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HETEROSIS AND COMBINING ABILITY STUDIES IN ASIATIC COTTON

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ABSTRACT

In a diallel set involving 7 strains/varieties of Asiatic cotton, additive gene action was predominant for seed cotton yield. The cross Bhav-38 x 824 showed significant heterosis for yield over midparent as well as better parent, while crosses 733 x G. 27 and 588 BK x G. 27 showed a significantly high heterosis for this trait over the standard hybrid check. Two parents, i.e. 824 and G. 27, proved to be the best general combiners for yield. The gca effects of the parents and sca effects of the crosses were not related with their *per se* performance.

Key words: Heterosis, combining ability, Asiatic cottons.

In Gujarat, 62% of the total cotton area is under *G. herbaceum* L. and *G. arboreum* L. due to their ability to withstand drought, resistance to common sucking pests and diseases, and high ginning outturn. Release of a high yielding desi cotton hybrid G. Cot. DH-7 in 1984, and a modified commercial seed production technique developed at Surat [1] aroused interest in developing *desi* cotton hybrids. For this, information about general combining ability (gca) of different strains/varieties of desi cotton and the extent of heterosis manifested in their crosses is essential. The present study aims to gather this information.

MATERIALS AND METHODS

The experimental material comprised seven diverse parents of the Asiatic species, *G. herbaceum* L. and *G. arboreum* L., and their 21 crosses excluding reciprocals. The parents and F_1 were grown in randomised block design replicated thrice. Each plot had two rows and each row had 10 plants spaced at 45 cm, the row-to-row distance being 120 cm. Usual cultural practices and plant protection measures were adopted. Five random competitive plants were used to record seed cotton yield per plant in each replication.

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Heterosis was calculated as per standard procedures and combining ability analysis was done following Method 2, Model 1 of Griffing [2].

RESULTS AND DISCUSSION

Analysis of variance for combining ability showed that variances due to both specific combining ability (sca) and general combining ability (gca) were significant for seed cotton yield, indicating operation of both additive and nonadditive gene actions. The gca: sca ratio was 7.91 for seed cotton yield, indicating predominance of additive gene action.

Seven crosses, i.e. 2441 x G. 27, 733 x G. 27, 2441 x 824, 824 x G. 27, 588 BK x 824, Bhav-38 x 824, and 558 BK x G. 27, showed significant positive sca effects (Table 1). All these crosses, except 824 x G. 27, involved parents with low x high gca. The cross 824 x G. 27 involved both parents with high gca. Thus, high x high general combining parents do not always result in crosses with sca effects of high order.

Table 1. Mean performance (in parentheses) MP, BP heteroses and CH, sca effects and types of general combiners used for seed cotton yield in selected crosses of Asiatic cottons

Cross	Mean yield (g/plant)	gca male	gca female	sca	Heterosis		
					MP	BP	CH
2441 x G. 27	92.0	Low (35.3)	High (77.3)	29.5**	63.4**	19.0*	0.0
733 x G. 27	124.6	Low (31.3)	High (77.3)	26.3**	129.4**	61.1**	35.4**
2441 x 824	34.0	Low (35.3)	High (39.3)	22.2**	125.2**	113.7**	-8.6
824 x G. 27	80.0	High (39.3)	High (77.3)	17.4**	37.2**	3.4	13.0*
588 BK x 824	60.3	Low (41.6)	High (39.3)	15.1**	49.2**	44.9**	-34.4**
Bhav-38 x 824	94.6	Low (28.6)	High (39.3)	10.9**	79.0**	190.7**	2.8
588 BK x G. 27	114.3	Low (41.6)	High (77.3)	6.7**	92.4**	47.8**	24.2**

*, ** Significant at 5% and 1% levels, respectively.

Heterosis for seed cotton yield ranged from -0.28 to 179.0% over midparent (MP), -16.9 to 140.7% over better parent (BP), and -61.9 to 35.4% over commercial check (CH). Fourteen crosses recorded significantly positive MP heterosis, while seven crosses showed significantly high BP heterosis. Only two crosses, viz. 733 x G. 27 and 588 BK x G. 27, showed significantly high heterosis over the check G. Cot. DH-7. Several workers [4–8] have reported high degree of heterosis for seed cotton yield in desi cotton. Holla et al. [9] reported up to 227.0% MP heterosis, 148.8% BP heterosis and 62.4% standard heterosis (CH) in interspecific indigenous cotton hybrids. Two parents, i.e. 824 and G. 27, were involved in four out of seven best cross combinations and appeared to be the best parents. Strikingly, the cross Bhav-38 x 824, though recorded highest MP and BP heterosis, did not outyield the check hybrid. In such cases, MP and BP heteroses do not offer any economic promise. Therefore,

heterosis over the check variety or hybrid should be considered as the most reliable guide for commercial exploitation of hybrid. A hybrid merits consideration only when it yields at least 50% more than the highest yielding pure line. In our material 588 BK x G. 27 and 733 x G. 27 were commercially exploitable.

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