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Combining Ability Estimates for Yield and Fibre Quality Traits in Line X Tester Crosses of Cotton

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ABSTRACT

Combining ability analysis using line × tester design was conducted during *kharif* 2009-10 on 54 hybrids produced by crossing 9 lines and 6 testers. The perusal of results on estimates of *gca* effects RCR 2 among lines while, RCRC 4 and RCRC 5 among testers were detected as good general combiners. It was found that all the characters studied were controlled predominantly by non-additive gene action. Out of 54 crosses, seven crosses exhibited significant positive *sca* effects and among them RCR 5 X RCRC 5, RCR 2 X RCRC 4 and RCR 136 X RCRC 5 were found to be better based on their *per se* performance and positive *sca* effects for seed cotton yield per plant.

Key words : Cotton, Line × tester Analysis, General and Specific Combining Ability

The knowledge of gene action and combining ability helps in identifying the best combiners which may be hybridized either to exploit heterosis or to accumulate the genes through selection and in understanding the characters to choose the proper selection method to be followed in breeding programmes.

MATERIAL AND METHODS

The experimental material for the present investigation comprised 54 hybrids derived from crossing 9 lines with 6 testers which are intra-hirsutum lines developed from heterotic pools of segregating generations of multiple crosses. These 54 hybrids were grown at Agricultural College Farm, Bapatla, Andhra Pradesh during *kharif* 2009-10. The experiment was laid out in a randomized block design with three replications with a spacing of 120cm × 60cm. Data on plant height, days to 50% flowering, number of monopodia per plant, number of sympodia per plant, number of bolls per plant, boll weight, seed index, lint index, ginning out-turn, 2.5% span length, micronaire value, bundle strength, uniformity ratio, fibre elongation, lint yield per plant and seed cotton yield per plant were recorded.

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 except uniformity ratio in line x tester effect. The analysis of variance also revealed significant differences among the lines for the characters, number of monopodia per plant, 2.5% span length, micronaire value, uniformity ratio and in testers, plant height, lint index, ginning out-turn, lint yield per plant and seed cotton yield per plant.

The ratio of general combining ability of variance to specific combining ability of variance was low indicating the role of non-additive gene action in governing the inheritance of seed cotton yield per plant. Ashok Kumar and Ravikesavan (2008), Kalpande *et al*. (2008), Kumboh *et al*. (2008), Cetin Karademir *et al*. (2009) and Deosarkar *et al*. (2009) also confirmed the above findings.

Combing ability studies revealed that line RCR 2 and the testers, RCRC 4 and RCRC 5 showed positive *gca* effects for seed cotton yield per plant (Table 2). The line RCR 2 also showed positive *gca* effects for number of monopodia per plant, boll weight, ginning out-turn, lint index and lint yield per plant. Whereas the testers RCRC 4 showed positive *gca* effects for plant height, number of bolls per plant, ginning out turn, seed index, lint index and lint yield per plant and RCRC 5 showed positive *gca* effects for number of sympodia per plant, number of bolls per plant, boll weight, seed index and lint yield per plant.

Table 1: Analysis of variance for combining ability and estimates of genetic components of variance and proportional contribution of lines, testers, and line x tester interaction to total variance for seed cotton yield per plant and yield components in cotton (*Gossypium hirsutum* L.)

Source of variation	d.f	Plant height (cm)	Days to 50% flowering	No. of monopodia plant^{-1}	No. of sympodia plant^{-1}	No. of bolls plant^{-1}	Boll weight (g)	Ginning out-turn (%)	Seed index (g)
Replication	2	35.539	1.462	0.024	0.479	11.117	0.070	0.596	0.202
Crosses	53	239.818**	6.075**	0.341**	12.948**	189.718**	0.547**	6.393**	2.074**
Line effect	8	242.320	3.138	0.763**	7.422	116.496	0.485	4.574	3.017
Tester effect	5	733.652**	6.370	0.368	14.354	381.120	0.447	19.117**	2.872
Line X Tester effect	40	177.589**	6.625**	0.254**	13.877**	180.437**	0.572**	5.167**	1.785**
Error	106	70.396	0.519	0.038	0.567	28.236	0.086	0.708	0.070
σ^2gca		1.8187	-0.0161	0.0026	-0.0272	0.2712	-0.0007	0.0358	0.0084
σ^2sca		35.7307**	2.0355**	0.0720**	4.4366**	50.7336**	0.1618**	1.4862**	0.5719**
σ^2gca/σ^2sca		0.0509	-0.0079	0.0356	-0.0061	0.0053	-0.0045	0.0241	0.0147
Contribution of									
Line (%)		15.25	7.79	33.70	8.65	9.26	13.38	10.79	21.95
Tester (%)		28.86	9.89	10.18	10.45	18.95	7.71	28.20	13.06
Line x tester (%)		55.88	82.30	56.10	80.88	71.77	78.89	60.99	64.97

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

Table 1 cont.....

Source of variation	d.f	Lint index (g)	2.5% span length (mm)	Micronaire value (10^{-6}g/in)	Bundle strength (g/tex)	Uniformity ratio	Fibre elongation (%)	Lint yield plant^{-1} (g)	Seed cotton yield plant^{-1} (g)
Replication	1	0.077	1.073	0.039	0.252	2.084	0.007	43.088	955.897
Crosses	47	0.666**	8.223**	0.275**	1.332**	6.396**	0.007**	394.990**	3034.129**
Line effect	7	0.598	31.993**	0.753**	2.170	18.849**	0.010	460.256	3338.903
Tester effect	5	2.313**	4.523	0.088	0.317	6.579	0.006	921.249**	7552.489*
Line X Tester effect	35	0.474**	3.93**	0.202**	1.292**	3.882	0.007**	316.154**	2445.880**
Error	47	0.065	1.199	0.112	0.107	2.832	0.003	58.457	494.964
σ^2gca		0.0056	0.1254	0.0021	0.0012	0.0735	0.0001	2.3040	17.1917
σ^2sca		0.1363**	0.9107**	0.0300**	0.3948**	0.3500**	0.0012**	85.8988**	650.3051**
σ^2gca/σ^2sca		0.0412	0.1377	0.0705	0.0030	0.2099	0.0833	0.0268	0.0264
Line (%)		13.53	58.72	41.34	24.58	44.48	20.11	17.58	16.61
Tester (%)		32.72	5.18	3.04	2.24	9.70	8018	22.00	22.55
Line x tester (%)		53.74	36.08	55.60	73.17	45.81	71.69	60.40	60.83

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

Table 2. Estimates of general combining ability (*gca*) effects of lines and testers for 16 traits in cotton (*Gossypium hirsutum L.*)

Parents	Plant height (cm)	Days to 50% flowering	No. of monopodia plant^{-1}	No. of sympodia plant^{-1}	No. of bolls plant^{-1}	Boll weight (g)	Ginning out-turn (%)	Seed index (g)
				Lines				
RCR-8691	-5.86**	0.00	0.03	-1.10**	2.29	-0.17*	-0.52**	-0.54**
RCR-9002	3.25	0.27	-0.12*	0.11	1.51	0.06	-0.39*	0.4**
RCR-5	2.04	-0.55**	-0.31**	0.41*	-3.32**	0.01	-0.77**	0.62**
SAHANA	3.47	0.72**	-0.10*	0.05	0.23	0.15*	0.37	-0.38**
RCR-361	3.94*	0.22	-0.06	0.42*	0.01	0.11	0.08	0.44**
RCR-791	-2.98	-0.05	0.29**	-0.01	-0.54	0.05	0.49*	-0.13*
RCR-2	1.91	0.22	0.13**	-0.88**	1.79	0.20**	0.68**	-0.12
RCR-100	-1.98	-0.55**	0.28**	0.95**	2.73*	-0.26**	-0.23	-0.09
RCR-136	-3.79	-0.27	-0.14**	0.02	-4.71**	-0.17*	0.29	-0.23**
SE (gi)	**1.97**	**0.16**	**0.04**	**0.17**	**1.25**	**0.06**	**0.19**	**0.06**
CD at 5%	**3.92**	**0.33**	**0.09**	**0.35**	**2.48**	**0.13**	**0.39**	**0.12**
				Testers				
RCRC-1	-3.21*	0.48**	-0.18**	-0.67**	2.82**	-0.11*	-1.34**	-0.41**
RCRC-2	1.43	0.14	0.00	-0.25	1.04	-0.13*	1.08**	-0.27**
RCRC-3	-4.94**	0.29*	0.13**	-0.58**	-4.69**	-0.09	-0.04	0.14**
RCRC-4	8.56**	-0.40**	0.06	0.23	2.64*	0.09	0.50**	0.37**
RCRC-5	2.54	-0.77**	0.07	1.31**	3.01**	0.11*	-0.47**	0.31**
RCRC-6	-4.38**	0.25	-0.08*	-0.03	-4.84**	0.14*	0.27	-0.15**
SE (gj)	**1.61**	**0.13**	**0.03**	**0.14**	**1.02**	**0.05**	**0.16**	**0.05**
CD at 5%	**3.20**	**0.27**	**0.07**	**0.28**	**2.02**	**0.11**	**0.32**	**0.10**

Table 2 cont…….

Parents	Lint index (g)	2.5% span length (mm)	Micronaire value (10^{-6}g/in)	Bundle strength (g/tex)	Uniformity ratio	Fibre elongation (%)	Lint yield plant^{-1} (g)	Seed cotton yield plant^{-1} (g)
				Lines				
RCR-8691	-0.18**	0.13	0.20*	-0.37**	-0.09	-0.01	-1.82	-2.52
RCR-9002	0.20**	0.54*	-0.05	0.06	0.04	0.02	3.03	8.99
RCR-5	-0.00	2.99**	-0.38**	0.45**	-2.23**	0.01	-6.18**	-12.57*
SAHANA	0.00	-1.09**	0.06	-0.16*	0.16	-0.04**	4.30*	10.02
RCR-361	0.14*	-0.09	-0.22**	-0.06	0.03	0.02	1.87	7.18
RCR-791	-0.13*	-1.55**	0.26**	-0.18*	1.68**	0.01	1.05	0.57
RCR-2	0.25**	-0.95**	0.13	-0.38**	0.64	-0.01	7.91**	18.91**
RCR-100	-0.00	0.47	0.04	0.62**	-0.27	0.01	-2.25	-3.88
RCR-136	-0.21**	-0.44	-0.04	0.02	0.02	-0.00	-7.92**	-26.71**
SE (gi)	**0.06**	**0.25**	**0.07**	**0.07**	**0.39**	**0.01**	**1.80**	**5.24**
CD at 5%	**0.12**	**0.51**	**0.15**	**0.15**	**0.78**	**0.02**	**3.57**	**10.39**
				Testers				
RCRC-1	-0.51**	-0.64**	0.07	-0.02	0.28	0.01	-2.12	1.62
RCRC-2	0.27**	0.47*	0.03	0.13*	-0.96**	-0.00	0.32	-4.42
RCRC-3	-0.02	0.38	0.02	0.03	0.02	0.01	-8.08**	-22.57**
RCRC-4	0.28**	-0.11	-0.04	-0.15*	0.01	-0.02	7.86**	20.40**
RCRC-5	0.03	0.05	-0.08	0.08	0.30	-0.01	5.29**	16.31**
RCRC-6	-0.05	-0.16	-0.00	-0.07	0.34	0.01	-3.28*	-11.34**
SE (gj)	**0.04**	**0.21**	**0.06**	**0.06**	**0.32**	**0.01**	**1.47**	**4.28**
CD at 5%	**0.09**	**0.41**	**0.12**	**0.12**	**0.64**	**0.02**	**2.91**	**8.48**

Table 3. Estimates of specific combining ability (*sca*) effects of crosses for 16 traits in cotton (*Gossypium hirsutum* L.)

Crosses	Plant height (cm)	Days to 50% flowering	No.of monopodia plant^{-1}	No. of sympodia plant^{-1}	No. of bolls plant^{-1}	Boll weight (g)	Ginning out-turn (%)	Seed index (g)
RCR-8691 X RCRC-1	-5.38	1.85**	-0.16	-1.47**	4.78	0.11	-1.53**	0.72**
RCR-9002 X RCRC-1	3.82	2.57**	0.09	-0.22	6.56*	-0.05	-1.02*	-0.11
RCR-5 X RCRC-1	0.70	-1.59**	-0.21	-3.39**	-5.27	-0.06	0.33	-1.27**
SAHANA X RCRC-1	6.40	-0.87*	0.24*	6.77**	1.50	-0.61**	-0.99*	0.39*
RCR-361 X RCRC-1	0.06	-0.37	-0.19	-0.53	4.06	0.22	0.46	-0.16
RCR-791 X RCRC-1	-3.09	-2.09**	0.29*	-1.09*	-12.04**	0.85**	-0.09	0.61**
RCR-2 X RCRC-1	-0.53	0.63	-0.36**	-0.65	-2.71	-0.14	-0.27	0.89**
RCR-100 X RCRC-1	-2.56	1.07*	0.42**	0.13	3.34	-0.36*	1.68**	-1.59**
RCR-136 X RCRC-1	0.57	-1.20**	-0.11	0.46	-0.21	0.03	1.43**	0.51**
RCR-8691 X RCRC-2	10.43*	-0.81	0.34**	1.57**	3.56	-0.15	-0.53	0.67**
RCR-9002 X RCRC-2	1.61	-2.09**	-0.10	1.09*	-6.32*	0.65**	1.50**	-0.25
RCR-5 X RCRC-2	-8.80	-1.25**	-0.27*	-1.44**	-5.82	0.45**	0.94	0.51**
SAHANA X RCRC-2	0.76	0.46	-0.05	-0.84	-3.04	0.77**	1.03*	0.18
RCR-361 X RCRC-2	-9.17	-1.03*	0.00	-1.28**	1.84	-0.60**	-0.40	-1.04**
RCR-791 X RCRC-2	0.89	2.57**	-0.35**	0.15	7.72*	-0.66**	-1.56**	0.33*
RCR-2 X RCRC-2	9.72*	-0.03	-0.05	-0.10	-11.60**	0.09	-1.16*	0.62**
RCR-100 X RCRC-2	1.79	-0.25	0.19	1.15**	11.11**	-0.34*	1.18*	-0.33*
RCR-136 X RCRC-2	-7.23	2.46**	0.29*	-0.28	2.56	-0.22	-1.00*	-0.69**
RCR-8691 X RCRC-3	0.07	0.37	0.12	1.27**	-1.69	-0.39*	-1.13*	-0.84**
RCR-9002 X RCRC-3	0.16	-1.90**	0.27*	0.61	4.08	-0.13	0.97*	0.32*
RCR-5 X RCRC-3	2.03	0.25	0.03	0.78	-3.08	0.21	1.43**	-0.67**
SAHANA X RCRC-3	3.06	2.31**	-0.10	0.15	-7.64*	-0.11	0.88	-0.03
RCR-361 X RCRC-3	-5.40	1.81**	-0.18	-1.02*	-2.42	0.50**	-0.13	0.33*
RCR-791 X RCRC-3	3.06	0.42	-0.47**	-0.25	1.13	-0.09	0.85	-0.74**
RCR-2 X RCRC-3	-14.52**	0.14	0.08	0.09	2.80	-0.03	0.51	-0.39*
RCR-100 X RCRC-3	10.90*	-1.74**	-0.09	-0.68	11.19**	-0.34*	-1.54**	0.88**
RCR-136 X RCRC-3	0.07	-1.68**	0.33**	-0.95*	-4.36	0.39*	-1.24*	1.15**
RCR-8691 X RCRC-4	-11.56*	0.74	-0.54**	-1.51**	-1.69	-0.06	0.03	0.36*
RCR-9002 X RCRC-4	-0.94	1.13**	0.00	-0.33	-3.25	-0.71**	0.45	0.39*
RCR-5 X RCRC-4	-5.53	0.63	0.10	1.93**	4.91	-0.40*	0.21	-0.07
SAHANA X RCRC-4	-4.30	0.68	-0.27*	-4.07**	-1.30	0.09	0.19	-0.32*
RCR-361 X RCRC-4	-1.57	-1.81**	0.28*	0.55	-3.42	0.78**	-2.04**	1.07**
RCR-791 X RCRC-4	5.62	-0.20	-0.00	0.25	8.80**	-0.13	-1.05*	0.02
RCR-2 X RCRC-4	11.52*	-1.48**	0.42**	1.80**	13.46**	-0.11	0.88	-1.12**
RCR-100 X RCRC-4	0.82	0.29	0.07	1.02*	-8.47**	0.71**	1.73**	-0.28
RCR-136 X RCRC-4	5.96	0.01	-0.06	0.35	-9.03**	-0.23	-0.41	-0.04
RCR-8691 X RCRC-5	2.72	-0.22	0.04	-0.56	-7.40*	0.43*	1.03*	0.19
RCR-9002 X RCRC-5	-12.19*	1.50**	-0.33**	-3.48**	-2.62	0.44**	-0.72	-0.44**
RCR-5 X RCRC-5	16.15**	1.66**	-0.00	5.11**	17.21**	-0.34*	-2.34**	0.65**
SAHANA X RCRC-5	-4.11	-1.61**	0.18	-2.01**	5.98	-0.33	-0.23	-0.06
RCR-361 X RCRC-5	4.51	0.88*	-0.12	2.40**	2.54	-0.37*	1.36**	-1.03**
RCR-791 X RCRC-5	-8.45	-0.83*	0.25*	-0.12	-11.23**	0.10	0.63	0.05
RCR-2 X RCRC-5	6.74	-0.11	0.41**	0.38	1.09	-0.03	0.36	0.76**
RCR-100 X RCRC-5	-8.55	-0.66	-0.20	-3.05**	-15.17**	0.09	-0.39	0.24
RCR-136 X RCRC-5	3.18	-0.61	-0.23*	1.33**	9.59**	0.01	0.89	-0.38*
RCR-8691 X RCRC-6	3.71	-1.92**	0.20	0.69	2.45	0.06	2.13**	-1.10**
RCR-9002 X RCRC-6	7.53	-1.20**	0.05	2.33**	1.56	0.20	-1.19*	0.09
RCR-5 X RCRC-6	-4.55	-0.29	0.39**	-2.99**	-7.93*	0.14	-0.58	0.85**
SAHANA X RCRC-6	-2.35	-0.98*	0.00	0.00	4.50	0.19	-0.28	-0.16
RCR-361 X RCRC-6	11.57*	0.51	0.20	-0.10	-2.60	-0.53**	1.35**	-0.83**
RCR-791 X RCRC-6	1.97	0.13	0.27*	1.06*	5.61	-0.07	1.22*	-0.28
RCR-2 X RCRC-6	-12.93**	0.85*	-0.49**	-1.52**	-3.04	0.24	-0.32	-0.76**
RCR-100 X RCRC-6	-2.39	1.29**	-0.38**	1.43**	-1.99	0.16	-2.67**	1.08**
RCR-136 X RCRC-6	-2.55	1.10*	-0.21	-0.90*	1.45	0.01	0.33	-0.54**
SE (s_{ij})	**4.84**	**0.41**	**0.11**	**0.43**	**3.06**	**0.17**	**0.48**	**0.15**
CD at 5%	**9.60**	**0.82**	**0.22**	**0.86**	**6.08**	**0.33**	**0.96**	**0.30**

Table 3 cont.....

Crosses	Lint index (g)	2.5% span length (mm)	Micronaire value (10^{-6} g/in)	Bundle strength (g/tex)	Uniformity ratio	Fibre elongation (%)	Lint yield plant^{-1} (g)	Seed cotton yield plant^{-1} (g)
RCR-8691 X RCRC-1	-0.21	1.79**	0.10	-0.34	-2.05*	-0.13**	4.82	25.72*
RCR-9002 X RCRC-1	0.50**	0.70	0.15	0.11	-1.49	0.02	6.02	15.97
RCR-5 X RCRC-1	-0.45**	-0.12	0.08	-0.01	0.18	-0.02	-7.11	-22.46
SAHANA X RCRC-1	-0.00	-1.86**	0.24	0.51**	0.65	-0.00	-11.67**	-30.39*
RCR-361 X RCRC-1	-0.04	-0.27	-0.53**	-0.12	-1.65	0.05	13.01**	34.61**
RCR-791 X RCRC-1	0.44**	-0.78	0.18	0.39*	0.23	0.00	-1.87	-4.24
RCR-2 X RCRC-1	0.17	0.02	-0.08	-0.20	0.17	0.06	-6.22	-15.24
RCR-100 X RCRC-1	-0.66**	0.63	-0.27	0.35	2.69**	-0.00	-1.87	-3.65
RCR-136 X RCRC-1	0.26	-0.10	0.12	-0.68**	1.26	0.02	4.89	-0.32
RCR-8691 X RCRC-2	0.39**	0.09	0.12	-0.60**	-0.37	0.05	-0.84	1.04
RCR-9002 X RCRC-2	0.04	-0.06	0.01	0.24	0.12	0.02	4.81	9.99
RCR-5 X RCRC-2	0.32*	-0.11	0.09	0.20	0.29	0.06	1.57	3.59
SAHANA X RCRC-2	0.20	0.56	-0.48*	-0.78**	0.36	0.01	14.69**	31.92*
RCR-361 X RCRC-2	-0.79**	-0.04	-0.29	0.84**	-0.17	-0.05	-7.03	-21.60
RCR-791 X RCRC-2	-0.08	-0.14	0.07	-0.23	0.20	-0.00	-5.52	-7.68
RCR-2 X RCRC-2	-0.21	0.91	0.04	0.69**	-0.75	-0.01	-19.59**	-49.32**
RCR-100 X RCRC-2	0.48**	-0.86	0.13	-0.28	-0.59	-0.04	11.41*	22.40
RCR-136 X RCRC-2	-0.36*	-0.34	0.31	-0.08	0.90	0.01	0.50	9.66
RCR-8691 X RCRC-3	-0.84**	-1.48*	-0.27	0.29	2.03*	0.00	-9.14*	-19.43
RCR-9002 X RCRC-3	0.37*	-0.48	-0.05	0.41*	0.09	-0.00	5.87	14.04
RCR-5 X RCRC-3	0.31	-0.39	0.15	0.85**	0.37	0.04	3.43	2.44
SAHANA X RCRC-3	0.03	0.76	0.34	-0.12	-0.06	0.00	-10.60*	-36.01**
RCR-361 X RCRC-3	-0.00	-1.03	0.40*	0.34	0.13	-0.00	3.65	11.41
RCR-791 X RCRC-3	0.14	0.22	-0.16	-0.07	-1.98*	0.01	6.27	11.69
RCR-2 X RCRC-3	0.35*	0.44	-0.18	-0.07	0.72	0.00	1.93	2.85
RCR-100 X RCRC-3	-0.15	0.95	-0.03	-1.24**	-1.39	-0.06	2.99	18.21
RCR-136 X RCRC-3	-0.13	1.02	-0.18	-0.38*	0.08	-0.00	-4.43	-5.21
RCR-8691 X RCRC-4	-0.08	0.34	0.10	0.28	0.55	0.07	-5.23	-17.81
RCR-9002 X RCRC-4	-0.00	-0.21	-0.01	-1.35**	0.07	-0.04	-17.17**	-50.24**
RCR-5 X RCRC-4	-0.02	-2.49**	-0.00	-0.85**	0.05	-0.12**	3.24	6.42
SAHANA X RCRC-4	-0.04	0.10	-0.11	0.70**	-0.54	-0.00	-1.25	0.9
RCR-361 X RCRC-4	0.18	2.07**	0.03	-1.03**	1.31	-0.00	2.43	22.66
RCR-791 X RCRC-4	-0.56**	0.54	-0.11	0.19	0.30	0.00	6.43	25.44
RCR-2 X RCRC-4	0.07	0.41	-0.26	1.12**	-1.22	0.01	20.58**	48.01**
RCR-100 X RCRC-4	0.23	-0.10	0.07	0.54**	0.06	0.10**	7.79	11.60
RCR-136 X RCRC-4	0.22	-0.66	0.30	0.38*	-0.59	-0.01	-16.82**	-47.10**
RCR-8691 X RCRC-5	0.49**	-0.77	-0.24	-0.15	-0.64	-0.03	0.49	-6.88
RCR-9002 X RCRC-5	-0.42**	2.14**	-0.03	0.19	-0.34	0.08*	2.74	11.29
RCR-5 X RCRC-5	-0.51**	2.01**	-0.32	0.50**	-1.53	0.03	12.28**	48.35**
SAHANA X RCRC-5	-0.02	0.53	0.41*	0.36	-0.56	-0.01	-0.07	7.56
RCR-361 X RCRC-5	-0.06	-2.11**	0.27	0.29	1.62	0.02	-0.35	-11.06
RCR-791 X RCRC-5	0.18	-0.19	0.17	-0.48*	0.57	-0.02	-14.00**	-43.25**
RCR-2 X RCRC-5	0.12	-0.74	0.12	-0.91**	0.68	-0.03	4.65	12.04
RCR-100 X RCRC-5	0.25	-0.53	-0.04	-0.29	0.67	-0.03	-17.33**	-53.03**
RCR-136 X RCRC-5	-0.02	-0.34	-0.34	0.50**	-0.45	-0.02	11.58**	34.99**
RCR-8691 X RCRC-6	0.25	0.02	0.18	0.53**	0.48	0.03	9.89*	17.36
RCR-9002 X RCRC-6	-0.49**	-2.08**	-0.03	0.39*	1.54	-0.04	-2.27	-1.05
RCR-5 X RCRC-6	0.44**	1.11	-0.00	-0.70**	0.62	0.01	-13.41**	-38.35**
SAHANA X RCRC-6	-0.16	-0.09	-0.40*	-0.67**	0.15	-0.01	8.92*	25.91*
RCR-361 X RCRC-6	0.72**	1.39*	0.11	-0.31	-1.24	-0.01	-11.72**	-36.02**
RCR-791 X RCRC-6	-0.12	0.35	-0.15	0.20	0.66	-0.02	8.68	18.03
RCR-2 X RCRC-6	-0.51**	-1.05	0.36	-0.62**	0.40	-0.03	-1.35	1.66
RCR-100 X RCRC-6	-0.15	-0.08	0.14	0.92**	-1.43	0.03	-2.99	4.45
RCR-136 X RCRC-6	0.03	0.44	-0.21	0.26	-1.19	-0.02	4.26	7.98
SE (s_{ij})	**0.14**	**0.63**	**0.19**	**0.18**	**0.97**	**0.03**	**4.41**	**12.84**
CD at 5%	**0.29**	**1.25**	**0.38**	**0.37**	**1.92**	**0.07**	**8.75**	**25.46**

Among the crosses, RCR 5 X RCRC 5, RCR 2 X RCRC 4 and RCR 136 X RCRC 5 exhibited significant positive *sca* effect and high *per se* performance for seed cotton yield per plant (Table 3). The highest significant positive *sca* effect was recorded by RCR 5 X RCRC 5 (48.35) for seed cotton yield per plant.

Thus, in the present study based on their *per se* performance and combining ability effects RCR 2 X RCRC 4 and RCR 5 X RCRC 5 are identified as promising hybrids and these hybrids can be commercially exploited after thorough testing over large number of wider environments. The combing ability analysis disclosed that all the traits in general are predominantly controlled by non-additive gene action. The present study indicated the scope of developing hybrids with high seed cotton yield per plant and desired fibre qualities through heterosis breeding.

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