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Improvement in lint yield and fibre quality traits in inter and intra specific hybrids in American cotton

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ABSTRACT : This study was conducted to improve yield potential allow with good combination of fibre quality hybrid. The 35 inter specific and 15 intraspecific hybrids were generated by using five lines and ten testers. Highest positive significant heterosis for lint yield/plant was exhibited by hybrids GSHV 01/1338 × TCB 26 (39.2%), GSHV 01/1338 x GSB 41 (25.1%), G Cot 10 x DB 10 (20.0%) in inter specific group and crosses GSHV 01/1338 x GSHV 112 (24.6%) and G Cot 20 x GSHV 112 (20.2%) in intra specific group and also possesses acceptable level of fibre quality. Among parental, G Cot 10, GSHV 01/1338, GSB 41, GSHV 112, 76 IH 20 and BC 68-2WW reported good general combiners for lint yield and fibre qualities. These high yielding hybrids involved good x good and good x poor combinations of GCA effects and also exhibited significant positive SCA effects for lint yield and fibre qualities.

Key words : American cotton, combining ability, heterosis, lint yield quality, traits

In the global cotton scenario, India has the distinction of having the largest cotton area. However, the productivity is far lower than the world average. Although, Indian cottons have wider quality spectrum, the right combination of fibre length, micronaire and fibre strength is however absent in many of the popular high yielding varieties and hybrids. Indian cottons confirming to long and extra long staple group are too fine coupled with weak strength and micronaire. There is an urgent need to promote those higher yielding hybrids/ variety that could come closer in quality to the most sought by modern textile mills.

Using heterosis to raise yield and fibre quality of cotton has long been an objective for researchers and producers. Since then, heterosis in interspecific and intraspecific hybrids has been reported by a number of researchers in lint yield and for fibre qualities (Basbag and Gencer, 2007; Patel *et al.,* 2012; Ekinci *et al.,* 2016). Therefore, the objective of the present study was to determine magnitude of heterosis for lint yield of intrespecific (H×B) and intraspecific (H×H) hybrids for commercial cultivation with good combination of fibre traits which may gratify requirements of our Indian textile industries.

MATERIALS AND METHODS

The genetic population was developed by line x tester (5 × 10) mating design. The five well adapted South Gujarat cotton cultivars (G Cot 20, G Cot 10, GSHV 01/1338, GSHV 97/ 612 and GSHV 01/12) were used as lines and were hand pollinated by ten testers, which is belonging from three different cotton growing zones of India. Testers were selected on the basis of their fibre variability and yielding potentiality (GSB 40, GSB 41, GSHV 112, 76-IH 20 and BC 68-2WW from Central; TCB 26, Suvin, CCB 5 and DB 10; RAB 8 from north zones). The 35 inter and 15 intraspecific hybrids were generated at Main Cotton Research Station, Navsari Agricultural University, Surat during 2010-2011. Parents and their resultant 50 F_1 along with two checks *viz.*, G Cot Hy 12 for interspecific and G Cot Hy. 102 for intraspecific hybrids were grown in one row plots in a randomized block design (RBD) with three replications during 2011-2012 at three locations of south Gujarat *viz.*, Surat, Navsari and Achhalia. The rows and plants spacing were 120 and 45 cm, respectively. At maturity the data from five competitive plants/replication were collected for the lint yield (g), ginning outturn (%), 2.5 per cent staple length (mm), fibre strength (g/tex) and fibre fineness (Mv). Magnitude of heterosis in terms of percentage of increase or decrease of hybrid over standard check for each character was calculated.

RESULTS AND DISCUSSION

Analysis of variance for lint yield and fibre quality traits is presented in Table 1. Analysis of variance indicated that lines, testers and hybrids were highly significant for all studied traits. This revealed the existence of considerable genetic variability in all the characters under study except for lines in fibre strength. The success in the development of superior variety/hybrid depends on the choice of parents for hybridization and amount of genetic variability present in the base population to be improved. Lines *vs.* testers was significant, this indicated that selection of parental lines was right. However, parents *vs.* hybrids were significant for all traits except ginning percentage which suggested that the presence of substantial amount of heterosis in crosses for all studied characters. Female lines showed consistent performance across locations while hybrids and testers did not. These results might be due to that females were adaptable to this environment.

The estimates of economic heterosis for different characters are presented in Table 2a and b. The degree and direction of heterosis varied from character to character depending on the parent involved in cross combination. Cotton is mainly grown for fibre, hence, lint yield is the most important economic trait. In case of economic heterosis, lint yield ranged from -25.5 (G Cot 20 x Suvin) to 39.2 per cent (GSHV 01/1338 x TCB 26) in pooled data of *hirsutum* x *barbadense* crosses. The hybrid combination GSHV 01/1338 x TCB 26 had highest 39.2 per cent economic heterosis

Table 1. Analysis of variance for experimental design in American cotton

Source of variances	d.f.	Lint yield/ plant (g)	Ginning (%)	2.5 per cent span length (mm)	Fibre strength (g/tex)	Fibre fineness (Mv)
Lines	4	223.3**	53.4**	18.2**	2.0	0.2**
Testers	9	663.6**	78.1**	181.8**	50.1**	2.8**
Lines *vs.* Testers	1	5361.8**	155.7**	850.2**	647.7**	16.2**
Hybrids	49	378.0**	59.7**	118.3**	66.3**	1.9**
Parents *vs.* Hybrids	1	9653.5**	1.0	971.7**	381.8**	11.3**
Lines x Locations	8	20.2	7.5*	9.7*	0.3	0.03
Testers x Locations	18	4.6	9.9**	7.5*	4.2**	0.1**
Hybrids x Locations	98	49.6**	11.8**	10.3**	7.1**	0.1**

*,** = Significant at 0.05 and 0.01 level of probability, respectively

which was followed by GSHV 01/1338 x GSB 41 (25.9%), GSHV 01/12 x GSB 41 (25.5%), G Cot 10 x DB 10 (21.0%) and G Cot 20 x GSB 40 (10.2%) over check G Cot Hy. 102. Among intra *hirsutum* group, hybrid vigour varied between 22.6 (GSHV 01/12 x GSHV 112) to 25.3 per cent (G Cot 10 x 76-IH 20) in pooled analysis. The cross combination G Cot 10 x 76-IH-20 produced highest significant and positive economic heterosis (25.3%) followed by hybrids *viz.*, GSHV 01/1338 x GSHV 112 (24.6%) and G Cot 20 x GSHV 112 (20.2%) in pooled analysis. Our study showed that hybrids in this experiment had both positive and negative

Table 2a. Economic heterosis and specific combining ability effects for lint yield and fibre quality in inter specific hybrids of cotton (Pooled of three locations)

Inter specific hybrids	Lint yield/ plant (g)		Ginning percentage (%)		2.5 per cent span length (mm)		Fibre strength (g/tex)		Fibre fineness (Mv)	
	SC (%)	SCA	SC (%)	SCA	SC (%)	SCA	SC (%)	SCA	SC (%)	SCA
G Cot 20 x CCB 5	-12.3	-0.80	1.3	-0.82	1.0	1.12	2.8	0.64	-4.6	-0.25**
G Cot 20 x RAB 8	-13.5	0.23	-2.9	-0.28	1.4	1.00	5.6	0.81*	-5.4	-0.18*
G Cot 20 x DB 10	-16.8	-3.26*	-5.2	0.75	-1.7	-1.29	0.7	-0.98*	1.8	-0.01
G Cot 20 x TCB 26	-17.1	-3.47*	0.3	2.38	-4.4	-2.52**	-2.2	-1.44**	3.4	0.09
G Cot 20 x GSB 40	10.2	5.74**	-6.2	-3.76	8.9*	3.05**	13.3**	2.74**	-2.4	-0.05
G Cot 20 x GSB 41	-5.2	-3.62*	4.2	-1.02	-7.3	-2.30**	-11.7*	-2.51**	3.1	0.06
G Cot 20 x Suvin	-25.5**	-0.09	-0.3	1.32	4.1	1.49**	9.9*	1.37**	-0.3	-0.01
G Cot 10 x CCB 5	6.3	2.00	3.2	-3.73	-4.2	-0.27	0.1	0.82*	-1.6	-0.14*
G Cot 10 x RAB 8	-20.7*	-5.07**	-4.1	-2.23	-2.5	0.08	1.7	0.67	0.8	0.05
G Cot 10 x DB 10	21.0*	5.59**	1.1	-1.15	9.0*	2.86**	7.8	1.80**	4.2	0.08
G Cot 10 x TCB 26	-3.5	-2.22	6.7	1.77	-0.6	-0.76	1.8	0.52	5.2	0.16*
G Cot 10 x GSB 40	5.7	1.28	21.4**	3.91	-5.7	-1.62*	-7.4	-1.82**	-10.1*	-0.21**
G Cot 10 x GSB 41	13.9	-0.65	13.3**	3.67	-3.1	-0.43	-15.1**	-2.52**	3.1	0.06
G Cot 10 x Suvin	-18.0	-0.80	9.4	-0.86	-2.8	-0.48	5.1	1.01*	0.4	0.02
GSHV 01/1338 x CCB 5	-7.8	-3.49*	4.4	0.02	5.4	1.72*	-8.0	-1.76**	12.4**	0.33**
GSHV 01/1338 x RAB 8	0.5	0.52	12.8*	4.89	-4.3	-1.92**	-11.7*	-3.28**	12.1**	0.42**
GSHV 01/1338 x DB 10	-0.8	-2.32	2.0	1.82	-2.2	-2.38**	-1.0	-0.93*	1.8	-0.04
GSHV 01/1338 x TCB 26	39.2**	10.15**	5.8	0.17	5.2	1.89**	7.7	1.68**	-1.5	-0.12
GSHV 01/1338 x GSB 40	-6.1	-3.50*	6.0	0.08	1.5	-0.44	5.1	1.06**	0.3	0.02
GSHV 01/1338 x GSB 41	25.9**	2.07	10.6*	-0.38	9.9*	2.76**	7.0	2.93**	-0.6	-0.06
GSHV 01/1338 x Suvin	-22.0*	-3.10*	5.1	-2.75	-0.6	-1.07	3.6	0.19	2.3	0.05
GSHV 97/612 x CCB 5	-7.0	1.41	11.9*	5.01	-11.4*	-3.12**	-10.3*	-2.74**	2.3	-0.02
GSHV 97/612 x RAB 8	1.4	5.44**	-4.0	-0.69	-1.7	0.04	8.8*	1.75**	-2.6	-0.10
GSHV 97/612 x DB 10	-10.5	-0.72	-7.5	-0.42	-0.4	-0.73	7.3	0.85*	1.5	-0.03
GSHV 97/612 x TCB 26	-16.9	-2.85	-5.8	-2.89	3.5	0.32	2.1	-0.20	-0.1	-0.05
GSHV 97/612 x GSB 40	-17.2	-2.33	-6.3	-2.90	3.5	1.27	4.3	0.46	-1.4	-0.03
GSHV 97/612 x GSB 41	-6.5	-3.49*	-1.5	-1.22	0.3	0.43	8.5	2.92**	1.2	-0.03
GSHV 97/612 x Suvin	-19.7*	2.26	-6.5	-1.39	2.8	1.12	-0.2	-1.20**	5.9	0.20**
GSHV 01/12 x CCB 5	-5.9	0.88	8.9	-0.49	-2.8	0.56	10.5*	3.04**	10.3*	0.08
GSHV 01/12 x RAB 8	-16.7	-1.11	1.7	-1.69	-1.4	0.80	1.3	0.05	-0.2	-0.20**
GSHV 01/12 x DB 10	-3.2	0.70	-2.4	-0.99	4.3	1.54*	0.2	-0.73	7.3	-0.01
GSHV 01/12 x TCB 26	-10.2	-1.61	0.8	-1.43	3.8	1.07	-0.3	-0.56	4.8	-0.07
GSHV 01/12 x GSB 40	-10.8	-1.19	5.5	2.67	-8.5*	-2.26**	-7.7	-2.44**	11.8**	0.27**
GSHV 01/12 x GSB 41	25.5**	5.69**	4.1	-1.05	-4.1	-0.46	-6.7	-0.82*	6.1	-0.04
GSHV 01/12 x Suvin	-18.6*	1.73	17.0**	3.68	-5.4	-1.07	-1.9	-1.37**	-1.7	-0.27**

*,** = Significant at 0.05 and 0.01 level of probability, respectively

economic heterosis for lint yield. The results indicated that these parental genotypes had different genotypic performance. Basbag and Gencer (2007), Xiaoquan *et al.,* (2008), Rajamani *et al.,* (2009) and Patel *et al.,* (2012) observed significant positive and negative heterosis over standard parent.

The extent of standard heterosis for ginning percentage ranged from -7.5 (GSHV 97/612 x DB 10) to 21.4 per cent (G Cot 10 x GSB 40) in the pooled analysis. The hybrid G Cot 10 x GSB 40 recorded highest useful heterosis (21.4%) among inter specific crosses which was followed by hybrid GSHV 01/12 x Suvin (17.0%), G Cot 10 x GSB 41 (13.3%), GSHV 01/1338 x RAB 8 (12.8%), GSHV 97/612 x CCB 5 (11.9%) and GSHV 01/1338 x GSB 41 (10.6%). The maximum standard heterosis in intra specific crosses was observed in cross combination G Cot 20 x GSHV 112 (9.9%) and minimum was in G Cot 20 x BC-68-2WW (-7.3%) in pooled analysis. Three crosses *viz.*, G Cot 20 x GSHV 112 (9.9%), GSHV 01/1338 x GSHV 112 (9.1%) and G Cot 10 x GSHV 112 (9.1%) produced higher significant positive standard heterosis in all environments. This indicated that partial dominance of high ginning outturn of *hirsutum* specie over low ginning outturn of *barbadense* genotypes in inter specific hybrids. Xiaoquan *et al.,* (2008), Wankhade *et al.,* (2009), Patel *et al.,* (2012) and Sharma *et al.,* (2016) in their studies noted varying amount of heterotic effect for ginning percentage.

The maximum and minimum economic heterosis for 2.5 per cent span length was reported in GSHV 01/1338 x GSB 41 (9.9%) and GSHV 97/612 x CCB 5 (-11.4%) in inter specific crosses. Only three crosses *viz.*, GSHV 01/1338 x GSB 41 (9.9%), G Cot 10 x DB 10 (9.0%) and G Cot 20 x GSB 40 (8.9%) registered positive economic heterosis in pooled analysis. In intra *hirsutum* hybrids, only one hybrid G Cot 10 x 76-IH 20 (9.9%) produced positive and significant heterosis for this important fibre trait. The range of heterosis fluctuated between -2.5 (G Cot 10 x BC-68-2WW) to 9.9 per cent (G Cot 10 x 76-IH 20). Five crosses reported negative heterosis in intra-specific group. These results were in partial agreement with the results reported by Xiaoquan *et al.,* (2008) and Rajamani *et al.,* (2009).

Standard heterosis for fibre strength, ranged from -15.1 (G Cot 10 x GSB 41) to 13.3 per cent (G Cot 20 x GSB 40) in pooled analysis. Four interspecific combinations *viz.*, G Cot 20 x GSB 40 (13.3%), GSHV 01/12 x CCB 5 (10.5%), G Cot 20 x Suvin (9.9%) and GSHV 97/612 x RAB 8 (8.8%) producing significant heterotic effect over standard check (G Cot Hy 102). None of the intraspecific hybrids exhibited significant standard heterosis in pooled. However, out 15 crosses, three hybrids reported positive standard heterosis in pooled analysis. The range of economic heterosis in pooled analysis was varied between -22.3 (GSHV 01/12 x GSHV 112) to 25.3 per cent (G Cot 10 x 76-IH 20). Above result might be due to inverse relation of fibre strength with lint yield and fibre length. Results are in agreement with Xiaoquan *et al.,* (2008), Wankhede *et al.,* (2009) and Patel *et al.,* (2012).

The fibre fineness value in particular range is desirable as it is one of the most important quality parameters. In hybrid group, mostly the negative heterosis is desirable. Twelve hybrids manifested negative heterosis of which, one cross G Cot 10 x GSB 40 showed significant economic heterotic effect in pooled analysis. It range varied between -10.1 (G Cot 10 x GSB 40) to 12.4 per cent (GSHV 01/1338 x CCB 5). Regarding the intraspecific crosses, the maximum value was 9.1 per cent (GSHV

Table 2b. Economic heterosis and specific combining ability effects for lint yield and fibre quality in interspecific hybrids of cotton (Pooled of three locations)

Inter specific hybrids	Lint yield/ plant (g)		Ginning percentage (%)		2.5 per cent span length (mm)		Fibre strength (g/tex)		Fibre fineness (Mv)	
	SC (%)	SCA	SC (%)	SCA	SC (%)	SCA	SC (%)	SCA	SC (%)	SCA
G Cot 20 x GSHV 112	20.2**	9.92**	9.9*	1.22	1.5	-0.21	1.9	-0.32	3.6	0.11
G Cot 20 x 76-IH 20	-18.9*	-5.00**	-3.1	0.57	0.4	-1.15	7.2	0.66	2.9	0.06
G Cot 20 x BC-68 2WW	-15.2*	0.35	-7.3	-0.35	5.0	0.81	0.5	-0.96*	0.7	0.17*
G Cot 10 x GSHV 112	-9.3	-5.01**	9.1*	-0.55	-2.0	-0.71	-4.0	-0.68	1.7	0.03
G Cot 10 x 76-IH 20	25.3**	9.76**	6.3	0.55	9.9*	2.13**	2.7	0.60	-3.7	0.10
G Cot 10 x BC-68 2WW	-20.6**	-4.88**	1.5	-1.37	-2.5	-0.79	-1.3	-0.41	-6.3	-0.15*
GSHV 01/1338 x GSHV 112	24.6**	7.61**	9.1*	-0.63	7.7	0.54	0.1	-0.23	1.6	-0.01
GSHV 01/1338 x 76-IH 20	-5.7	-3.80*	-0.6	-1.87	6.3	-0.48	-1.6	-0.75	-6.3	-0.39**
GSHV 01/1338 x BC-68 2WW	-16.1*	-4.16**	2.8	-1.35	3.2	-0.62	7.7	1.10**	-6.7	-0.20**
GSHV 97/612 x GSHV 112	-17.9*	-4.87**	6.2	0.30	-0.0	-0.52	0.4	-0.56	-4.7	-0.28**
GSHV 97/612 x 76-IH 20	-10.6	-1.10	1.0	0.19	5.2	0.26	0.00	-0.80*	4.3	0.11
GSHV 97/612 x BC-68 2WW	-1.8	6.26**	8.3	3.99	5.1	0.93	2.2	-0.48	2.3	0.23**
GSHV 01/12 x GSHV 112	-22.6**	-7.65**	2.4	-0.34	2.8	0.89	10.0	1.79**	9.1**	0.16*
GSHV 01/12 x 76-IH 20	-5.3	0.13	3.4	0.56	-0.9	-0.76	3.8	0.30	8.7**	0.12
GSHV 01/12 x BC-68 2WW	-9.2	2.43	2.4	-0.93	-1.9	-0.33	6.6	0.74	0.2	-0.06
S. Ed.	2.2	2.19	0.9	0.92	1.0	1.00	0.6	0.56	0.1	0.10
CD (p=0.05)	5.7	1.70	2.4	0.71	2.6	0.77	1.5	0.43	0.3	0.08

01/12 x GSHV 112) and minimum value was -6.7 per cent (GSHV 01/1338 x BC-68-2WW). Higher performing hybrids on the pooled basis were GSHV 01/1338 x BC-68-2WW (-6.7%), G Cot 10 x BC-68-2WW (-6.3%), GSHV 01/1338 x 76-IH-20 (-6.3%) and GSHV 97/612 x GSHV 112 (-4.7%). Among inter and intra hybrids did not produce significant improvement over their respective checks. The lower micronaire may be due to inherent reduction in fibre diameter, inadequate cellulose deposition of the fibre wall or a combination of the diameter and wall thickness factors. Above results are in close agreements with Xiaoquan *et al.,* (2008) and Rajamani *et al.,* (2009).

A pooled analysis over locations was computed to obtain reliable estimates of the various types of variances and their interactions with environments. The mean square due to males was highly significant for all the traits and lines for ginning percentage only indicating the diverse nature of parents (Table 3). As male group content two different species which contributes to divergence in terms of lint yield and fibre quality. Due to the diverse nature of females and males, the crosses between them are also found to be significant for all the traits. Significant nature of line x tester interaction indicated the importance of specific combining ability. The variance due to GCA was greater than the SCA for all the traits which indicated the preponderance of additive gene action in expression of these traits except for 2.5 per cent span length and fibre strength. These results were more or less agreement with the findings of Basbag and Gencer (2007) and Azhar *et al.,* (2007), Sawarkar *et al.,* (2015), Kannan and Saravanan (2015) and Prasad *et al.,* (2016). While performing of hybrids varied over locations, this is might be due to the inconsistent performance of males. *Barbadense* specie is not well adopted in south zone than central zone of cotton particle in boll opening.

Lines GSHV 01/1338 and G Cot 10 gave higher GCA effects whereas among testers, GSHV 112, 76-IW 20, BC 68-2WW and GSB 41 manifested higher GCA effects indicating that these parents retain more additive genes, thus may be utilized in hybridization programmes for the improved lint yield/plant in segregating population. The results further revealed that five inter specifc and four intra specific crosses which gave significant SCA effects hence may be suitable crosses for hybrid crop development (Table 2a,b and 4). This result is in akin with Xiaoquan *et al.,* (2008) and Rajamani *et al.,* (2009)

In cotton, ginning percentage in inter specific and intra specific hybrids is major component of heterosis in lint yield. Regarding GCA effects, lines G Cot 10 and GSHV 01/1338 and tester GSHV 112, BC 68-2WW, revealed significant effects for ginning percentage. These higher GCA scoring parents may be suitable for crossing and selection programmes. Among the crosses, none of the hybrid showed significant desirable SCA effect for this trait. Present findings are also in more or less with those of Sohu *et al.,* (2016) and Reddy *et al.,* (2016).

Lint yield and fibre length are negatively correlated that means increase in lint yield will simultaneously decease fibre length. GCA analysis, all the *barbadense* lines showed good combiner for this trait except *hirsutum* line GSHV 01/1338. In case of inter specific hybrids, five crosses showed significant positive GCA effect. While intra specific crosses similar trend as parental lines. This is because due dominant effect of their maternal and parental effect. Sohu *et al.,* (2016) reported similar result in their experiment.

For fibre strength, all testers of *barbadense* and lines (G Cot 20 and GSHV 97/612) showed significant positive GCA effect. 11 intrespecific and two Intraspecific hybrids (GSHV 01/12 x GSHV 112 and GSHV 01/1338 x BC-68-2WW) were found best specific combination for this trait. Similar result reported by Xiaoquan *et al.,* (2008) and Sohu *et al.,* (2016).

Line GSHV 01/12 and testers 76-IH-20, GSHV 112 and BC-68-2WW were the good

Table 3. Analysis of variance for combining ability effects for fibre traits in American cotton

Source of variances	d.f.	Lint yield/ plant (g)	Ginning (%)	2.5 per cent span length (mm)	Fibre strength (g/tex)	Fibre fineness (Mv)
Locations	2	1939.1	5.2	7.4	6.8**	0.32**
Females	4	379.2	107.6**	35.8	11.6	0.69
Males	9	1013.5**	170.5**	528.6**	244.1**	9.00**
Females x Males	36	219.0**	26.7**	24.9**	27.9**	0.31**
Female x Locations	8	95.4*	5.2	13.1	8.1	0.10
Male x Location	19	52.1	17.1	8.8	3.6	0.11
Female x Male x Location	72	43.9**	11.2**	10.3**	7.9**	0.12*
Error	294	21.6	3.8	4.5	1.4	0.04
ó^2 GCA		10.0	2.0	4.1	1.9	0.07
ó^2 SCA		21.9	2.5	2.3	3.0	0.03
ó^2 GCA/ ó^2 SCA		2.2	1.3	0.6	1.6	0.41

*,** = Significant at 0.05 and 0.01 level of probability, respectively

Table 4. General combining ability effects of five lines and 10 testers for lint yield and fibre qualities in American cotton of (Pooled of three locations)

Source of variances	Lint yield/ plant (g)	Ginning (%)	2.5 per cent span length (mm)	Fibre strength (g/tex)	Fibre fineness (Mv)
Females					
G Got 20	-1.39**	-1.26**	0.06	0.37**	-0.05*
G Cot 10	1.65**	1.13**	-0.36	-0.54**	-0.05*
GSHV 01/1338	2.72*	0.81**	1.00**	-0.11	-0.02
GSHV 97/612	-1.93**	-1.06**	-0.03	0.28*	-0.03
GSHV 01/12	-1.06*	0.35	-0.68**	-0.01	0.15**
S.E.	0.69	0.29	0.32	0.18	0.03
Males					
CCB 5	-2.64	-0.17	1.31**	0.92**	-0.22**
RAB 8	-4.04**	-1.75**	1.56**	1.48**	-0.32**
DB 10	-1.60*	-2.69**	2.78**	1.96**	-0.23**
TCB 26	-1.49*	-1.49**	3.07**	1.66**	-0.27**
GSB 40	-2.10**	-0.73*	2.13**	1.58**	-0.34**
GSB 41	2.42**	-0.10	1.84**	0.23	-0.25**
Suvin	-7.49**	-0.47	2.02**	2.04**	-0.30**
GSHV 112	7.48**	3.78**	-5.10**	-3.45**	0.70**
76-IH 20	6.66**	1.79**	-4.46**	-3.29**	0.72**
BC 68-2WW	2.81**	1.83**	-5.15**	-3.14**	0.51**
S.E.	0.98	0.41	0.45	0.25	0.04

*,** = Significant at 0.05 and 0.01 level of probability, respectively

general combiner for fibre fineness. These parents could be utilized for isolating the good transgressive segragents. Crosses G Cot 10 x TCB 26, GSHV 01/1338 x CCB 5, GSHV 01/1338 x RAB 8, GSHV 97/612 x Suvin, GSHV 01/12 x GSB 40 in inter specific group and G Cot 20 x BC-68-2WW, GSHV 97/612 x BC 68-2WW and GSHV 01/12 x GSHV 112 in intraspeific group exhibited significant SCA effect. The similar result reported by Xiaoquan *et al.,* (2008) and Ekinci *et al.,* (2016).

The results of the parent study indicated that the interspecific hybrids produced more heterotic effects for lint yield and fibre quality as compared to intra specific hybrids. This is because one of the parents are highly divergent, the hybrid exhibits positive heterosis for both yield and quality traits. The heterotic effect was more pronounced for quality traits than yield components. Such phenomenon may be due to the fact that the quality characters contributed more to the total divergence (Manimaran and Raveendra, 2001). Evaluation of fibre quality is of paramount importance in hybrid/varietal improvement in cotton, as hybrids/varieties not conferring to industrial standards in fibre quality will not stand for test of time. It is generally accepted by breeders, enhancement in yield may have been sacrificed for the enhancement of fibre quality. However, at our results both satisfactorily yield and quality were obtained from inter and intra specific hybrid cottons. Hybrids like *viz.*, GSHV 01/1338 x TCB 26, GSHV 01/1338 x GSB 41 and G Cot 10 x DB 10 (inter) and GSHV 01/1338 x GSHV 112 and G Cot 10 x 76-IH 20 (intra) having higher lint yield than their respective checks and acceptable level of fibre quality. These hybrids could be exploited at commercial level after sufficient testing over multiplications trails. Combining ability analysis, revealed lines G Cot 10, GSHV 01/1338, GSB 41, GSHV 112, 76-IH 20 and BC-68 2WW found good general combiners for lint yield and fibre qualities. Hence, these lines could be used for transferring the yield potential. These yielding hybrids involved good x good and good x poor GCA effects combinations and also exhibited significant positive SCA effects for lint yield and fibre qualities. So, these crosses could also be used for fixation of desirable genes for lint yield and fibre qualities transgressive segregating, as these characters are governed by additive gene action.

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