STUDIES ON *CRUCIFERAE*: VII. A LEAF SHAPE MUTANT IN *BRASSICA NIGRA* (L.) KOCH

by

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Abstract

GÓMEZ-CAMPO, C. (1980). Studies on Cruciferae: VII. A leaf shape mutant in Brassica nigra (L.) Koch. *Anales Jard. Bot. Madrid* 36: 115-118.

A mutant in *Brassica nigra* (L.) Koch (black mustard) with deeply divided pinnatisect leaves is reported. The genetic behaviour of the plant and its offspring suggests the existance of a dominant pleiotropic gene. The possible significance of this type of leaf variations is discussed.

Resumen

GÓMEZ-CAMPO, C. (1980). Estudios sobre cruciferas: VII. Un mutante en la forma de la hoja en Brassica nigra (L.) Koch. *Anales Jard. Bot. Madrid* 36: 115-118 (En inglés).

Se da cuenta de un mutante con hojas pinnatisectas en *Brassica nigra* (L.) Koch, la mostaza negra. El comportamiento genético de la planta y de su descendencia sugiere la existencia de un gen dominante pleiotrópico. Se comenta el posible significado de este tipo de variación en la forma de la hoja.

In 1973 we received some seed samples of *Brassica* species from Ethiopia, including the amphidiploid *B. carinata* Braun and its parents *B. oleracea* L. and *B. nigra* (L.) Koch. The latter sample was given the number GC-2262 in our seed collection, and a small sub-sample was sown early in 1974 in the greenhouse.

Out of one hundred and fifty seedlings approximately, a single individual showed completely normal cotyledons but a strong tendency toward leaf division from the earliest stages of its development. The character persisted into the adult stage and made the plant very distinct in every moment. All fully developed leaves had the aspect shown in

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Figure 1, with many deeply and irregularly divided segments that are either narrow or somewhat widened or roundish toward their ends. Such leaf silhouette is completely different from that of typical *B. nigra,* which is lyrate pinnatifid with a big terminal segment and only a few pairs of smaller lateral segments.

Additionally, the mutant was much less hairy in both the leaves and the stem. Many of the narrower leaf segments were completely glabrous. No other character from the stems, flowers or fruits was seen to have changed with respect to the characters shown by the original GC-2262 plants.

The plant was grown up to maturity and some flowers were self-pollinated, but an almost complete self-sterility was found to exist. Some fertile seeds could only be obtained from other flowers of the same individual that had been freely pollinated by the non mutated plants growing besides. To this seed population, a new number (GC-3481) was given.

The seedling population in 1975 was only composed of nine individuals. Five were normal, while four exhibited the same mutant characteristics of their mother. Normal individuals were separated and the small mutant population was grown up to maturity. They were allowed to pollinate freely within the group, but were isolated from other normal *B. nigra* plants.

A similar selection procedure was followed between 1976 and 1979. The subsequent selected samples kept the same number GC-3481 and they were differentiated by the year of collection. By 1979, the low initial cross fertility within the mutant group had been satisfactorily

Fig. 1.—*Deeply divided pinnatisect leaf in a mutant of Brassica nigra (L.) Koch*

overcome. The proportion of normal segregating individuals was approximately 25 % in 1976 and it has decreased rapidly afterwards.

Parts of the GC-2262 sample were also sown every year in an attempt to rescue some other possible primary mutants from the original population. Several hundreds of seedlings were scored, but no success was obtained.

DISCUSSION

All the facts described above are concordant with the view that the new phenotype first appeared as the result of a dominant gene in heterocygosis. Since the indumentum of the plant was also affected, it is suggested that the same gene is pleiotropic in its action. An alternative hypothesis might consist of two closely linked genes respectively affecting the leaf shape and plant pilosity, but this is not likely to be the case where a mutation seems to be involved.

Small seed sub-samples of both GC-2262 and GC-3481 (the latter still segregating) are available to anybody interested. Since self-fertilization has to be discarded, we are now trying to get the pure strain by repeated selection and also through a parallel system of directed crosses.

Leaves strongly resembling the shape of this mutant, can also be found naturally in at least two related taxa. These are *Sinapis dissecta* Lag. (syn. *Sinapis alba* L. subsp. *dissecta* (Lag.) Bonnier) a relative of *Sinapis alba* L. that occasionally appears in the Mediterranean region, and also *Sinapis allioni* Jacq., a relative of *Sinapis turgida* (Pers.) Del. from Egypt. The name *S. dissecta* has been often wrongly assigned to plants of *S. alba* with a number of leaf segments slightly higher or narrower than usual, and the error has been propagated through seed exchange. In fact, the leaves of true *S. dissecta* are similar to that represented in Fig. 1. Both species seem to be interfertile, but it is warned that reports on this subject might be based on false *S. dissecta* material. As for *S. allioni,* we received a seed sample a few years ago that was later segregating for *S. turgida* leaf type.

It seems evident that only low taxonomic ranks should be associated to variations with such a simple genetic basis. For the moment, no definite proposals are made in this respect. But it is emphasized that any interpretation of the leaf in taxonomic and evolutionary studies on the tribe Brassiceae should take these facts into account.

From an ecological point of view, it is noteworthy that both *Sinapis dissecta* and *Sinapis allioni* have been independently described as weeds in flax cultures. How can their common leaf shape be of significance in regard to that narrow adaptation? In our opinion, it might be purely a matter of mimicry. Weeding has been historically done by hand, so that pinnatisect seedlings of these taxa were more often undetected and their survival was favoured in comparison to their relatives *S. alba*

or *S. turgida*. If this hypothesis is correct, the mutant here described would mean an incipient *Brassica* candidate for the same ecological niche. Unfortunately, it has appeared in the wrong place —our greenhouse— and perhaps also at the wrong time, an epoch when most weeding is being done by chemical means.

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