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A REPORT ON IDENTIFICATION OF NECROTIC GENES IN SOME TETRAPLOID AND HEXAPLOID WHEATS

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ABSTRACT

Crosses were made between hexaploid and tetraploid wheats to obtain pentaploid hybrids. Majority of the crosses showed hybrid necrosis. Taking C-306, Kalyan Sona and Lerma Rojo as testers, the genes carried by other strains have been identified and their genotypic formulae suggesed.

Key words: Hybrid necrosis, genotypic formulae.

The presence of hybrid necrosis is a serious problem in making successful crosses between different wheat lines. Since such genes are present on chromosomes of B genome [1], crosses between 6x wheat *Triticum aestivum* (AABBDD) and 4x wheat *T. durum* (AABB) are difficult to make. Zeven [2–5] categorised different wheat cultivars on the basis of their geographical distribution and the types of necrotic genes they carry. According to him, the two genes Ne_1 and Ne_2, controlling necrosis, have a definite geographical distribution pattern.

The present investigation aims to identify some tetraploid and hexaploid wheat lines with respect to their necrotic genes and to use them in producing pentaploid wheat hybrids for production of D genome chromosome addition lines in tetraploid wheat.

MATERIALS AND METHODS

Four lines each of 4x wheat (DD-21, Israel durum, Jairaj and DD-147) and 6x wheat (HD-2119, Lerma Rojo, Kalyan Sona and C-306) were selected for making the crosses. Reciprocal crosses involving 4x wheat and 6x wheat were made at the Meerut University farm during March, 1982 and March, 1983 and at Lahaul during August, 1982. The F_1 hybrids were confirmed cytologically. Only those combinations showing neorosis after germination were considered necrotic. Others were categorised under the group no germination.

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RESULTS AND DISCUSSION

Out of the 16 possible combinations, 9 crosses showed necrosis and only 2 were nonnecrotic. Both the nonnecrotic combinations had C-306 as one of the parents. The other parents were DD-21 and Jairaj. The reciprocal crosses Israel durum × C-306 and DD-147 × C-306 were not attempted. Seeds from reciprocal crosses DD-21 × Kalyan Sona, DD-147 × HD 2119, and DD-147 × Kalyan Sona did not germinate. Nongermination of seeds may also be a manifestation of hybrid necrosis [2]. The crosses DD-21 × HD 2119, DD-21 × Lerma Rojo, Israel durum × HD-2119, Israel durum × Lerma Rojo, Israel durum × Kalyan Sona, Jairaj × HD-2119, Jairaj × Lerma Rojo, Jairaj × Kalyan Sona, and DD-147 × Lerma Rojo were clearly necrotic. Thus, most of the crosses attempted turned out to be necrotic. This can be explained, since most of the breadwheats currently under cultivation in India are derivatives of Mexican wheats, while most of the durums are not. The indigenous wheats of India are known to carry Ne_1 gene, while the exotic wheats carry Ne_2 gene. C-306, an old Indian wheat, which carries Ne_1 gene, is strongly necrotic when used in crosses with Mexican wheats having Ne_2 gene [6].

Table 1. List of suggested genotypic formulae

4x wheats	Genotype	6x wheats	Genotype
DD-21	$Ne_1Ne_1ne_2ne_2$	HD-2119	$ne_1ne_1Ne_2Ne_2$
Israel durum	$Ne_1Ne_1ne_2ne_2$	Lerma Rojo	$ne_1ne_1Ne_2Ne_2$
Jairaj	$Ne_1Ne_1ne_2ne_2$	Kalyan Sona	$ne_1ne_1Ne_2Ne_2$
DD-147	$Ne_1Ne_1ne_2ne_2$	C-306	$Ne_1Ne_1ne_2ne_2$

The nonnecrotic cross combinations, yielding viable hybrids (2n=35), had C-306 as one of the parents. This would suggest that the tetraploid wheat lines involved in these crosses also carry Ne_1 gene. This is in conformity with the widely held view that Ne_1 gene is typical of durum wheats and the breadwheats carrying Ne_1 gene must have derived it from durums [7]. That the present tetraploid wheat lines carry Ne_1 gene is further substantiated by the observation that these lines give strong necrosis when crossed to Lerma Rojo and Kalyan Sona, which carry Ne_2 genes [3, 8].

Based on these arguments, we suggest genotypic formulae (Table 1) for the strains studied by us.

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