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EFFECT OF PARENTAL GENOTYPES OF CROSSABILITY IN TRITICALE x WHEAT CROSSES

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ABSTRACT

Six hexaploid triticale strains were crossed as female parents with a set of six commercial wheat cultivars to study the effect of parental genotypes on crossability in triticale x wheat crosses. Significant differences were observed in crossability among different parental lines. Crossability in triticale x wheat crosses ranged from 0.7 to 59.7%. The highest mean seed sets of 26.3 and 22.5% were obtained with DT 78 and Raj 3077, respectively.

Key words: Crossability, triticale, polymorphism, DMRT.

Swaminathan and Gupta [1] suggested that rather than utilizing wheat for the improvement of triticale, much of the genetic variability present in the triticale material should be used for wheat improvement. The success of triticale x wheat hybridization, however, largely depends on the crossability of parental lines, cross direction and on environmental conditions [2–4]. Thus extremely low seed set in triticale x wheat crosses in conjunction with poor F_1 embryo survival appears to be the main barrier which limits the transfer of triticale gene(s) to cultivated wheat.

In order to identify easily crossable parental lines and to determine the effect of maternal and paternal genotypes on crossability in triticale x wheat crosses, a set of six hexaploid triticale strains was crossed with six commercial wheat cultivars. The present communication reports the influence of maternal and paternal genotypes on crossability in triticale x wheat crosses.

MATERIALS AND METHODS

The experimental material comprised six hexaploid triticale strains, viz., DT 76, DT 77, DT 78, DT 79, TL 2858 and TL 2860 which were crossed with six commercial wheat cultivars, viz. HD 2380, Sonalika, HD 2329, HD 2285, Raj 3077 and PBW 154. The parental lines were

grown and crossed under field conditions. Spikes of the triticale parents were emasculated prior to anthesis and hand pollinated 2–3 days later. Emasculated spikes were protected from uncontrolled pollination by crossing bags before and after pollination. Neither hormone application nor embryo resuce and culture technique was employed and the hybrid seeds were harvested at maturity. The number of florets pollinated and seed set were recorded in each cross and crossability was estimated as the percentage. Crossability data were transformed to arcsin percentage for analysis and the means were compared using Duncan's multiple range test (DMRT).

RESULTS AND DISCUSSION

Data analysis revealed significant differences in crossability among different triticale strains on crossing as female parents with different wheat cultivars (Table 1). Seed set values in different triticale x wheat crosses ranged from 0.7 to 59.7%. The highest mean crossability (26.3%) was found in DT 78 followed by TL 2860 (17.2%), TL 2860 (14.6%), DT 79 (10.5%), DT 76 (9.7%) and DT 77 (6.6%). Further, wide variations in the crossability of a specific triticale strain with the male set also indicated significant differences in pollination effectiveness among the wheat (male) parents. For example, seed set in DT 78 varied from 10.0 to 35.9% with Sonalika and HD 2285 as male parents, respectively. Similarly, crossability in TL 2860 ranged from 1.6% with HD 2329 to 59.7% with HD 2380. Remaining triticale strains also showed almost a similar trend when crossed to wheat parents. The

Table 1. Crossability in triticale x wheat crosses

Female parent	Crossability with different male parents (%)												Mean cross-ability (%)
	HD 2380		Sonalika		HD 2329		HD 2285		Raj 3077		PBW 154		
	FP	SS	FP	SS	FP	SS	FP	SS	FP	SS	FP	SS	
DT 76	140	0.7	108	11.1	110	10.0	–NA–		–NA–		70	17.1	9.7^{bc}
DT 77	78	7.0	102	10.8	120	2.5	63	4.4	138	8.0	114	6.1	6.6^{c}
DT 78	110	23.6	110	10.0	70	28.6	78	35.9	96	29.2	128	30.5	26.3^{a}
DT 79	284	9.1	260	7.3	120	2.5	114	29.0	110	4.5	–NA–		10.5^{bc}
TL 2858	92	5.4	98	20.4	70	12.8	86	4.6	66	40.9	92	3.3	14.6^{b}
TL 2860	72	59.7	108	1.8	142	1.6	104	7.7	64	29.7	118	2.7	17.2^{ab}
Mean		17.7^{ab}		102^{bc}		9.7^{c}		16.3^{abc}		22.5^{a}		11.9^{bc}	

Note. The mean values marked with common letters are not significantly different at 5% level by the Duncan's multiple range test.

NA—Cross not attempted; FP—florets pollinated; and SS—seed set (%).

maximum mean crossability in crosses with triticale genotypes was obtained with Raj 3077 (22.5%) followed by HD 2380, HD 2285, PBW 154, Sonalika and HD 2329 with seed sets of 17.7%, 16.3%, 11.9%, 10.2% and 9.7%, respectively. Inter- and intraspecific variations in crossability detected in the present study are in conformity with those reported earlier [2–7].

Since high crossability of wheat cultivars is primarily attributed to the presence of three recessive alleles, Kr_1, Kr_2 and kr_3 [8–10], the variations observed in the crossability of the parental genotypes could be ascribed either to multiple alleles [11] or polymorphism of the kr loci [12]. While the genotypes of the male and female parents have been identified as the major determinants of crossability in triticale x wheat crosses, the influence of environmental factors cannot be completely ruled out.

Although a few parental lines were examined, the present study effectively differentiated the parent genotypes with respect to crossability. Some of the parental genotypes and triticale x wheat crosses, viz., DT 78, Raj 3077, DT 78 x HD 2380, DT 78 x HD 2285, TL 2860 x HD 2380 and TL 2858 x Raj 3077 with medium to high crossability hold great promise for transferring useful triticale gene(s) to cultivated wheat.

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