# INTERSPECIFIC TRANSFER OF CYTOPLASMIC MALE STERILITIES TO BRASSICA NAPUS

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Numerous cytoplasmic male sterilities have been obtained from interspecific hybridization, for a variety of plant species, of which several in the genus Brassica. Introduction of B.campestris genome to Diplotaxis muralis cytoplasm, in particular, has provided a cytoplasmic male sterility system in the former (HINATA and KONNO, 1979). Similarly, B.nigra cytoplasm induces cytoplasmic male sterility in B.oleracea (PEARSON, 1972; DICKSON, 1975). The present paper describes transfer of these two sterilities to B.napus and characteristics of each resultant system.

## A. TRANSFER OF CYTOPLASMIC MALE STERILITY INDUCED BY DIPLOTAXIS MURALIS CYTOPLASM

A male-sterile B.campestris line carrying D.muralis cytoplasm, and its maintainer line, were kindly supplied by Dr. HINATA (Faculty of Agriculture, Tohoku University, Japan).

### 1. Crosses between male-sterile B.campestris and B.napus

Initial crosses between male-sterile B.campestris and four different lines of winter rapeseed only produced male-fertile hybrid plants (ROUSSELLE, pers.comm.). This implied that if D.muralis cytoplasm could induce cytoplasmic male sterility in oilseed rape, restorer genes must have been present in the four lines used. Male-sterile B.campestris plants were crossed with various rapeseed lines in order to establish their ability to act as maintainers or restorers for this cytoplasm. Sixty-seven winter and eighty spring lines of oilseed rape from different countries were tested. F1 plants were all male-fertile except for the two crosses with the two spring cultivars 'Mangun' (South Korea) and 'Hinchu' (Taiwan) which produced male-sterile progeny (PELLAN-DELOURME, 1986; PELLAN-DELOURME and RENARD, 1987). The results show that D.muralis cytoplasm can induce cytoplasmic male sterility in B.napus and that most oilseed rape lines carry restorer genes. Nevertheless, two maintainer lines were revealed.

### 2. Creation of male-sterile B.napus lines

Male-sterile F1 plants obtained from 'Mangun' and 'Hinchu' cultivars were backcrossed with their respective male parents.Second backcross was obtained with 'Hinchu' and third with 'Mangun'.Flowers of male-sterile plants were smaller than those on male parents,and only had two,as opposed to four,nectaries,producing virtually no nectar.Different flower types were distinguished on the basis of stamen morphology.Stamens were either very short and thin,or short and flattened with an expanded fringe containing a little pollen,or petaloid,or pistilloid.Backcrossed plants were selected on these criteria.Those with very short or petaloid stamens had better seed production than those with pistilloid stamens which often produced deformed pods.Despite this,seed production of male-sterile plants was low.

## B.TRANSFER OF CYTOPLASMIC MALE STERILITY INDUCED BY B.NIGRA CYTOPLASM

Cytoplasmic male sterility was transferred from B.oleracea to B.napus using a male-sterile line of broccoli,G1117 A,established by DICKSON (1975).

### 1. Transfer of male sterility to oilseed rape

The F1 hybrid from the male-sterile line G1117 A and the oilseed rape line 'Crop' was obtained from in vitro embryo culture.A single F1 plant (male-fertile) from a spontaneous doubling of chromosome number,gave offspring (ROUSSELLE and EBER,pers.comm.).Male-sterile plants were obtained after a generation of open pollination.Oilseed rape lines used for the following backcrosses also restored male fertility.However,male-sterile plants could be selected from the F2 at each backcross cycle.This indicates that B.nigra cytoplasm can induce cytoplasmic male sterility in B.napus.Observations on male-sterile plants showed that the male sterility was very stable.Stamens could be petaloid or pistilloid,sometimes on a same flower.Male-sterile flowers produced virtually no nectar.Seed set varied for different male-sterile plants.Normal or twisted pods were produced,sometimes on a same plant.However,plants with higher number of seeds per pod were selected.

### 2. Search for maintainers

The first oilseed lines used have proved to be restorers.Then,male-sterile plants have been crossed with a variety of lines in a search for maintainers.However,for 150 lines so far tested,no maintainer has yet been found.

## CONCLUSION

Two systems of cytoplasmic male sterility, in B.campestris and B.oleracea were transferred to oilseed rape. D.muralis and B.nigra cytoplasm also induced male sterility in rapeseed. In both cases, restorer line frequencies were high. Only two maintainer lines were found for D.muralis cytoplasm and none for that of B.nigra. For D.muralis system, male-sterile plants with 2n = 38 chromosomes which were obtained made it possible to check for stability of male sterility, and to assess possibilities of improving seed production. The two maintainer lines 'Mangun' and 'Hinchu' are not adapted to european conditions. Maintainer genes for male sterility will have to be introduced to oilseed rape lines with high agricultural value, satisfying disease resistance criteria and requirements for seed quality. Search for maintainer lines for the B.nigra system is continuing. If no maintainer line can be found transfer of male sterility maintainer genes to oilseed lines may be envisaged using male-sterile plants, but use of protoplast fusion technique should also be considered.

## REFERENCES

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