



Heterosis for yield and its components in Asiatic cotton hybrids based on GMS system under varied environments

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Efforts are now being made to explore heterosis in Asiatic cotton for further increase in productivity. A *desi* cotton hybrid LDH 11 has been released for general cultivation in North Zone. The use of male sterility system can reduce the cost of hybrid seed production considerably [1]. Therefore, in the present study, 30 GMS based hybrids were evaluated under varied environmental conditions to study the economic heterosis and to identify the suitable combination for commercial exploitation. Hybrids were developed between DS-5 GMS line and 30 male parents of Asiatic cotton selected from germplasm. Thus 30 genotypes alongwith DS-5 were sown during 1993-94 at two locations viz. Hisar and Sirsa with three level of spacing 67.5 × 45 cm., 67.5 × 60 cm. and 67.5 × 75 cm., at each location, thus creating six different environments (E1 to E6). Data were recorded on five competitive plants randomly selected in each replication of each experiments on plant height, number of monopods, number of sympods, number of bolls/plant, boll weight, seed index, lint index and seed cotton yield. Economic heterosis was calculated for all the characters by taking greater value either at normal spacing or broad spacing of standard check DS-5 and its significance was tested as per method proposed by Wyanne *et al.* [2].

For plant height the hybrids DS-5 × N 12, DS-5 × PR 62 and DS-5 × GCD91 exhibited significant positive heterosis in 5 out of 6 environments, while DS-5 × Climiniless-2, DS-5 × BDN 6733C and DS-5 × N 38 were found to be significantly superior over check DS-5 in four environments only. For number of monopods the hybrids DS-5 × B 33, DS-5 × HD 280, DS-5 × N 87 and DS-5 × C 397 were able to express heterosis over check in four environments only. The hybrids DS-5 × HD 167, DS-5 × Climiniless-2 and DS-5 × GCD 91 were found to be significantly heterotic for

number of sympods against check in three environments. It would be pertinent to mention that, these crosses also depicted the significant heterotic values for yield of seed cotton indicating thereby the contribution of fruit bearing branches towards seed cotton yield.

For number of bolls/plant, the crosses DS-5 × AC 3079, DS-5 × AC 3631, DS-5 × N 12 and DS-5 × PR 62 expressed significant superiority in five environments, out of which two hybrids DS-5 × N 12 and DS-5 × PR 62 have also shown significant heterotic values for seed cotton yield in three environments, pin pointing their likelihood of becoming commercially viable hybrids. Aher *et al.* [3] and Nirania *et al.* [4] had also observed similar results in their studies. Similarly, for boll weight which is direct contributing component trait for seed cotton yield, a large number of hybrids exhibited significant heterotic effects. Significant positive effects to the extent of 40.7, 38.3 and 35.8 per cent were exhibited in the crosses DS-5 × PR 62, DS-5 × HD 266 and DS-5 × HD 280, respectively in environment E6. Govil and Singh [5] and Tuteja *et al.* [6] have shown that an increased boll size is also an important contributor to seed cotton yield.

For seed index the hybrid DS-5 × BDN 6377C could show significant economic heterosis in 4 out of 6 environments. Similarly for lint index, three hybrids DS-5 × C 163, DS-5 × HD 273 and DS-5 × X AC 3244 were found to be significantly superior over check variety in four environments. As expected the expression of heterosis for lint index was concomitant with that of seed index in most of the crosses.

In the present study, none of the hybrids appears to be exhibiting stable heterosis over all the environments for all the traits studied. For seed cotton yield the

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Table 1. Estimation of per se performance and mean heterosis for yield and its components in desi cotton

Hybrids	Seed cotton yield		Plant height		No. of monopods		No. of sympods		No. of bolls		Boll weight		Seed index		Lint index	
	Per se performance	Mean heterosis	Per se performance	Mean heterosis	per se performance	Mean performance	Per se performance	Mean heterosis	Per se performance	Mean heterosis	Per se performance	Mean heterosis	Per se performance	Mean heterosis	Per se performance	Mean heterosis
DS 5 × B 33	2437.4	32.8 [*]	149.4	-1.2	7.3	27.0	21.8	-7.8	44.1	22.9	3.4	21.6	5.3	1.7	3.5	6.9
DS 5 × B 34	2304.6	25.6 [*]	151.6	0.2	6.1	4.8	23.7	0.0	45.4	26.5	3.1	11.2	5.4	3.1	3.6	10.4
DS 5 × C 163	2289.3	24.8 [*]	158.9	5.1	7.1	23.5	22.4	-5	38.3	6.8	3.4	24.6	5.2	-1.0	3.9	21.2
DS 5 × HD 167	2696.9	46.9 [*]	156.5	3.5	4.9	-14.7	27.1	14.3	42.7	19.0	3.3	19.2	5.2	-0.6	3.0	-5.3
DS 5 × HD 273	2266.1	23.5 [*]	140.5	-7.1	5.9	2.1	22.8	-3.5	40.8	13.7	3.0	9.4	5.5	5.2	3.7	15.3
DS 5 × HD 305	2383.1	29.9 [*]	166.4	10.0 [*]	5.5	-5.7	24.4	2.9	49.6	38.0	3.0	7.6	5.2	0.2	3.0	-7.8
DS 5 × Climiniless 2	2289.3	24.8 [*]	178.7	18.4 [*]	5.9	2.6	25.8	8.8	43.4	20.9	2.9	5.4	5.6	6.7	3.5	7.5
DS 5 × Coconada white	2710.0	46.7 [*]	168.6	11.5 [*]	6.9	18.8 [*]	25.0	5.4	44.7	24.5 [*]	3.1	10.5	5.4	4.0	3.6	12.2
DS 5 × N 43	2280.4	24.3 [*]	175.5	16.0 [*]	6.7	15.6 [*]	25.8	8.9	39.7	10.7	3.0	11.6	5.3	1.0	3.3	3.1
DS 5 × N 84	2513.0	36.9 [*]	153.8	1.7	6.6	13.7	24.2	2.4	41.8	16.5	3.1	11.6	5.1	-1.7	3.6	12.5
DS 5 × N 87	2279.6	24.2 [*]	158.8	5.0	7.9	36.7 [*]	20.8	-12.3	39.7	10.5	3.2	14.1	5.2	0.8	3.4	7.2
DS 5 × PR 41	2488.9	35.6 [*]	149.2	-1.4	6.0	3.6	25.7	8.4	42.4	18.1	2.9	6.2	5.1	-2.5	3.3	3.1
DS 5 × PR 51	2262.3	23.3 [*]	165.4	9.4 [*]	7.1	23.5 [*]	23.2	-1.9	45.7	27.3 [*]	2.9	6.52	5.5	6.4	3.5	8.1 [*]
DS 5 × C 402	2587.5	40.9 [*]	157.3	4.0	7.4	28.5 [*]	23.4	-1.1	42.0	17.0	3.0	7.25	5.2	-0.6	3.3	3.4
DS 5 (B) Check variety	1835.0		151.2		5.7		23.7		35.9		2.8		5.2		3.2	
	218.7		20.6		0.9		7.7		10.5		0.2		0.47		0.39	

*Significant at 5% level of probability

hybrids DS-5 × HD 305, and DS-5 × C 402 exhibited significant heterotic effects against check variety DS-5 in all the six environments, whereas, DS-5 × B 32, DS-5 × HD 167, DS-5 × HD 273, DS-5 × Climiniless-2, DS-5 × Coconada white, DS-5 × N 43 and DS-5 × GCD 158 exhibited significant standard heterosis in 5 environments.

Among the aforesaid hybrids DS-5 × HD 167, DS-5 × HD 305, DS-5 × C 402 and DS-5 × Coconada white registered highest heterotic effects (more than 40 per cent) for seed cotton yield when measured over the mean of all the environments (Table 1). These results were akin to those reported by other workers [3, 5, 7].

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