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Heterobeltiosis for Some Economic Characters Over Environments in Upland Cotton (*G. hirsutum* L.)

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ABSTRACT

Twenty-eight hybrids from an 8 x 8 diallel of *G. hirsutum* L. were tested with thier parents at Junagadh in three environments. The maximum heterobeltiosis over environments was recorded for seed cotton yield (74.16%). The cross, H. 777 x Surat Dwarf exhibited maximum heterobeltiosis for seed cotton yield. The same cross also displayed significant numerical estimates for ginning outturn and lint index. The hybrid LRK-516 x Surat Dwarf had maximum link index, ginning outturn and a high seed cotton yield.

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INTRODUCTION

Cotton, being the king of apparel fibre, has played a key role in the development of human civilization. Even today it occupies an outstanding position in the textile industry despite the pressure of man-made fibre and blended fabrics. Heterosis has been by far the most important and effective tool in the hands of crop breeders for effecting rapid improvement in yield and other ecomony attributes. Keeping these view in mind the present study was carried out.

MATERIALS AND METHODS

Eight parental lines, viz., G. Cot-10, H. 777, Sharda, DCI-108, G. 2360, LRK-516, Bikaneri Narma (B. N.) and Surat Dwarf (S.D.) and their 28 F1's, were evaluated during *kharif*, 1993 at the College Farm, Gujarat Agricultural University, Junagadh in a randomized block design replicated thrice in three different environments (date of sowing : end of May, end of June and end of July). Each entry was represented by a single-row plot of ten plants, spaced at 90 x 60 cm. The normal agronomical and plant protection practices were followed from time to time for successful raising of the crop. Observations were recorded on five randomly tagged plants in each plot. Heterobeltiosis over environments was worked out using standard formula viz.

$$\text{Heterobeltiosis} = \frac{\overline{F1} - \overline{BP}}{\overline{BP}} \times 100$$

RESULTS AND DISCUSSION

The pooled analysis of variance involving 36 genotypes (8 Parents + 28 F1's) for seed

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TABLE 1

Pooled mean squares for six characters in upland cotton (*G. hirsutum* L.).

Sources	*d.f.*	*Character*					
		Seed cotton yield/plant	*Ginning outturn*	*Seed index*	*Lint index*	*2.5% span length*	*fibre fineness*
Environments (E)	2	74292.679**	115.419**	30.169**	2.428**	92.150**	1.753**
Genotypes (G)	35	3948.863**	11.622**	4.459**	2.096**	7.600**	0.868**
G x E	70	444.616**	0.627**	0.391**	0.173**	0.770	0.246**
Error	210	58.136	0.331	0.055	0.036	1.109	0.164

* Significant at 5% probability level.

** Significant at 1% probability level.

TABLE 2

Heterobeltiosis pooled over environments for six characters in upland cotton (*G. hirsutum* L.).

Crosses	Characters					
	Yield/ Plant	*Ginning outturn*	*Seed Index*	*Lint Index*	*2.5% span length*	*Fibre fineness*
G. Cot-10 x H 777	-14.27**	2.45**	1.15	5.03**	-2.61	11.35**
x Sharda	60.30**	-0.47	-3.78**	-4.48**	3.59	8.02
x DCI-108	24.42**	0.20	-0.77	3.26	-1.77	5.65
x G. 2360	-2.48	1.31	-3.58**	7.37**	2.44	-1.23
X LRK-516	24.32**	2.62**	5.81**	10.37**	0.83	-2.94
x B. N.	43.67**	-1.41**	2.03	-0.41	3.12	1.66
x S. D.		-2.20**	7.47**	3.49**	2.83	6.82
H 777 x Sharda	62.05**	-0.06	-3.01**	-1.30	0.42	11.75**
x DCI-108	8.95**	-1.34	-2.43		-6.07**	19.00**
X G. 2360	25.59**	-1.01	-8.50**	7.93**	-1.63	0.26
X LRK-516	36.33**	-3.09**	2.89**	-7.05**	2.03	6.76
x B.N.	33.08**	1.06**	-5.14**	-2.10	-4.16*	10.77*
X S.D.	.74.16**	2.04**	1.38	-3.78	–3.04	2.11
				6.40**		
Sharda x DCI-108	20.40**	-2.21**	-1.19	4.39*	-3.36	18.34**
x G. 2360	29.13**	2.31**	-8.16**	2.91	4.22	10.89*
x LRK-516	33.50**	-0.69	-0.14	-1.38	-1.20	2.94
x B.N.	31.00**	0.80	-0.72	0.49	-2.88	8.31
x S.D.	43.00**	-0.92	0.84**	5.14*	-2.83	6.59
DCI-108 x G. 2360	1.16	-4.33**	-8.31**	-3.46	-0.34	10.10*
x LRK-516	-26.28**	0.01	-1.76	5.05**	-1.20	24.77**
x B. N.	-00.23	-0.66	-0.33	3.90	0.15	17.96**
x S. D.	23.84**	-2.83**	5.83**	6.82**	1.18	12.34*

1		2.	3.	4.	5.	6.	7.
G. 2360	x LRK–516	-6.49	-0.-08	1.96	7.99**	4.80*	13.53*
	x B. N.	29.63**	-1.75*	-12.45**	14.51**	1.60	-2.36
	x S. D.	35.50**	3.21**	8.86**	2.97	3.68	4.46
LRK-516	x B. N.	25.16**	-1.37	0.49	-1.82	-0.37	5.88
	x S. D.	52.92**	7.32**	0.00	12.27**	.-0.42	9.71
B. N.	x S. D.	19.71**	3.16**	5.34**	10.83**	0.74	8.84

* Significant at 5% Probability level

** Significant at 1% Probability level

B. N. Bikaneri Narma

S. D. = Surat Dwarf

cotton yield, ginning outturn, seed index, link index, 2.5% span length and fibre fineness is presented in Table 1. The analysis of variance revealed that a larger portion of the total variance for all the characters studied was attributed to genotypes and environments when these were tested against G x E component. Both environmental and genotypic variances were found to be highly significant for all the characters. The magnitude of variance for G x E interaction was found to be highly significant for all the characters except 1.5% span length. The magnitude of G x E variance for different characters was lower than those due to genotypes.

The heterosis over better parent in all the 28 crosses for all the six character has been presented in Table 2.

Yield / plant

The extent of heteribeltiosis for seed cotton yield/plant ranged from -26.28 to 74.16 per cent. Out of 28 hybrids, 22 cross combinations exhibited significant positive heterobetiosis. The cross, H. 777 x S. D. gave the highest heterosis (74.16 %) over the better patents. Singh and Singh (1981) and Bhatade and Rajewar (1994) also reported heterosis for seed cotton yield.

Ginning outturn

The heterobeltiosis varied from -4.33 to 7.32 per cent. In the present study, seven crosses manifested significant positive heterobeltiosis indicating importance of non-additive gene action. These results are in partial agreement with the results reported by Singh and Singh (1981) and Bhatade and Rajewar (1994).

Seed Index

In cotton, it has been reported that seed index had high positive association with boll weight (Kadapa, 1961, Singh *et al.* 1968). Six crosses exhibited highly significant positive heterobeltiosis. This may be ascribed to non-additive gene action for the inheritance of this trait. Among these, the cross G. Cot-10 x S. D. displayed highest heterobeltiosis (7.47%) and also recorded high seed cotton yield. Similar results have also been reported by Nagarajan *et al.,* (1994).

Link Index

The range of heterosis over better parent was from -14.51 (G. 2360 x LRK 516) to 12.27 (LRK-516 x S.D.) per cent. Only 13 out of 28 cross showed significant positive heterobeltiosis. Patil and Sheriff (1980)) and Nagarajan *et al.* (1994) also observed heterosis for link index.

2.5% Span length

Throughout the world, fibre length is considered as the most important character amongst the fibre attributes (Sundaram, 1974). Heterobeltiosis for this trait was observed in only one cross, G.-2360 x LRK 516 (4.80%). This is in accordance with the results of Gururajan and Basu (1992).

Fibre fineness

In the present investigation a little improvement was recorded for this character. The results indicated that none of the hybrids under test recorded significant desired negative heterobeltiosis. The additive gene action with little dominance could have resulted in lower degree of heterosis for this character. These results are in partial agreement with the results reported by Prakash (1982).

The overall study of heterosis indicated that the cross combination LRK 516 x Surat Dwarf manifested highest link index, ginning percentage and high seed cotton yield. Thus it become apparent that this hybrid could be successfully exploited for commercial cultivation after its sufficient testing over locations.

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