

Accomplishment of CMS MSL _ and Polima system in different Genotypes of Brassica napus L.

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ABSTRACT

Successful hybrid seed production requires identification of good combiners and a male sterility /restorer system .Different genotypes of spring – and winter rapeseed ,with broader genetic distance were crossed with male sterile plants found in F2 hybrid populations ,based on MSL – and polima system.

As next step good maintainers which assured thermostability of male sterility independent of varying environmental conditions were selected..Parallel to this experiment fertile plants of F2 hybrid populations were selfed and crossed with CMS plants in the same time to prove their homozygosity for restorer genes. The results showed that some F3 fertile lines are homozygous for restorer genes and can be used in early generation tests for combining ability with improved CMS lines.

Keywords: Brassica napus , hybrid breeding male sterility system , restores lines .

INTRODUCTION

Many previous tests for heterosis in Brassica napus L. showed that there was significant yield heterosis in F1 varietal hybrids .The heterosis level in spring and winter type of rapeseed was about 20-30% and 30-40% respectively (Brandle and McVetty 1989).Therefore ,Hybrid breeding has been regarded as an important way for further increasing the seed yield of rapeseed.

In order to produce hybrid seed uncontaminated with selfed seed pollination , control methods must be implemented to ensure cross pollination .Gene- cytoplasmic male sterility CMS pol found in oilseed rape spring variety polima in China (FU,1981) , is one of the most promising CMS forms which can be used for creation of hybrid varieties .However , instability of male sterility expression as well as low frequency of maintaining and restoring genotypes in B.napus limit the possibility of utilization of CMS pol for hybrid seed production (Bett and Sguin –Swartz ,1995). Three types of anthers have been identified in the pol CMS –system namely completely male sterile , intermediate and normal anthers that shed pollen (Tai and McVetty ,1988) In winter oilseed rape the first hybrid varieties that were registered in Europe are hybrid-line–associations using the INRA Ogura system and fully restored hybrids using the MSL system (Frauen and Paulmann ,1999) .

Attempts for breeding rapeseed hybrid varieties in Iran has began in last decade (Ahmadi,1996).The male sterility character is transferred in a number of open pollinated varieties and backcrosses are done with the belonging maintainers . Some restored hybrids made with polima , Ogura and NPZ hybridation system was successfully tested widely over the country . Among the proved hybrids one Canadian spring variety has reached more than 50% of Iranian market share during 2002-2003 crop season .

MATERIAL AND METHODS

The experimental material comprised 50 diverse CMS lines (different BCn stages) , which were developed through backcross substitution of nuclear genome of Iranian and exotic accessions of Brassica napus into the sterilizing cytoplasm of some locally bred stable CMS lines. Stability of male sterility expression was assayed through out the vegetation period. Freshly opened flowers were sampled every third day during entire flowering period (March to May). Each sample of specified genotypes was assigned a visual male fertility index 0,1 stable sterile; 2,3 partially fertile and 4 completely fertile . A total of 40 selected and selfed plants from F2 generation of commercial hybrids were crossed with CMS lines and selfed again for scoring the male fertility restoration .

RESULTS AND DISCUSSION

The quantification of male sterility expression revealed that stability / instability of CMS expression was manifested in the developmental patterns of anthers and filaments, rather than per se increase or decrease of fertile /sterile pollen grains. Male sterility was characterized by presence of rudimentary anthers with little or no fertile pollen grain. Attempts are usually made to select plants with flowers containing six completely male sterile anthers. The pollen of oilseed rape is entomophilous and an insect vector is required to achieve good level of cross pollination between A,-B,- and restoring R-line. But the insect and wind pollination is not enough effective in this case. One of supposition is the change in floral morphology of male sterile parents. Petals of CMS pol plants are small and narrow what allows bees obtain nectar by approaching the flower from side without touching the stigma. In the majority of the CMS lines studied the nectary size and female fertility was normal. In 32 CMS lines evaluated, impaired male fertility and a reduced nectary size was observed. The most of complete male sterile lines however had smaller flowers and narrow petals as compared to their euplasmic male fertile B-line parent. Meantime some complete CMS lines produced flowers with normal or semi-normal petals (Table 1). Reversion to fertility was always associated with increased pollen abundance.

For certain homozygous restorer lines, fertile plants of F2 hybrid populations were selfed and at the same time crossed with proper CMS plants. The results showed that some used F2 fertile lines are homozygous for restorer genes and can be used in early generation tests for combining ability with improved CMS lines.

(Table 1) variation in floral morphology of investigated stable sterile CMS-lines

Genotypes inverted to CMS-lines with small and narrow petals	LG3310, WW.1432, Lorted, Option500, Sponsor, Bristol, PF7045/91 Kabel, " Regent.Cobra ", Tracia, Garssion
Genotypes inverted to CMS –lines With normal petals	Norsman, Pronto, Amber, Legacy, Aladin, Commanchi, Crusher

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