STUDIES ON *CRUCIFERAE:* VIII. NOMENCLATURAL ADJUSTMENTS IN *DIPLOTAXIS* DC.

by

CÉSAR GÓMEZ-CAMPO*

Abstract

GÓMEZ-CAMPO, C. (1981). Studies on Cruciferae: VIII. Nomenclatural adjustments in Diplotaxis DC. *Anales Jard. Bot. Madrid* 38(1):29-35.

The specific status of two rare *Diplotaxis* taxa which had been previously subordinated to *D.catholica* is here substantiated on morphological, karyological and genetical bases. These are *Diplotaxis siettiana* Maire and *Diplotaxis ibicensis* (Pau) Gómez-Campo *stat. nov.* The combination *Diplotaxis erucoides* (L.) DC. subsp. *longisiliqua* (Cosson) Gómez-Campo *comb. nov.* is also proposed after verifying that this taxon is much closer to *D.erucoides* than to *D.virgata.* The geographical distribution and possible affinities of these plants are also discussed.

Resumen

GÓMEZ-CAMPO, C. (1981). Estudios sobre crucíferas: VIII. Ajustes nomenclaturales en Diplotaxis DC. *Anales Jard. Bot. Madrid* 38(1):29-35 (En inglés).

Se aportan datos morfológicos, cariológicos y genéticos para sustanciar el rango específico de dos *Diplotaxis* poco conocidos, antes subordinados a *D. catholica.* Son aquellos *Diplotaxis siettiana* Maire y *Diplotaxis ibicensis* (Pau) Gómez-Campo. Se propone además la nueva combinación *Diplotaxis erucoides* (L.) DC. subsp. *longisiliqua* (Cosson) Gómez-Campo *comb. nov.* tras comprobar que el correspondiente taxon se encuentra mucho más próximo a *D.erucoides* que a *D.virgata.* Se comentan igualmente la distribución geográfica y las posibles afinidades de las plantas mencionadas.

Until recently, only *D.erucoides* and *D.acris* were known to exhibit $2n = 14$ ($n = 7$) chromosomes, while the reported base numbers for other species of the genus were $n = 9$, 10, 11 and 13. Numbers 8 and 12 were apparently missing. On the other hand no autotetraploids have been found in *Diplotaxis,* but *D.muralis* ($n = 10 + 11$) seems to have an alloploid origin (HARBERD & MCARTHUR, 1972).

An additional taxon with $n = 7$ (erroneously named *Diplotaxis virgata* (Cav.) DC. subsp. *cossoniana* (Reut.) Maire & Weiller) and two taxa with $n = 8$ (*Diplotaxis siettiana* Maire and *Diplotaxis catholica* (L.) DC. subsp. *ibicensis* (Pau) Font Quer) have now been reported (GÓMEZ-CAMPO & HINATA,

(*) E.T.S. Ingenieros Agrónomos. Universidad Politécnica. Madrid-3.

1980). This invites a comparative study of these three taxa with respect to each other and also with respect to *D.erucoides* (L.) DC., *D.catholica* (L.) DC. and *D.virgata* (Cav.) DC. in order to determine their correct taxonomic position. *D.acris* has been excluded from this comparison because it shows several specializations to desertic conditions that make it clearly different from its Mediterranean counterparts.

This study has been mainly based on living plants, both wild and cultivated. Cultivation was done either in the greenhouse or in the open. Some interspecific crosses were conducted in the greenhouse. Also, herbarium specimens from MA, BCF, P and K were observed. Pollen malformations were studied with a mini-SEM scanning electron microscope.

Diplotaxis erucoides (L.) DC. subsp. **longisiliqua** (Cosson) Gómez-Campo **comb. nov.**

≡ *Diplotaxis virgata* (Cav.) DC. var. *longisiliqua* Cosson, Compend. 2 :165 (1887) ≡ *Diplotaxis virgata* (Cav.) DC. subsp. *longisiliqua* (Cosson) Nègre. — *Diplotaxis cossoniana*, sensu O. E. Schulz *pro parte* — *Diplotaxis virgata* (Cav.) DC. subsp. *cossoniana* sensu Maire & Weiller *pro parte* (non *Erucastrum cossonianum* Reut.).

Chromosome number: $n = 7$.

We are following NÈGRE (1960) in his interpretation of Reuter's type of *Erucastrum cossonianum* as being different from the plant considered here.

From Table I it is easily concluded that the affinities of this plant are much stronger in relation to *D.erucoides* than to *D.virgata*. Historically, the white flowers of *D.erucoides* subsp. *erucoides* have made it so distinct to botanists, that the eventual existence of infra-specific yellow flowered relatives has been completely overlooked. *D.erucoides* (L.) DC. subsp. *longisiliqua* seems to be one of these relatives. At first view it certainly appears to be little more than a yellow flowered form or variety of *D.erucoides*. However, a closer look has led us to propose the rank of subspecies.

Apart from flower color there is a group of small differential characters such as narrower basal leaves and longer fruits which are not as straight as in subsp. *erucoides* and have their principal veins not so well marked. The geographical area is restricted to the regions of Batna, Bou Saada and Ain Sefra (Algeria) while the type of *D.erucoides* is much more widespread as a weed of cultivated lands.

Breeding barriers between both subspecies are not only geographic but also genetic. Interfertility is very low and F_1 hybrids are completely sterile. It is suggested that such sterility was positive for the survival of subsp. *longisiliqua*. In fact, both areas overlap in certain places north of the Aures mountains, and there the production of natural F_1 hybrids becomes possible. These are largely similar to subsp. *erucoides* and show white flowers, but a slight yellow tinge may serve to recognize them.

In the Aures region the maximum infra-specific variability for *Diplotaxis erucoides* seems to exist, including some forms with violet flowers (f. *apula* (Ten.)O.Kuntze). The yellow flowered subsp. *longisiliqua* might well represent a primitive type from which the white flowered subsp. *erucoides* evolved.

TABLE I

DIFFERENTIAL CHARACTERS FOR *D. VIRGATA* AND TWO SUBSPECIES OF *D. EUROCOIDES*

D. virgata	*D. erucoides* subsp. *longisiliqua*	*D. erucoides* subsp. *erucoides*
Cauline leaves petiolate.	Cauline leaves sessile.	Cauline leaves sessile.
Trichomes adpressed (Morocco) or erect (Iberian Peninsula).	Trichomes adpressed.	Trichomes adpressed.
Flowers yellow.	Flowers yellow.	Flowers white.
Median nectaries ovoid.	Median nectaries cylindrical.	Median nectaries cylindrical.
Fruit 2-4 cm long.	Fruit up to 6 cm long.	Fruit 3-5 cm long.
Seeds 0,5 - 0,75 mm without protruding radicula.	Seeds approx. 1 mm with slightly protruding radicula.	Seeds approx. 1 mm with slightly protruding radicula.
$n = 9$	$n = 7$	$n = 7$

Diplotaxis ibicensis (Pau) Gómez-Campo **comb. & stat. nov.**

≡ *Diplotaxis catholica* (L.) DC. var. *ibicensis* Pau, Mem. Real Soc. Esp. Hist. Nat. 12:278(1921) ≡ *Diplotaxis catholica* (L.) DC. subsp. *ibicensis* (Pau) Font Quer.

— *Diplotaxis ibicensis* Pau *nom. nud. in herb.* (non *Diplotaxis catholica* (L.) DC. var. *bipinnatifida* Kunze).

Chromosome number: n = 8

Table II shows a number of differential characters for this species, arranged for comparison with *D. catholica* and *D. siettiana*. Differences with *D. catholica* appear deep enough to reject any subordinative treatment between both taxa.

One of the most striking characters can only be observed in seedlings or young plants. The earliest leaves are only slightly divided and the subsequent complication is relatively slow (Fig. 1) so that at least ten to twelve leaves need to appear before the pinnatisect silhouette is achieved. Young plants, therefore, sharply differ from those of *D. catholica*, though they become somewhat similar at later stages.

The apparent intra-population polymorphism of this species is often related to its slow heteroblastic development and to the coexistence of plants of different ages. Morphological differentiation (reflected in the division of adult leaves, fruit length, number of seed rows, etc.) is also frequent in the isolated localities where the species is found. This is a subject deserving further studies.

D. ibicensis grows mainly on maritime calcareous rocks of scattered localities in the Ibiza and Formentera (Balearic Is.) coasts as well as in many coastal islets (*Font Quer* 1908-1920, BCF; unpublished investigations by KUHBIER and FINSCHOW pers. communic.). It can be also found in some islets surrounding Cabrera (south of Mallorca) (*Marcos*, 1933 and *Ferrer*, 1949, BCF) but not in Cabrera itself. It seems to be absent from Mallorca and Menorca. However, it is found in the small island Portichol, near Cabo de S. Antonio in the Alicante coast (*Font Quer* 1923, BCF). It should be therefore included in any Peninsular flora.

Diplotaxis siettiana Maire, Bull. Soc. Hist. Nat. Afrique N. 24:198 (1933).

≡ *Diplotaxis catholica* (L.) DC. subsp. *siettiana* (Maire) Maire ≡ *Diplotaxis catholica* (L.) DC. var. *siettiana* (Maire) Nègre

Chromosome number: n = 8.

The most apparent differential character of this species is the width (3-4 mm) of the siliqua, which contains more than one hundred 2 to 4 seriate minute seeds. The plant hardly shows the kind of heteroblastic development exhibited by *D. ibicensis*, and is different from it in other ways (Table II). However, in accordance with their common chromosome number and perhaps a common origin, both species proved to be identical to each other at their seedling stage, while they both differred from all other *Diplotaxis* taxa (more than twenty) cultivated with them. This similarity is based on cotyledon shape, color, aspect of the developing leaves, etc.

TABLE II

DIFFERENTIAL CHARACTERS FOR *D. CATHOLICA*, *D. SIETTIANA* AND *D. IBICENSIS*

D. catholica	*D. siettiana*	*D. ibicensis*
Cotyledon narrowly ellyptical Width/length = 0,6-0,7.	Cotyledon widely ellyptical Width/length = 0,9-1,0.	Cotyledon widely ellyptical Width/length = 0,9-1,0.
Always herbaceous.	Always herbaceous.	Often a short lived perennial with lignescent stem.
20-40 cm high.	20-40 cm high.	60 cm high or more.
Juvenile leaves pinnatisect.	Juvenile leaves pinnatisect.	Juvenile leaves lobed to pinnatifid.
Ultimate leaf divisions acute.	Ultimate leaf divisions obtuse.	Ultimate leaf divisions obtuse.
Petals 5-7 mm.	Petals 9-10 mm.	Petals 5-6 mm.
Fruit narrow, 1,5-2,0 mm with 2 seriate seeds.	Fruit wide, 3,0-4,0 mm with 3-4 seriate seeds.	Fruit narrow 1,5-2,0 mm with 1-2 seriate seeds.
1 seeded beak.	Always sedless beak.	Usually (0)-1 seeded beak.
$n = 9$	$n = 8$	$n = 8$

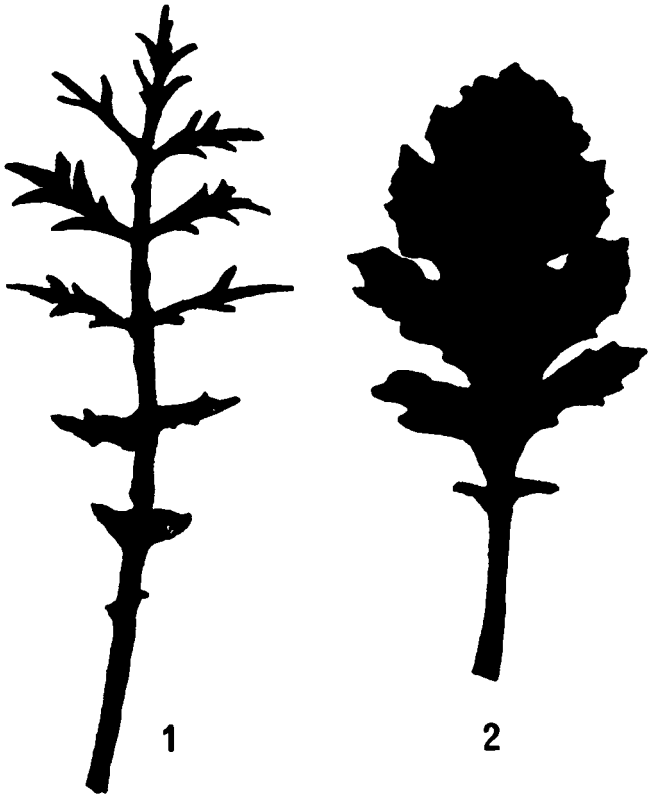

Fig. 1.—The seventh leaf in the heteroblastic development of:
1. *Diplotaxis catholica* (L.) DC.; 2. *Diplotaxis ibicensis* (Pau) Gómez Campo (Natural size).

Its distribution is restricted to the sandy soils of Alborán island (midway between Almería and Melilla) where no more than 200 individuals grow. The variability within the only existing population is rather narrow.

Attempts to fertilize *D. ibicensis* flowers with *D.siettiana* pollen were unsuccessful. In the opposite direction the obtention of hybrids is favored by the high number of seed primordia in the *D. siettiana* siliquas. Several hybrid individuals could be obtained and they were grown together with their parents for comparison. They were intermediate in earliness and also in behaviour with respect to the heteroblastic development. Regarding flower size they resembled *D. ibicensis*. Pollen grains contained abundant malformations. Fully developed fruits could not be obtained because the plants were almost completely sterile.

Diplotaxis siettiana might be seen as an extreme variation of the polymorphic *D. ibicensis* which became fixed by isolation. Such variation has been in

the direction of some *D. catholica* characters (annual herbaceous habit and accelerated heteroblastic development) but it seems clear that this was a pure convergence which occurred independently. At least six differential characters exist for any combination of two of the species described in Table II. This strongly suggests a separate specific treatment for each one.

Some subtle similarities could be traced between *D. ibicensis* and some *Erucastrum* species. Various considerations also suggest that it might perhaps be the closest living relative of *Brassica balearica* Pers., a taxon from Mallorca with uncertain affinities.

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