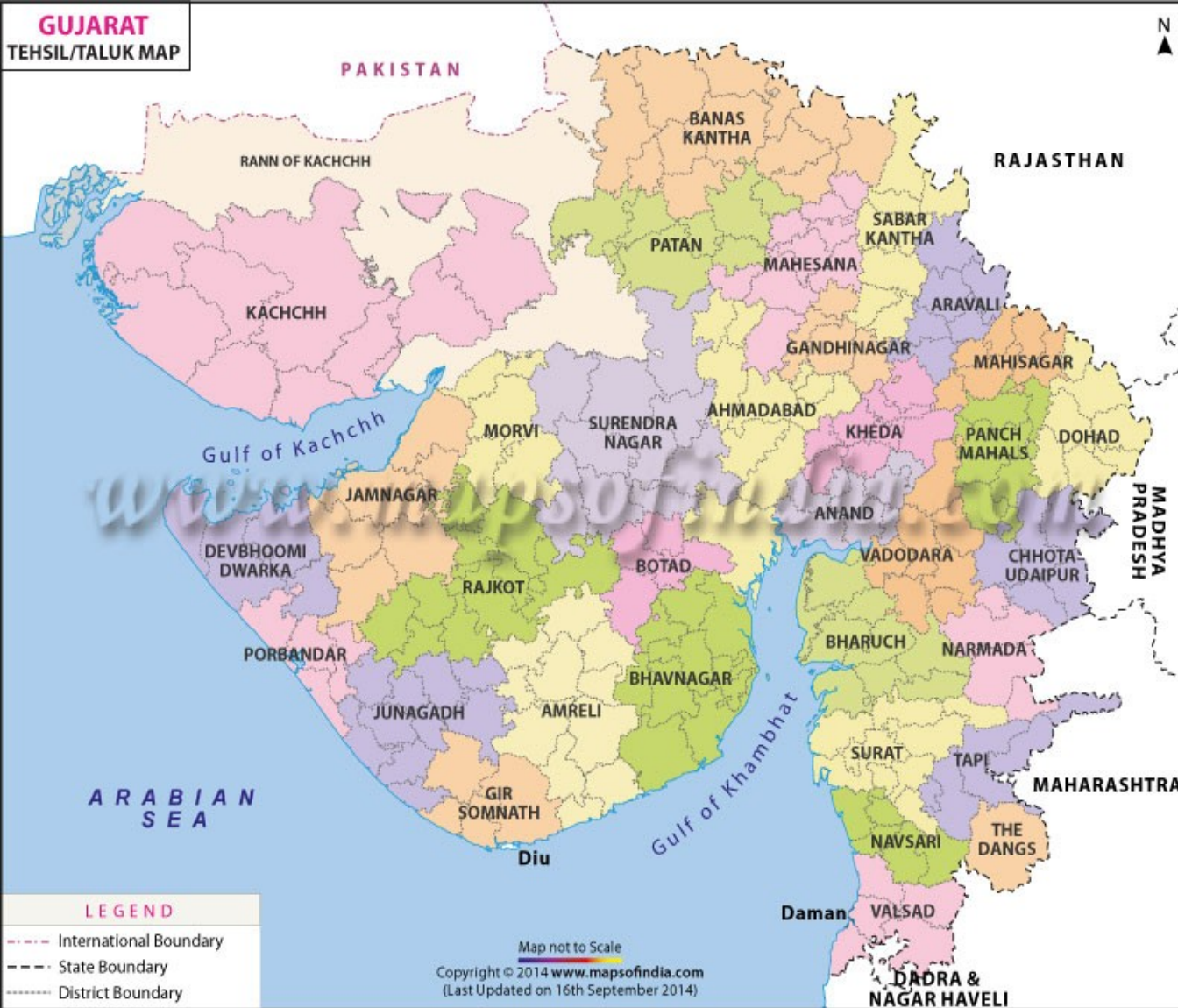


Combining Ability Analysis for Seed Cotton Yield and Its Component Traits in Cotton (*Gossypium hirsutum* L.)



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Districts of Gujarat

Gujarat Situated in west India on the 22°18'N latitude & 72°08'E longitude. Gujarat has God gift of 1600 K.M. long sea shore. Cotton is grown in most of districts of Gujarat except Navsari, Valsad & Dang.



Area, Production and productivity of cotton in Gujarat

2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
Area (Lakh ha)						
26.33	29.62	24.97	25.19	27.73	27.19	24.00
Production (Lakh bales)						
103.00	118.80	89.80	120.80	108.80	90.80	91.80
Productivity (lint kg/ha)						
686	700	633	837	687	588	673
Majority of cotton produced in Gujarat having medium long staple (25.0 to 28.0 mm) with average micronaire (4.0 – 4.5 mv)						

Experimental Details

1.	Location	:	1. Main Cotton Research Station, Surat 2. Regional Cotton Research Station, Bharuch 3. Cotton Research Station, Hansot Navsari Agril. University
2	Year and season	:	2015-16 (Kharif)
3	Experimental Design	:	RBD
4	Replication	:	Three

5	Spacing	:	120 x 45 cm
6	Treatments	:	46 (36 Hybrids + 9 Parents + 1 Check)
7	Name of Parents involved :		
	1. GSHV-97/13 2. GJHV-337 3. AET-5 4. GN.Cot.22 5. GSHV-97/1016	6. GISV-8/1029 7. DELTA-15 8. EC-10/786 9. KH-119	

Combining Ability and Gene Action approaches



Table 1. Analysis of variance for seed cotton yield and its component traits in cotton (*G.hirsutum* L.)

Source of variance	df	Sympodia /plant	Bolls/ plant	Boll weight (g)	Seed index (g)	Ginning outturn (%)	Seed cotton yield /plant (g)	Lint yield/ plant (g)
GCA	8	106.74 **	107.30 **	87.07**	127.90**	46.16**	149.22 **	134.02 **
SCA	36	149.12 **	188.38 **	98.38**	198.43**	47.49**	152.34 **	152.52 **
Environm ent (E)	2	160.16 **	1202.43**	596.37**	1332.99**	125.01**	3225.13 **	538.74 **
GCA x E	16	5.85	24.32 **	16.53**	24.06	5.01**	52.83	23.76 **
SCA x E	72	6.39 **	25.97 **	21.85**	30.15**	4.45**	81.36 **	10.80 **
Error	264	3.71	11.53	10.44	15.24	1.97	35.53	6.17
σ^2 gca		3.12	2.90	5.35	3.41	1.34	30.72	11.65
σ^2 sca		8.47	25.62	37.32	27.73	8.51	111.71	46.34
σ^2 gca / σ^2 sca		0.37	0.11	0.14	0.12	0.16	0.27	0.25

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

Table : 2. Estimation of general combining ability (gca) effect on seed cotton yield and its component traits in cotton (*G. hirsutum* L.)

Sr. No.	Parents	Sympo- dia /plant	Bolls/ plant	Boll weight (g)	Seed index (g)	Ginnin g outturn (%)	Seed cotton yield /plant (g)	Lint yield/ plant (g)
1.	GSHV-97/13	-1.56 **	-2.20 **	0.19 **	0.42	-0.09	-2.61 **	-2.54 **
2.	GJHV-337	2.82 **	2.68 **	1.71 **	3.35 **	1.66 **	5.73 **	3.28 **
3.	AET-5	-1.33 **	-0.73	-1.31 *	-0.77	-1.59 **	-4.44 **	0.26
4.	GN.Cot-22	1.86 **	2.80 **	3.78 **	1.39 *	0.76 **	6.27 **	3.10 **
5.	GSHV-97/1016	-0.91 **	-0.91	-2.26 **	-2.02 **	-1.07 **	-5.10 **	-1.72 **
6.	GISV-8/1029	-1.04 **	-0.89	-3.14 **	-1.95 **	-0.79 **	-5.37 **	-2.46 **
7.	DELTA-15	-2.02 **	-1.65 **	-1.10 *	-2.59 **	-0.63 **	-3.10 **	-2.85 **
8.	EC-10786	2.07 **	1.10	3.06 **	1.31 *	1.77 **	9.51 **	3.99 **
9.	KH-119	0.11	-0.20	-0.94	0.87	-0.01	-0.89	-1.07 **
	S.E.(gj)	0.32	0.56	0.53	0.64	0.23	0.98	0.39

***Significant at 5 & 1% level respectively

Table 3 :Summary of general combining ability effect of parents for different characters in cotton (<i>G.hirsutum</i> L.)							
Character Parents	Sympodia /plant	Bolls/ plant	Boll weight (g)	Seed index (g)	Ginning outturn (%)	Seed cotton yield /plant (g)	Lint yield/ plant (g)
GSHV-97/13	P	P	G	A	A	P	P
GJHV-337	G	G	G	G	G	G	G
AET-5	P	A	P	A	P	P	A
GN.Cot.22	G	G	G	G	G	G	G
GSHV-97/1016	P	A	P	P	P	P	P
GISV- 8/1029	P	A	P	P	P	P	P
DELTA-15	P	P	P	P	P	P	P
EC-10/786	G	A	G	G	G	G	G
KH-119	A	A	A	A	A	A	P

Table 4: Summary of the best general combining parents for various traits in cotton (*G.hirsutum* L.)

Characters	Best General Combiners		
Bolls/ plant	GN.Cot.22	GJHV-337	EC-10/786
Seed index (g)	GJHV-337	GN.Cot.22	EC-10/786
Seed cotton yield /plant (g)	EC-10/786	GN.Cot.22	GJHV-337

Table 5: Estimates of specific combining ability (sca) effects of hybrids for seed cotton yield and its component traits in cotton (<i>G. hirsutum</i> L.)								
Sr. No.	Hybrids	Sympo- dia/pl	Bolls/ Pl	Boll weight (g)	Seed index (g)	Ginning outturn (%)	Seed cotton yield /plant (g)	Lint yield/ plant (g)
1	GSHV-97/13 x GJHV-337	3.03 **	8.49 **	12.30 **	6.41 **	4.10 **	15.31 **	13.17 **
2	GSHV-97/13 x AET-5	2.09 *	0.17	2.23	5.87 **	1.18	5.69	4.33 *
3	GSHV-97/13 x GN.Cot-22	-3.89 **	-2.25	-5.63 **	-6.29 **	-1.47	-3.43	-12.75 **
4	GSHV-97/13 x GSHV- 97/1016	-0.74	-1.87	7.38 **	-0.99	0.69	-4.52	2.75
5	GSHV-97/13 x GISV- 8/1029	-0.27	0.80	1.00	0.94	0.29	-0.61	4.14 *
6	GSHV-97/13 x DELTA-15	-0.50	0.32	2.23	-1.42	0.43	-14.94 **	0.48
7	GSHV-97/13 x EC-10786	-3.22 **	2.33	-9.49 **	-1.21	-2.57 **	7.26 *	-3.46
8	GSHV-97/13 x KH-119	1.34	0.27	-2.03	1.79	4.44 **	20.28 **	13.24 **
9	GJHV-337 x AET-5	0.47	-0.73	-4.73 **	-1.73	2.35 **	7.19 *	0.61
10	GJHV-337 x GN.Cot-22	6.63 **	7.65 **	12.15 **	8.89 **	5.90 **	18.22 **	22.29 **
11	GJHV-337 x GSHV- 97/1016	-1.39	-0.69	-4.60 **	0.08	-1.63 *	-10.71 **	-2.86
12	GJHV-337 x GISV-8/1029	-2.23 *	1.30	0.52	-0.10	-0.88	-7.69 *	-7.92 **

Table 5: continue..

Sr. No.	Hybrids	Sympodia /plant	Bolls/ plant	Boll weight (g)	Seed index (g)	Ginning outturn (%)	Seed cotton yield /plant (g)	Lint yield/ plant (g)
13	GJHV-337 x DELTA-15	-1.83	-0.35	-3.68 *	-0.24	-1.12	-7.83 *	-7.97 **
14	GJHV-337 x EC-10786	5.68 **	9.89 **	8.54 **	9.19 **	3.77 **	13.04 **	11.15 **
15	GJHV-337 x KH-119	0.19	-0.05	-6.15 **	-1.48	-1.37	-18.49 **	-7.28 **
16	AET-5 x GN.Cot-22	-1.62	-0.23	-3.93 *	2.12	0.09	-0.10	1.02
17	AET-5 x GSHV-97/1016	1.20	2.35	2.43	1.65	1.36	5.08	2.92
18	AET-5 x GISV-8/1029	0.13	5.30 **	3.91 *	-0.98	-0.09	-2.57	-0.57
19	AET-5 x DELTA-15	0.90	1.87	2.71	2.43	0.76	-7.61 *	0.59
20	AET-5 x EC-10786	-0.80	1.74	3.11	0.20	0.49	-0.38	6.52 **
21	AET-5 x KH-119	-1.10	3.23	-0.07	2.54	-0.79	0.58	-1.33
22	GN.Cot-22 x GSHV-97/1016	0.73	3.57 *	2.57	-4.18 *	-1.06	-10.59 **	-5.93 **
23	GN.Cot-22 x GISV-8/1029	1.62	0.77	0.96	5.30 **	1.06	-2.89	3.44
24	GN.Cot-22 x DELTA-15	-1.30	-2.42	-4.77 **	1.38	-0.72	-7.86 *	5.68 **

Table 5: continue..

Sr. No.	Hybrids	Sympodia /plant	Bolls/ plant	Boll weight (g)	Seed index (g)	Ginning outturn (%)	Seed cotton yield /plant (g)	Lint yield/ plant (g)
25	GN.Cot-22 x EC-10786	3.51 **	7.66 **	5.82 **	7.37 **	3.82 **	7.64 *	10.18 **
26	GN.Cot-22 x KH-119	4.94 **	5.81 **	8.13 **	7.04 **	2.12 **	18.80 **	12.43 **
27	GSHV-97/1016 x GISV-8/1029	-0.81	4.71 **	-0.84	-4.39*	3.89 **	12.11 **	5.51 **
28	GSHV-97/1016 x DELTA-15	2.13 *	0.73	1.49	0.91	3.06 **	13.60 **	8.65 **
29	GSHV-97/1016 x EC-10786	-2.39 *	-3.66 *	-8.19 **	-0.10	-0.18	-7.52 *	-3.64
30	GSHV-97/1016 x KH-119	2.70 **	2.05	-2.67	-1.66	1.46 *	0.08	1.42
31	GISV-8/1029 x DELTA-15	3.27 **	4.43 *	-4.70 **	4.17 *	2.87 **	2.98	4.32 *
32	GISV-8/1029 x EC-10786	0.37	2.31	-2.92	0.94	1.93 **	-2.79	1.18
33	GISV-8/1029 x KH-119	-1.81	-2.14	1.81	1.27	-0.20	-7.12 *	-2.94
34	DELTA-15 x EC-10786	1.26	-2.46	10.93 **	5.35 **	3.51 **	15.80 **	10.49 **
35	DELTA-15 x KH-119	-2.03 *	6.06 **	-1.01	5.58 **	-1.94 **	3.53	-1.47
36	EC-10786 x KH-119	5.35 **	-3.00	11.74 **	2.46	2.70 **	7.34 *	6.20 **
	S.E. (S _{ij})	1.02	1.79	1.71	2.06	0.74	3.14	2.01
	Signi. Positive	10	10	9	10	14	12	7
	Signi.Negative	5	1	10	3	4	10	1

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

Table 6 : Promising hybrids having higher seed cotton yield with combining ability effects in cotton (*G. hirsutum* L.)

Sr. No.	Hybrids	Seed cotton yield/ plant (g)	GCA effects	SCA effects
1	GJHV-337 x GN.Cot.22	152.9	G X G	18.22**
2	GJHV-337 x EC-10/786	151.0	G X G	13.04*
3	GN.Cot.22 x KH-119	146.9	G X A	18.80**
4	GN.Cot.22 x EC-10/786	146.2	G X G	7.64*
5	DELTA-15 X EC-10/786	144.9	P X G	15.80*
6	GSHV-97/13 X GJHV-337	141.1	P X G	15.51**

*, ** Significant @ 5 and 1 % level of probability respectively

G = Good parent having significant GCA effect in desired direction

A = Average parent having either positive or negative but non significant GCA effects

P = Poor parent having significant GCA effects in undesirable direction

Conclusion

- Variance due to SCA were higher in magnitude than their respective GCA variances for all the characters signifying preponderance of non-additive gene action involved among the hybrids which could be exploited by heterosis breeding.
- The magnitudes of GCA x E interactions were greater than those of SCA x E interaction for the characters viz., ginning outturn and lint yield per plant whereas, SCA x E interaction were greater than those of GCA x E interaction for the characters viz., number of sympodia per plant, number of bolls per plant, boll weight, seed cotton yield per plant and seed index. Thus, it suggested that evaluation of newly developed hybrids on multi locations would be highly essential for estimating these variances with high precision.
- The cross combination GN.Cot.22 x KH-119 having higher SCA effects, involved good x average parents might be due to additive x dominance gene interaction. Which can be use as commercial hybrid.
- Among the parents, GJHV-337, GN. Cot. 22 and EC-10/786 were the best general combiners for seed cotton yield per plant and its attributing traits.
- Among the hybrids, GJHV-337 x GN.Cot.22, GJHV-337 x EC-10786 and GN.Cot.22 x KH-119 registered high *per se* performance coupled with high and desirable SCA effects for seed cotton yiled per plant and yield attributing traits.





Thank you