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Combining Ability Analysis for Seed Cotton Yield and Yield Contributing Traits in Desi Cotton (*Gossypium arboreum* L.) over the Environments

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A B S T R A C T

Cotton is one of the most important fiber and cash crop of India and plays a dominant role in the industrial and agricultural economy of the country. Fifty six crosses with fifteen parents and four checks *viz.*, PKVDH 1, PKVSuvarna, NACH 12 and PA 255 were grown in Randomized Block Design with two replications. Pooled over the environments, the highest GCA effect for seed cotton yield plant was showed by line PAIG 346and also exhibited high GCA (in desirable direction) for the traits, sympodia per plant, number of bolls per plant, seed index, lint index and harvest index. Among the testers, highest GCA for seed cotton yield per plant (9.72) was reported in CNA 449.This tester showed significantly desirable GCA for the characters *viz.* plant height, number of sympodia per plant, number of bolls per plant, boll weight, seed index and harvest index. Pooled over the environments, among the crosses highest SCA for seed cotton yield per plant was reported in PA 740 x Digvijay. It has also exhibited significant SCA in desirable direction for days to 50 % boll bursting, number of sympodia per plant, number of bolls per plant, boll weight, seed index and harvest index. Another cross which ranked second for with high *per se* and high SCA for seed cotton yield per plant was PAIG 346 x DWDa 1402.It showed significantly desirable SCA for days to 50 % flowering, number of sympodia per plant, number of bolls per plant, seed index, lint index and harvest index.

Introduction

Cotton, the king of fibres, occupies a pre-eminent position as a commercial crop in India. Cotton also known as 'white gold' as it is preferred by farmers as cash crop beside other field crops. It is grown commercially in the temperate and tropical regions of more than 70 countries. India is perhaps the first country to make use of cotton. Cotton, the 'white gold' enjoys a pre-eminent status among all cash crops in the country.

It is grown commercially in the temperate and tropical regions of more than 70 countries. Specific areas of production include countries

such as China, USA, India, Pakistan, Uzbekistan, Turkey, Australia, Greece, Brazil, Egypt *etc*. Genetic improvement in *desi* cotton could be gained either through selection or exploitation of specific hybrid.

Therefore, more emphasis should be given to increase the seed cotton yield per unit area by developing hybrids with short stature, big boll size, longer staple length with sustained yield in multiple environments.

To achieve such desirable characteristics in a new cultivar, proper breeding strategies should be followed.

There is an urgent need to promote those cottons that could come closer in quality to the most sought by modern textile mills.

Line x tester analysis provides a systematic approach for selection of appropriate parents on the basis of general combining ability effects (GCA) and superior crosses on the basis of specific combining ability effects (SCA).

Combining ability describes the breeding value of parental lines to produce hybrids. Sprague and Tatum (1942) used the terms general combining ability (GCA) to designate the average performance of a line in hybrid combinations and specific combining ability (SCA) as deviation in performance of across combination from that predicted on the basis of the general combining abilities of the parents involved in the cross.

In order to choose appropriate parents for hybridization as well as specific crosses, it is essential to determine the combining ability of parents and specific combining ability (SCA) of cross combinations by using line x tester analysis. The method has been widely used by plant breeders. This method was applied to improve self and cross-pollinated crop plants.

Materials and Methods

The present study comprised of seven females (lines) and eight males (testers) with four standard checks thus making 56 F_1s using Line x Tester mating design. These lines, testers and hybrids along with four checks were sown during *kharif*, 2016 at three locations *viz.*, Cotton Research Station, Nanded (L-1), Experimental farm of Department of Agricultural Botany, VNMKV, Parbhani (L-2) and Experimental farm, Agricultural Research Station, Badnapur(L-3).

The observations were recorded on days to 50 % flowering, days to 50 % boll bursting, plant height (cm), number of sympodia per plant, number of boll per plant, boll weight (g), seed cotton yield per plant (g), seed index (g), lint index (g) and harvest index (%).Combining ability analysis was based on the procedure developed by Kempthorne (1957) related to design II of Comstock and Robinson (1952).

Results and Discussion

The pooled analysis of variance for line x tester was found significant for most of the characters. The significance of environment x crosses interaction for days to 50 % boll bursting, plant height, number of sympodia per plant, number of bolls per plant, boll weight, seed cotton yield per plant and days to maturity given the diversity between the environments sampled. Environment x line effect were found significant for plant height and ginning percentage whereas the environment x tester effect were found significant for number of sympodia per plant, boll weight and seed cotton yield per plant. This significance indicated the significant differences between the additive genetic contributions of individual line or tester to overall genetic variation observed between the crosses. The significance of environment x line x tester interaction effect for days to 50 %

boll bursting, number of sympodia per plant, number of bolls per plant, boll weight, seed cotton yield per plant, seed index and days to maturity indicated higher interaction of non-additive genetic effects for yield with environments. This could be the reason for difference in heterosis over the environment for yield.

GCA effect of parents

Pooled over the environments, the highest GCA effect for seed cotton yield plant was showed by line PAIG 346 (6.04). This line has also showed high GCA in desirable direction number of sympodia per plant, number of bolls per plant, seed index, lint index and harvest index. Another line with high GCA which also showed high *per se* for seed cotton yield was PA 809. This genotype also showed the higher GCA in desirable direction for number of sympodia per plant, number of bolls per plant, seed index and harvest index. Line PA 809 found to be the best general combiner for yield and yield contributing characters which in combination can be efficiently used for most of the yield improvement. Line PA 812 was found to be the best general combiner for earliness traits viz. days to 50 % flowering, days to 50 % boll bursting, days to maturity.

Among the testers, highest GCA for seed cotton yield per plant (9.72) was reported in CNA 449. This tester showed significantly desirable GCA for the characters *viz.* plant height, number of sympodia per plant, number of bolls per plant, boll weight, seed index and harvest index. Hence this tester could be used for improving yield in the cotton. Second largest GCA for seed cotton yield per plant was recorded by the tester AKA 8 (6.12).This genotype also showed the higher GCA in desirable direction for earliness characters viz. days to 50 % flowering, days to 50 % boll bursting, days to maturity as well as for number of sympodia per plant, number of bolls per plant and harvest index. Other testers which showed high GCA for seed cotton yield plant were JLA 794 (4.44) and DWDa 1402 (4.03). These testers also showed significant desirable GCA for plant height, number of sympodia per plant, number of bolls per plant, boll weight, seed index and harvest index. Therefore, these testers could be used in the improvement of the said traits. Almost identical results have been reported by Deshpande *et al.*, (2003), Maisuria *et al.*, (2006), Laxman (2010), Kumar *et al.*, (2014), Madhuri *et al.*, (2014), Patel and Choudhari (2015) and Shakeel *et al.*, (2016).

SCA effect of crosses

Pooled over the environments, among the crosses highest SCA for seed cotton yield per plant was reported in PA 740 x Digvijay (15.53). It has also exhibited significant SCA in desirable direction for days to 50 % boll bursting, number of sympodia per plant, number of bolls per plant, boll weight, seed index and harvest index. Another cross which ranked second for with high *per se* and high SCA for seed cotton yield per plant was PAIG 346 x DWDa 1402 (11.92). It showed significantly desirable SCA for days to 50 % flowering, number of sympodia per plant, number of bolls per plant, seed index, lint index and harvest index. Cross PA 809 x AKA 8 ranked third with respect to high *per se* and high SCA (11.76). It recorded significantly desirable SCA for number of sympodia per plant, number of bolls per plant, harvest index and days to maturity. It also recorded non-significant SCA in desirable direction for days to 50 % flowering, days to 50 % boll bursting, plant height, seed index and harvest index. In the present study, cross combinations viz. PAIG 346 x JLA 794, PAIG 346 x DWDa 1402 and PA 809 x AKA 8 possessed high *per se*, SCA with highly significant GCA of both the parents.

Table.1 Pooled estimates of GCA effects of parents and SCA effects of crosses studied over three environments

Sr. No.	Genotype	Days to 50 % flowering	Days to 50 % boll bursting	Plant height (cm)	Number of sympodia /plant	Number of bolls /plant	Boll weight (g)	Seed cotton yield /plant (g)	Seed index (g)
	GCA Lines								
1	PA 801	0.40*	0.79**	1.46*	-0.56	0.14	-0.003	0.37	-0.14 **
2	PA 740	0.40*	0.37	0.72	-0.63	-1.13**	0.06**	-2.18 **	0.06**
3	PA 812	-1.64**	-1.53**	-3.64**	-0.50	-0.34	-0.03*	0.10	0.08**
4	PA 809	0.31	0.33	1.50*	0.81*	2.09**	0.02	3.81**	0.06*
5	PA 785	0.21	0.37	-2.72**	0.30	0.49	-0.05**	0.61	-0.24**
6	PA 832	-0.62**	-0.56**	0.15	-2.24**	-3.34**	-0.05**	-8.75**	0.02
7	PAIG 346	0.92**	0.21	2.51**	2.82**	2.09**	0.06**	6.04**	0.21**
	GCA Testers								
1	AKA 8	-2.98**	-3.39**	-1.05	1.50**	2.88**	-0.07**	6.12**	-0.21**
2	PhuleDhanwantary	0.27	0.10	-16.61**	-3.42**	-3.74**	-0.10**	-10.25**	-0.52 **
3	CNA 449	0.87**	1.17**	6.35**	2.87**	3.45**	0.08**	9.72**	0.40**
4	HD 514	-2.50**	-3.042**	-9.76**	1.56**	1.90**	-0.04**	3.52**	0.28 **
5	DWDa 1402	-0.79**	-0.94**	7.92**	0.76*	1.32**	0.06**	4.03**	-0.002
6	JLA 794	0.56**	0.76**	8.95**	0.38	1.44**	0.09**	4.44**	0.54**
7	Digvijay	2.06**	2.50**	2.90**	-2.18**	-4.71**	-0.03*	-10.43**	0.005
8	G.Cot 23	2.51**	2.83**	1.29	-1.47**	-2.53**	0.02	-7.14**	0.005
	SCA Crosses								
1	PA 801 x AKA 8	-3.80**	-4.08***	-4.50*	0.56	-0.09	0.04	1.73	-0.12
2	PA 801 x PhuleDhanwantary	-2.40**	-1.74**	-2.00	-0.18	-0.33	0.09**	2.47	0.02
3	PA 801 x CNA 449	0.17	0.18	-3.26	-1.51	-1.95	0.05	-1.44	0.08
4	PA 801 x HD 514	0.55	0.39	15.24**	1.93	4.56**	0.04	7.96**	-0.14
5	PA 801 x DWDa 1402	-2.16**	-2.86**	0.49	1.00	0.64	0.02	-0.28	-0.11
6	PA 801 x JLA 794	-0.52	-0.91	1.16	1.41	1.75	-0.05	1.81	-0.002
7	PA 801 x Digvijay	4.81**	5.01**	-4.22*	-1.69	-1.42	-0.08*	-5.35*	0.05
8	PA 801 x G.Cot 23	3.36**	4.01**	-2.90	-1.53	-3.17**	-0.10**	-6.90**	0.22*
9	PA 740 x AKA 8	1.69**	2.50**	2.04	-3.60**	-1.57	-0.08*	-6.41**	-0.38**
10	PA 740 x PhuleDhanwantary	0.43	2.33**	-0.49	0.72	-2.45*	-0.03	-4.24	-0.14

Table.1 (Contd…)

Sr. No.	Genotype	Days to 50 % flowering	Days to 50 % boll bursting	Plant height (cm)	Number of sympodia /plant	Number of bolls /plant	Boll weight (g)	Seed cotton yield /plant (g)	Seed index (g)
11	PA 740 x CNA 449	0.17	0.09	0.34	-1.58	-3.54**	-0.07*	-5.45*	-0.002
12	PA 740 x HD 514	0.21	0.47	-1.36	-0.10	2.81*	-0.05	4.44	-0.17*
13	PA 740 x DWDa 1402	0.00	-0.11	-0.43	0.24	0.22	-0.01	0.14	0.10
14	PA 740 x JLA 794	-0.85	-1.16*	0.54	-3.42**	-5.26**	-0.008	-11.36**	-0.01
15	PA 740 x Digvijay	-0.85	-1.56**	-0.38	4.71**	6.52**	0.19**	15.53**	0.44**
16	PA 740 x G.Cot 23	-0.80	-2.56**	-0.23	3.03**	3.27**	0.05	7.35**	0.16
17	PA 812 x AKA 8	0.06	-0.08	-0.49	0.001	-0.77	0.05	1.41	-0.03
18	PA 812 x PhuleDhanwantary	-1.19*	-1.08	-0.76	-0.64	0.96	0.01	-1.06	-0.02
19	PA 812 x CNA 449	-0.62	-0.98	-1.39	-1.64	-0.91	-0.04	-3.76	-0.11
20	PA 812 x HD 514	-0.24	-0.27	-1.44	2.70**	1.89	-0.006	3.27	0.34**
21	PA 812 x DWDa 1402	1.87**	2.13**	-2.20	-2.36*	-2.54 *	0.02	-3.75	-0.09
22	PA 812 x JLA 794	0.52	0.58	-0.22	-0.18	-2.16	-0.01	-3.51	-0.18*
23	PA 812 x Digvijay	-0.47	-0.65	3.51*	0.21	2.40*	0.06	2.59	0.16*
24	PA 812 x G.Cot 23	0.06	0.34	2.99	1.90	1.15	-0.08 *	4.81*	-0.07
25	PA 809 x AKA 8	0.94	-0.62	-1.67	4.45**	4.76**	0.008	11.76**	0.12
26	PA 809 x PhuleDhanwantary	-0.48	-0.45	0.15	-0.85	-1.21	-0.006	-0.66	0.17*
27	PA 809 x CNA 449	0.25	0.64	5.59**	0.14	1.03	-0.04	-2.38	0.21*
28	PA 809 x HD 514	0.96*	1.02	-4.82**	-0.84	-0.62	0.008	-4.91*	0.15
29	PA 809 x DWDa 1402	-0.41	-0.74	2.42	-1.44	-2.41*	0.02	-2.12	0.19*
30	PA 809 x JLA 794	-0.27	-0.12	0.22	-0.66	-1.09	0.05	-0.56	0.05
31	PA 809 x Digvijay	-0.10	-0.36	-3.22	-1.13	-2.30	-0.06	-2.53	-0.21*
32	PA 809 x G.Cot 23	-0.89	0.64	1.32	0.33	1.85	0.02	1.40	-0.68**
33	PA 785 x AKA 8	0.21	0.17	3.62*	-0.17	-0.73	-0.002	-1.00	0.27**
34	PA 785 x PhuleDhanwantary	0.11	0.17	2.58	0.79	4.89**	0.06	9.43**	0.32**
35	PA 785 x CNA 449	0.35	0.26	-1.51	1.65	3.77**	0.01	6.30**	-0.11
36	PA 785 x HD 514	-0.76	-1.85**	-2.63	-0.10	-5.38**	0.05	-9.72**	-0.04
37	PA 785 x DWDa 1402	1.52**	1.88**	0.67	-0.66	-2.24	-0.05	-4.83*	-0.41**
38	PA 785 x JLA 794	1.00*	1.33*	-1.37	-0.36	-0.02	0.009	-1.99	-0.22**
39	PA 785 x Digvijay	-1.16*	-1.40*	0.29	0.88	0.80	-0.12**	3.11	0.21*

Table.1 (Contd…)

Sr. No.	Genotype	Days to 50 % flowering	Days to 50 % boll bursting	Plant height (cm)	Number of sympodia /plant	Number of bolls /plant	Boll weight (g)	Seed cotton yield /plant (g)	Seed index (g)
40	PA 785 x G.Cot 23	-1.28**	0.44	-1.65	-1.13	-1.07	0.04	-1.30	-0.03
41	PA 832 x AKA 8	0.05	0.27	2.55	-1.79	-1.76	0.03	-7.41**	0.08
42	PA 832 x PhuleDhanwantary	0.28	-0.46	0.11	2.00*	0.13	-0.06	1.16	-0.08
43	PA 832 x CNA 449	-0.14	-1.08	0.88	3.47**	2.12	0.03	6.79**	-0.14
44	PA 832 x HD 514	-1.92**	0.15	-1.00	-3.58**	-3.95**	-0.06	-5.84*	-0.07
45	PA 832 x DWDa 1402	0.35	0.44	-0.82	-0.71	0.86	0.07*	-1.09	0.03
46	PA 832 x JLA 794	0.50	0.86	-1.08	-0.21	2.54*	0.02	3.90	0.24**
47	PA 832 x Digvijay	-0.16	-0.63	0.62	0.59	-1.33	-0.07*	-0.06	-0.24**
48	PA 832 x G.Cot 23	1.04*	0.44	-1.25	0.22	1.38	0.05	2.55	0.17*
49	PAIG 346 x AKA 8	0.83	1.67**	-1.55	0.54	0.17	-0.03	-0.07	0.04
50	PAIG 346 x PhuleDhanwantary	3.24**	0.50	0.41	-1.83	-1.98	-0.07*	-7.10**	-0.28**
51	PAIG 346 x CNA 449	-0.18	0.26	-0.65	-0.53	-0.50	0.06	-0.07	0.08
52	PAIG 346 x HD 514	1.19*	1.31*	-3.97*	0.88	0.69	0.01	4.80*	-0.09
53	PAIG 346 x DWDa 1402	-1.18*	-0.44	-0.12	3.92**	5.46**	-0.06	11.92**	0.28**
54	PAIG 346 x JLA 794	-0.37	-0.16	0.75	3.42**	4.24**	-0.003	11.71**	0.13
55	PAIG 346 x Digvijay	-2.04**	-1.90**	3.39	-3.58**	-4.67**	0.07*	-13.29**	-0.41***
56	PAIG 346 x G.Cot 23	-1.49**	-1.23*	1.74	-2.82**	-3.42**	0.02	-7.90**	0.24**
	S.E. ±								
	Lines	0.17	0.20	0.62	0.36	0.41	0.011	0.81	0.029
	Tester	0.18	0.22	0.66	0.38	0.44	0.012	0.87	0.032
	Crosses	0.49	0.58	1.76	1.01	1.17	0.032	2.30	0.084

Table.1 (Contd…)

Sr. No.	Genotype	Lint index (g)	Harvest index (%)	Ginning outturn (%)	Days to maturity
	GCA Lines				
1	PA 801	0.01	-0.56*	-0.31	0.83**
2	PA 740	-0.001	0.15	0.43**	0.25
3	PA 812	0.02	-0.62**	-0.40**	-1.20**
4	PA 809	-0.03	0.66**	0.55**	0.33
5	PA 785	0.02	-0.31	-0.09	0.08
6	PA 832	-0.09 **	-1.39 **	-0.60**	-0.89**
7	PAIG 346	0.06**	2.07**	0.42*	0.58*
	GCA Testers				
1	AKA 8	0.02	0.91**	1.00**	-2.54**
2	PhuleDhanwantary	-0.06**	-1.87**	0.02	-0.80**
3	CNA 449	-0.05*	2.28**	-0.52**	1.33**
4	HD 514	0.17**	0.83**	1.67**	-2.71**
5	DWDa 1402	-0.09**	0.42	-1.06**	-1.21**
6	JLA 794	-0.03	0.62*	-0.40*	0.54
7	Digvijay	-0.02	-1.55**	-0.81**	2.21**
8	G.Cot 23	0.06**	-1.65**	0.09	2.97**
	SCA Crosses				
1	PA 801 x AKA 8	0.13	-1.17	0.27	-3.95**
2	PA 801 x PhuleDhanwantary	-0.04	0.061	0.19	-1.86**
3	PA 801 x CNA 449	-0.03	-0.81	0.54	-0.50
4	PA 801 x HD 514	-0.03	2.70**	-0.66	-0.45
5	PA 801 x DWDa 1402	-0.01	-0.43	0.64	-2.28**
6	PA 801 x JLA 794	-0.07	0.41	-1.37**	0.42
7	PA 801 x Digvijay	-0.04	-0.54	0.14	4.44**
8	PA 801 x G.Cot 23	0.09	-0.21	0.24	4.18**
9	PA 740 x AKA 8	-0.10 *	-2.01**	0.88	1.29*
10	PA 740 x PhuleDhanwantary	0.02	-0.21	-0.10	1.22

Table.1 (Contd…)

Sr. No.	Genotypes	Lint index (g)	Harvest index (%)	Ginning outturn (%)	Days to maturity
11	PA 740 x CNA 449	0.005	-2.44**	0.033	-0.58
12	PA 740 x HD 514	-0.05	0.69	0.46	-0.20
13	PA 740 x DWDa 1402	-0.05	-0.36	-0.22	0.12
14	PA 740 x JLA 794	0.02	-1.79**	-1.18 *	-1.15
15	PA 740 x Digvijay	0.12	3.47**	0.85	0.53
16	PA 740 x G.Cot 23	0.06	2.67**	-0.72	-1.22
17	PA 812 x AKA 8	-0.18**	0.64	0.33	0.75
18	PA 812 x PhuleDhanwantary	0.04	1.47*	0.47	0.015
19	PA 812 x CNA 449	-0.07	-1.45 *	-0.36	-0.96
20	PA 812 x HD 514	0.18**	0.67	-1.23 *	-0.41
21	PA 812 x DWDa 1402	-0.01	-0.24	-0.59	1.42*
22	PA 812 x JLA 794	0.11*	-0.58	0.78	0.46
23	PA 812 x Digvijay	-0.09	0.24	0.70	-1.84**
24	PA 812 x G.Cot 23	0.02	-0.74	-0.10	0.56
25	PA 809 x AKA 8	0.08	3.76**	-0.42	1.71**
26	PA 809 x PhuleDhanwantary	0.07	-0.84	-0.43	-0.69
27	PA 809 x CNA 449	-0.08	0.79	-0.38	1.66*
28	PA 809 x HD 514	0.01	-2.51**	-0.60	0.045
29	PA 809 x DWDa 1402	-0.01	-0.98	0.67	-1.12
30	PA 809 x JLA 794	-0.04	0.09	1.63**	-0.74
31	PA 809 x Digvijay	0.01	-0.98	-0.47	0.11
32	PA 809 x G.Cot 23	-0.04	0.66	0.025	-0.97
33	PA 785 x AKA 8	0.06	-0.08	1.29**	-0.70
34	PA 785 x PhuleDhanwantary	-0.009	0.84	-0.22	0.89
35	PA 785 x CNA 449	0.18**	2.27**	1.78**	-0.42
36	PA 785 x HD 514	-0.08	-1.75*	-0.20	0.46
37	PA 785 x DWDa 1402	-0.09	-0.34	-2.23**	1.79**
38	PA 785 x JLA 794	-0.001	-0.49	-0.58	2.67**
39	PA 785 x Digvijay	-0.05	-0.61	-0.44	-1.80**

Table.1 (Contd…)

Sr. No.	Genotypes	Lint index (g)	Harvest index (%)	Ginning outturn (%)	Days to maturity
40	PA 785 x G.Cot 23	-0.02	0.18	0.61	-2.89**
41	PA 832 x AKA 8	0.04	-1.32	-0.65	-0.06
42	PA 832 x Phule Dhanwantary	-0.06	0.44	-0.31	0.36
43	PA 832 x CNA 449	0.05	2.31**	-1.08*	-0.77
44	PA 832 x HD 514	-0.10	-0.69	0.24	-0.89
45	PA 832 x DWDa 1402	0.06	-0.09	0.16	0.77
46	PA 832 x JLA 794	-0.01	0.05	-0.72	-0.17
47	PA 832 x Digvijay	0.03	0.04	1.17*	-0.65
48	PA 832 x G.Cot 23	-0.02	-0.73	1.19*	1.41*
49	PAIG 346 x AKA 8	-0.03	0.20	-1.72**	0.96
50	PAIG 346 x Phule Dhanwantary	-0.02	-1.77*	0.42	0.05
51	PAIG 346 x CNA 449	-0.05	-0.66	-0.53	1.58*
52	PAIG 346 x HD 514	0.06	0.88	2.00**	1.46*
53	PAIG 346 x DWDa 1402	0.11*	2.47**	1.56**	-0.70
54	PAIG 346 x JLA 794	0.003	2.32**	1.45**	-1.49*
55	PAIG 346 x Digvijay	0.02	-1.61*	-1.95**	-0.80
56	PAIG 346 x G.Cot 23	-0.09	-1.82**	-1.23*	-1.06
	S.E. ±				
	Lines	0.017	0.24	0.17	0.23
	Tester	0.019	0.26	0.18	0.24
	Crosses	0.050	0.69	0.48	0.64

Significance of SCA variances have been reported by Amolik *et al.*,(1997), Saxena *et al.,* (1998), Pathak and Patel (1999), Deshpande *et al.,* (2003), Nimbalkar *et al.,* (2004), Karademir *et al.,* (2009), Laxman (2010) and Patil *et al.,* (2014) for seed cotton yield and other traits.

Nature of gene action

The ratio of GCA vs. SCA mean square *i.e.* predictability ratio for seed index was greater than unity indicating the predominantly additive gene action in the expression of these character. This ratio for boll weight and days to 50% boll bursting was also very close to unity indicating the presence of additive gene action. The predictability ratio for days to 50 % flowering, plant height, number of sympodia per plant, number of bolls per plant, seed cotton yield per plant, lint index, harvest index and days to maturity was greater than 0.50 but lesser than 0.80 indicated the equal importance of additive as well as non-additive gene action for these characters whereas the rest of the character possessed lesser predictability ratio than 0.50 indicating the non-additive gene action as the prime cause in the expression of these traits.

Selection of promising parent and crosses

Lines PAIG 346 and PA 809 and testers CNA 449, AKA 8, JLA 794 and DWDa 1402 appeared to be the best general combines for seed cotton yield and yield contributing characters which may do well in cross combination with other parents. These parents along with high GCA also possessed high *per se* for yield and yield contributing characters. Line PA 812 was the best general combiner for earliness characters.Selection of the most encouraging cross combination needs high SCA along with high *per se* and GCA effects of respective parents. The cross combination PAIG 346 X JLA 794, PAIG 346 X DWDa 1402, PA 809 X AKA 8, PA 785 X CNA 449, PA 801X HD 514 were found significantly positive for SCA effects with high mean for seed cotton yield. Whereas, PA 801 X AKA 8 should be further exploited for earliness.

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