

Biotechnology methods in research and breeding of winter oilseed rape in Poland

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This report will give general short information on elements of biotechnology used in Polish breeding of oilseed rape. Some more detailed information is given in posters.

1. Tissue Culture

Vegetative propagation of plant parts was the first step made in this area. Then came the embryo rescue method and later haploidization.

1.1. Haploid use

The most widely used method is haploid or doubled haploid production by anther or microspore culture. Anther culture was elaborated earlier and is preferred in breeding works, because of higher yield of spontaneous doubled haploids. Microspore culture is preferred by induction of artificial mutations or by research on resistance to diseases.

Up to now, about five thousand doubled haploid lines were produced from breeding materials of double low winter oilseed rape. The best of them are now tested in preliminary field trials before applying for official trials.

The possibility of homozygous lines to adapt themselves to environmental changes which occurred in different years and locations is still

uncertain. That is the reason why other research studies are conducted to produce synthetic varieties from DH-lines. The choice of DH-lines for intercrossing is based on their combining abilities.

Haploids are very helpful to speed up breeding of homozygous maintainer and restorer lines for CMS systems.

Chemical analyses demonstrated that a greater variability existed among obtained DH lines in comparison with varieties or strains which were the donors of anthers or microspores. This variability is genetically fixed and highly heritable. It can be an efficient way in making further improvements in the reduction of the glucosinolate level.

DH-lines may be used in various experiments when the elimination of genetic variability leads to reduce errors and simplify the interpretation results. For instance, the seed of DH-line can be the best reference standard for analytical purposes, or a good experimental material for physiological and mutation studies.

Haploids and doubled haploids are used in resistance breeding. A pathotype differentiation scale was made for *Phoma lingam* and *Erysiphe polygoni* by the use of doubled haploid lines. Selection for resistance is conducted on haploid level by inoculation or by toxin treatment of haploid embryos.

1.2. Vegetative propagation of unfixed genotypes or haploids by in vitro culture of different parts of plant

1.3. Protoplast fusion

This method is used mainly to improve the plant with cytoplasmic-genetic male sterility of Ogura Type.

1.4. Interspecific crosses with the use of embryo rescue method

This method is used to produce greater variability by resynthesis of Brassica napus or to introduce special traits to oilseed rape, like new fatty acid composition or yellow seed colour.

2. Oilseed rape transformation

These works are now in very early stages. It is expected that the resistance to insects and viruses can be the main area of interest. Some works to transform the resistance to cauliflower mosaic virus or to turnip yellow virus are now conducted in cooperation with the United-Kingdom, Spain and Hungary in the framework of EEC-projects.

3. Breeding and production of hybrid winter oilseed rape

Breeding studies are carried out on three systems : CMS-polima, CMS-juncea and CMS ogura. Research on CMS-polima is particularly

advanced. The system is complete and in double low quality material. Differentiated restorer and maintainer lines are now bred and experimental hybrids are evaluated in field trials to find the best yielding combinations.

CMS-juncea system is now in inter forms of double low quality and intensive breeding is conducted to find gens for full fertility restoration.

CMS ogura is transferred to winter forms of double low quality. The works are concentrated now on the protoplast fusion to eliminate chlorophyll deficiencies and lack of nectaries. Interspecific crosses are conducted to produce restorers.

4. General and specific combining ability and heterosis effect

Many homozygous lines and strains of double low winter oilseed rape are tested now to estimate the heterosis effect. General and specific combining ability are also evaluated in F1 and F2 generations. The results of these works are important for hybrid production, for setting up synthetic varieties and for choosing the best parents in pedigree breeding;