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INTERSPECIFIC HYBRIDIZATION BETWEEN *BRASSICA JUNCEA* (L.) CZERN & COSS AND *BRASSICA HIRTA* MOENCH.

J. S. BIJRAL, B. B. GUPTA, KULDEEP SINGH AND T. R. SHARMA

SKUAST, Regional Agriculture Research Station, R. S. Pura 181102

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ABSTRACT

An interspecific hybrid between *B. juncea* and *B. hirta* was produced. Neither hormonal treatment nor embryo culture was necessary. Morphological features of the trigenomic (ABS) hybrid resembled the female parent Varuna more closely than *B. hirta*. Chromosome pairing at MI was 4.06 univalents, 12.31 bivalents and 0.44 trivalents per cell. High fertility of the F_1 hybrid indicated the possibility of transferring desirable traits of *B. hirta* to the elite cultivars of Indian mustard.

Key words: *Brassica juncea, Brassica hirta,* interspecific hybrid.

While all the important oleiferous Brassicas are susceptible to leaf blight (*Alternaria brassicae*), white mustard (*Brassica hirta* Moench. syn. *Sinapsis alba*, 2n=2x=24, SS) is highly resistant and holds the greatest promise of contributing leaf blight resistance to the adapted cultivars of the cultivated species. Although in vitro hybrids between *Brassica juncea* and *Brassica hirta* have been obtained [1], the commercial production of such hybrids by conventional breeding methods is practically impossible due to interspecific incompatibility [2]. Therefore, transfer of leaf blight resistance from *B. hirta* to the cultivated species has been a cherished goal for many years.

The present communication deals with the production, morphology and cytogenetics of an interspecific hybrid *B. juncea* x *B. hirta*—the first successful hybrid through conventional method.

MATERIALS AND METHODS

Over 25 manually emasculated flowers of *B. juncea* cv. Varuna (2n=4x=36, AABB) were pollinated by *B. hirta*. Neither hormonal treatment nor embryo culture was necessary. Only one out of the three seeds obtained at maturity gave rise to viable plant. Pollen fertility was determined by counting more than 500 pollen grains stained with acetocarmine. For meiotic

studies, flower buds were fixed in 1:3 acetic acid–ethanol mixture, stored in 70% ethanol overnight, and squashed in 1% acetocarmine.

RESULTS AND DISCUSSION

Morphological features of the trigenomic (ABS) polyhaploid essentially resembled the female parent Varuna more closely than *B. hirta*. Hybrid vigour was apparent in the hybrid plant, manifested as greater height, profuse branching and larger siliquae than either parent. Pollen stainability exceeded 90% and the allotriploid F_1 hybrid produced a large number of F_2/BC_1 seeds on selfing or backcrossing to Varuna.

Chromosome pairing at metaphase I (MI) averaged 4.06 univalents, 12.31 bivalents and 0.44 trivalents per meiocyte. Trivalents occurred in 43.75% of the cells analysed (Table 1). Based on a sum of autosyndetic bivalent frequencies in haploids/polyhaploids of the parental species (3–5), the bivalent frequency in the present F_1 hybrid averaged from 0 to 2.0 bivalents per cell. Since the observed frequency of paired configurations far exceeded the expected levels, chromosome pairing in the F_1 hybrid cannot be explained on the basis of nonhomologous associations alone. Therefore, allosyndetic pairing (homeology) between parental genomes is implied. The presence of multivalents (trivalents) lends further support to allosyndesis between maternal (AB) and paternal (S) genomes. Since the chromosomes of *B. juncea* and *B. hirta* cannot be readily distinguished from each other, the relative proportion of auto- and allosyndetic bivalents could not be assessed. However, the possibility of nonhomologous associations cannot be ruled out completely.

Table 1. Chromosome associations at metaphase I in the F_1 hybrid of *B. juncea* and *B. hirta*

Genome	No. of chromosomes	No. of PMCs analysed	Frequency of different configurations (No./cell)*				
			I*	II			III
				rod	ring	total	
ABS	30	48	4.06	3.87	8.44	12.31	0.44
			(1–7)	(1–6)	(5–12)	(10–14)	(0–1)

*I, II and III indicate univalents, bivalents and trivalents, respectively.

Note. Figures in the parentheses indicate range.

In conclusion, a close homeologous relationship between the parental genomes and high fertility of the F_1 hybrid may mean that useful traits of *B. hirta* can be easily integrated into the target genotypes of the Indian mustard.

REFERENCES

1. D. Mohapatra and Y. P. S. Bajaj. 1987. Interspecific hybridization *Brassica juncea* x *B. hirta* using embryo rescue. Euphytica, 36: 321–326.

2. R. K. Downey, A. J. Klassen and G. R. Stringam. 1980. Rapeseed and mustard. *In*: Hybridization of Crop Plants (eds. W. R. Fehr and H. H. Hadley). American Soc. of Agronomy, USA: 495–509.

3. S. Ramanujam and D. Srinivasachar. 1943. Cytologenetical investigations in the genus *Brassica* and the artificial *Brassica juncea*. Indian J. Genet., 3: 373–78.

4. U. Mizushima. 1944. Haploid parthenogenesis in *Brassica* and *Sinapis*. Agri. Hort. Tokyo, **19**: 743–44.

5. U. Mizushima. 1980. Genome analysis in *Brassica* and allied genera. *In*: *Brassica* Crops and Wild Allies—Biology and Breeding (eds. S. Tsunoda et al.). Tokyo, Japan: 89–108.