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FERTILITY RESTORATION CAPACITY OF FOUR RESTORERS IN HYBRIDS WITH CMS LINES HAVING *TRITICUM TIMOPHEEVI* CYTOPLASM

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ABSTRACT

Fertility restoration capacity of four exotic Rf-sources (W 8156, 3401/478466, PE/YQ and R3-401) in five CMS lines (msHD 2204, msHD 2260, msHP 1102, msUP 368 and msWH 157) with *T. timopheevi* cytoplasm and their reciprocal crosses was studied in two sets during 1983 and 1984. The set I included A x R and set II R x B crosses. The significant differences in the fertility restoration capacity of all the Rf-sources studied were observed in both the years. R x B crosses showed better seed set than their respective A x R crosses. During both crop seasons msHD 2204 x PE/YQ in set I gave the highest seed set while msUP 368 gave consistently high seed set with all restorers.

Key words: CMS lines, Rf-sources, *T. timopheevi*.

Complete restoration of pollen fertility in the F_1 generation is essential for the production of hybrid wheat. Fertility restoring (Rf) genes for cytoplasm i.e. male sterile lines with *T. timopheevi* cytoplasm have been found in various tetraploid and hexaploid wheats [1–7]. The fertility restoration capacity primarily depends on the effect of Rf-genes present and their interaction with the cytoplasm of the CMS lines [8]; it can also be influenced by the environment and the nuclear genes of the CMS lines [9]. Therefore, detailed investigations on the fertility restoration capacity of different restorers are necessary for various CMS lines. This investigation was aimed to study the level of fertility restoration in the F_1 generation of five CMS lines (msHD 2204, msHD 2260, msHP 1102, msUP 368 and msWH 157) after pollination with four restorer lines (W 8156, 3501/478466, PE/YQ, and R_3 - 401) in wheat.

MATERIALS AND METHODS

The five *T. timopheevi* derived CMS lines (A lines) were used as females and four exotic restorers (R lines) as male parents [10]. Hybrid seed was produced by crossing each of the five CMS lines with four restorer lines, the latter were also emasculated and crossed with maintainers (B lines) by hand pollination. The F_1 seed produced on each CMS and restorer line was harvested and grown in a randomized block design with three replications during 1983 and 1984 crop seasons. Set I included A x R and set II R x B crosses. At the time of flowering one spike on each of the ten randomly selected plants in each cross was bagged to prevent out crossing. After the harvest, number of kernels per bagged spike on A x R and R x B lines were counted and the seed set percentage was calculated using the following formula:

$$\text{Seed set \%} = \frac{\text{No. of kernels/spike x 100}}{\text{No. of spikelets/spike x 2}}$$

2 grains per spikelets = 100%

Seed set percentage data for both years was statistically analysed to estimate the variation in fertility restoration. The evaluation and ranking was done on the basis of critical difference between the two crosses. The higher percentage of seed set is considered as standard parameter in the two crosses.

RESULTS AND DISCUSSION

The fertility restoration of Rf-lines in terms of seed set percentage on CMS lines (A x R) and their reciprocals (R x B) are presented in table 1 for 1983 and 1984. The differences in the fertility restoration capacity of all Rf- sources studied and various tester lines were statistically significant for both the years. In set I, the highest seed set was observed in cross msHD 2204 x PE/YQ and lowest in msWH 157 x R_3-401 during both crop seasons. In set II the highest seed set was shown by 3401/478466 x HD 2260 and lowest by PE/YQ x WH 157. On comparison of both sets during two crop seasons it was found that the R x B crosses gave higher seed set percentage than their respective A x R crosses with the exception of some crosses (W 8156 x UP 368, 3401/478466 x UP 368, PE/YQ x HD 2204 and R_3-401 x UP 368 during both years while R_3-401 x HD 2204 in 1983 and PE/YQ x HP 1102 in 1984) which gave lower seed set than their respective A x R crosses.

It is evident from the data presented in Table 1, that fertility restoration by different restorers differ in individual CMS line. During both crop seasons, in set I, msHD 2204 x PE/YQ gave the highest seed set percentage while msUP 368 gave consistently high seed set with all four restorers. In reciprocal combination R x B crosses showed better seed set percentage than their respective A x R crosses. Thus the high seed set in R x B crosses is perhaps due to interaction of major Rf-genes in the R lines with some minor genes present in the B lines.

These results clearly indicate that the genotype of the CMS line influences the fertility restoration by the restorer line. This suggests that the genes from CMS line can modify the

Table 1. Fertility restoration capacity of different Rf-sources in terms of seed set percentage during two crop seasons

Cross		Set I (A x R)		Cross		Set II (R x B)	
		1983	1984			1983	1984
msHD 2204	x W 8156	118.9	120.5*	W 8156	x HD 2204	130.3	129.4*
-do-	x 3401/478466	116.3	115.4*	-do-	x HD 2260	124.6	125.2*
-do-	x PE/YQ	140.5	144.3	-do-	x HP 1102	105.7	105.8*
-do-	x R 3-401	119.3	120.5*	-do-	x UP 368	104.6	103.6*
msHD 2260	x W 8156	122.4	122.3*	-do-	x WH 157	140.5	138.7*
-do-	x 3401/478466	86.3	85.4*	3401-478466	x HD 2204	145.2	144.5*
-do-	x PE/YQ	105.2	102.2*	-do-	x HD 2260	162.2	155.3*
-do-	x R 3-401	108.5	106.3*	-do-	x HP 1102	138.3	134.6*
msHP 1102	x W 8156	104.4	104.7*	-do-	x UP 368	132.3	130.4*
-do-	x 3401/478466	116.5	132.2*	-do-	x WH 157	139.9	136.5*
-do-	x PE/YQ	123.9	123.6*	PE/YQ	x HD 2204	134.3	130.3*
-do-	x R_3-401	112.3	112.6*	-do-	x HD 2260	125.6	122.2*
msUP 368	x W 8156	138.3	140.2*	-do-	x HP 1102	124.2	120.3*
-do-	x 3401/478466	132.7	144.2*	-do-	x UP 368	137.2	134.6*
-do-	x PE/YQ	124.8	123.4*	-do-	x WH 157	102.6	101.8*
-do-	x R3-401	130.1	128.1*	R3-401	x HD 2204	118.5	144.5*
msWH 157	x W 8156	118.7	121.3*	-do-	x HD 2260	116.4	144.9*
-do-	x 3401/478466	139.0	137.7*	-do-	x HP 1102	119.0	116.5*
-do-	x PE/YQ	93.2	95.8*	-do-	x UP 368	126.2	123.2*
-do-	x R3-401	73.3	76.9*	-do-	x WH 157	124.2	121.5*

*Values in the two years significantly different at P = 0.01 level based on C.D.

action of the restorer genes. These results support the findings of Wilson [11] who interpreted the variation in fertility restoration to the number and effectiveness of the sterility/fertility genes acting in a complementary or additive fashion with the restorer genes. Excess sterility genes could act as inhibitors of pollen fertility restoration in the F_1 generation.

The information presented here may be useful in selecting the parents for hybrid seed production. The result also suggest that HD 2204 CMS line would be preferable for use in hybrid wheat programme.

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