

**STUDIES ON CRUCIFERAE: X.
CONCERNING SOME WEST MEDITERRANEAN SPECIES
OF ERUCASTRUM**

by

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Abstract

GÓMEZ-CAMPO, C. (1983). Studies on Cruciferae: X. Concerning some West Mediterranean species of *Erucastrum*. *Anales Jard. Bot. Madrid* 40(1):63-72.

The co-specificity of *Erucastrum virgatum* (J. & C. Presl) C. Presl from S Italy and NE Sicily and the Spanish plant known as *Erucastrum laevigatum* (L.) O. E. Schulz, whose area extends from Gibraltar to the province of Castellón, is established. In the Iberian Peninsula, three subspecies of *E. virgatum* are proposed: subsp. *baeticum* (Boiss.) Gómez-Campo, subsp. *pseudosinapis* (Lange) Gómez-Campo and subsp. *brachycarpum* (Rouy) Gómez-Campo. Chromosome numbers for fifteen populations are reported. Former Moroccan subspecies of *E. laevigatum* are combined under *Erucastrum littoreum* (Pau & Font Quer) Maire and *E. elatum* (Ball) O. E. Schulz.

Resumen

GÓMEZ-CAMPO, C. (1983). Estudios sobre crucíferas: X. Acerca de algunas especies mediterráneas occidentales de *Erucastrum*. *Anales Jard. Bot. Madrid* 40(1): 63-72 (En inglés).

Se establece la co-especificidad del *Erucastrum virgatum* (J. & C. Presl) C. Presl del S de Italia y NE de Sicilia con la planta española que ha venido siendo conocida con el nombre de *Erucastrum laevigatum* (L.) O. E. Schulz cuya área se extiende desde Gibraltar hasta la provincia de Castellón. Se reconocen tres subespecies de *E. virgatum* para la Península Ibérica: la subsp. *baeticum* (Boiss.) Gómez-Campo entre Gibraltar y Almuñécar, la subsp. *pseudosinapis* (Lange) Gómez-Campo entre Motril y Cartagena, y la subsp. *brachycarpum* (Rouy) Gómez-Campo en la provincia de Valencia y áreas limítrofes. Se dan los números cromosómicos de quince poblaciones. En Marruecos, el *Erucastrum littoreum* (Pau & Font Quer) Maire y el *E. elatum* (Ball) O. E. Schulz son considerados especies distintas, combinándose dentro de ellos algunas subespecies que antes se incluían en *E. laevigatum*.

INTRODUCTION

During the past few years we have had frequent opportunities of obtaining living seeds from many populations of the plant known at present as *Erucastrum laevigatum* (L.) O. E. Schulz. The distribution area of this taxon in the Iberian Peninsula extends from Gibraltar to the province of Castellón in Eastern Spain. We were also able to complete these seed stocks with material

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of *E. virgatum* (J. & C. Presl) C. Presl from Southern Italy and Northwestern Sicily and also with some Moroccan taxa [*E. littoreum* (Pau & Font Quer) Maire, *E. elatum* (Ball) O. E. Schulz and some allies] which are commonly referred to *E. laevigatum* as subspecies.

In this work we intend to establish the proper taxonomic frame for all these taxa and to characterize their infraspecific variability through the use of comparative morphology and karyology. As individual variability is often high for many characters, no attempt at formal quantifications has been done. Instead, we propose a short number of reliable characters that can be successfully used to delimit the specific and infraspecific taxa. Information on the pertinent geographic distribution is also compiled and supplemented.

MATERIAL AND METHODS

Seeds from more than thirty populations of the species under study were sown in a greenhouse and the resulting plants were cultivated side by side in the open for observation during three consecutive seasons. Previous seed collecting activities allowed us to observe most of these populations in the wild. The herbaria MA, MAF, BCF, RAB, P, K, BM and COI were consulted. Chorological citations have been completed with those from some ancient sources and also with collections (GC initials) performed for our seed bank.

Chromosome numbers were determined after treatment by immersion in tap water at 0° C for 24 hrs., fixation in alcohol-acetic (3:1) and acetic orcein staining.

RESULTS AND DISCUSSION

A) THE RELATIONSHIP BETWEEN *ERUCASTRUM VIRGATUM* AND *ERUCASTRUM LAEVIGATUM*

The similarity between *Erucastrum virgatum* and *Erucastrum laevigatum* was already noticed by COSSON (1849) and other ancient authors. More recently, TUTIN (1964) once more suggests that both taxa might be co-specific, but no formal comparison seems to have been done so far. Our results strongly support such view. In fact, plants from Denia (Alicante) were practically identical to the plants from Sicily in the vegetative and floral stages. The only difference consisted of a sparser indumentum in the former, but the trichomes themselves —addressed in the direction of the leaf apex— were identical for both. The same was true for the general facies of the plant, leaf shape, flower color and size, raceme elongation, perennial habit, etc. At the fruiting stage a new differential character showed up: the beak of the siliqua was comparatively longer and thicker in the plants from Denia. However, it is to be noted that the character «thick beak» is rather variable in other populations of Eastern Spain, and even within the same population. Other characters (such as leaf division or position of the fruit) show different patterns

of variation along the Eastern and Southern coasts of the Iberian Peninsula, but the differences between the plants from Sicily and the plants from Valencia are smaller than the differences between i. e. the plants from Valencia and the plants from Almería or Málaga.

Consequently, we formally propose the unification of both taxa under the same specific epithet. Although the priority corresponds to *E. laevigatum* (bas. *Sinapis laevigata* L., Amoen. Bot. 280-281. 1756) we strongly feel and propose that this name should be rejected as «nomen ambiguum» and the name *Erucastrum virgatum* (J. & C. Presl) C. Presl (bas. *Sinapis virgata* J. & C. Presl, Del Prag. 1:19. 1822) be taken as valid. The Linnean typus of *S. laevigata* (from «Hispania») is misleading in several respects (siliqua beak, leaf silhouette, etc.) and it does not show one of the characters that we have more constantly observed in this taxon: trichomes adpressed (or at least curved or inclined) in the direction of the leaf apex. Though it was described as glabrous, it shows instead a few robust conical retrorse hairs at the base of the leaf and in the petiole, strongly suggesting that the specimen might better correspond to the species *Brassica nigra* (L.) Koch or perhaps to *Hirschfeldia incana* (L.) Lagrèze-Fossat. COSSON (1849) expresses similar doubts with respect to the specimens of *S. laevigata* L. in the herbarium of De Candolle.

Such uncertainties probably generated a number of mistakes (cf. WILLKOMM & LANGE, 1880) by some early authors who claimed to have found *Sinapis laevigata* L. on localities quite far from the present area of the taxon under consideration (Cavanilles reported the plant in Madrid, and Lagasca in León). No collection before 1839 refers to the real area between Gibraltar and Castellón. This never extends too far from the coast (see map of figure 1); the most continental locality ever found (Sot de Chera in Valencia) is only 50 km away from the sea. Other more recent reports in Alconetar (Cáceres) (MA) and in Valdeazores (Jaén) (MAF) actually correspond to *Hirschfeldia incana* and to *Brassica barbelieri*, respectively.

B) INFRA-SPECIFIC VARIATION OF *ERUCASTRUM VIRGATUM* IN THE IBERIAN PENINSULA

Erucastrum virgatum (J. & C. Presl) C. Presl subsp. *virgatum* is relatively common in the South of Italy and in part of Sicily. The three additional subspecies that we are recognizing here for the Iberian Peninsula are based on former descriptions at specific or varietal level. Together with the basionyms and other synonyms, we express some characters that could be taken as differential, we report the chromosome numbers and we make precissions on their geographic distribution.

KEY FOR THE IDENTIFICATION OF THE SUBSPECIES OF *ERUCASTRUM VIRGATUM*

1. Siliqua 1,5-2,0 (-2,5) cm long, erect (at angles less than 20° from the axis) . . . 2
1. Siliqua (2,0-) 2,5-3,5 (-4,0) cm long, erecto-patent (at angles of approx. 20-40° from the axis) 3
2. Siliqua distinctly contracted at the base of the beak. Beak representing 1/4 to 1/3 of the fruit length and about as thick as the valvar portion subsp. **virgatum**

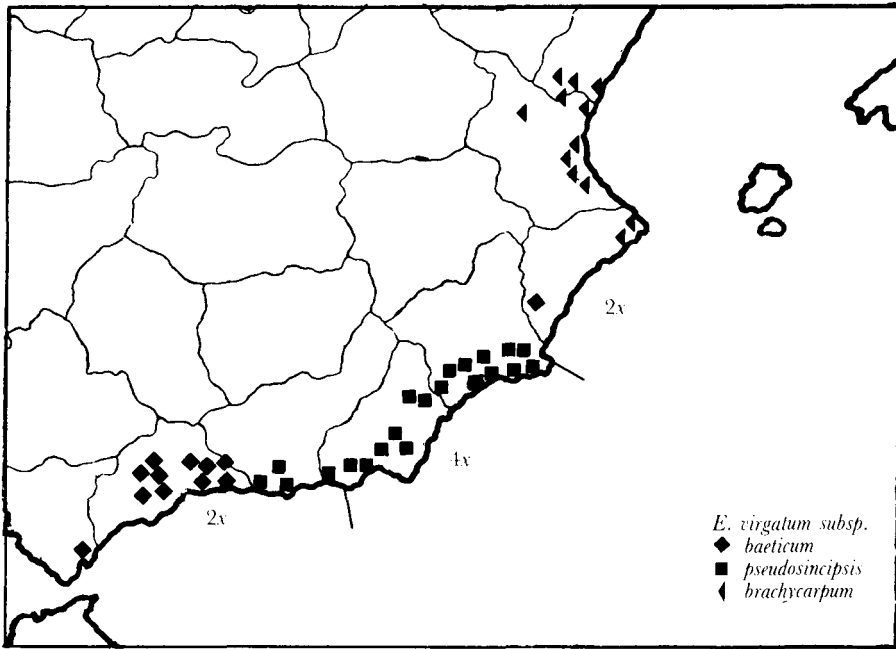


Fig. 1. Distribution of three subspecies of *Erucastrum virgatum* along the Southern, Southeastern and Eastern Spanish coasts. Tetraploidization has occurred in the provinces of Almería and Murcia, just in the area where drought and high temperature are more severe. Plants from Granada are diploid, but they correspond morphologically to subsp. *pseudosinapis*.

2. Siliqua not contracted at the base of the beak. Beak representing 1/3 to 1/2 or more of the fruit length and most often thicker than the valvar portion subsp. **brachycarpum**
3. Annuals or biennials. Median leaves pinnatisect. Siliqua usually more than 3 cm long subsp. **pseudosinapis**
3. Usually perennials. Median leaves lyrate. Siliqua usually less than 3 cm subsp. **baeticum**
- Key to varieties 4
4. Trichomes curved or inclined var. **baeticum**
4. Trichomes adpressed var. **lucentinum**

Erucastrum virgatum (J. & C. Presl) C. Presl subsp. **baeticum** (Boiss.)

Gómez-Campo, **comb. nov.**

Basionym: *Sinapis baetica* Boiss., Elenchus Plant. Nov. 14 (1838).

Synonyms: *Brassica baetica* Boiss., *Erucastrum baeticum* (Boiss.) Nyman, *Erucastrum baeticum* (Boiss.) Lange, *Erucastrum laevigatum* (L.) O. E. Schulz subsp. *baeticum* (Boiss.) Maire & Weiller.

Usually perennial. Leaves lyrate, with an indumentum formed by hairs curved or inclined (some times adpressed) in the direction of the leaf apex.

Fruits of approx. 1,5-3,0 cm, erecto-patent at angles of approx. 20-30 degrees from the raceme axis.

- Trichomes curved or inclined var. **baeticum**
 Beaks subglobose fma. **corynelobum** (Roemer)
 Gómez-Campo [basionym: *Corynelobus baeticus* Roemer
 in Willk., Linnaea 25:7 (1852)] (Churriana, Málaga).
 Trichomes adpressed (*pilis ad foliae laminam adpressis*)
 var. **lucentinum** Gómez-Campo, var. nov. (Crevillente, Alicante) *Typus* MA.

Reported in Gibraltar. Frequent in the province of Málaga on disturbed habitats. Var. *lucentinum* in Sierra de Crevillente (Alicante) on stony slopes. Diploid $2n=2x=14$.

Some localities: Colmenar (Málaga), BOISSIER (1839). Int. Monda et Coin (Málaga), BOISSIER (1839); Gómez-Campo, 1979 (GC 5364). Canillas de Accituno (Málaga), BOISSIER (1839). Int. Almuñécar et Nerja (Málaga), BOISSIER (1839). Churriana, Sierra de Mijas (Málaga), *Willkomm* (in WILKOMM & LANGE, 1880). Sierra de Carratraca (Málaga), *Rivas Goday & Borja Carbonell*, 1965 (MAF). Pizarra (Málaga), *Borja Carbonell*, 1970 (MAF 75709). Sierra Almijara (Málaga), *Laza Palacios*, 1936 (MAF 85300). Ardales (Málaga), Gómez-Campo, 1979 (GC 5420). Mezquitilla

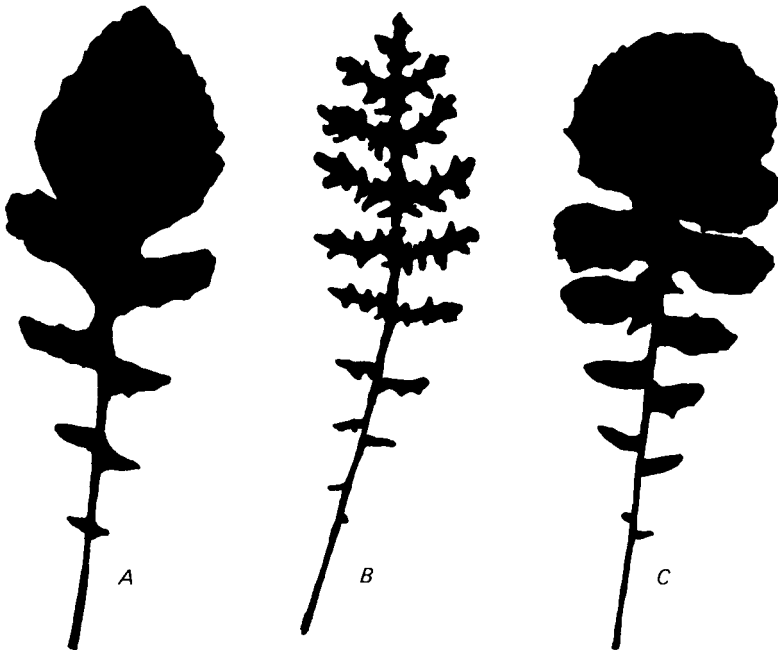


Fig. 2.—Leaf silhouettes of: A) *Erucastrum virgatum*, this leaf could belong to either subsp. *virgatum*, subsp. *brachycarpum* or subsp. *baeticum*. B) *Erucastrum virgatum* subsp. *pseudosinapis*. C) *Erucastrum littoreum*.

(Málaga), *Gómez-Campo*, 1979 (GC 5346). Gibraltar (Cádiz), *Dasoi* (in WILLKOMM, 1893). Crevillente (Alicante), *Gómez-Campo*, 1978 (MA, GC 5161) (var. *lucentium*).

Ericastrum virgatum (J. & C. Presl) C. Presl subsp. ***pseudosinapis*** (Lange) Gómez-Campo, **comb. nov.**

Basionym: *Ericastrum pseudosinapis* Lange, Pugillus Pl. Hisp. 79 (1860).

Synonyms: *Hirschfeldia pseudosinapis* (Lange) Pau, *Ericastrum laevigatum* (L.)

O. E. Schulz var. *pseudosinapis* (Lange) O. E. Schulz

Often annual or biennial. Leaves pinnatisect (figure 2), with an indumentum of adpressed hairs in the direction of the leaf apex. Fruits up to 3,0-3,5 cm, erecto-patent at angles of 20-40 degrees from the axis.

The complication of the leaf silhouette tends to be maximum in the provinces of Granada and Almería, while it is somewhat more moderate and appears later in the ontogeny in the province of Murcia.

Provinces of Granada, Almería and Murcia, from Motril to Cartagena. Tetraploid ($2n=4x=28$) for most of the area, but diploid ($2n=2x=14$) in the western part (Granada).

Some localities: Barranco del Caballar (Almería), *Porta & Rigo*, 1890 (in WILLKOMM, 1893); *Ellman & Sandwith*, 1928 (K); *Pau*, 1929 (MA). Barranco de Mojana (Almería), *Sennen*, 1932 (BM, MAF, MA 46439). Barranco Cerro Cagueta, Rambla de Belén (Almería), *P. W. Ball, Chater, Ferguson & B. Valdés*, 1967 (BM). C. Almería, *Bourgeau* (in WILLKOMM & LANGE, 1880); *Lange* (in WILLKOMM & LANGE, 1880); *Gandoger*, 1896 (MA, K); *Borja Carbonell*, 1961 (MAF 103353); *Stace*, 1961 (BM). Rambla del Manzano (Almería), *Lacaita*, 1928 (BM). Sierra de Carboneros (Almería), *Ladero*, 1973 (MAF 84654). Peñón de Turrillas, Sierra Alhamilla (Almería), 900-1.000 m, *P. W. Ball, Chater, Ferguson & B. Valdés*, 1967 (BM). Tabernas (Almería), *Borja Carbonell*, 1950 (MA 178261). Aguadulce (Almería), *Losa*, 1957 (MAF). Vicar (Almería), *Gómez-Campo*, 1974 (GC 3261). C. Vélez Rubio (Almería), *Rouy* (in WILLKOMM, 1893); *Borja Carbonell*, 1963 (MAF). Adra (Almería), *Lacaita*, 1925 (BM, MA); *Pau*, 1929 (MA). Calahonda (Granada), FERNÁNDEZ CASAS (1973). La Rábita (Granada), *F. Pérez García*, 1979 (GC 5457). Int. Orgiva et Pampaneira, Alpujarra (Granada), *Pau*, 1902 (MA 46442); *Gómez-Campo*, 1965 (GC 0804). Motril (Granada), *Gómez-Campo*, 1965 (GC 0825); *Molero*, 1979 (GC 5500). Puerto Lumbreras (Murcia), *Rouy* (in WILLKOMM, 1893); *Gómez-Campo*, 1976 (GC 4116). Lorca (Murcia), *Guirao* (in WILLKOMM & LANGE, 1880); *Sennen*, 1923 (COI), 1925 (BM). Sierra Almenara (Murcia), *Sennen*, 1924 (COI, MA 46435), 1925 (BM). Sierra Tercia y Sierra del Caño (Murcia) 350-450 m, *Sennen*, 1929 (MA 46437). Calnegre (Murcia), *Gómez-Campo*, 1978 (GC 5187). Int. Aguilas et Mazarrón (Murcia), *Borja Carbonell*, 1969 (MAF). Morrón de Espuña (Murcia), *C. Vicioso s/f.* (MA, RD); *Gómez-Campo*, 1976 (GC 4266). Fuensanta (Murcia), *Rouy* (in WILLKOMM, 1893); *Codorniu*, 1876 (MA). Cresta de Gallo (Murcia), *Gómez-Campo*, 1973 (GC 2279). Puerto de la Cadena, int. Murcia et Cartagena, *Gómez-Campo*, 1966 (GC 0908). Los Camachos, Torre Pacheco (Murcia), *Townsend*, 1969 (BM). C. Cartagena (Murcia), *Porta & Rigo*, 1891 (BM); *Ibáñez & Pau*, 1902 (MA 46437); *Ibáñez*, 1903 (MAF).

Ericastrum virgatum (J. & C. Presl) C. Presl subsp. ***brachycarpum*** (Rouy) Gómez-Campo, **comb. nov.**

Basionym: *Ericastrum brachycarpum* Rouy, Exc. Bot. III:33 (1884).

Synonyms: *Ericastrum laevigatum* (L.) O. E. Schulz var. *brachycarpum*

(Rouy) O. E. Schulz, *Erucastrium laevigatum* (L.) O. E. Schulz subsp. *brachycarpum* (Rouy) O. Bolòs & Vigo, *Erucastrium segobricensis* Pau in herb.

Usually perennial. Leaves lyrate with an indumentum of closely adressed hairs in the direction of the leaf apex. Fruits erect (angles 0-20 degrees) often crowded around the inflorescence axis. Beak representing 1/3 to 1/2 or more of total fruit length, very often thicker than the valvar portion.

The thickness of the beak shows inter- and intra-populational (and even intra-individual) variation.

Provinces of Alicante (East), Valencia and Castellón. Diploid $2n = 2x = 14$.

Some localities: Montgó, Denia (Alicante), Rouy, 1883 (in WILLKOMM, 1893); Pau, 1901 (MA 46425); Font Quer, 1923 (BCF); O. de Bolòs, 1950 (BCF); Gómez-Campo, 1968 (GC 1556); Prentice, 1978 (GC 5118). Puig Campana (Alicante), Rigual (1972). Sierra de Valldigna (Valencia), Rouy, 1880 (in WILLKOMM, 1893). Sierra de Corbera (Valencia), Borja Carbonell, 1978 (MAF 101262); Gómez-Campo, 1979 (GC 5431). Barraca de Falzia (Valencia), Font Quer, 1923 (BCF). Barraca d'Aigues Vives (Valencia), Font Quer, 1923 (BCF); Gómez-Campo, 1979. Sierra de la Murta (Valencia), Borja Carbonell, s/f. (MAF 17633). Sierra de Agullent (Valencia), Rivas Goday, Fernández Galiano, Borja Carbonell & Monasterio, 1949 (MA 172122, MAF). Castillo de Sagunto

TABLE I

SUMMARY OF THE AVAILABLE DATA ON CHROMOSOME NUMBERS OF DIFFERENT POPULATIONS IN *ERUCASTRUM VIRGATUM* (J. & C. PRESL.) C. PRESL. ($n=7$)

Population	Chromosome Number	Reference
ITALY	14	Harberd, 1972
SPAIN:		
Chóvar (Castellón)	14	orig.
Bca. Aigues Vives (Valencia)	14	orig.
Sot de Chera (Valencia)	14	orig.
Denia (Alicante)	14	orig.
Crevillente (Alicante)	14	orig.
La Unión (Murcia)	14	orig.
Cresta del Gallo (Murcia)	28	orig.
Puerto de la Cadena (Murcia)	28	Harberd, 1972
West of Cartagena (Murcia)	28	orig.
Sierra de Espuña (Murcia)	28	orig.
Calnegre (Murcia)	28	orig.
Vicar (Almería)	28	orig.
Adra (Almería)	14	orig.
Calahonda (Granada)	14	Fdez. Casas, 1973
Motril (Granada)	14	orig.
Churriana (Málaga)	14	orig.
Ronda (Málaga)	14	orig.

Chromosome numbers of *Erucastrium littoreum* ($n=8$) can be found in GÓMEZ-CAMPO (1980) and those of *Erucastrium elatum* ($n=15$) in HARBERD (1972).

(Valencia), *Moroder & Pau*, 1932 (MA 46426). Coll de las Muelas, Sot de Chera (Valencia), *Gómez-Campo*, 1979 (GC 5446). Int. Gátova et Marines (Castellón), *Gómez-Campo*, 1979 (GC 5442). Sierra de Segorbe (Castellón), *Pau*, 1886 (MA 46427), 1904 (COI). Sierra de Espadán (Castellón), 500-900 m, *Pau*, 1897 (MA 46428), 1908 (MA 46424, BCF). Vall d'Uixó (Castellón), *O. de Bolòs*, 1974 (BCF); *Hernández Ingelmo*, 1979 (GC 5344). Collado de Eslida, s. Chóvar (Castellón), 500 m, *Font Quer & Rivas Goday*, 1947 (MA 46554, MAF 17661); *Gómez-Campo*, 1978 (GC 5172). Nules (Castellón), 400 m, *Beltrán*, 1915 (MA 46443).

C) TAXONOMIC STATUS AND INFRA-SPECIFIC VARIATION OF *ERUCASTRUM LITTOREUM* AND *ERUCASTRUM ELATUM* IN MOROCCO

The infra-specific variation of these two species is analyzed in MAIRE (1964) where they are subordinated to *Erucastrum laevigatum* (L.) O. E. Schulz. Thus, new combinations need to be proposed.

Erucastrum littoreum (Pau & Font Quer) Maire should be considered a distinct species with respect to the newly described concept of *Erucastrum virgatum*. Table II lists five differential characters which, together with the differences in basic chromosome number and in geographic area, leave little room for doubt.

TABLE II
COMPARATIVE CHARACTERS OF *E. VIRGATUM*, *E. ELATUM* AND *E. LITTOREUM*

<i>Erucastrum virgatum</i>	<i>Erucastrum elatum</i>	<i>Erucastrum littoreum</i>
Seeds without (or with vestigial) mucilage.	Seeds without (or with vestigial) mucilage.	Seeds mucilaginous when wet.
Trichomes adpressed or curved in the direction of the leaf apex.	Trichomes erect.	Trichomes erect.
Stems usually glabrous.	Stems hairy.	Stems hairy.
Fruits erect or irregularly erecto-patent at angles of 0-30 degrees from the axis.	Fruits erect or irregularly erecto-patent at angles of 0-30 degrees from the axis.	Fruits regularly erecto-patent at angles of approx. 45 degrees from the axis.
Leaf apex subacute (fig. 2)	Leaf apex subacute or obtuse	Leaf apex obtuse (fig. 2)
$n=7$	$n=7+8$	$n=8$

Erucastrum elatum (Ball) O. E. Schulz is morphologically closer to *E. virgatum*, to which it was in fact subordinated by Cosson. However, we propose to keep it as a separate species in concordance with its amphi-diploid character and separate geographic area. Its basic chromosome number $n=15$ might be interpreted as if one of the parents were related to the *E. littoreum* stock and the other to either *Erucastrum virgatum* or *Hirschfeldia incana*. If this hypothesis is correct, *E. elatum* might be obtained artificially by crossing of the putative parents and subsequent chromosome duplication. The best

discriminatory character for this species with respect to *E. virgatum* lies in the type and distribution of the indumentum.

Consequently, we propose the following nomenclatural adjustments:

Erucastrum littoreum (Pau & Font Quer) Maire subsp. ***littoreum*** should be the correct name for the type-subspecies (basonym: *Hirschfeldia littorea* Pau & Font Quer in Font Quer, Iter Maroc. 1927, n. 229. 1929).

Geographic distribution: Rif, Boccoias, Tizi Ouzli, Ain Zorah, etc.

Karyology: Tetraploid ($2n=4x=32$).

Erucastrum littoreum (Pau & Font Quer) Maire subsp. ***glabrum*** (Maire) Gómez-Campo, **comb. nov.** (basonym: *Erucastrum laevigatum* (L.) O. E. Schulz subsp. *glabrum* Maire, Bull. Soc. Hist. Nat. Afrique Nord 36:88. 1945).

Geographic distribution: Middle Atlas, Khenifra.

Karyology: Diploid ($2n=2x=16$).

Erucastrum littoreum (Pau & Font Quer) Maire subsp. ***brachycarpum*** (Maire & Weiller) Gómez-Campo, **comb. nov.** (basonym: *Erucastrum littoreum* (Pau & Font Quer) Maire var. *brachycarpum* Maire, Bull. Soc. Hist. Nat. Afrique Nord 29:405. 1938).

Geographic distribution: An isolated population in Jbel Zelagh (Fes).

Karyology: Hexaploid ($2n=6x=48$).

Erucastrum elatum (Ball) O. E. Schulz subsp. ***elatum*** should be the correct name for the type subspecies (basonym: *Brassica elata* Ball, J. Bot. 11:298. 1973).

Geographic distribution: Middle Atlas, Great Atlas, Siroua.

Karyology: $2n=10$ (amphidiploid origin).

Erucastrum elatum (Ball) O. E. Schulz var. ***rerayense*** (Ball) Gómez-Campo, **comb. nov.** (basonym: *Brassica rerayensis* Ball, J. Bot. 11:298. 1873).

Erucastrum elatum (Ball) O. E. Schulz var. ***scabriusculum*** (O. E. Schulz) Gómez-Campo, **comb. nov.** (basonym: *Erucastrum laevigatum* (L.) O. E. Schulz var. *scabriusculum* O. E. Schulz, Pflanzenreich, fasc. 70:93. 1919).

Erucastrum elatum (Ball) O. E. Schulz var. ***microspermum*** (Maire & Weiller) Gómez-Campo, **comb. nov.** (basonym: *Erucastrum laevigatum* (L.) O. E. Schulz subsp. *microspermum* Maire & Weiller, Bull. Soc. Hist. Nat. Afrique Nord 36:88. 1945).

The infra-specific variation of *E. elatum* is rather sparsely distributed within the general area of the species; var. *microspermum* was thought to be exclusive of the Gorges du Dades, but we have found it in other far apart localities (Taufraute area). This is the reason why they deserve the category of varieties.

D) EVOLUTIONARY ASPECTS

The evolutionary position of *Erucastrum virgatum*, *E. littoreum* and *E. elatum* is somewhat intermediate with respect to other *Erucastrum* species present in the West Mediterranean region. On one side, the group formed by *Erucastrum gallicum*, *E. nasturtiifolium* and *E. leucanthum* might be more primitive if we attend to the shape of their cotyledons which is much closer to that of *Diplotaxis*; the lack of simplification in the upper leaves might be a second primitive character. On the other side, *Erucastrum varium*, *E. brevirostre* and *E. canariense* show more evolved cotyledons (comparable to those of the group we are studying) but they are annual and probably more modern. The present geographic area of *E. virgatum* suggests that a former continuous distribution along the Mediterranean coast between Gibraltar and Southern Italy was eventually split as a consequence of the quaternary ice ages. The striking vegetative and floral similarity between the Denian and the Sicilian plants, suggests that such event has been a relatively recent one (perhaps the last ice age?). Tetraploidization and a tendency to the annual habit have occurred in Almería and Murcia, in concordance with more severe conditions of temperature and drought.

The divergence between *E. virgatum* and *E. littoreum* is probably much older. In the past, plants similar to *E. littoreum* ($n=8$) may have given rise, on one side, to $n=7$ erect-fruited *E. virgatum* in Europe, and on the other, to *E. elatum* ($n=15$), through amphi-diploidy, in the Atlas. In turn, *E. rivanum* ($n=8$) shows some evolution in the direction of more progressive *Brassica*-like characters.

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