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Study on Heterosis for Yield and Yield Contributing Traits in *Desi* Cotton (*Gossypium arboreum* L.)

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A B S T R A C T

The present investigation entitled "Studies on Heterosis for Yield and Yield Contributing Traits in *Desi* Cotton (*Gossypium arboreum* L.) was undertaken with the objective to study the scale of heterosis over mid parent (Average heterosis), better parent (Heterobeltiosis) and standard check (Standard heterosis). The line x tester method of analysis was followed involving four females viz., PA 811, PA 839, PA 808 and PAIG 380 and six males viz. AKA 8, JLA 505, PA 812, AKA 7, PA 08 and Phule Dhanwantry for study of heterosis for various yield and yield contributing characters. The F1's and theis parents were evaluated in Randomized Block Design with two replications. Observations were recorded on Days to 50 % flowering, Plant height (cm), Number of sympodia, Number of bolls/plant, Boll weight (g), Seed index, Seed cotton yield/plant (g) and Lint index. The magnitude of heterosis was highest for seed cotton yield per plant, which was recorded to the extent of 115.28 % over standard check PKV Suvarna in the cross PAIG 380 x AKA 8 followed by 109.68 % over standard check PKVDH 1.

Keywords

Cotton, king of appraisal fibre, heterosis, rural and urban sectors

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Introduction

The first evidence of cotton use was found in India and Pakistan and dates from about 6000 B.C. The history of the domestication of cotton is very complex and is not known exactly. Several isolated civilization in both old and new world independently domesticated and converted cotton into fabric. Cotton is also known as "king of appraisal fibre" which is one of the most important fibre and cash crop of India socially and economically. Cotton enjoys pre-eminent status among all crops in the country. It has an extensive potential in providing employment both in rural and urban sectors. Cotton in India provides direct livelihood to 6 million farmers and about 40-50 million people are employed

in cotton trade and its processing. *Desi* cotton is Indigenous cotton. 97% of India's *desi* cotton today has been reduced to an alarming 3%. due to the vast dependence on Genetically Modified cotton, the country has forgotten its own indigenous seeds. The genetic improvement in *desi* cotton could be gained either through selection or exploitation of hybrid vigour. Hybridization is the most potential technique for breaking yield barriers. The objective of the present study was to determine the extent of heterosis for seed cotton yield and yield contributing traits to identify the promising hybrids.

Materials and Methods

The present investigation "Study on heterosis for yield and Yield Contributing Traits in *Desi* Cotton (G*ossypium arboreum L.*)" was conducted during *kharif* 2020-2021. The twenty four cross combinations obtained by crossing four lines with six testers along with their parents and 2 checks were sown at Cotton Research Station, Mahboob Baugh Farm, Vasantarao Naik Marathwada Krishi Vidyapeeth, Parbhani. The experiment material consisted of 24 crosses developed from the four lines and six tester parents along with PKVDH 1 and PKV Suvarna as standard checks. The mean values of all the characters under study were worked out. Standard error and critical difference at 1 and 5 per cent level of significance were calculated by using the formula (Panse and Sukhatme, 1961). The heterosis was calculated over mid parent, better parent and standard checks.

Results and Discussion

The analysis of variance showed significant difference among treatments for the characters studied (Table 1). Heterosis over mid parent (MP), better parent (BP) and standard check (SC) was calculated for yield and yield contributing traits. The results obtained are presented in Table 2, which are discussed below.

For days to 50 % flowering, The crosses PAIG 380 x AKA 7 (-9.90), PAIG 380 x PA 812 (-6.80 %), PA 808 x JLA 505 (-6.67 %) exhibited significantly negative heterosis over mid parent. The cross PAIG 380 x AKA 8 (-4.96 %) and PAIG 380 x PA 812 (-2.84 %) exhibited significant negative heterosis over standard check PKVDH 1. Heterosis over standard check PKV Suvarna ranged from -10.81 % (PAIG 380 x AKA 7) to 8.78 % (PA 811 x Phule Dhanwantry). Significant negative heterosis for earliness was also reported by Jaiwar *et al.,* (2012), Gangasekaran & Padmavathi (2017) and Shinde *et al.,* (2018).

The proportion of sympodial and monopodial branches, size and arrangement in a particular genotype together with height of the plant determine architecture of the cotton plant. These branches provide structural arrangements or nodes for fruiting points which are finally converted into productive open bolls after floral shedding. The cross combination PA 839 x Phule Dhanwantry (42.60 %) exhibited highest significantly positive heterosis over mid parent followed by PAIG 380 x PA 812 (26.74 %) and PA 839 x PA 08 (26.11 %). Highest significant positive heterosis over better parent was exhibited by cross combination PA 839 x Phule Dhanwantry (26.97 %) followed by PAIG 380 x PA 812 (20.71 %) and PAIG 380 x Phule Dhanwantry (16.11 %). Sixteen cross combinations reported significantly positive heterosis over standard check PKVDH 1, where as fourteen hybrids recorded significantly positive heterosis over check PKV Suvarna.These findings are in accordance with the results obtained by Patel *et al.,* (2011), Jaiwar *et al.,* (2012), Kumar (2013), Shinde *et al.,* (2018) and Naimatullah *et al.,* (2019).

Higher number of sympodia plays an important role in yield, hence positive heterosis for this trait is considered desirable. Highest positive significant heterosis over mid parent was exhibited by PA 839 x PA 08 (39.02 %) followed by PAIG 380 x PA 08 (38.33 %) and PAIG 380 x AKA 7 (25.83 %).

Twelve hyarids exhibited significant positive heterosis over mid parent. Seventeen crosses exhibited significant negative heterosis over better parent. Twenty one crosses exhibited positive significant heterois over PKVDH 1. Eighteen crosses showed positive significant heterosis over standard check PKV Suvarna. Heterosis for this trait was also reported by the earlier workers Tuteja *et al.,* (2011), Shinde *et al.,* (2018) and Naimatullah *et al.,* (2019).

For number of bolls per plant, positive heterosis is desirable. The cross PAIG 380 x PA 08 (46.58 %) exhibited significant positive heterosis over mid-parent followed by PAIG 380 x Phule Dhanwantry (27.69 %), PA 808 x AKA 8 (24.4 %) and PAIG 380 x AKA 8 (17.71 %).

The cross combination PAIG 380 x PA 08 (42.47%) displayed significant positive heterosis over better parent followed by PAIG 380 x Phule Dhanwantry (19.71 %) and PAIG 380 x JLA 505 (13.08 %). Eleven cross combinations each exhibited positive significant heterosis over standard check PKV Suvarna and PKVDH 1. PAIG 380 x PA 08 (55.15 %)

Cross combination showed highest positive heterosis over standard check PKV Suvarna. Heterosis for this trait was reported by the earlier workers Patil *et al.,* (2011), Tuteja *et al.,* (2011), Jaiwar *et al.,* (2012), Sekhar *et al.,* (2012), Kumar *et al.,* (2013), Singh *et al.,* (2013), Gangasekaran & Padmavathi (2017) and Naik *et al.,* (2020). For boll weight, The cross combination PA 839 x Phule Dhanwantry (5.88 %) exhibited highest significant positive mid parent heterosis for boll weight followed by PAIG 380 x Phule Dhanwantry (4.56 %) and PAIG 380 x AKA 8 (3.82 %).

Only one cross exhibited significant positive heterosis over mid-parent. The cross combination PA 839 x Phule Dhanwantry recorded highest significant positive heterosis over standard check PKVDH 1 (11.60 %) and PKV Suvarna (5.68 %). Heterosis for this trait was also reported by the earlier workers, Tuteja *et al.,* (2011), Jaiwar *et al.,* (2012), Patil *et al.,* (2012), Singh *et al.,* (2013), Gangasekaran & Padmavathi (2017) and Gohil *et al.,* (2018).

For the seed index, positive heterosis is desirable.Among twenty four hybrids, PA 811 x AKA 8 (41.62 %) cross combination exhibited maximum significant positive heterosis over mid-parent for seed index followed by PA 839 x AKA 8 (30.77 %) and PAIG 380 x AKA 8 (27.42 %).

The cross PAIG 380 x Phule Dhanwantry (5.56 %) exhibited highest heterosis over the standard check PKVDH 1 and the hybrid PAIG 380 x Phule Dhanwantry (5.98 %) exhibited highest heterosis over the standard check PKV Suvarna. Heterosis for this trait was reported by the earlier workers Tuteja *et al.,* (2011), Naimatullah *et al.,*(2019) and Gohil *et al.,* (2018).

For lint index heterosis in positive direction is desirable. Out of twenty four crosses, the cross PA 811 x AKA 8 (28.72 %) showed highest significant positive heterosis over mid-parent for lint index followed by PA 839 x AKA 8 (27.79 %) and PA 811 x JLA 505 (26.89 %).

Significant positive heterosis over mid-parent was reported by twenty two crosses out of twenty four crosses.

Table.1 Analysis of variance for Randomized Block Design

Source of Variation	d.f.	Days to 50% flowering	Number of sympodia/plant	Number of boll/plant	Boll weight (gm)	Plant height (cm)	Seed cotton yield/plant	Seed index
Mean sum of squares								
Replications	1	0.125	0.001	0.160	0.002	0.211	1.312	0.077
Treatments	35	20.366***	24.725**	81.997***	0.025***	506.747***	266.214***	0.737***
Error	35	0.267	0.444	0.0441	0.006	0.067	0.362	0.095

*, ** significant at 5% and 1% levels, respectively

Table.2 Estimates of heterosis in percentage over mid parent (M.P.), better parent (B.P.) and standard checks (S.C.) for various characters

Sr no	Hybrids	Days to 50% flowering					Number of sympodia/plant				
		Mean	M.P. Heterosis (%)	B.P. Heterosis (%)	% standard heterosis over		Mean	M.P. Heterosis (%)	B.P. Heterosis (%)	% standard heterosis over	
					PKVDH1	PKV Suvarna				PKVDH1	PKV Suvarna
1	PA 811 x AKA 8	72.00	3.97**	3.60**	2.13**	-2.70**	13.60	-32.35**	-39.85**	-2.82**	-10.53**
2	PA 811 x JLA 505	69.50	-3.47**	-6.71**	-1.42	-6.08**	16.20	-19.79**	-28.94**	15.76**	6.58**
3	PA 811 x PA 812	73.50	3.52**	1.38	4.26**	-0.68	17.89	-8.21**	-16.36**	27.88**	17.74**
4	PA 811 x AKA 7	79.00	11.66**	9.72**	12.06**	6.76**	11.80	-34.71**	-36.38**	-15.69**	-22.38**
5	PA 811 x PA 08	75.50	4.50**	0.67	7.09**	2.03**	11.79	-29.57**	-32.97**	-15.73**	-22.41**
6	PA 811 x Phule Dhanwantary	80.50	16.25**	15.83**	14.18**	8.78**	14.19	-23.46**	-27.19**	1.43	-6.61**bh \
7	PA 839 x AKA 8	69.50	1.09	0.72	-1.42	-6.08**	15.59	-16.8**	-31.02**	11.44**	2.60**
8	PA 839 x JLA 505	70.50	-1.40*	-5.37**	0.00	-4.73**	17.39	7.70**	-23.69**	24.30**	14.45**
9	PA 839 x PA 812	73.00	3.55**	0.69	3.55**	-1.35	14.59	-19.57**	-31.79**	4.29**	-3.98**
10	PA 839 x AKA 7	71.50	1.78*	-0.69	1.42	-3.38**	14.00	-16.24**	-24.49**	0.07	-7.86**
11	PA 839 x PA 08	72.50	1.05	-3.33**	2.84**	-2.03**	21.39	39.02**	34.64**	52.93*	40.80**

12	PA 839 x Phule Dhanwantary	73.00	6.18**	5.80**	3.55**	-1.35	20.99	22.11**	7.70**	50.04**	38.14**
13	PA 808 x AKA 8	72.00	-0.35	-4.64**	2.13**	-2.70**	22.19	10.41**	-1.81**	58.61**	46.03**
14	PA 808 x JLA 505	70.00	-6.67**	-7.28**	-0.71	-5.41**	21	5.96**	-6.12**	52.93**	40.80**
15	PA 808 x PA 812	75.00	1.35*	-0.66	6.38**	1.35	18	-4.60**	-13.07**	32.92**	22.38**
16	PA 808 x AKA 7	74.00	0.34	-1.99**	4.96**	0.00	17	-4.83**	-7.25**	22.91**	13.16**
17	PA 808 x PA 08	74.00	-1.66*	-1.99**	4.96**	0.00	16.99	1.48*	-3.44**	21.44**	11.81**
18	PA 808 x Phule Dhanwantary	78.00	7.96**	3.31**	10.64**	5.41**	19.79	6.73**	1.54*	41.46**	30.24**
19	PAIG 380 x AKA 8	67.00	-6.62**	-10.07**	-4.96**	-9.46**	22.39	8.18**	-0.93	60.04**	47.35**
20	PAIG 380 x JLA 505	71.50	-4.03**	-4.03**	1.42	-3.38**	22.99	10.57*	0.88	64.33**	51.30**
21	PAIG 380 x PA 812	68.50	-6.80**	-8.05**	-2.84**	-7.43**	23.00	14.47**	7.53**	64.40**	51.37**
22	PAIG 380 x AKA 7	66.00	-9.90**	-11.41**	-6.38**	-10.81**	23.49	25.83**	24.98**	67.91**	54.59**
23	PAIG 380 x PA 08	72.50	-3.01**	-3.33**	2.84**	-2.03**	23.99	38.33**	27.64**	71.48**	57.88**
24	PAIG 380 x Phule Dhanwantary	71.50	-0.35	-4.03**	1.42	-3.38**	18.99	-0.80	-2.57**	35.74**	24.98**
	S.E.±	0.766	0.9451	1.0913	1.0913	1.0913	1.198	1.4693	1.6966	1.6966	1.6966

Sr no	Hybrids	Plant height (cm)					Number of bolls/plant				
		Mean	M.P. Heterosis (%)	B.P. Heterosis (%)	% standard heterosis over		Mean	M.P. Heterosis (%)	B.P. Heterosis (%)	% standard heterosis over	
					PKVDH1	PKV Suvarna				PKVDH1	PKV Suvarna
1	PA 811 x AKA 8	143.60	-2.54**	-9.97**	-2.01**	-4.96**	23.00	-30.41**	-36.11**	-20.83**	-19.72**
2	PA 811 x JLA 505	157.35	2.34**	-8.68**	7.37**	4.14**	27.30	-13.81**	-17.89**	-6.02**	-4.71**
3	PA 811 x PA 812	145.30	7.19**	6.92**	-0.85**	-3.84**	19.50	-41.53**	-46.72**	-32.87**	-31.94**
4	PA 811 x AKA 7	135.50	4.01**	0.22	-7.54**	-10.32**	22.40	-30.54**	-34.88**	-22.89**	-21.82**
5	PA 811 x PA 08	141.35	-3.47**	-10.34**	-3.55**	-6.45**	12.80	-57.01**	-57.48**	-55.94**	-55.32**
6	PA 811 x Phule Dhanwantary	160.50	13.89**	9.44**	9.52**	6.22**	26.30	-8.36**	-12.62**	-9.47**	-8.20**
7	PA 839 x AKA 8	129.55	-5.44**	-18.78**	-11.60**	-14.26**	26.80	-21.81**	-25.56**	-7.75**	-6.46**
8	PA 839 x JLA 505	149.70	4.39**	-13.12**	2.15**	-0.93**	19.30	-41.34**	-41.95**	-33.56**	-32.64**
9	PA 839 x PA 812	151.35	20.89**	11.37**	3.28**	017	23.45	-32.18**	-35.93**	-19.28**	-18.15**
10	PA 839 x AKA 7	137.65	14.78**	9.81**	-6.07**	-8.90**	25.55	-23.67**	-25.73**	-12.05**	-10.82**
11	PA 839 x PA 08	171.60	26.11**	8.85**	17.09**	13.57**	29.50	-4.84**	-9.37**	1.55**	2.97**
12	PA 839 x Phule Dhanwantary	186.20	42.60**	26.97**	27.06**	23.23**	32.10	7.27**	-1.38**	10.50**	12.04**
13	PA 808 x AKA 8	152.50	-5.25**	-6.10**	4.06**	0.93**	41.45	24.47**	-15.14**	42.69**	44.68**
14	PA 808 x JLA 505	144.10	-13.89**	-16.37**	-1.67**	-4.63**	27.35	-14.33**	-17.74**	-5.85**	-4.54**
15	PA 808 x PA	163.95	9.92**	0.95**	11.87**	8.50**	27.20	-19.05**	-25.68**	-6.37**	-5.06**

	812										
16	PA 808 x AKA 7	151.85	5.54**	-6.50**	3.62**	0.50**	30.55	-6.00**	-11.19**	5.16**	6.63**
17	PA 808 x PA 08	168.10	5.25**	3.51**	14.70**	11.25**	28.45	-5.25**	-7.03**	-2.07**	-0.70
18	PA 808 x Phule Dhanwantary	168.10	8.78**	3.51**	14.70**	11.25**	32.10	10.88**	4.90**	10.50**	12.04**
19	PAIG 380 x AKA 8	152.40	-1.58**	-4.45**	3.99**	0.86**	39.55	17.71**	9.86**	36.14**	38.05**
20	PAIG 380 x JLA 505	130.65	-18.98*	-24.17**	-10.85**	-13.53**	37.60	16.68**	13.08**	29.43**	31.24**
21	PAIG 380 x PA 812	181.30	26.74**	20.71**	23.71**	19.99**	31.30	-7.67**	-14.48**	7.75**	9.25**
22	PAIG 380 x AKA 7	147.50	7.06**	-1.80**	0.65**	-2.38**	33.80	3.05**	-1.74**	16.35**	17.98**
23	PAIG 380 x PA 08	162.45	5.54**	3.04**	10.85**	7.51**	44.45	46.58**	42.47**	53.01**	55.15**
24	PAIG 380 x Phule Dhanwantary	174.40	17.50**	16.11**	19.00**	15.42**	37.35	27.69**	19.71**	28.57**	30.37**
	S.E.±	4.600	5.7163	6.6006	6.6006	6.6006	1.644	2.0122	2.3235	2.3235	2.3235

Sr no	Hybrids	Boll weight (g)					Seed cotton yield/plant (g)				
		Mean	M.P. Heterosis (%)	B.P. Heterosis (%)	% standard heterosis over		Mean	M.P. Heterosis (%)	B.P. Heterosis (%)	% standard heterosis over	
					PKVDH1	PKV Suvarna				PKVDH1	PKV Suvarna
1	PA 811 x AKA 8	2.61	-1.88	-2.61	4.40	-1.14	35.00	-37.30**	-44.79**	1.16	3.86*
2	PA 811 x JLA 505	2.53	-8.17**	-10.60**	1.20	-4.17	37.00	-41.66**	-41.69**	6.94**	9.79**
3	PA 811 x PA 812	2.61	-3.69	-4.74	4.40	-1.14	23.30	-53.33**	-63.25**	-32.66**	-30.86**
4	PA 811 x AKA 7	2.67	0.00	-0.37	6.80*	1.14	32.60	-40.07**	-48.58**	-5.78**	-3.26
5	PA 811 x PA 08	2.40	-12.41**	-14.29**	-4.00	-9.09**	27.00	-51.74**	-57.41**	-21.97**	-19.88**
6	PA 811 x Phule Dhanwantary	2.74	2.62	2.24	9.60**	3.79	40.15	-23.60**	-36.67**	16.04**	19.14**
7	PA 839 x AKA 8	2.66	1.33	0.76	6.40*	0.76	30.40	-31.26**	-36.99**	-12.14**	-9.79**
8	PA 839 x JLA 505	2.43	-10.85**	-14.31**	-3.00	-8.14**	32.50	-37.29**	-48.78**	-6.07**	-3.56
9	PA 839 x PA 812	2.74	2.43	0.00	-9.60**	3.79	28.20	-26.42**	-29.85**	-18.50**	16.32**
10	PA 839 x AKA 7	2.42	-8.16**	-9.02**	-3.20	8.33**	35.50	-17.06**	-21.81**	2.60	5.34**
11	PA 839 x PA 08	2.49	-8.13**	-11.25**	-0.60	-5.87*	39.25	-11.50**	-19.07**	13.44**	16.47**
12	PA 839 x Phule Dhanwantary	2.79	5.88*	4.89	11.60**	5.68*	52.35	27.84**	25.54**	51.30**	55.34**
13	PA 808 x AKA 8	2.45	-8.75**	-10.26**	-2.00	-7.20*	47.25	-17.82**	-29.10**	36.27**	39.91**
14	PA 808 x JLA 505	2.59	-6.83**	-8.48**	3.60	-1.89	40.20	-38.13**	-39.55**	16.18**	19.29**

15	PA 808 x PA 812	2.76	0.91	0.73	10.40**	4.55	40.40	-21.52**	-39.25**	16.76**	19.88**
16	PA 808 x AKA 7	2.70	0.19	-1.10	8.00**	2.27	47.65	-14.83**	-28.35**	37.72**	41.39**
17	PA 808 x PA 08	2.61	-5.61*	-6.79*	4.40	-1.14	56.60	-1.57	-14.89**	63.58**	67.95**
18	PA 808 x Phule Dhanwantary	2.73	1.30	0.00	9.20**	3.41	48.25	-10.81**	-27.44**	39.45**	43.18**
19	PAIG 380 x AKA 8	2.72	3.82	3.03	8.80**	3.03	72.55	63.68**	50.36**	109.68**	115.28**
20	PAIG 380 x JLA 505	2.61	-3.87	-7.77**	4.40	-1.14	49.99	-3.73**	-21.21**	44.48**	48.34**
21	PAIG 380 x PA 812	2.70	1.12	-1.46	8.00**	2.27	37.45	2.54	-7.30**	8.24**	11.13**
22	PAIG 380 x AKA 7	2.57	-2.28	-3.38	2.80	-265	52.20	21.38**	14.98**	50.87**	54.90**
23	PAIG 380 x PA 08	2.54	-5.93**	-9.29**	1.60	-3.79	47.20	6.19**	-2.68**	36.42**	40.06**
24	PAIG 380 x Phule Dhanwantary	2.75	4.56	3.38	10.00**	4.17	56.45	37.52**	35.37**	63.15**	67.51**
	S.E.±	0.052	0.0652	0.0752	0.0752	0.0752	2.440	2.9924	3.4553	3.4553	3.4553

Sr no	Hybrids	Lint index(g)					Seed index(g)				
		Mean	M.P. Heterosis (%)	B.P. Heterosis (%)	% standard heterosis over		Mean	M.P. Heterosis (%)	B.P. Heterosis (%)	% standard heterosis over	
					PKVDH1	PKV Suvarna				PKVDH1	PKV Suvarna
1	PA 811 x AKA 8	4.09	28.72**	24.32**	19.07**	1.36**	6.13	41.62**	13.43**	-2.78	-2.39
2	PA 811 x JLA 505	4.37	26.89**	21.59**	27.07**	8.18**	6.40	3.02	-8.90	1.59	1.99
3	PA 811 x PA 812	4.24	19.75**	11.71**	23.58**	5.20**	5.46	-8.81	-16.96**	-13.33*	12.99*
4	PA 811 x AKA 7	3.79	19.28**	15.20**	10.33**	-6.07**	6.03	1.77	-6.51	-4.29	-3.90
5	PA 811 x PA 08	3.19	-9.25**	-14.71**	-7.13**	-20.94**.	5.72	-3.78	-11.92	-9.13	-8.76
6	PA 811 x Phule Dhanwantary	4.31	21.75**	13.72**	25.47**	6.82**	6.08	6.07	0.33	-3.57	-3.19
7	PA 839 x AKA 8	4.04	27.79**	24.15**	17.47**	0.00	5.95	30.77**	1.71	-5.56	-5.18
8	PA 839 x JLA 505	4.03	17.69**	12.12**	17.18**	-0.25	5.42	-15.73**	-22.78**	-13.89**	-13.55*
9	PA 839 x PA 812	4.07	15.32**	6.96**	18.34**	0.74	6.07	-2.37	-7.76	-3.73	-3.35
10	PA 839 x AKA 7	3.48	10.06**	6.92**	1.16*	-13.88**	5.58	-9.35*	-13.57**	-11.51*	-11.16*
11	PA 839 x PA 08	3.52	0.72	-5.88**	2.47**	-12.76**	6.40	3.64	-1.54	1.59	1.99
12	PA 839 x Phule Dhanwantary	4.10	16.48**	8.18**	19.36**	1.61**	6.08	2.06	0.33	-3.57	-3.19
13	PA 808 x AKA 8	3.23	1.49**	-1.98**	-6.11**	-20.07**	6.22	26.08**	-6.04	-1.19	-0.80

14	PA 808 x JLA 505	4.23	23.11**	17.97**	23.29**	4.96**	6.00	-12.09**	-14.59**	-4.76	-4.38
15	PA 808 x PA 812	3.79	6.91**	-0.26	10.33**	-6.07**	6.65	0.76	0.38	5.56	5.98
16	PA 808 x AKA 7	3.49	9.83**	6.08**	1.60**	-13.51**	6.25	-4.40	5.66	-0.79	-0.40
17	PA 808 x PA 08	3.67	4.27**	-2.01**	6.70**	-9.17**	6.55	-0.19	-1.13	3.97	4.38
18	PA 808 x Phule Dhanwantary	4.06	14.55**	6.99**	18.05**	0.50	6.04	-4.81	-8.91	-4.21	-3.82
19	PAIG 380 x AKA 8	4.13	23.34**	13.60**	20.38**	2.48**	6.07	27.42**	-3.27	-3.73	-3.35
20	PAIG 380 x JLA 505	3.74	3.32**	2.61**	8.73**	-7.43**	6.08	-8.61*	-13.52**	-3.57	-3.19
21	PAIG 380 x PA 812	3.03	-18.41**	-20.13**	-11.64**	-24.78**	6.15	-4.24	-6.46	-2.38	-1.99
22	PAIG 380 x AKA 7	3.84	14.54**	5.49**	11.79**	-4.83**	6.42	1.02	-0.39	1.98	2.39
23	PAIG 380 x PA 08	4.06	10.03**	8.56**	18.20**	0.62	6.28	-1.72	-3.46	-0.40	0.00
24	PAIG 380 x Phule Dhanwantary	3.17	-14.80**	-16.49**	-7.86**	-21.56**	6.65	7.91	6.06	5.56	5.98
	S.E.±	0.052	0.0649	0.0750	0.0750	0.0750	0.0937	0.1118	0.1291	0.1291	0.1291

The cross PA 811 x AKA 8 (24.32 %) displayed highest significant positive heterosis over better parent followed by PA 839 x AKA 8 (24.15 %) and PA 811 x JLA 505 (21.59 %).

Among twenty four crosses, twenty and seven crosses each exhibited positive significant heterosis over check PKVDH 1and PKV Suvarna, respectively. Similar results were obtained by Chinchane *et al.,* (2018), Shinde *et al.,* (2018) and Gohil *et al.,* (2018).

The highest significantly positive average heterosis for seed cotton yield per plant was displayed by the cross combination PAIG 380 x AKA 8 (63.68 %) followed by PAIG 380 x Phule Dhanwantry (37.52 %) and PA 839 x Phule dhanwantry (22.84 %).

Six cross combinations showed significant positive heterosis over mid-parent. In case of better parent heterosis, the cross PAIG 380 x AKA 8 (50.36 %) exhibited highest significant positive heterosis followed by the crosses PAIG 380 x Phule Dhanwantry (35.37 %).

The range of heterobeltiosis was from -63.25 per cent (PA 811 x PA 812) to 50.36 % (PAIG 380 x AKA 8). Among twenty four cross combinations, only four hybrids showed significantly positive heterosis over better parent. The significant positive heterosis over the standard check PKVDH 1 ranged from -32.66 % (PA 811 x PA 812) to 109.68 % (PAIG 380 x AKA 8). The cross combination PAIG 380 x AKA 8 (115.28 %) showed highest significant positive heterosis over the standard check PKV Suvarna. Out of twenty four cross combinations, seventeen and twenty cross combinations showed significant positive heterosis over the check PKVDH 1 and PKV Suvarna, respectively. Heterosis for seed cotton yield and other related characters in cotton has also been reported by Jaiwar *et al.,* (2012), Singh *et al.,* (2013), Kumar *et al.,* (2013) and Singh *et al.,* (2013).

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