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Combining ability studies for yield and yield contributing traits in desi cotton (*Gossypiumarboreum* L.)

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Abstract
Line x tester analysis was carried out involving 5 line and 6 testers for seed cotton yield and yield contributing traits. Significant difference among genotypes was observed for all traits under study meaning thereby considerable amount of genetic variability. The genotypes PA 828, PA 848and AKA 9703 were found good general combiner for seed cotton yield and yield contributing characters. The cross combinations PA 848 x Phule Dhan wantary and PA 760 x PA 08had significant sca effects for seed cotton yield. Therefore, the breeder should compromise at acceptable values of seed cotton yield and fiber quality parameters. It is advocated that the genotypes having such values for these traits could be used in further breeding programme.

Keywords: *Gossypiumabroreum, gca, sca,* Seed cotton yield

Introduction
Combining ability analysis is the most widely used biometrical tool for identifying parents and for formulating breeding procedures most likely to succeed. In heterosis breeding programme, the selection of parents or inbreds based on their morphological diversity with good combining ability is very important in producing superior hybrids. The analysis of general combining ability and specific combining ability helps in identifying potential parents or inbreds for the production of superior hybrids. The Line x Tester analysis (Kempthorne, 1957) [5] is one of the simplest and efficient methods of evaluating large number of inbreds/parents for their combining ability. Based on the information from Line x Tester analysis, production of commercially viable hybrids is possible.
Yield is a complex polygenic character resulting from multiple interaction of its contributing characters. It is highly influenced by the environment, hence selection based on yield alone may limit the improvement. Whereas, the yield component characters are less complex in inheritance and influenced by environment to a lesser extent. Thus, effective improvement in yield may be brought about through selection of yield contributing characters. Linex tester analysis is a useful procedure for preliminary evaluation of genotypes for use in hybridization programme.

Materials and Methods
Four lines namely, PA 740, PA 760, PA 828,PA 848 and PAIG 77 crossed as females (lines) to six male parents of cotton *viz*, AKA 9703, AKA 7, JLA 505, RAC 024, PA 08 and Phule Dhanwantary as testers in line x tester manner. Thirty F_1's along with 11 parents and three checks were grown in randomized block design with three replications at Cotton Research Station, Mahboob Baugh Farm, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani during *kharif* 2017-2018. Two rows of each treatment having 6.0 m length and spacing of 60 cm between rows and 30 cm between plants was sown. All the recommended package of practices were followed to raise a good crop. Observations were recorded on 5 randomly selected plants in each plot on seed cotton yield /plant, plant height, number of boll/plant, boll weight, seed index, lint index and number of sympodia/ plant. After recording the observations for each character, the analysis of variance was carried out. The mean square from line x tester design and the general combining ability (GCA) and specific combining ability (SCA) variance and effects were calculated. The data was subjected to statistical analysis as suggested by Kempthrone (1957) [5].

Results and Discussion
The combining ability analysis indicated presence of considerable genetic variability among the crosses for all the traits under study. Except for, days to 50 % flowering none of the female

line exhibited significant differences for all the characters studied. None of the male lines exhibited significant differences for the characters under study. The crosses and Male x female interaction exhibited significant differences for all the characters. Analysis of variance of combining ability with respect to characters that were under study is summarized in Table 1.

The data on general combining ability effects (GCA) of parents and specific combining ability effects (SCA) of crosses were presented in Table 2,3 and 4.Male Parent, AKA 7 and female parent PA 828 expressed significant desirable positive general combining ability effects (GCA) for plant height. Female parents PAIG 77 and male parent Phule Dhawantary exhibited positive significant general combining ability effects (GCA) for number of sympodia per plant Similar result were also observed by Jatoi *et al.* (2011) [4] and Mendez-Natera *et al.* (2012) [8]. The hybrid PA 740 x Phule Dhawantary exhibited positive specific combining ability effect (SCA) for plant height in desirable direction. The hybrid PAIG 77 x Phule Dhawantary, PA 760 x PA 08 and PA 848 x RAC 024 showed significant positive specific combining ability effects (SCA) for days to 50% flowering, for days to maturity and for number of sympodia per plant, respectively. Jatoi *et al.* (2011) [4], Mendez-Natera *et al.* (2012) [8], Dai Gang *et al.* (2012) and Kumar *et al.* (2014) [6] were reported same results. Among the parents, PA 848 exhibited significant positive general combining ability effect (GCA) for lint index and in desirable direction. The study of specific combining ability effect (SCA) of economic traits revealed that the cross PA 848 x Phule Dhawantary exhibited significant specific combining ability effect (SCA) for lint index, while the hybrid PA 760 x PA 08 had highest positive significant specific combining ability effect (SCA) for seed index.

Among parents, PA 848 and AKA 9703 exhibited significant positive general combining ability effects for number of bolls per plant in desirable direction revealing that these are best general combiners for this trait. Parent PA 740 and Phule Dhawantary exhibited highest significant positive general combining ability effects (GCA) for boll weight, while parents, PA 828 and AKA 9703 had significant positive general combining ability effect (GCA) for seed cotton yield per plant. Similar findings were observed Dhamayanthi (2011) [2], Mendez-Natera *et al.* (2012) [8], Dai Gang *et al.* (2012), Kumar *et al.* (2014) [6].

The hybrid PAIG 77 x AKA 9703 exhibited highest positive significant specific combining ability effect (SCA) for seed cotton yield per plant. Whereas, the hybrids PA 740 x RAC 024 and PA 760 x Phule Dhanwantary recorded significant positive specific combining ability effects (SCA) for boll weight. Similar results were reported by Dhamayanthi (2011) [2], Nidagundi *et al.* (2011) [9] and Kumar *et al.* (2014) [6], Giri *et al*. (2006) [3], Ashok kumar *et al.* (2008) [1], Sarvanan *et al.* (2010) [10] and Kumar *et al*. (2013) [7]. The genotypes which are found good general combiner could be used in crossing programme for improvement of the concerned traits. The cross combining having significant sca effects should be tested across the years and locations prior to recommendation for commercial exploitation.

Table 1: Analysis of variance for combining ability for different characters

Source	d.f.	Days to 50% flowering	No. of sympodia/plant	No. of bolls/plant	Boll weight (g)	Plant height (cm)	Days to maturity	Seed cotton yield/plant (g)	Lint index	Seed index (g)
Replications	1	0.60	0.156	6.666	0.023	0.0001	0.016	1.983	0.010	0.082
Crosses	29	27.68**	3.354**	15.92**	0.052*	808.4**	48.42**	123.3**	0.052**	1.233**
Females	4	77.73*	4.148	7.400	0.087	120.0	91.69	40.61	0.047	0.127
Males	5	16.06	4.910	17.70	0.060	489.0	28.79	162.4	0.071	2.135
M X F	20	20.58**	2.806**	17.19**	0.042	1025.9**	44.68**	130.0**	0.048**	1.228**
Error	29	7.60	0.540	3.252	0.026	17.76	7.395	7.530	0.017	0.266

*and ** indicated significance at 5 and 1 per cent respectively

Table 2: Estimates of general combining ability (GCA) for Lines

Parents	Days to 50% flowering	No. of sympodia/plant	No. of bolls/plant	Boll weight (g)	Plant height (cm)	Days to maturity	Seed cotton yield/plant (g)	Lint index	Seed index (g)
PA 740	1.033	0.040	-0.967	0.120**	-4.398**	0.867	-1.399	-0.057	-0.124
PA760	2.617**	-0.326	0.533	0.037	-1.364	3.367**	-1.359	0.007	0.002
PA 848	-2.550**	-0.604**	1.033*	-0.105*	0.538	-0.883	1.968**	0.102*	0.092
PA 828	-2.883**	-0.062	-0.300	-0.003	4.173**	-4.133**	2.061**	-0.007	0.111
PAIG 77	1.783*	0.952**	-0.300	-0.049	1.051	0.783	-1.272	-0.045	-0.081
S.E. (Gi)	0.802	0.194	0.496	0.043	1.148	0.802	0.705	0.040	0.133
S.E. (Gi-Gj)	1.134	0.274	0.701	0.061	1.624	1.134	0.997	0.057	0.189
CD @5%	1.640	0.397	1.014	0.088	2.348	1.641	1.442	0.082	0.273
CD @1%	2.210	0.535	1.367	0.119	3.165	2.211	1.944	0.111	0.368

*and ** indicated significance at 5 and 1 per cent respectively.

Table 3: Estimates of General Combining Ability (GCA) of Testers

Parents	Days to 50% flowering	No. of sympodia/plant	No. of bolls/plant	Boll weight (g)	Plant height (cm)	Days to maturity	Seed cotton yield/plant (g)	Lint index	Seed index (g)
AKA 9703	1.067	0.577*	1.867**	-0.011	6.421**	-1.650	5.052**	0.049	0.632**
JLA 505	0.667	-0.890**	-0.833	-0.046	-11.460**	2.650**	-3.994**	-0.005	-0.220
RAC 024	1.467	0.269	0.567	0.092	-1.609	1.150	1.089	0.062	0.064
AKA 7	-1.233	-0.057	-2.033	-0.070	8.247**	0.350	-5.685**	-0.158**	-0.758**
PA 08	-1.633	-0.741**	-0.033	-0.067	-0.598	-1.450	1.742*	-0.013	0.173
Phule Dhanwantary	-0.333	0.840**	0.467	0.102*	-1.003	-1.050	1.797*	0.065	0.109
S.E. (Gi)	0.878	0.212	0.543	0.047	1.258	0.879	0.772	0.043	0.146
S.E. (Gi-Gj)	1.242	0.301	0.768	0.067	1.779	1.243	1.092	0.062	0.207
CD @5%	1.797	0.435	1.111	0.096	2.572	1.797	1.580	0.090	0.299
CD @1%	2.421	0.586	1.497	0.130	3.467	2.422	2.129	0.122	0.403

*and ** indicated significance at 5 and 1 per cent respectively.

Table 4: Estimates of specific combining ability (SCA) of crosses for different characters

Hybrids	Days to 50% flowering	No. of sympodia/plant	No. of bolls/plant	Boll weight (g)	Plant height (cm)	Days to maturity	Seed cotton yield/plant (g)	Lint index	Seed index (g)
PA 740 x AKA 9703	-2.233	1.009*	-1.533	0.156	-28.37**	1.233	-2.842	0.049	-0.297
PA 740 x JLA 505	-1.333	0.646	-1.333	-0.104	-18.26**	-2.567	-3.252	-0.057	-0.426
PA 740 x RAC 024	-3.633	-2.183**	3.767**	0.283*	-13.52**	-3.567	5.472**	0.186	0.407
PA 740 x AKA 7	4.567*	-0.287	2.367	-0.060	0.224	4.733*	9.344**	-0.029	1.038**
PA 740 x PA 08	0.467	1.527**	-1.133	-0.133	27.62**	-0.467	-0.881	-0.084	-0.103
PA 740 x Phule Dhanwantary	2.167	-0.714	-2.133	-0.142	32.30**	0.633	-7.842**	-0.067	-0.619
PA 760 x AKA 9703	-0.317	1.125*	-2.533*	-0.127	15.10**	1.233	-5.232**	-0.080	-0.688*
PA 760 x JLA 505	0.083	0.542	-0.333	0.029	-0.808	-1.067	-0.286	-0.056	-0.056
PA 760 x RAC 024	2.283	-0.052	-1.733	-0.125	21.10**	3.433	1.332	-0.043	0.181
PA 760 x AKA 7	-0.517	-0.516	0.367	-0.178	-10.31**	-3.267	1.205	0.117	0.017
PA 760 x PA 08	-2.117	-0.987*	4.367**	0.125	-20.99**	-6.467**	9.979**	0.202	1.247**
PA 760 x Phule Dhanwantary	0.583	-0.113	-0.133	0.276*	-4.100	6.133**	-6.997**	-0.141	-0.699*
PA 848 x AKA 9703	-1.650	-1.367**	2.967*	0.051	11.56**	-2.017	4.542*	0.200	0.698*
PA 848 x JLA 505	2.250	-1.330**	-3.333*	-0.084	28.44**	10.68**	-5.783**	-0.156	-0.735*
PA 848 x RAC 024	2.450	2.381**	-3.733**	-0.147	-17.87**	-1.817	-10.96**	-0.203*	-0.949**
PA 848 x AKA 7	-2.850	-0.263	-1.133	0.070	12.65**	-2.517	-4.947**	-0.058	-0.153
PA 848 x PA 08	-3.450	-0.104	-0.133	0.097	-20.91**	-4.217*	0.052	-0.063	-0.057
PA 848 x Phule Dhanwantary	3.250	0.685	5.367**	0.013	-13.86**	-0.117	17.09**	0.279**	1.197**
PA 828 x AKA 9703	6.183**	-0.504	-1.200	0.009	-10.52	1.233	-6.951**	-0.027	-0.592
PA 828 x JLA 505	-1.417	-0.957	3.000*	0.074	-20.43**	-5.067*	10.19**	0.027	1.025**
PA 828 x RAC 024	-1.717	0.254	2.100	-0.029	16.76**	1.433	7.412**	0.181	0.837*
PA 828 x AKA 7	-4.017	0.545	-2.800*	0.113	-23.88**	-0.267	-4.120*	-0.045	-0.457
PA 828 x PA 08	2.883	0.939	-1.300	-0.135	29.19**	3.033	-8.141**	-0.135	-0.927**
PA 828 x Phule Dhanwantary	-1.917	-0.277	0.200	-0.034	8.878**	-0.367	1.604	-0.003	0.112
PAIG 77 x AKA 9703	-1.983	-0.263	2.300	-0.090	12.22**	-1.683	10.48**	-0.143	0.880*
PAIG 77 x JLA 505	0.417	1.099*	2.000	0.085	11.05**	-1.983	-0.873	0.241*	0.192
PAIG 77 x RAC 024	0.617	-0.400	-0.400	0.017	-6.479*	0.517	-3.255	-0.121	-0.476
PAIG 77 x AKA 7	2.817	0.521	1.200	0.054	21.32**	1.317	-1.482	0.014	-0.445
PAIG 77 x PA 08	2.217	-1.375**	-1.800	0.046	-14.91**	8.117**	-1.008	0.079	-0.160
PAIG 77 x Phule Dhanwantary	-4.083*	0.419	-3.300*	-0.113	-23.21**	-6.283**	-3.863*	-0.069	0.009
S.E.±	1.964	0.476	1.215	0.105	2.813	1.965	1.727	0.099	0.327

*and ** indicated significance at 5 and 1 per cent respectively.

References

1. Ashok kumar K, Ravi kesavan R. Genetic studies of combining ability estimates for seed oil, seed protein and fibre quality traits in upland cotton (*G. hirsutum* L.). Res. Journal. Agri. and Biolo. Sci. 2008; 4(6):798-802.
2. Dhamayanthi KPM. Study of interspecific hybrids (*Gossypiumhirsutum x G. barbadense*) for heterosis and combining ability. World Cotton Research Conference-5., Mumbai, India, 2011, 51-55.
3. Giri RK, Nirannia KS, Dutt Y, Sangwan RS. Combining ability studies for yield quality traits in upland cotton (*Gossypiumhirsutum* L.). J Cotton. Res. Dev. 2006; 20(2):178-180.
4. Jatoi WA, Baloch MJ, Veesar NF, Panhwar SA. Combining ability estimates from line x tester analysis

for yield and yield components in upland cotton genotypes. J Agri. Res. 2011; 49(2):165-172.
5. Kempthorne O. An Introduction to Genetic Statistics New York, John Wiley and Sons, 1st Edn. 1957, 456-471.
6. Kumar KS, Ashok kumar K, Ravikesavan R. Genetic effects for combining ability studies for yield and fibre quality traits in diallel crosses of upland cotton (*Gossypiumhirsutum* L.) Academic Journals. 2014; 13(1):119-126.
7. Kumar Manish KS, Nirania RS, Sangwan, Yadav NK. Combining ability studies for yield and quality traits in upland cotton (*Gossypiumhirsutum* L.). J Cotton Res. Dev., 2013; 27(2):171-147.
8. Mendez-Natera JR, Randon A, Hernandez J, Merazo-Pinto JF. Genetic studies in upland cotton (*G. hirsutum* L.). Genral and specific combining ability. J Agri Sci. and Tech. 2012; 14(3):617-627.
9. Nadagundi JM, Deshpande SK, Patil BR, Mane RS. Combining ability and heterosis for yield and fibre quality traits in American cotton. *Crop Improv*. 2011; 38(2):179-185.
10. Saravanan NA, Ravikesavan R, Raveendran TS. Combinig ability analysis for yield and fibre quality parameters in intraspecific hybrids of *G. hirsutum* L. Electronic Journal of Plant Breeding. 2010; 1(4):856-863,