

DEVELOPMENT OF HYBRIDS OF INDIAN MUSTARD USING PGS HYBRIDIZATION TECHNOLOGY

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ABSTRACT

Attempts have been made to transfer Barnase and Barstar genes from B napus to B juncea parent lines to develop hybrids in the Indian mustard using PGS hybridization technology. The material in BC3 and BC4, using B juncea as recurrent parents, were studied for stability of male sterility (barnase gene) under tropical conditions, Basta susceptibility and female fertility in the MS lines. Prospects of hybrid seed production under field trial were evaluated using non-transgenic male line as pollinator in the experiment. The seed set was normal in open pollinated MS lines. Results of hybrid seed production in the field are presented alongwith other morphological character in MS lines as compared to normal non-transgenic mustard line.

INTRODUCTION

The Indian mustard (Brassica juncea L.) is the second most important of 9 oilseed crops grown in the country after peanut. By volume India is the largest producer of the mustard in the world, which occupies more than 6.0 million hectares in the Northern India. Though mustard is often cross pollinated species high heterosis in inter-varietal crosses are reported by several workers (Yadav et al., 1974; Agrawal, 1976; Varma, Gulati, Raman, 1991; Badwal and Agrawal, 1991). To exploit the high heterosis commercially an appropriate pollination control mechanism is required. Keeping these objectives in sight attempts have been made to utilize PGS hybridization technology Mariani et. al. 1991, which has been success fully applied to the Canola Rapeseed to develop the commercial hybrids of Indian mustard.

MATERIALS AND METHODS

Development of hybrid of Indian Mustard is based on the transferring a male sterile (Barnase) and herbicide tolerant gene to an Indian mustard line to be used as female and fertility restoration (Barstar) and herbicide tolerant gene to another line to be used as male parent. The success of hybrid development depends upon (i) stability of male

sterility throughout the flowering period under tropical conditions (ii) female fertility under same conditions (iii) restoration of fertility in similar conditions with enough load of pollen.

Experimental material for present studies were the three MS Lines at BC4 using *B. juncea* as recurrent parent viz. BJ1 MS1-1, BJ1 MS1-2 and BJ1 MS6-1 and one non-transgenic pollinator line BJ6. Three male : female row ratio i.e. 1:2, 1:3 and 1:4 were compared for hybrid seed production in preliminary trial for each female line. Data were recorded on single plants for height (PH) in cm, primary branches (PB), secondary branches (SB), number of siliquae on main branches (S/MS), average number of seed/siliquae (S/S), number of aborted siliquae on main shoot (ABS), seed yield/plant (Y/PL) and days to maturity (MAT). The trial was sown in December 1994 and transgenic MS lines were sprayed with 1.5% Basta after 30 days at three to four true leaves stage to get rid off fertile plants. In each MS plants, a branch was covered in a butter paper bag for selfing.

EXPERIMENTAL RESULTS

The mean values for 4 lines for different plant characters are presented in table 1.

TABLE 1(Mean value of plant characters in MS and pollinator lines.

Line	MAT	PH (cm)	PB	SB	S/MS	S/S	ABS	Y/Pl (gms)
BJ1MS1-1 (333plants)	129	89.2	3.2	3.8	15.0	7.6	5.5	2.9
BJ1MS1-2 (204plants)	128	66.8	2.6	2.8	10.5	5.5	4.3	3.1
BJ1MS6-1 (500plants)	133	117.6	4.7	4.7	25.6	8.7	6.0	6.4
BJ 6 (40 plants)	131	135.8	5.8	7.1	23.0	10.7	9.5	13.7

The results of the experiment are concluded below:

1) The male sterility was very stable as none of the selfed buds set seeds in butter paper covered branches. Basta treatment (1.5% spray) at 3-4 true leaves stage was effective in BJ1 MS6-1, whereas in other two MS lines a second spray after 15 days was required to get fertile plants completely killed.

2) The female fertility in the male sterile line was as good as in non transgenic male line. It was evident by the fact that seed set in all the 3 MS lines was very good and number of aborted siliquae were less in the MS lines as compared to pollinator line.

3) BJ1 MS6-1 was better for seed yield per plant as well as other characters followed by BJ1 MS1-2, though yield of pollinator was best among all the lines.

4) Comparison of yield of MF and MS indicates that MS Lines yield about 50% than normal seed yield. Thus, per kilogram cost of hybrid seed production will be around double the cost of seed

To confirm the restoration of male fertility in the hybrid, number of crosses between MS line and RF line are attempted during the season. The results of the same would be available in the next season.

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