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Combining Ability Analysis for Seed Cotton Yield and Fibre Quality in Inter-specific Hybrids of Cotton (*G. hirsutum* L. x *G. barbadense* L.)

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ABSTRACT

Combining ability analysis using line × tester design was conducted on 54 hybrids developed by crossing 6 lines and 9 testers. Based on estimates of *gca* effects, ACH 703 E in lines and RHCB 001 among testers were detected as good general combiners. It was found that monopodia per plant, syonpodia per plant, number of bolls per plant, 2.5% span length, fibre elongation and seed cotton yield per plant were predominantly controlled by additive gene action. Among the cross combinations, 0892 B X CCB 5 was found to be better based on their *per se* performance and positive *sca* effects for seed cotton yield per plant. For good fibre quality parameters CNH 120 MB X DB 11 was better.

Key words : Cotton, General and Specific Combining Ability, Inter-specific Crosses, Line × Tester Analysis

Cotton occupies a proment place among the cash crops and plays a major role in india's economy. Knowledge on combining ability is useful for selection of desirable parents for development of hybrids and transgressive expression. Combining ability studies also elucidate the nature and magnitude of gene action involved in the inheritance of seed cotton yield along with fibre quality characters.

MATERIAL AND METHODS

The material for study consisted of 15 parental genotypes and their 54 hybrids of cotton. Fifty-four crosses were synthesized during *kharif* 2009-10 by utilizing 6 high yielding, adapted hirsutum varieties as female lines (REBA B 50, 0892 B, RFS 3438, CNH 120 MB, BB 2 and ACH 703E) and 9 barbadense varieties (CCB 5, DB 11, CCB 6, TCB 108, RHCB 001, DB 1, SUVIN, CCB1 and BRAZIL) as male testers. The parents and their hybrids were evaluated in a randomized block design with three replications with a spacing of 120cm × 60cm during *kharif* 2010-11at RARS, Lam Farm, Guntur. Data were recorded on number of monopodia per plant, number of sympodia per plant, number of bolls per plant, boll weight (g), seed index (g), lint index (g), ginning out-turn (%), 2.5% span length (mm), micronaire value (10^{-6} g inch^{-1}), bundle strength (g text^{-1}), uniformity ratio, fibre elongation (%), harvest index and seed cotton yield per plant(g).The data were subjected to combining ability analysis following the method suggested by Kempthorne (1957). The ratio of GCA/SCA was worked out for each character to find out the predominance of additive / non-additive gene action.

RESULTS AND DISCUSSION

The analysis of variance (Table 1) for combining ability revealed significant differences among crosses and line x tester effects for all the characters suggesting the scope for different characters improvement by selecting better parents. The analysis of variance also revealed significant difference among the lines for number of monopodia per plant, number of sympodia per plant, number of bolls per plant, 2.5% span length, uniformity ratio and seed cotton yield per plant, while significant difference among the testers was noticed for all the characters except seed index, lint index, ginning out-turn, micronaire value and harvest index.

The GCA:SCA ratio was less than unity for seed cotton yield per plant suggesting the trait was governed predominantly by non-additive component (Tab 1). Similar results genetic were

Table 1. Analysis of variance for combining ability for 14 traits in inter-specific hybrids of cotton.

Source of variation	d.f	No. of monopodia plant^{-1}	No. of sympodia plant^{-1}	No. of bolls plant^{-1}	Boll weight (g)	Seed index (g)	Lint index (g)	Ginning out-turn (%)
Replication	2	0.01	10.22	34.44	0.05	0.93	0.02	12.76
Genotypes	68	2.39**	98.55**	468.16**	2.13**	6.32**	1.81**	28.14**
Parents	14	1.23**	80.94**	107.53**	3.20**	4.45**	1.82**	22.17**
Parents *Vs* Crosses	1	54.53**	471.74**	11529.70**	2.86**	15.57**	0.86**	150.58**
Crosses	53	1.71**	96.15**	354.71**	1.83**	6.64**	1.83**	27.41**
Line effect	5	6.05**	306.67**	545.77**	0.85	6.02	2.62	6.74
Tester effect	8	4.35**	245.65**	1277.58**	4.73**	5.85	1.94	44.94
Line X Tester effect	40	0.64**	39.94**	146.26**	1.37**	6.88**	1.70**	26.57**
Error	136	0.06	3.79	18.40	0.08	0.45	0.05	2.60
σ^2gca		0.40	20.99	68.03	0.12	-0.08	0.05	-0.08
σ^2sca		0.19**	12.05**	42.62**	0.43**	2.14**	0.55**	7.99**
σ^2gca/σ^2sca		2.08	1.74	1.59	0.29	-0.03	0.09	-0.01

Source of variation	d.f	2.5% span length (mm)	Uniformity ratio	Micronaire (10^{-6}g inch^{-1})	Bundle strength (g tex^{-1})	Fibre elongation (%)	Harvest index	Seed cotton yield (g)
Replication	2	0.74	6.78	0.05	2.84	0.03	0.01	238.51
Genotypes	68	22.32**	14.09**	0.70**	17.63**	0.18**	0.01**	2244.63**
Parents	14	30.48**	14.33**	1.94**	35.282**	0.26**	0.01**	1096.66**
Parents *Vs* Crosses	1	205.10**	118.97**	8.54**	7.78*	0.15*	0.05**	37774.13**
Crosses	53	16.72**	12.05**	0.23**	13.16**	0.16**	0.01**	1877.50**
Line effect	5	34.51**	20.27*	0.26	3.69	0.18	0.02	5752.61**
Tester effect	8	46.00**	29.42**	0.40	42.24**	0.54**	0.01	3735.16**
Line X Tester effect	40	8.64**	7.55**	0.19**	8.53**	0.08**	0.01**	1021.59**
Error	136	0.62	2.85	0.05	1.27	0.03	0.01	149.27
σ^2gca		2.81	1.53	0.01	1.28	0.02	0.00	330.87
σ^2sca		2.67**	1.56**	0.04**	2.41**	0.01**	0.01*	290.77**
σ^2gca/σ^2sca		1.05	0.98	0.27	0.53	1.64	0.17	1.13

*, ** = Significant at 5% and 1% level respectively.

also reported by Naqib Ullah *et al*. (2010), Patel *et al*. (2009), Mohammad Reza *et al*. (2010), Bbebe *et al.* (2010), Wandhare *et al*. (2010) and Singh *et al.* (2010).

The estimates of general combining ability of parents revealed that the tester RHCB 001 was found to be a good general combiner for number of monopodia per plant, number of sympodia per plant, number of bolls per plant, 2.5% span length, uniformity ratio, bundle strength, fibre elongation, harvest index and seed cotton yield per plant. Among the lines, ACH 703 E was found to be a good general combiner for monopodia per plant, number of sympodia per plant, number of bolls per plant, seed index, lint index, uniformity ratio, bundle strength and seed cotton yield per plant.

Among the crosses, 0892 B X CCB 5, CNH 120MB X RHCB 001and RFS 3438 X

Table 2. Estimates of general combining ability (*gca*) effects of lines and testers for 14 traits in inter-specific hybrids of cotton (*G. hirsutum* L.X *G. barbadense* L.).

Parents	No. of monopodia plant^{-1}	No. of sympodia plant^{-1}	No. of bolls plant^{-1}	Boll weight (g)	Seed index (g)	Lint index (g)	Ginning out-turn (%)
			LINES				
REBA B 50	-0.33**	-5.75**	-4.71**	-0.28**	-0.64**	-0.40**	-0.01
0892B	0.23**	1.92**	0.52	0.01	0.15	0.07	0.05
RFS 3438	0.47**	0.38	4.26**	0.03	0.19	0.28**	0.66*
CNH120MB	-0.68**	1.61**	3.41**	-0.07	-0.30*	-0.36**	-0.73*
BB2	-0.16**	-1.87**	-6.36**	0.26**	-0.12	0.10*	0.38
ACH 703E	0.47**	3.69**	2.86**	0.04	0.72**	0.30**	-0.35
SE (g_i)	0.04	0.37	0.82	0.05	0.13	0.04	0.31
CD at 5%	0.09	0.74	1.63	0.11	0.25	0.09	0.61
			TESTERS				
CCB5	0.06	0.70	2.86**	-0.02	-0.14	-0.15**	-0.33
DB11	0.69**	2.27**	6.16**	0.24**	-1.01**	-0.34**	0.86*
CCB6	0.28**	0.91*	-2.86**	-0.28**	0.22	0.26**	0.54
TCB108	-0.25**	2.34**	-2.58*	-0.55**	0.38*	0.23**	0.12
RHCB001	0.43**	3.22**	10.14**	-0.26**	0.24	-0.18**	-1.07**
DB1	0.09	-0.36	4.25**	-0.35**	0.15	-0.04	-0.35
SUVIN	0.06	1.61**	-0.52	0.44**	0.94**	-0.26**	-2.81**
CCB1	-0.40**	-1.69**	2.08*	-0.28**	-0.59**	-0.17**	-0.01
BRAZIL	-0.96**	-9.01**	-19.52**	1.08**	-0.18	0.67**	3.06**
SE (g_i)	0.05	0.45	1.01	0.06	0.15	0.05	0.38
CD at 5%	0.11	0.91	2.00	0.13	0.31	0.11	0.75

	2.5% span length (mm)	Uniformity ratio	Micronaire (10^{-6}g inch^{-1})	Bundle strength (g tex^{-1})	Fibre elongation (%)	Harvest index	Seed cotton yield (g)
			LINES				
REBA B 50	-0.27	0.45	0.17**	-0.03	0.09*	0.04**	8.86**
0892B	1.31**	0.10	0.05	-0.02	0.06	0.02**	14.84**
RFS 3438	-1.68**	0.63	-0.01	0.22	0.04	0.00	6.22**
CNH120MB	1.21**	-1.18**	-0.09*	0.05	-0.09**	-0.01*	-10.31**
BB2	-0.50**	-0.93**	-0.05	-0.65**	-0.09*	-0.03**	-24.44**
ACH 703E	-0.06	0.92**	-0.06	0.44*	-0.00	-0.02**	4.83*
SE (g_i)	0.15	0.32	0.04	0.21	0.03	0.01	2.35
CD at 5%	0.30	0.64	0.09	0.43	0.07	0.01	4.66
			TESTERS				
CCB5	0.48*	-1.22**	-0.10	-0.87**	-0.06	0.02**	-7.01*
DB11	0.27	1.21**	0.04	-0.17	-0.01	0.02**	23.20**
CCB6	0.46*	-1.17**	0.04	-0.42	-0.09*	0.01**	-1.16
TCB108	1.01**	0.09	-0.11*	1.99**	0.23**	-0.01**	-14.10**
RHCB001	0.82**	1.08**	-0.07	1.82**	0.33**	0.02**	19.54**
DB1	0.71**	-0.10	-0.12*	1.27**	0.00	-0.02**	-1.09
SUVIN	0.52**	-1.41**	-0.05	0.20	-0.11*	-0.05**	3.30
CCB1	-0.12	-0.71	0.02	-1.05**	-0.06	0.04**	-0.82
BRAZIL	-4.17**	2.23**	0.35**	-2.78**	-0.20**	-0.02**	-21.84**
SE (g_i)	0.18	0.38	0.05	0.26	0.04	0.01	2.87
CD at 5%	0.36	0.78	0.11	0.52	0.09	0.01	5.70

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

Table 3. Estimates of specific combining ability (*sca*) effects of interspecific hybrids for yield and yield components in cotton (*G. hirsutum* L. × *G. barbadense* L.)

Crosses	No. of monopodia plant^{-1}	No. of sympodia plant^{-1}	No. of bolls plant^{-1}	Boll weight (g)	Seed index (g)	Lint index (g)	Ginning out-turn (%)
	1	2	3	4	5	6	7
REBA B 50 X CCB 5	-0.16	1.74	3.49	-0.57**	0.34	-0.22	-2.06*
REBA B 50 X DB 11	-0.28	1.57	-7.00**	0.29	3.24**	0.29*	-5.58**
REBA B 50 X CCB6	-0.14	4.10**	0.21	0.49**	1.40**	0.31*	-1.76
REBA B 50 X TCB 108	0.06	-7.79**	-3.06	-0.13	-2.12**	0.14	5.44**
REBA B 50 X RHCB 001	-0.39**	-2.43*	5.88*	-0.46**	-2.37**	-0.66**	1.98*
REBA B 50 X DB1	0.93**	-1.38	8.10**	0.49**	1.97 **	0.42**	-2.50**
REBA B 50 X SUVIN	-0.16	2.60*	3.54	0.66**	1.62**	0.94**	0.12
REBA B 50 X CCB 1	0.24	2.00	-13.72**	-0.77**	-3.97**	-1.85**	1.87*
REBA B 50 XBRAZIL	-0.09	-0.40	2.54	0.01	-0.11	0.62**	2.47**
0892 B X CCB 5	-0.04	1.85	14.58**	0.72**	-0.02	-0.00	-0.04
0892 B XDB 11	-0.26	2.13	6.94**	0.25	-1.61**	0.05	4.06**
0892 B X CCB 6	0.07	1.68	-0.69	-0.71**	-1.36**	-0.72**	-0.11
0892 B X TCB 108	-0.38**	-0.91	-4.30	1.49**	0.28	1.27**	3.85**
0892 B X RHCB 001	-0.27	-2.38*	-5.36*	-0.53**	0.89*	-0.47**	-3.71**
0892 B X DB 1	0.52**	3.76**	3.52	0.35*	-0.31	0.08	0.75
0892 B X SUVIN	0.32*	0.55	-11.69**	-0.87**	-0.30	0.50**	2.41*
0892 B X CCB1	-0.23	-5.07**	-8.30**	-0.78**	1.29**	-0.35*	-3.48**
0892 B X BRAZIL	0.26	-1.62	5.30*	0.08	1.15**	-0.34*	-3.72**
RFS 3438 X CCB 5	0.12	2.59*	2.17	0.77**	0.86*	0.45**	0.04
RFS 3438 X DB 11	-0.00	-4.23**	4.87	-0.02	1.03**	1.20**	2.25*
RFS 3438 X CCB 6	-0.19	-6.61**	0.56	-1.02**	-0.57	-1.20**	-3.62**
RFS 3438 X TCB 108	0.84**	4.62**	-0.38	-0.49**	-0.96*	-0.83**	-1.26
RFS 3438 X RHCB 001	0.45**	0.61	2.56	1.04**	0.04	0.58**	2.00*
RFS 3438 X DB1	-0.90**	1.13	-2.21	-0.66**	-0.39	-0.39**	-0.85
RFS 3438 X SUVIN	0.39**	-5.10**	-1.76	-0.32	-0.58	-0.24	0.19
RFS 3438 X CCB 1	-0.00	4.59**	-3.38	1.03**	1.44**	0.73**	0.44
RFS 3438 X BRAZIL	-0.70**	2.38*	-2.43	-0.33	-0.89*	-0.28*	0.80
CNH 120 MB X CCB5	0.61**	-2.17	-5.64*	0.28	-0.90*	-0.40**	0.00
CNH 120 MB X DB 11	-0.24	-1.66	-5.94*	0.27	-0.39	0.08	1.04
CNH 120 MB X CCB 6	0.40**	1.69	-1.91	-0.38*	-0.15	0.64**	2.10*
CNH 120 MB X TCB108	-0.46**	2.39*	-0.86	-0.18	0.30	-0.69**	-3.53**
CNH 120 MB X RHCB 001	0.31*	-1.07	-3.58	-0.14	1.21**	0.25	-1.50
CNH 120 MB X DB 1	-0.35*	-1.32	-3.36	0.01	-0.13	-0.05	-0.20
CNH 120 MB X SUVIN	-0.45**	-3.73**	11.74**	0.78**	1.11**	0.03	-1.97*
CNH 120 MB X CCB 1	-0.21	4.69**	11.47**	-0.25	-0.45	0.04	1.64
CNH 120 MB X BRAZIL	0.38**	1.18	-1.91	-0.39*	-0.89*	0.09	2.40*
BB 2 X CCB 5	-0.23	-0.67	-9.19**	-0.41*	1.48**	0.25	-1.53
BB 2 X DB 11	0.04	2.86*	6.50**	-0.55**	-1.07**	-0.18	2.11*
BB 2 X CCB 6	-0.11	-2.21	-5.80*	1.61**	-0.41	0.93**	4.58**
BB 2 X TCB 108	0.49**	3.26**	6.91**	-0.24	1.42**	0.00	-2.22*
BB 2 X RHCB 001	0.40**	5.54**	6.19*	-0.07	1.50**	0.08	-2.25*
BB 2 X DB 1	-0.66**	-3.62**	-6.58**	-0.42*	-1.94**	-0.65**	2.05*
BB 2 X SUVIN	-0.16	4.52**	0.86	-0.34*	-2.06**	-0.66**	1.58
BB 2 X CCB 1	0.37*	-4.67**	2.91	0.47**	0.40	1.23**	0.50
BB 2 X BRAZIL	-0.13	-5.01**	-1.80	-0.02	0.66	-1.01**	-4.83**

Crosses	No. of monopodia plant^{-1}	No. of sympodia plant^{-1}	No. of bolls plant^{-1}	Boll weight (g)	Seed index (g)	Lint index (g)	Ginning out-turn (%)
	1	2	3	4	5	6	7
ACH 703 E X CCB 5	-0.29*	-3.34**	-5.41*	-0.80**	-1.76**	-0.07	3.59**
ACH 703 E X DB 11	0.76**	-0.67	-5.38*	-0.24	-1.19**	-1.45**	-3.90**
ACH 703 E X CCB6	-0.02	1.34	7.36**	0.02	0.79*	0.03	-1.20
ACH 703 E X TCB 108	-0.55**	-1.58	1.69	-0.43*	1.07**	0.10	-2.27*
ACH 703 E X RHCB 001	-0.51**	-0.25	-5.69*	0.17	-1.28**	0.00	3.48**
ACH 703 E X DB 1	0.45**	1.43	0.52	0.22	0.80*	0.60**	0.75
ACH 703 E X SUVIN	0.05	1.15	-2.69	0.09	0.21	-0.56**	-2.35*
ACH 703 E X CCB1	-0.17	-1.54	11.02**	0.29	1.28**	0.20	-0.98
ACH 703 E X BRAZIL	0.28*	3.47**	-1.69	0.65**	0.07	0.92**	2.88**
SE (s_{ij})	0.14	1.12	2.47	0.17	0.39	0.13	0.93
CD at 5%	0.28	2.22	4.91	0.33	0.77	0.27	1.84

*, ** = Significant at 5% and 1% level, respectively.

Table 3 Cont.....

Crosses	2.5% span length (mm)	Uniformity ratio	Micronaire (10^{-6}g/ inch)	Bundle strength (g/tex)	Fibre elongation (%)	Harvest index	Seed cotton yield (g)
	8	9	10	11	12	13	14
REBA B 50 X CCB 5	0.72	0.91	0.16	1.25	0.09	- 0.01	22.99**
REBA B 50 X DB 11	-0.06	-1.03	-0.41**	1.36*	0.06	-0.02	6.21
REBA B 50 X CCB6	-0.10	1.90	0.14	-0.22	-0.06	-0.00	16.44*
REBA B 50 X TCB 108	0.16	1.97*	-0.00	0.55	0.05	0.03*	-16.37*
REBA B 50 X RHCB 001	-0.48	-1.12	0.23	-2.63**	-0.13	0.00	-13.92
REBA B 50 X DB1	-0.36	0.47	0.02	0.17	-0.05	0.08**	15.46*
REBA B 50 X SUVIN	0.60	-0.54	-0.34*	1.52*	0.03	0.04**	12.77
REBA B 50 X CCB 1	1.02*	-3.64**	0.03	-0.88	-0.07	-0.09**	-18.76**
REBA B 50 X BRAZIL	-1.50**	1.07	0.15	-1.11	0.06	-0.02	-24.82**
0892 B X CCB 5	1.72**	-1.93	-0.22	0.05	0.15	0.01	46.86**
0892 B XDB 11	-0.57	-0.08	-0.26	-1.28	-0.06	0.03*	9.20
0892 B X CCB 6	-1.90**	-0.50	0.35*	-1.54*	0.06	0.03**	-5.82
0892 B X TCB 108	-0.05	0.04	0.08	1.04	0.19	0.07**	7.79
0892 B X RHCB 001	-0.54	2.41*	-0.10	1.03	0.12	-0.12**	-20.07**
0892 B X DB 1	0.39	0.24	0.13	0.33	-0.06	0.00	11.62
0892 B X SUVIN	1.34**	0.23	-0.03	1.40*	0.08	-0.12**	-36.62**
0892 B X CCB1	0.97*	-0.44	-0.00	-1.67*	-0.27*	0.03*	-3.13
0892 B X BRAZIL	-1.35**	0.02	0.05	0.62	-0.21	0.04**	-9.82
RFS 3438 X CCB 5	0.16	-0.76	-0.04	0.94*	-0.06	0.02	-25.26**
RFS 3438 X DB 11	0.09	-0.50	0.18	-1.30*	-0.15	0.05**	12.16
RFS 3438 X CCB 6	-0.18	-1.68	-0.45**	0.65	-0.02	0.04**	-14.54*
RFS 3438 X TCB 108	0.62	-0.06	0.27	-1.03	-0.11	-0.04**	4.49
RFS 3438 X RHCB 001	-0.60	1.05	0.18	2.28**	0.34**	0.05**	-15.85*
RFS 3438 X DB1	-0.35	-0.55	-0.09	-1.81**	0.00	-0.10**	-23.94**
RFS 3438 X SUVIN	-0.17	1.34	0.01	0.42	-0.12	0.05**	26.59**
RFS 3438 X CCB 1	0.85	0.42	0.14	1.67*	0.16	0.04**	20.49**
RFS 3438 X BRAZIL	-0.40	0.74	-0.21	-1.83**	-0.02	-0.13**	15.86*

Crosses	2.5% span length (mm)	Uniformity ratio	Micronaire (10^{-6}g inch^{-1})	Bundle strength (g tex^{-1})	Fibre elongation (%)	Harvest index	Seed cotton yield (g)
	8	9	10	11	12	13	14
CNH 120 MB X CCB5	-5.48**	2.64**	0.56**	-3.72**	-0.22	0.00	-15.43*
CNH 120 MB X DB 11	0.41	1.15	0.28*	1.62*	0.39**	-0.00	-1.75
CNH 120 MB X CCB6	1.10*	-1.13	0.04	-0.17	0.01	-0.03*	1.67
CNH 120 MB X TCB 108	0.33	-2.29*	-0.07	-1.26	-0.17	-0.09**	-2.18
CNH 120 MB X RHCB 001	-0.62	0.22	-0.29*	-1.74**	-0.31**	0.06**	27.47**
CNH 120 MB X DB 1	1.85**	1.00	-0.08	2.79**	0.22	0.11**	2.52
CNH 120 MB X SUVIN	-0.91*	-1.03	0.12	-2.45**	-0.04	0.03*	-0.73
CNH 120 MB X CCB 1	2.48**	-0.50	-0.62**	3.58**	0.04	-0.02	-12.52
CNH 120 MB X BRAZIL	0.83	-0.06	0.05	1.35*	0.08	-0.06**	0.95
BB 2 X CCB 5	2.36**	-0.26	-0.15	1.26	0.11	0.02	-7.17
BB 2 X DB 11	-0.48	0.16	0.10	-0.11	-0.13	0.01	-1.62
BB 2 X CCB 6	1.07*	-0.81	-0.19	1.16	0.02	0.00	-5.16
BB 2 X TCB 108	0.43	-0.19	-0.17	1.05	0.13	-0.07**	3.50
BB 2 X RHCB 001	0.67	-0.36	-0.03	0.82	0.11	0.00	19.15**
BB 2 X DB 1	-0.21	-0.56	-0.12	-0.67	-0.20	-0.06**	-8.52
BB 2 X SUVIN	-0.23	-1.39	0.17	-1.68*	-0.14	-0.00	-11.67
BB 2 X CCB 1	-5.79**	4.66**	0.50**	-2.81**	0.08	0.00	3.06
BB 2 X BRAZIL	2.18**	-1.23	-0.11	0.98	0.00	0.07**	8.45
ACH 703 E X CCB 5	0.50	-0.59	-0.30*	0.21	-0.07	-0.05**	-21.97**
ACH 703 E X DB 11	0.61	0.30	0.10	-0.27	-0.10	-0.07**	-24.20
ACH 703 E X CCB6	0.01	2.22*	0.09	0.12	-0.02	-0.05**	7.42
ACH 703 E X TCB 108	-1.49**	0.54	-0.10	-0.35	-0.09	0.09**	2.77
ACH 703 E X RHCB 001	1.58**	-2.21*	0.00	0.23	-0.13	0.00	3.22
ACH 703 E X DB 1	-1.31**	-0.61	0.14	-0.81	0.10	-0.03*	2.85
ACH 703 E X SUVIN	-0.62	1.39	0.06	0.77	0.20	-0.00	9.66
ACH 703 E X CCB1	0.45	-0.50	-0.06	0.11	0.05	0.03*	10.86
ACH 703 E X BRAZIL	0.25	-0.53	0.06	-0.01	0.08	0.10**	9.37
SE (s_{ij})	0.45	0.97	0.13	0.65	0.11	0.01	7.05
CD at 5%	0.90	1.93	0.27	1.29	0.22	0.02	13.98

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

SUVIN exhibited highly significant positive *sca* effect for seed cotton yield per plant (Table 3) but based on *per se* performance and *sca* effects 0892 X CCB5 was selected as the best cross combination for seed cotton yield. In hybrids for good fibre quality characterstics CNH 120 MB X DB 11 was identified as a good hybrid and the yield is on par with the check.

The significance of GCA and SCA mean squares suggests the importance of both additive and non-additive variances for all the characters studied. However, the higher GCA effects of female parent ACH 703 E and male tester RHCB 001 for majority of the traits indicate that both these parents may be preferred for hybridization and in selection programme. The *sca* effects revealed that, cross 0892 B X CCB 5 (14.58) could be better choice for number of bolls, BB2 X CCB 6 (1.61) for boll weight, REBA B 50 X TCB 108 (5.44) for ginning out-turn. Whereas for fibre strength CNH 120 MB X CCB 1(3.58) recorded highest *sca* effect.

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