclimación de La Orotava (TENE), Jardín Botánico Viera y Clavijo (JVC) and on living material of known wild origin from the following: University of Reading Botanical Garden, University of Oslo Botanical Garden, I.N.I.A. Madrid, Jardín Botánico Viera y Clavijo as well as ample field studies.

Cytological data were obtained from material of known provenance grown at the University of Reading and at the Jardín Botánico Viera y Clavijo or from seeds and buds collected in the field.

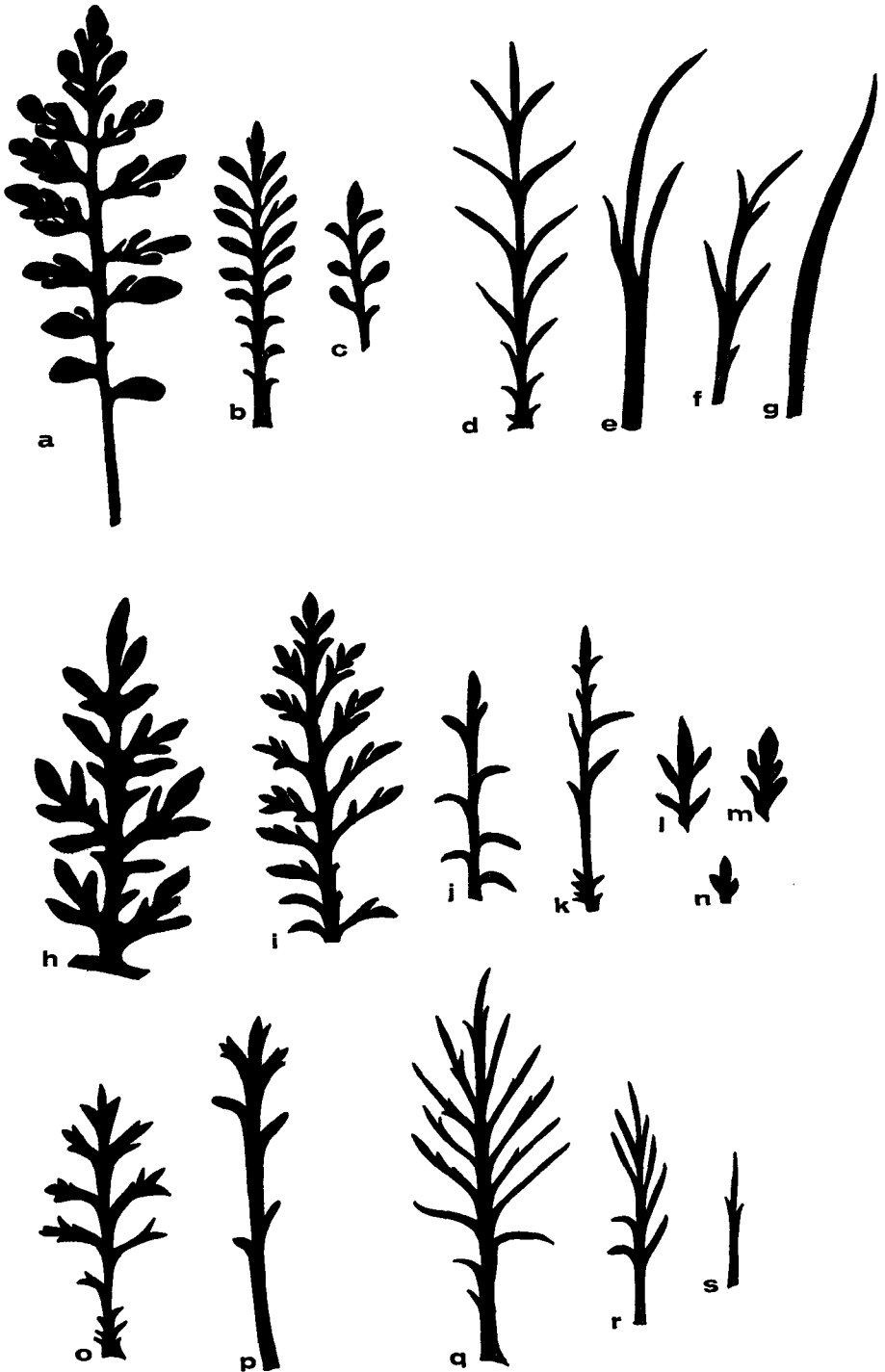
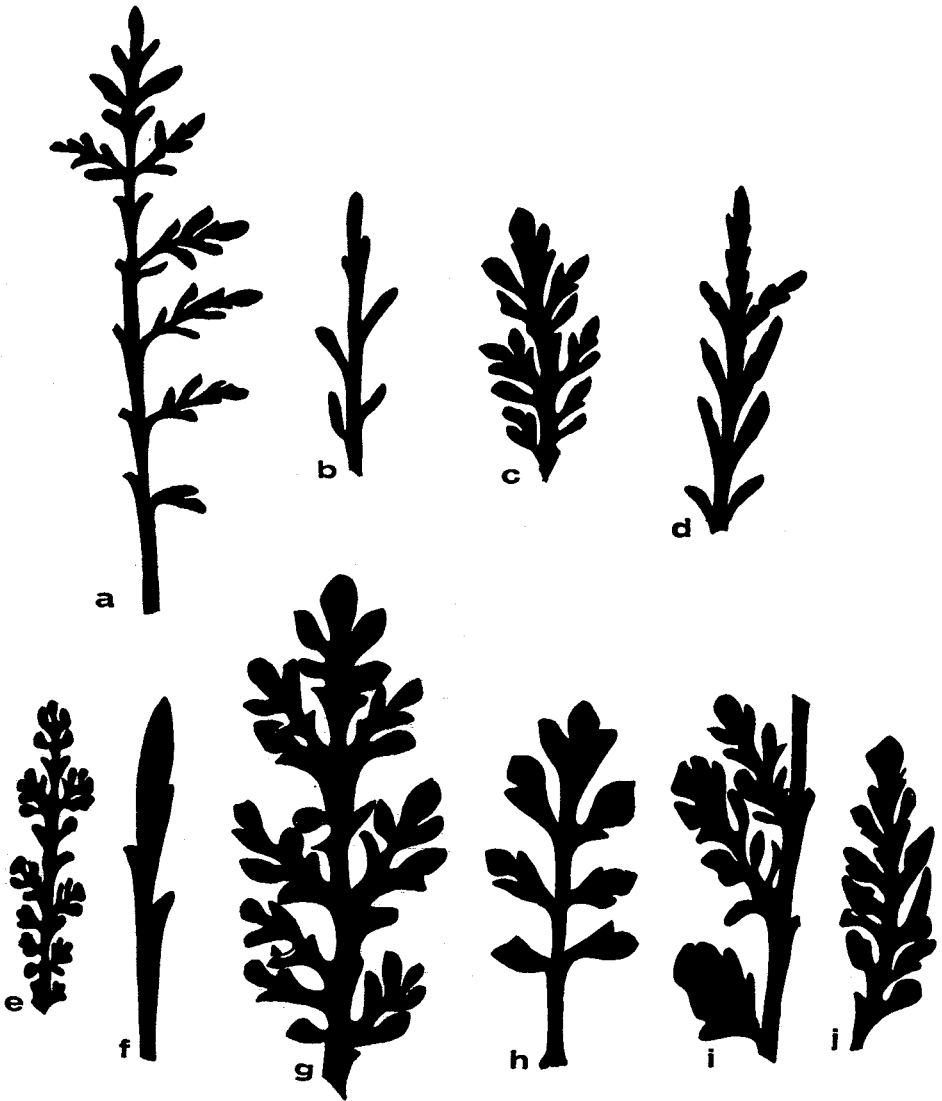


Figure 1. Leaf and leaf-segment variation in species of *Descurainia* sect. *Sisymbriodendron*.  
 1A. a-c *D. artemisoides*, d-g *D. gonzalezii*, h-n *D. lemsii* (h=primary segment),  
 o-p *D. bourgaeana*, q-s *D. preauxiana*.



1B. a-j *D. millefoiia*.

The author would like to acknowledge the considerable assistance given in the early stages of this revision by B. Petty MSc. at the Dept. of Botany, University of Reading.

## GENERAL MORPHOLOGY

*Habit.* There are two basic chamaephytic growth-forms within the section, a) a candelabra-shrub type with a well-developed central axis and short branches. *D. artemisoides* Svent., *D. lemsii* Bramwell and *D. gilva* Svent. have this growth-form and the very variable *D. millefolia* may be of this type or b), a compact, rounded habit branching freely from the base and without a definite central axis (*D. bourgaeana* (Webb ex Christ) O.E. Schulz, *D. gonzalezii* Svent., *D. preauxiana* (Webb) O.E. Schulz).

*Indumentum.* All species have both branched-substellate and unbranched hairs as well as glandular trichomes. The types of hair present may prove to be a useful character in infrageneric classification but this requires further study. The distribution and density of the indumentum is important for species delimitation in some cases within the section *Sisymbriodendron*. *D. preauxiana* has very few branched hairs and the indumentum consists mainly of glandular trichomes. In *D. lemsii*, however, glandular hairs are almost completely absent. The density of indumentum in *D. lemsii* and *D. bourgaeana* varies considerably in cultivation but the proportions of each type of hair remain relatively constant.

*Leaf-shape.* Though variable within species the degree of division of the leaves is a character of considerable taxonomic value within the group and a range of leaf-shapes is shown in Figure 1.

*D. bourgaeana*, *D. millefolia*, *D. lemsii*, *D. artemisoides* and *D. gilva* have 2- to 3-pinnatisect leaves with lobes of varying width whereas *D. gonzalezii* and *D. preauxiana* have pinnate leaves with linear lobes.

*Petals.* There are two basic petal-shapes within the section (Figure 2) oval and cuneate into a distinct claw (*D. millefolia*, *D. artemisoides*, *D. lemsii*, *D. gonzalezii*, *D. gilva*) and ovate to oblong-ovate, narrowing gradually into a short claw (*D. bourgaeana*, *D. preauxiana*). The length of the petal, the shape of the limb and the ratio of limb-to claw-length are generally reliable characters except in *D. millefolia* where the petal length is quite variable. This species sometimes has slightly lobed petals.

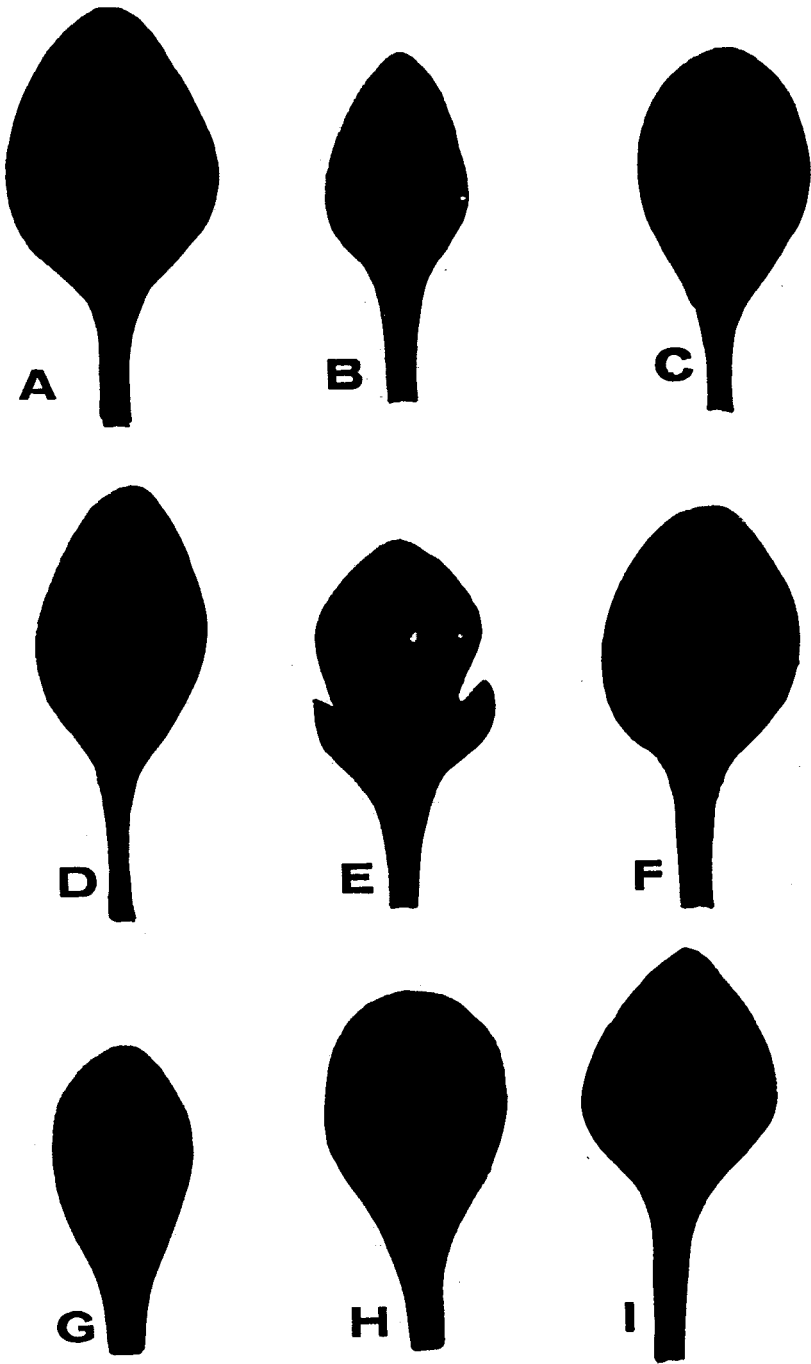


Figure 2. Petal shapes in *Descurainia*  
 A-B *D. artemisoides*, C. *gonzalezii*, D-F *D. millefolia*, G. *D. bourgaeana*, H.  
*D. preauxiana*, I *D. lemsii*.

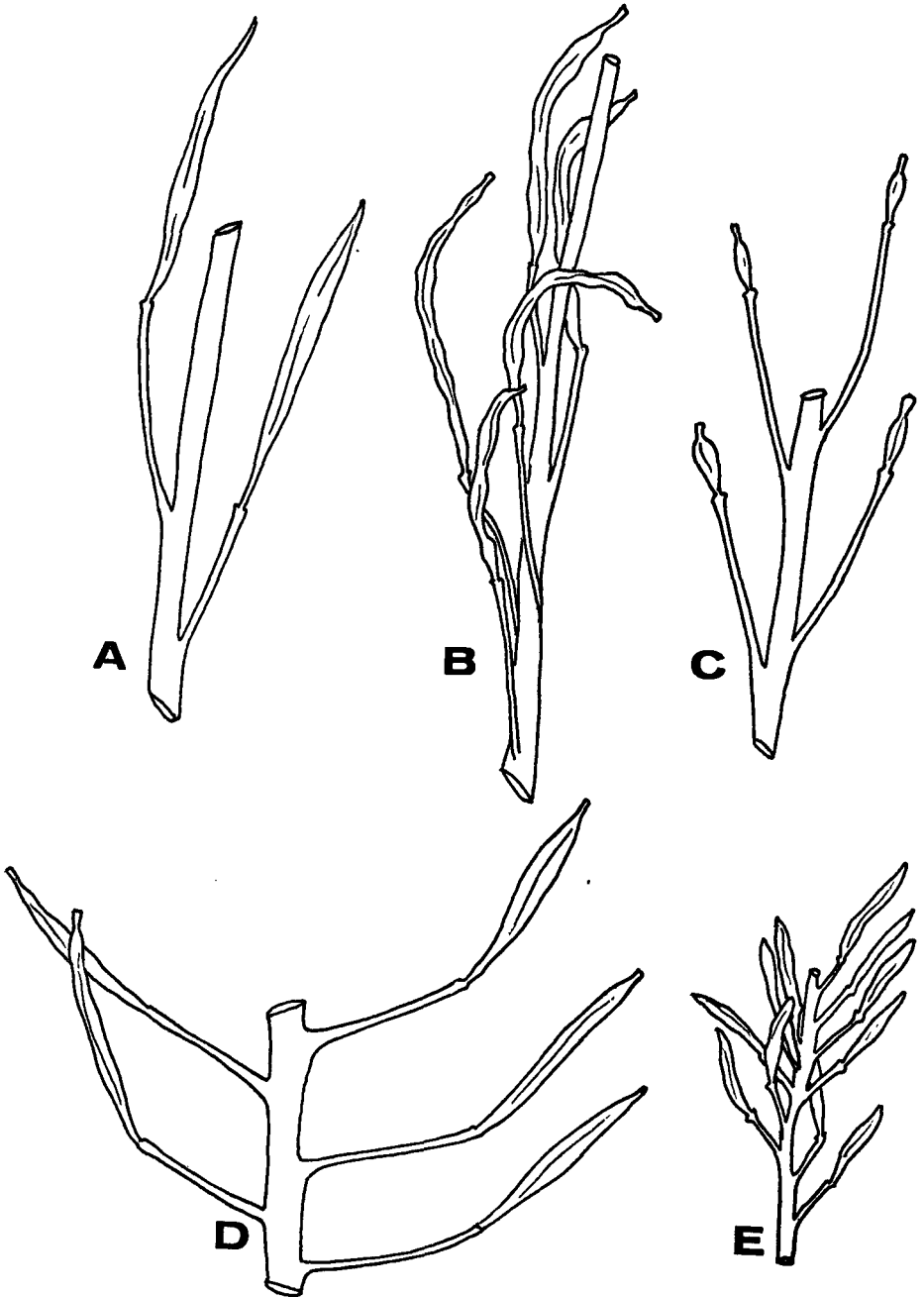


Figure 3. Fruiting Inflorescences in *Descurainia*  
A. *D. gonzalezii*, B. *D. lemsii*, C. *D. preauxiana*, D. *D. bourgaeana*, A. *D. millefolia*.

*Fruits and seeds.* The angle between the inflorescence axis and the base of the pedicel and the consequent orientation of the siliqua (patent, erect or ascending) is a reliable character for the separation of species in the group (Figure 4). The size of siliquae and the number of seeds per valve is also useful in several species. Several species have siliquae in which the seeds are biseriate rather than the normal uniseriate (Schulz, 1924). Detling (1939) has shown this variation to be associated with the width of the siliqua and the size of the seeds and certainly in *D. millefolia* and *D. artemisoides* the wider siliquae tend to have two rows of significantly smaller seeds whereas the narrow fruits have a single row of larger ones. Seed-shape, size and colour are, however, of value as taxonomic characters within the group.

#### CYTOLOGY AND BREEDING SYSTEMS

*Chromosome Numbers.* The chromosomes of *Descurainia* are uniformly small and form a polyploid series based on  $X=7$  (Baldwin & Campbell, 1940). Most of the Central and South American species are diploid with the exception of *D. myriophylla* (Willd.) R.E. Fries which is locally tetraploid (Manton, 1932). The North American species form a polyploid series up to hexaploid ( $2n=14, 28$  and  $42$ ). The Eurasian/Mediterranean *D. sophia* is tetraploid

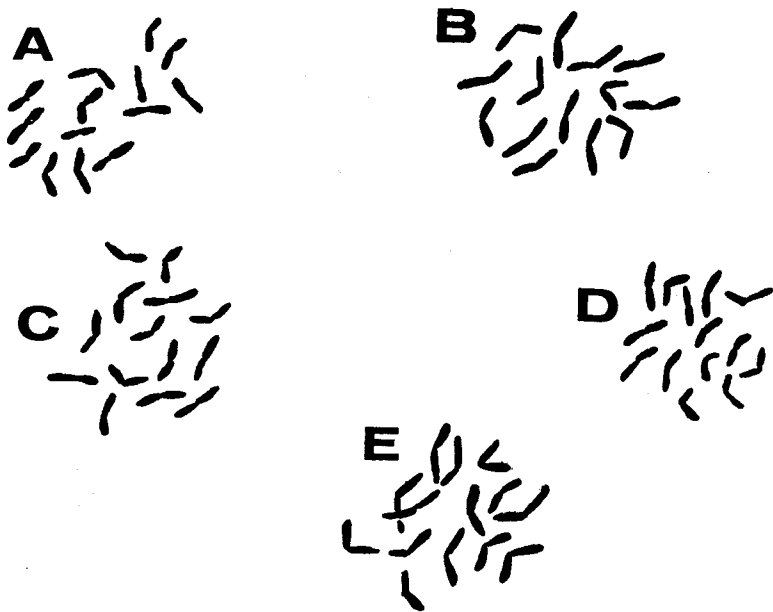


Figure 5. Mitotic Chromosomes of Canary *Descurainia* species, A. *D. lemsii*, B. *D. preauxiana*, C. *D. bourgaeana*, D. *D. artemisoides*, E. *D. millefolia*



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<u>SPECIES</u>	<u>2n</u>	<u>n</u>	<u>AUTHOR.</u>
D. artemisoides	14		Borgen, 1969 Bramwell, unpubl.
D. bourgaeana	14	7	Larsen, 1960, Bramwell, Bramwell, unpubl. Borgen, 1969
D. gonzalezii	21	7 14	Bramwell, unpubl. " "
D. lemsii	14	7	" "
D. millefolia	14		Larsen, 1960 Bramwell, unpubl.
D. preauxiana	14		Borgen, 1969 Bramwell, unpubl.

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Figure 4. Chromosome numbers in Canarian *Descurainia* species

(2=28) and all the Canarian endemics of sect. *Sisymbriodendron* are diploids ( $2n=14$ ) with the possible exception of some individuals of *D. gonzalezii*.

The chromosome numbers of the Canarian species are shown in Figure 4, *D. gilva* being the only uncounted species in the group. *D. gonzalezii*, a rare species from the subalpine zone of Tenerife, seems to have both diploid and tetraploids in two populations analysed at El Parador and Boca de Tauce (Figures 5 & 6). Borgen (1969), however, also reports triploid plants in this species grown from wild-origin seed. Borgen's material may well have come from a hybrid between diploid and tetraploid individuals and data on the fertility of the progeny as well as further analysis of wild populations of this species would be of considerable interest.

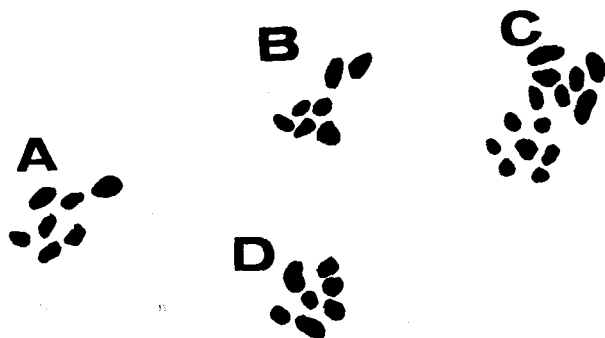


Figure 6. Meiotic chromosomes of Canarian *Descurainia* species, A. *O. lemsii* B. *D. bourgaeana*, D. *D. gonzalezii*  $n=14$ , D. *D. gonzalezii*  $n=7$ .

**Breeding System.** Compatibility tests were carried out on the following Canarian and non-Canarian species.

Canarian species	Non-Canarian species
<i>D. artemisoides</i>	<i>D. pinnata</i> ssp. <i>glabra</i>
<i>D. bourgaeana</i>	<i>D. pinnata</i> ssp. <i>menziesii</i>
<i>D. gilva</i>	<i>D. sophia</i>
<i>D. lemsii</i>	
<i>D. millefolia</i>	
<i>D. preauxiana</i>	

Some plants were isolated by bagging inflorescences and others by placing them in separate insect-proof greenhouses. Control plants were allowed to develop their inflorescences normally amongst plants of the same species or were actively cross-pollinated

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	bagged inflorescence	Isolated inflorescence	Open amongst plants of same species	Compatibility
	Percentage Siliqua formation			
1. <i>D. artemisoides</i>	0	0	74	SI
2. <i>D. bourgaeana</i>	0	0	53	SI
3. <i>D. gilva</i>	0	0	50	SI
4. <i>D. lemsii</i>	0	0	46	SI
5. <i>D. preauxiana</i>	0	0	50	SI
6. <i>D. millefolia</i>	0	0	65	SI
7. <i>D. pinnata</i> ssp <i>glabra</i>	75	100	100	SC.
8. <i>D. pinnata</i> ssp. <i>menziesii</i>	75	95	100	SC.
9. <i>D. sophia</i>	75	100	100	SC.

Figure 7. Compatibility tests on species of *Descurainia* 1-6 shrubby perennials SI, 7-9 herbaceous annuals S/C.

from other individuals of the same species. The number of siliquae formed with viable seeds was compared with the number of potential siliquae (number of individual flowers formed in each inflorescence) and a percentage fertility calculated (Figure 7).

The results indicate that the perennial Canarian species are strongly self-incompatible whereas the annual or biennial non-Canarian species are self-compatible. This would appear to be in accordance with the general trend from self-incompatibility to self-compatibility shown in other genera with annual, herbaceous weedy taxa derived from perennial frutescent ancestors.

This trend towards inbreeding is also found in floral morphology, the outbreeding Canarian shrubs have large, bright yellow petals and conspicuous nectaries but the herbaceous annual members of section *Descurainia* have smaller, pale yellow or whitish petals and small nectaries. As Baker (1959) points out there is a strong correlation between perennial species and self-incompatibility and annuals and self-compatibility and that the general trend is for outbreeding to be replaced by inbreeding rather than the reverse. In the case of *Descurainia* the change in breeding system coupled with cytological and morphological data seem to indicate a relictual nature for the shrubby Canarian taxa probably approaching the ancestral state of the other sections of the genus in habit, chromosome number, breeding system etc.

#### SYSTEMATIC TREATMENT

*Descurainia* Webb & Berth. sect. *Sisymbriodendron* (Christ) O.E. Schulz. Shrubs, base very woody. Lower leaves with dense, leafy axillary fascicles. Buds ovoid, not overtopping flowers. Flowers large; petals 3-6 mm, the lamina oblong to ovate, bright yellow, narrowing into a claw. Ovary cylindrical, 2-4 mm long. Siliquae more or less 4-angled; valves keeled. Seeds often slightly winged at apex and striate-granular. Canary Islands.

Type species *D. millefolia* (Jacq.) Webb & Berth.

#### KEY TO SPECIES

1. Sepals less than 2.5 mm, petals 3-4 mm.
2. Leaves more or less sessile, primary segments decurrent, pedicels of siliquae patent ..... *D. bourgaeana*

- 2. Leaves shortly petiolate, primary segments not decurrent, pedicels of siliqua ascending to erect. .... *D. gilva*
- 1. Sepals 3-4 mm, petals 5-6 mm.
  - 3. Lower leaves pinnate, lobes, linear, acute.
    - 4. Plants branched at base, leaves canescent with branched hairs ..... *D. gonzalezii*
    - 4. Plants branched above, leaves green, with glandular trichomes only ..... *D. preauxiana*
  - 3. Lower leaves 2- to 3- pinnatisect, lobes linear-lanceolate to ovate, obtuse to acute.
    - 5. Lower leaves petiolate, usually 3-pinnatisect, siliquae usually less than 20-seeded ..... *D. millefolia*
    - 5. Lower leaves sessile, usually 2-pinnatisect, siliquae 20- to 34- seeded.
    - 6. Leaf-lobes elliptic-ovate to spatulate, Siliquae about 20-seeded ..... *D. artemisoides*
    - 6. Leaf-lobes linear-lanceolate, Siliquae 28- to 32- seeded ..... *D. lemsii*

1. *D. gonzalezii* Svent., Bol. Inst. Nac. Inv. Agron. 28:17 (1953) *Sisymbrium gonzalezi* Svent. in exsicc. *Flora Selecta Canariensis* n° 218 (1950) *nomen nudum*.

Shrubby plant, 100-150 cm high, strongly branched at base, very woody. Branches erect, terete, covered by withered leaves; densely leaved but becoming sparse above; cortex of young branches creamish and of old, yellow to pale grey, splitting, covered in white branched hairs up to and including sepals, which have occasional long unbranched hairs. Lower leaves slightly pinnate, upper leaves entire, 2 - 5 cm long, pale nerved; segments 1 mm wide, linear, acute. Inflorescence unbranched or sparingly branched; pedicels 8 - 10 mm long; sepals 3 mm long x 1 mm wide, linear-lanceolate obtuse, erecto-patent; petals 5 mm long, lamina oblong. obtuse slightly undulate, equalling claw; stamens 2.5 - 3.0 mm long. Pedicels and siliquas lying close to axis of inflorescence; siliquas glabrous, linear, erecto-arcuate, about 2 cm long and 1 mm wide, gradually attenuate at both ends; septum 1 — nerved; seeds oblong-ovate, compressed, reddish, uniseriate. Figure 8.

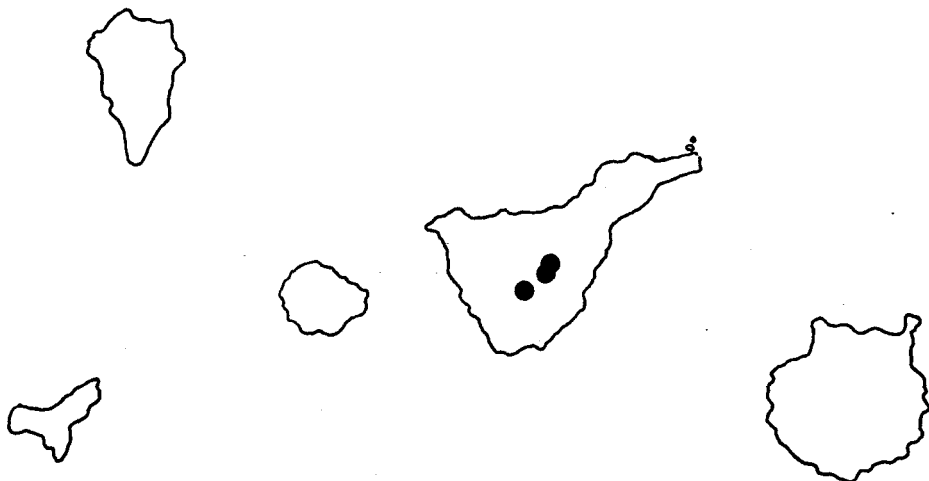


Figure 8. Distribution of *D.gonzalezii*.

Type: In insula nivaria reg. alpina "Las Cañadas" prope rupes "Azulejos" ad 2.200 m. supra mare. 28 aprilis 1944. E. R. *Sventenuis* (TENE).

Other specimens: Canary Islands, *Tenerife*; Las Cañadas, 2.100 m. 30.4.1969, *Bramwell* 1414 (RNG); Las Cañadas 2.000 m. 26.7.1972, *Bramwell* 3518 (RNG); Filo Las Cañadas 12.6.1899 R.P. Murray S.n. (BM), Las Cañadas, Montaña de las Arenas Negras, 20.5.1846, *Bourgeau* 682 (BM, K).

A rare species of the subalpine scrub vegetation of Las Cañadas, *D. gonzalezii* is found on lava and volcanic debris at about 200 m. Like *D. bourgaeana* which is found in the same area, this species overwinters as a few short woody stems which produce new shoots in spring after the winter snows have melted.

2. *D. bourgaeana* Webb ex O.E. Schulz, in Engler *Pflanzenr.* 105: 345.

*Sisymbrium bourgaea* Webb ex Fourn, *Recherch. Crucif.* 55 (1865)

*D. bourgaeana* Webb in Bourg., *Pl.Can.Exsics.* 1268 (1855)  
*Nomen nudum.*

*D. bourgaeana* Webb ex Christ, *Bot. Jahrb.* 9:89 (1888) in *synon.*

Branched shrub, woody at base, 25 - 65 cm high; young stems erect, greyish, more or less glabrous above, densely leafy below; mature cortex wrinkled and split. Leaves in axillary fascicles 2-pinnatisect, ovate, sessile, up to 4 cm. long, green-grey, tomentose with

branched hairs interspersed with glandular trichomes, primary segments decurrent, 3-toothed at apex; secondary segments shortly acute. Upper leaves petiolate, pinnate; segments linear-lanceolate, often 3-toothed. Inflorescences usually simple, erect, pedicels 6-10 mm long, sparsely pubescent with branched and glandular hairs. Sepals 2.0-2.5 mm with branched glandular and occasionally long, unbranched hairs. Petals 3-4 x 1.2-1.6 mm., lamina oblong, obtuse, gradually narrowing into a claw about 1/3 length of petal. Stamens 2.5-3.0 mm Siliqua-pedicels patent-ascending, 7-11 mm long; siliqua 11-17 mm x 0.75 mm, about 16-seeded; septum 1-nerved to about midway. Seeds 1.2 x 0.5 mm, brown, uniseriate. Figure 9.

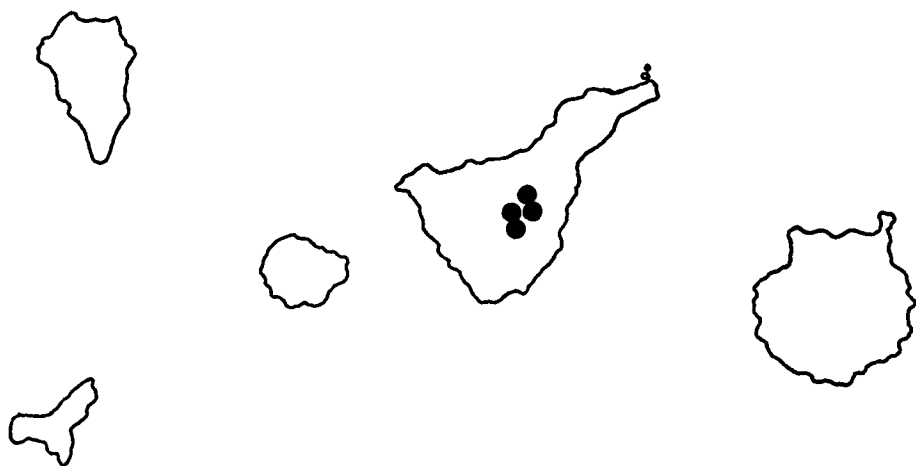


Figure 9. Distribution of *D. bourgaeana*.

Type: Tenerife, Filo de Las Cañadas, 7.7.1855 Bourgeau 1268 (FI, BM isotype).

Other specimens: Canary Islands. *Tenerifes* between Portillo and El Cabezón, 2000 m, 15-4-1969 Bramwell 1312; Las Cañadas, La Fortaleza, 2100 m, 16.7.1969 Bramwell 2102; Las Cañadas de Teide, Mirador de los Roques, 2000 m, 26.7.1972 Bramwell 3517; Las Cañadas, Portillo, 1 km along road to Pio, 22.6.1956 Lems 2690; Teide Crater, . 7000 ft., 15.5.1970 Mulford 149, 152 (all RNG); Las Cañadas, Hierba Pajonera, Sept. 1965 Bramwell 45; Las Cañadas, 3-4-1890 Murray s.n.; Anaga, 800 m, 24.4.1855 Perraudière 11204 (all BM); Las Cañadas, El Portillo, 200 m, 10.4.1971 Bramwell & Humphries 3383 (RNG, BM); Las Cañadas de Teide, Montaña de las Arenas Negras, 2000 m, 22.10.1968 Bramwell 262; Filo de Las Cañadas, 7.1. 1855 Bourgeau 1268; Las Cañadas, El Portillo, 20.4.1933 Asplund 864; Las Cañadas, at base of Mt. Teide, 2300 m, 8.5.1969 Okpon

Mt. Teide, 2000 m, 3.7.1855 Perraudière s.n.; Las Cañadas, 3-6-1890 Murray s.n. (all K).

*D. bourgaeana* is a locally dominant component of the vegetation of the subalpine zone of Tenerife between 1800 and 2300 m. where it occurs on phonolytic rock debris, volcanic sand and scree etc. in association with *Argyranthemum tenerifae*, *Tolpis webbii*, *Pterocephalus lasiospermus* and other locally endemic species.

Morphologically it most resembles *D. lemsii* but can be separated by its markedly decurrent primary leaf-segments with 3-pointed apices and its patent fruiting pedicels with ascending siliquae.

3. *D. lemsii* Bramwell, *Cuad. Bot. Canar.* 17:24 (1973).

Shrub 50-75 cm, branches erect, cortex brown with short, silvery pubescence on the younger stems. Leaves 2-pinnatisect, suberect, lanceolate 2-4 (-6) x 0.8-1.0 cm, sessile or shortly petiolate, densely pubescent with branched hairs only; primary lobes linear or linear lanceolate, 7.0 x 1.0-1.5 mm, shortly petiolate; secondary lobes linear-to ovate-lanceolate upto 2 mm, those towards the apex slightly longer, acute, upper leaves pinnate, sessile; lobes linear-lanceolate, those towards the base filiform. Inflorescence simple or sparsely branched, erect, pedicels up to 15 mm with branched and glandular hairs. Sepals erecto-patent 3-4 mm, pubescent with glandular and branched hairs. Petals broadly ovate 5-6 x 3-4 mm, cuneate with claw equalling lamina. Stamens 4-5 mm. siliqua pedicels erect.

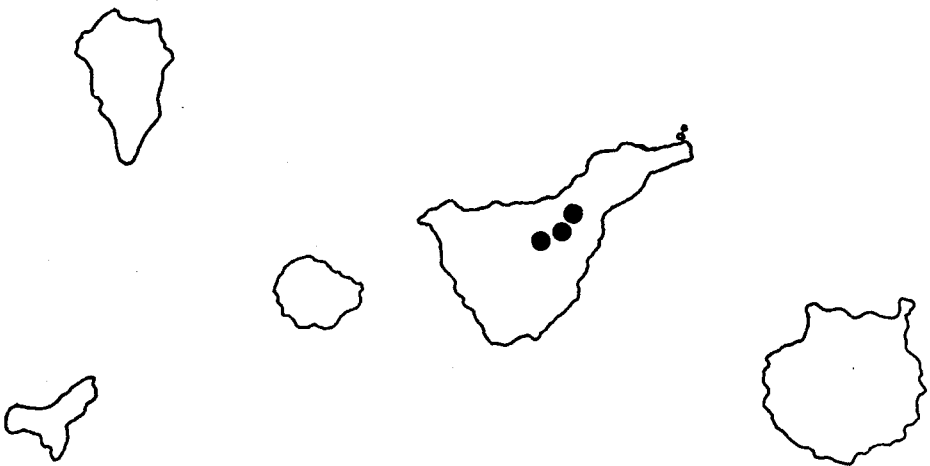


Figure 10. Distribution of *D. lemsii*.



Siliquae 20-35 mm. x 8 mm, torulose, often irregularly curved, 28-to 32- seeded. Seeds ovate, 1.5 mm, hetnut coloured, unise-riate. Figure 10.

TYPE: Tenerife, Lomo de Pedro Gil, 1800 m. 14-4. 1969 Bramwell 1299 (RNG).

Other specimens: Canary Islands, *Tenerife*, Lomo de Pedro Gil 1800 m. 14.4.1969 *Bramwell* 1299 (RNG, ISOTYPE): Tenerife Cumbres de Pedro Gil above Agua Mansa 1600 m, May 1969 *Bramwell* 1477 (RNG); Tenerife, Nr. Izaña, 200 m. 30.5.1969 *Bramwell* 2284 (RNG); Tenerife, nr. Fuente de Joco, 1900m, 2.4.1971, *Bramwell & Humphries* 3184, (RNG); Montaña Ayesa, 1950 m, 12.11.1965, *Lems* 6269 (RNG); Fuente de Joco, 1900 m, 2.2.1966 *Lems* 6905 (RNG).

*D. lemsii* is endemic to the higher northern slopes of Tenerife at the upper limit of the pine forest zone between 1700 and 2000 m. It occurs as scattered populations in the open habitats afforded where the high montane *Pinus canariensis* forests merge into the subalpine *Spartocytisus supranubius* and *Adenocarpus viscosus* scrub. *D. lemsii* is readily distinguishable from *D. bourgaeana* by the absence of decurrent leaf-segments, lack of glandular trichomes on the leaves and the erect siliqua pedicels. The more dissected leaves, broader leaf-segments, larger siliquae with more numerous ovate seeds and petal-claw equal to the lamina separate this species from its nearest relative *D. gilva* from similar habitats on the island of La Palma.

4. *D. millefolia* (Jacq.) Webb & Berth., *Phyt. Canar.* 1:73 (1936).

*Sinapis millefolia* Jacq., *Collectanea* 1:41 (1786).

*Sisymbrium millefolium* (Jacq.) Solander, in Aiton *Hort. Kew.* ed.1, 2:391 (1789).

*S. millefoliatum* Link., *Handb. Gewachk.* 2:313 (1831).

*Hesperis millefolia* O. Ktze., *Rev. Gen. Pl.* 1:33 (1891).

Branched, woody shrub up to 1 m. Lower stem very woody, glabrous, up to 1 m in diameter. Young branches ascending, terete, densely leafy, densely pubescent. Leaves petiolate, oblong-elliptical 20-80 mm long (2-) to 3- pinnatisect, with 4-10 pairs of primary segments and 2-8 pairs of crenate to pinnatipartite secondary segments; the ultimate lobes lanceolate to ovate, obtuse. Upper leaves shortly petiolate or sessile, usually 2-pinnatisect with ovate, entire, crenate

or pinnatifid lobes. Inflorescences dense, congested with 30—ca.100 flowers, elongating after anthesis. Pedicels 5-12 mm long, pubescent with branched and glandular hairs. Sepals erecto-patent, 3-4 mm, pale yellow, glandular hairy. Petals large, 5.0-6.5 x 2.0-3.0 mm; lamina shortly ovate, obtuse, occasionally lobed; claw equalling lamina. Stamens 3.5-5.0 mm Siliqua pedicels 6-17 mm irregularly outspreading or ascending. Siliquae 10-25 x 1.0-1.7 mm, 10-to 22-seeded, torulose; seeds ovate-triangular, about 1 mm long, reddish-brown, uniseriate or occasionally biseriate. Figure 11.

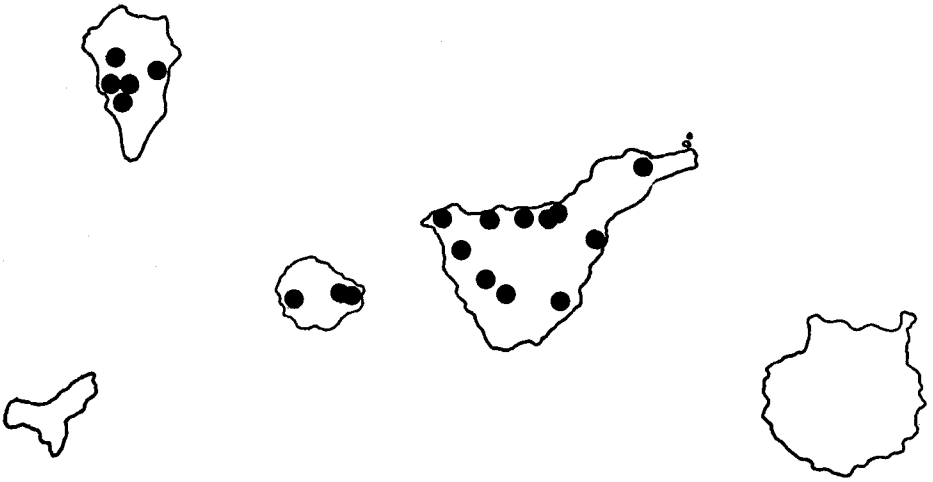


Figure 11. Distribution of *D. millefolia*.

Type: Not traced, Poiret in Lamarck's *Encycl. Meth. Bot.* 4 p. 345 (1797) states that Jacquin cultivated this species but no specimen has been traced which could be attributed to Jacquin. There is, however, an illustration in Jacquin's *Ic. Pl. Rar.* 1:t 27 which could serve as the type if no specimen comes to light.

Other specimens: Canary Islands. *Tenerife*: Mñas. de Teno, Roque de Fraile, 150 m, 16-10-68, *Bramwell* 225; Cuevas Negras de Los Silos, 400 m, 29-10-68; *Bramwell* 312; San Juan de la Rambla, 200 m, 9-11-69, *Bramwell* 366; Mñas. de Teno, Cumbre de Masca, 1000 m, 12-1-69, *Bramwell* 512; Icod el Alto in Barranco Ruiz, 650 m, 20.1.69, *Bramwell* 542; Bco. del Infierno, Adeje, 600 m, 10.3.69, *Bramwell* 932; Mñas. de Teno, Valle de Masca above the village of Masca, 500 m, 26.4.69 *Bramwell* 1394; Sierra Anaga below Cruz de Taganana, 500 m, 21.5.69, *Bramwell* 1532; Bco. del Fraile, Guía de Isora, 400 m, 26.5.69, *Bramwell* 1692; Bco. de Ruiz, 650 m, 22.6.69, *Bramwell* 1756; Punta de Teno, between Roque del Fraile and El

Faro, 50-150 m, 5.4.1971, *Bramwell & Humphries* 3276 (all RNG); Feb. 1845, *Bourgeau* 2; E: of Puerto de la Cruz, 20 m, 23.8.1971, *Chicken* 8; Icod, La Guanchara, 400, 3.9.1971, *Chicken* 134; Icod el Alto, 30.12.1857 *Lowe* Ten. 148; Güimar, Bco. del Anaga, April 1855, *Murray* s.n.; Below Icod de los Vinos, 6.6.1890, *Murray* s.n. (all BM); La Corona, 3.10.1927, *Czeezott* 389; Orotava, 9.1.1927, *Gram* 54; 1782, *Masson* s.n.; Bajamar, 30.5.1899, *Murray* s.n.; Bco. de los Silos, 3.5.1902, *Murray* s.n.; Icod, March 1933, *Trethelley* 142 (all K.).

*Gomera*: 4 km along road from San Sebastián to Benchiagua, 11.3.73, *Aldridge* 1167; road from San Sebastián to Lomo Fragoso, 12.3.73, *Aldridge* 1217; Bco. de Valle Gran Rey, 600 m, 20.12.1968, *Bramwell* 471 (all RNG); San Sebastián, 6.2.1858, *Lowe* G. 129 (BM).

*La Palma*: El Time, 29.3.1973, *Aldridge* 1450; La Cumbrecita, 1500 m, 9.6.1969, *Bramwell* 1879; terraces near El Paso, 15.4.1971, *Bramwell & Humphries* 441. (all RNG); El Río, S. Cruz, June 1892, *Murray* s.n. (BM); Bco. del Río above aquaduct, 2.6.1913, *Sprague & Hutchinson* 199; La Caldera, El Capadero, 13.6.1913, *Sprague & Hutchinson* 408 (all K.).

*D. millefolia* is a locally frequent species of the lower zone of Tenerife, La Palma and La Gomera (50-1200 m) found on cliffs, rocks, walls etc., usually in partial shade. It is a very variable species in terms of leaf-division and fruit length. Individuals with only 2-pinnatisect lower leaves have been described as var. *sabina-*

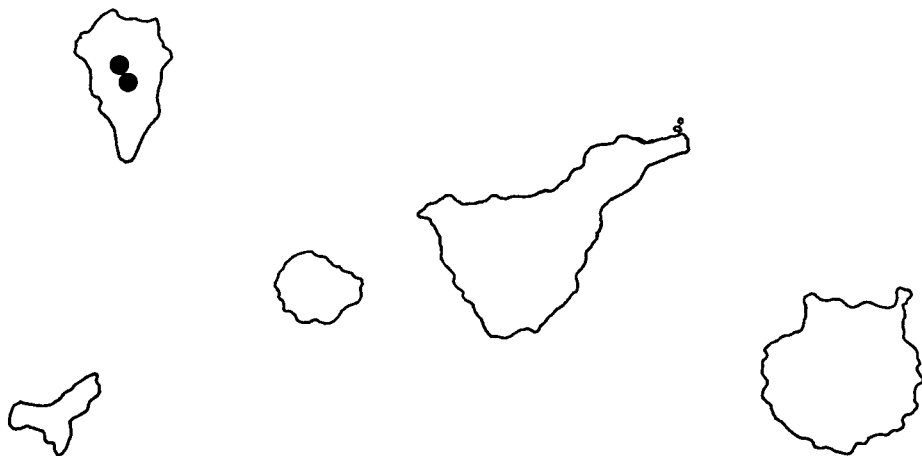


Figure 12. Distribution of *D. gilva*.

lis O.E. Schulz but in cultivation the character is not constant. Fma. *brachycarpa* Bornm. and var. *macrocarpa* Pitard cannot be satisfactorily delimited as they fall within the normal variation in fruit-size of most populations.

5. *D. gilva* Svent., *Bol. Inst. Nac. Inv. Agron.* 13:20 (1953).

Shrub up to 50 cm, strongly branched at base; cortex slightly pubescent. Leaves sessile, erecto-arcuate, lanceolate-elliptical, 20-40 x 7-15 mm., 2-pinnatifid, pubescent the segments linear subacute. Inflorescences simple or laxly branched, branches sub-erect.

Pedicels about 4 mm, densely pubescent. Sepals erect, about 2 mm, floccose-tomentose. Petals 4.0 x 2.0 mm elliptical-cuneate with a short claw. Stamens 2 mm. Fruiting branches more or less arcuate. Siliquae 15-20 x 1.0 mm. 16-to 24-seeded. Seeds 1.0 - 1.5 mm., oblong, compressed, chestnut-coloured, the surface finely papillate.

TYPE: Junonia Major (La Palma) in cacumine montis ad oram magni crateris "Gran Caldera" nuncupati ad 2.000 m supra mare, 21 Maii 1949. *E. R. Sventenius* (TENE).

Other Specimens: La Palma, Tijarafe, 1700 m. *E. R. Sventenius* 13.10.1949 (JCV).

*D. gilva* is endemic to the high mountains of the rim of the Caldera de Taburiente in the N. Central region of La Palma where it is locally frequent. It occupies open sunny clearings towards the upper limits of the pine forest zone between 1600 and 2000 m. It is morphologically similar to *D. lemsii* and *D. bourgaeana* and can be considered as a local vicariant of the latter. Very few specimens are available for consultation in herbaria but living material originating from the type locality and cultivated in the Jardín Botánico "Viera y Clavijo" has been studied.

6. *D. preauxiana* (Webb) Webb ex O.E. Schulz, in Engler *Pflanzenr.* 105:344 (1924).

*Sisymbrium preauxianum* Webb, *An. Sci. Nat. Bot.* 2 sér. 13: 137 (1840).

*D. preauxiana* Webb ex Christ, *Engl. Bot. Jahrb.* 9:90 (1888) *in synon.*

*Hesperis preauxiana* O.Ktze., *Rev. Gen. Pl.* 2:935 (1891).

*Sisymbrium briquetii* Pitard, in Pitard & Proust *Les Iles Canar. Fl. Archip.* 101 (1908).

*D. preauxiana* Webb ex Christ var. *briquetii* (Pit.) O.E. Schulz, *Pflanzenr.* 105:345 (1924).

Small shrub, woody at base, 60-80 cm, cortex glabrous, whitish. Leaves petiolate, simple-pinnatisect, 4-10 cm long, covered with glandular trichomes; the segments linear, to filiform in up to 6 pairs. Upper leaves more or less simple. Inflorescences simple, crowded at anthesis then elongating in Fruit, 40-to 80- flowered; pedicels 5 - 8 mm, glandular. Sepals 3 mm, oblong, erecto-patent. Petals 5 mm; lamina ovate, obtuse, gradually narrowing to a short claw. Stamens 3-4 mm. Siliqua pedicels 8-13 mm, sub-erect. Siliquae ascending, often irregularly curved, 10 - 17 mm, 18 - to 27 - seeded, torulous. Seeds 1.2 mm, oblong, uniseriate or occasionally biseriate, chestnut coloured. Figure 13.

TYPE: Gran Canaria, Bco. de Amurga leg. *Despreáux* (Fl).

Other Specimens: Canary Islands. *Gran Canaria*: Bco. de Tejeda between Tejeda and La Solana del Chorrillo, 1250 m, 11.5.1973, *Aldridge* 1535; central region just below Roque Nublo, 1600 m, 27.3.1969, *Bramwell* 1055; Bco. de Fataga, 400 m, 30.3.1969, *Bramwell* 1179; Bco. de Fataga velow Fataga, 500 m, 21.3.1971, *Bramwell & Humphries* 3037; Degollada de Tazartico, 600 - 700 m, 21.3.1971, *Bramwell & Humphries* 3074 (all RNG); Tejeda, 850 m, 20.4.1936, *Brooke* 135; Tejeda, 24.5.1897 *Gelest* s.n.; Lomo de los Morales (Fataga), 740 m, 20.1.1969, *Kunkel* 12308 (all BM); between Tirajana and Mogan, 10.5.1894, *Murray* s.n. (BM, K).

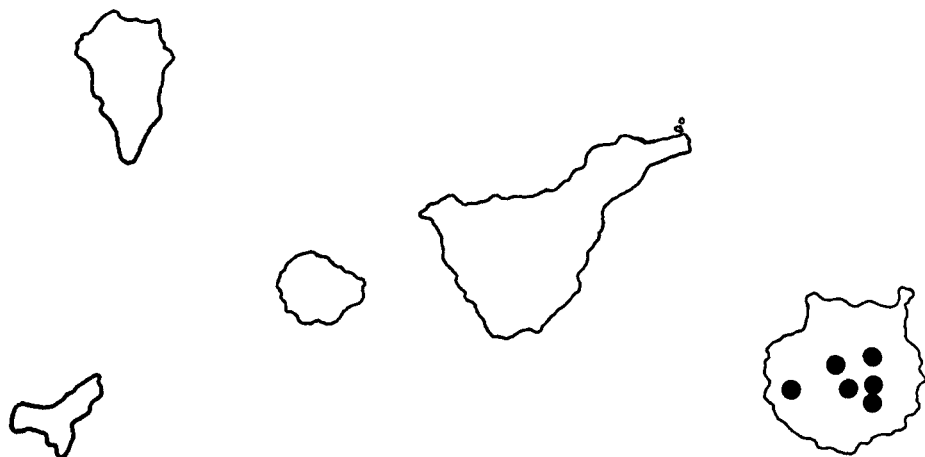


Figure 13. Distribution of *D. preauxiana*.

*D. preauxiana* is endemic to the island of Gran Canaria where it is relatively common in the interior region on cliffs between 400 and 1800 m. It is very variable in leaf-shape, size and in flower-size and several forms and varieties have been described. Variation is, however, reticulate without a consistent pattern and it seems appropriate simply to recognise a single polymorphic species without delimiting infraspecific taxa. Specimens with large leaves and flowers described as *S. briquetii* by Pitard (1908) fit into the normal variation pattern of *D. preauxiana* from shady or more humid habitats and despite Lems' (Lems, 1960) suggestion that *S. briquetii* Pitard is conspecific with *D. artemisoides* it is here included in *D. preauxiana*. Holzpfel in Lems & Holzpfel (1974) corrects Lems' original error and regards *S. briquetii* as part of *Descurainia preauxiana*.

7. *D. artemisoides* Svent., *Bol. Inst. Nac. Inv. Agron.* 28:15 (1953).

Shrub up to 80 cm; stems erect, the young tips tomentose, cortex greyish, splitting when older. Leaves ovate, 2-pinnatisect, shortly petiolate to sessile, densely tomentose, with branched hairs, primary segments 6-10 pairs, ovate-lanceolate, shortly petiolate, se-

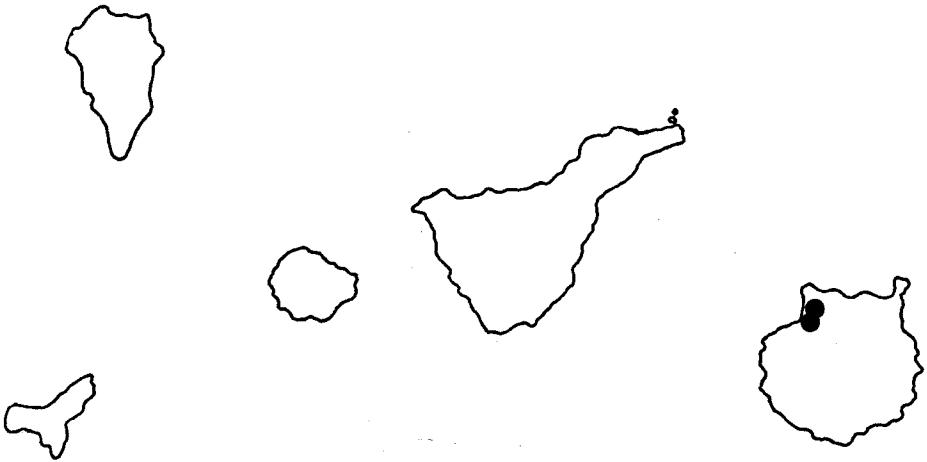


Figure 14. Distribution of *D. artemisoides*.

condary segments elliptic-spathulate, decurrent, the apical segment larger, lanceolate. Upper leaves pinnate with up to 4 pairs of segments. Inflorescence simple or branched. Pedicels 10-15 mm, erecto-arcuate, tomentose with glandular and branched hairs. Sepals oblong-spathulate, more or less patent, 3 mm, pale yellow. Petals twice as long as sepals 5.0-6.0 x 1.7-3.0 mm; lamina ovate and cu-

neate to a claw almost equal to lamina. Siliquae densely clustered in fruit. 15-20 x 1.0 mm, about 20- seeded, the seeds 3-angled, 2 mm long, compressed-semi-lunar, brown, uni- to biseriate.

TYPE: Canaria Magna; supra pagum Goyedrae ad 700 m supra mare, 2 aprilis 1947 E. R. Sventenius sn. (TENE).

Other Specimens: Canary Islands, *Gran Canaria*: Los Berrazales, Agaete, 500 m 29-3-1969 *Bramwell* 1155 (RNG), Agaete, barranco de los Berrazales 450 m 19-3-1969 *Bramwell* 1155 a (RNG), Berrazales, Agaete 600 m 7-2-1966, *Kunkel* 12457 (BM).

A local endemic of the Goyedra Massif on the W. side of Gran Canaria. *D. artemisoides* is locally frequent in shady ravines and in the shade of N. W. facing cliffs.

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