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RESEARCH ARTICLE

Study of heterosis for seed cotton yield, yield contributing and fibre quality traits in *Desi* cotton (*Gossypeum arborium* L.)

■ **K.M. Lokesh, S.B. Borgaonkar, D.B. Deosarkar and V.N. Chinchane**

SUMMARY

Twenty four crosses were evaluated for average heterosis, heterobeltiosis and standard heterosis. The magnitude of heterosis, heterobeltiosis and standard heterosis were found significant for all the characters studied. The magnitude of heterosis, heterobeltiosis and standard heterosis for all the characters in the present study was highly appreciable. Out of twenty four crosses, the crosses showed highest and desirable significant standard heterosis for various traits *viz.*, cross PA 832 x NDLA 3047 for days to 50 per cent flowering, for number of sympodia per plant and for number of bolls per plant; PA 778 x JLA 0716 for boll weight; PAIG 62 x CNA 1013 for days to maturity; PA 832 x ARBAS 1401 for 2.5% span length; PAIG 62 x CNA 1013 for fibre fineness (micronaire); PA 778 x JLA 0716 for fibre strength PA 832 x NDLA 3047 over standard check PKV Suvarna and PKVDH 1, respectively. The magnitude of average heterosis for plant height was 89.84 per cent in the cross combination PA 800 x CNA 1013. The cross PA 800 x CNA 1013 exhibited highest significant heterobeltiosis of 43.89 per cent. The cross PA 832 x NDLA 3047 displayed the highest significant positive heterosis over both standard check PKVDH 1 (13.83%) and PKV Suvarna (53.52%). The range of heterosis over check PKV Suvarna was -15.90 to 53.52 per cent. Three and eighteen crosses each recorded significant positive heterosis over standard check PKVDH 1, PKV Suvarna, respectively.

Key Words : Heterosis, Standard heterosis, Micronaire, Staple length, Heterobeltiosis

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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. where climatic conditions suit the natural growth requirements of cotton, which includes periods of hot and dry weather and adequate moisture obtained through irrigation. Genetic improvement in *Desi* cotton could be gained either through selection or exploitation of hybrid vigour. Therefore, more emphasis should be given to increase the seed cotton yield per unit area by developing hybrids with short stature, big boll size and 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.

For development of superior and heterotic hybrids in cotton, it is essential to utilize large number of available germplasm. In the context of quality assessment, high volume instrument testing is universally accepted by the industry and is becoming a requirement, enabling cotton to be marketed more directly on textile mill needs rather than the traditional grade, staple and micronaire. This has contributed to the development and acceptance of high quality hybrids and varieties.

In heterosis breeding programme, the selection of crosses on basis of heterosis is very important in producing superior hybrids.

MATERIAL AND METHODS

The present investigation was undertaken to study of heterosis for seed cotton yield, yield contributing and fibre quality traits in *Desi* Cotton (*Gossypium arboreum* L.). Twenty four cross combinations derived by crossing six lines with four testers in line x tester mating design. The experiment material consisted of 24 crosses ten parents along with two standard checks (PKVDH 1 and PKV Suvarna). The experiment was conducted at Cotton Research Station, Mahboob Baugh farm, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani during *Kharif* season of 2016-17. The mean values of all the treatments for 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, 1967). The magnitude of heterosis was estimated for all the characters under study over mid parent, better parent and standard check.

RESULTS AND DISCUSSION

The analysis of variance showed significant differences for all the characters studied. The mean sum of squares for the treatments were highly significant for various characters studied. The analysis of variance for all the characters is presented in Table 1. The heterosis over mid parent, better parent and standard checks are presented in Table 2.

Out of twenty four crosses, twelve crosses exhibited significantly negative heterosis over standard check PKV Suvarna for days to 50 per cent flowering. The cross PAIG 62 x NDLA 3047 displayed highest significant negative heterosis over better parent (-6.85%) and over better parent for days to 50 per cent flowering. While the cross combination PA 832 x NDLA 3047 displayed significant negative Standard heterosis over standard

Table 1 : Analysis of variance for seed cotton yield, yield contributing and fibre quality traits in desi cotton

Source of variation	d.f.	Days to 50% flowering	No. of sympodia/ plant	No. of bolls/ plant	Boll weight (g)	Plant height (cm)	Days to maturity
Mean sum of squares							
Replications	1	0.222	0.101	0.013	0.001	2.531	0.027
Treatments	35	8.465**	4.357**	7.927**	0.027**	1047.978**	12.058**
Error	35	0.136	0.079	0.081	0.005	8.127	0.040

Table 1 contd…

Contd.. Table 1

Source of variation	d.f.	Seed cotton yield/plant (g)	Lint index	Seed index (g)	Ginning out turn(%)	2.5% span length (mm)	Fibre fineness (micronire) (µg/inch)	Fibre strength (g/tex)	Uniformity ratio (%)
Mean sum of squares									
Replications	1	0.055	0.004	0.031	0.076	0.320	0.005	0.027	0.375
Treatments	35	50.598**	0.305**	1.067**	15.772**	5.802**	0.389**	0.694**	5.136**
Error	35	0.159	0.033	0.018	0.116	0.291	0.040	0.142	0.541

**indicates significance of value at P=0.01

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

Sr. No.	Hybrids	Days to 50% flowering				No. of sympodia/plant				No. of boll/ plant			
		M.P. (%)	B.P. (%)	% Standard heterosis over		M.P. (%)	B.P. (%)	% Standard heterosis over		M.P. (%)	B.P. (%)	% Standard heterosis over	
				PKVDH 1	PKV Suvarna			PKVDH 1	PKV Suvarna			PKVDH 1	PKV Suvarna
1.	PA 832 X NDLA 3047	-3.70**	-5.80**	-5.80**	-7.14**	24.14**	23.66**	31.07**	28.89**	31.07**	28.89**	32.57**	48.72**
2.	PA 778 X JLA 0716	0.36	-2.78**	1.45*	0.00	28.00**	15.11**	26.80**	20.88**	26.80**	20.88**	25.71**	41.03**
3.	PA 807 X NDLA 3047	5.80**	5.80**	5.80**	4.29**	8.27**	5.88*	18.86**	15.56**	18.86**	15.56**	18.86**	33.33**
4.	PA 778 X CNA 1013	2.16**	-1.39*	2.90**	1.43*	19.10**	9.43**	26.77**	24.85**	26.77**	24.85**	17.71**	32.05**
5.	PA 832 X ARBAS 1401	4.48**	2.94**	1.45*	0.00	-11.55**	-15.27**	10.65**	7.47**	10.65**	7.47**	6.86**	19.87**
6.	PAIG 62 X NDLA 3047	-4.23**	-6.85**	-1.45*	-2.86**	19.06**	16.54**	10.51**	2.22	10.51**	2.22	5.14**	17.95**
7.	PAIG 62 X CNA 1013	1.43**	-2.74**	2.90**	1.43*	7.39**	4.15	16.93**	14.38**	16.93**	14.38**	4.57*	17.31**
8.	PAIG 62 X JLA 0716	-4.63**	-8.22**	-2.90**	-4.29**	7.78**	2.16	7.46**	-1.10	7.46**	-1.10	2.86	15.38**
9.	PA 832 X JLA 0716	9.36**	8.15**	5.80**	4.29**	-10.37**	-12.95**	10.11**	7.69**	10.11**	7.69**	12.00**	25.64**
10.	PA 785 X CNA 1013	-0.74	-1.47*	-2.90**	-4.29**	4.11*	0.38	12.50**	12.50**	12.50**	12.50**	2.86	15.38**
11.	PA 800 X CNA 1013	5.45**	2.84**	5.07**	3.57**	-8.05**	-9.43**	8.70**	8.02**	8.70**	8.02**	0.00	12.18**
12.	PA 800 X NDLA 3047	-2.51**	-3.55**	-1.45*	-2.86**	8.70**	8.08**	6.43**	1.11	6.43**	1.11	4.00*	16.67**
	S.E.±	0.329	0.380	0.380	0.380	0.251	0.290	0.249	0.288	0.249	0.288	0.288	0.288

Table 2 contd..

Sr. No.	Hybrids	Boll Weight (g)				Plant height (cm)				Days to maturity			
		M.P. (%)	B.P. (%)	% Standard heterosis over		M.P. (%)	B.P. (%)	% Standard heterosis over		M.P. (%)	B.P. (%)	% Standard heterosis over	
				PKVDH 1	PKV Suvarna			PKVDH 1	PKV Suvarna			PKVDH 1	PKV Suvarna
1.	PA 832 X NDLA 3047	-9.22**	-9.69**	-8.75**	-5.60	22.14**	18.52**	38.04**	25.49**	-2.19**	-2.52**	-1.87**	-4.60**
2.	PA 778 X JLA 0716	1086**	10.62**	4.17	7.76*	-8.53**	-13.84**	2.55	-6.77*	1.02**	-0.45**	2.53**	-0.32*
3.	PA 807 X NDLA 3047	6.07*	2.68	3.75	7.33*	5.56*	3.37	20.39**	9.45**	2.93**	2.38**	3.07**	0.19
4.	PA 778 X CNA 1013	0.22	0.00	-5.83	-2.59	-9.09**	-10.53**	-5.88	-14.44**	-1.35**	-2.72**	0.20	-2.59**
5.	PA 832 X ARBAS 1401	7.19*	2.50	2.50	6.03	11.84**	10.51**	21.08**	10.07**	-0.10	-1.30**	1.13**	-1.69**
6.	PAIG 62 X NDLA 3047	-8.92**	-9.39**	-7.50*	-4.31	26.25**	20.45**	40.29**	27.54**	-1.96**	-3.23**	0.00	-2.79**
7.	PAIG 62 X CNA 1013	1.70	-2.45	-0.42	3.02	-21.77**	-23.22**	-18.77**	-26.16**	-3.80**	-5.29**	-2.13**	-4.86**
8.	PAIG 62 X JLA 0716	5.53*	1.22	3.33	6.90*	-11.64**	-16.56**	-0.69	-9.71**	-1.64**	-3.23**	0.00	-2.79**
9.	PA 832 X JLA 0716	-4.95	-7.92*	-7.92*	-4.47	10.66**	6.26*	26.47**	14.97**	3.00**	3.00**	3.00**	0.13
10.	PA 785 X CNA 1013	-1.33	-1.33	-7.50*	-4.31	31.56**	13.96**	16.08**	5.53*	0.47**	-0.13	0.00	-2.79**
11.	PA 800 X CNA 1013	-7.73*	-9.78**	-15.42**	-12.50**	89.84**	43.89**	46.57**	33.24**	2.20**	0.84**	3.73**	0.84**
12.	PA 800 X NDLA 3047	-5.57	-10.93**	-10.00**	-6.90*	43.27**	3.96	21.08**	10.07**	-2.39**	-3.43**	-0.67**	-3.43**
	S.E.±	0.061	0.071	0.071	0.071	2.533	2.925	2.925	2.952	0.179	0.207	0.207	0.207

Table 2 contd...

Table 2 contd...

Sr. No.	Hybrids	Seed cotton yield/ plant (g) M.P. Heterosis (%)	B.P. Heterosis (%)	% Standard heterosis over PKVDH 1	PKV Suvarna	Lint index M.P. Heterosis (%)	B.P. Heterosis (%)	% Standard heterosis over PKVDH 1	PKV Suvarna	Seed index (g) M.P. Heterosis (%)	B.P. Heterosis (%)	% Standard heterosis over PKVDH 1	PKV Suvarna
1.	PA 832 X NDLA 3047	29.55**	27.41**	13.83**	53.52**	17.35**	12.75*	15.00*	-8.49	-1.17	-3.85	21.95**	-10.50**
2.	PA 778 X JLA 0716	41.26**	38.62**	9.07**	47.09**	-8.70	-9.21	-4.67	-24.14**	4.60*	-3.17	42.46**	4.56*
3.	PA 807 X NDLA 3047	21.42**	21.26**	4.76**	41.28**	-6.79	-6.86	-5.00	-24.40**	-8.68**	-9.22**	10.20**	-19.12**
4.	PA 778 X CNA 1013	26.16**	25.07**	-1.59	32.72**	20.55**	20.55**	25.17**	-0.40	-10.46**	-16.43**	22.95**	-9.76**
5.	PA 832 X ARBAS 1401	15.50**	6.85**	-4.54**	28.75**	1.12	-7.87	5.33	-16.18**	-13.72**	-20.67**	19.96**	-11.96**
6.	PAIG 62 X NDLA 3047	14.25**	6.30**	-8.16**	23.85**	6.51	-1.79	18.67**	-5.57	-2.04	-7.76**	25.28**	-8.06**
7.	PAIG 62 X CNA 1013	20.48**	18.18**	-8.62**	23.24**	-17.80**	-23.59**	-7.67	-26.53**	0.29	-2.78	32.04**	-3.09
8.	PAIG 62 X JLA 0716	18.73**	17.66**	-10.88**	20.18**	9.23	2.07	23.33**	-1.86	13.46**	9.06**	48.12**	8.71**
9.	PA 832 X JLA 0716	5.22**	-2.79*	-13.15**	17.13**	5.86	0.32	5.33	-16.18**	12.31**	11.63**	41.57**	3.91
10.	PA 785 X CNA 1013	8.93**	7.08**	-14.29**	15.60**	12.82*	7.38	11.50	-11.27*	-1.60	-3.57	22.95**	-9.76**
11.	PA 800 X CNA 1013	10.65**	9.68**	-15.19**	14.37**	3.09	-3.53	0.17	-20.29**	3.04	-4.35	21.95**	-10.50**
12.	PA 800 X NDLA 3047	2.79**	-3.41**	-16.55**	12.54**	-10.65	-15.69**	-14.00*	-31.56**	3.63	-1.02	18.74**	-12.86**
	S.E.±	0.348	0.402	0.402	0.402	0.156	0.180	0.180	0.180	0.114	0.132	0.132	0.132

Table 2 contd...

Sr. No.	Hybrids	2.5% Span length (mm) M.P. Heterosis (%)	B.P. Heterosis (%)	% Standard heterosis over PKVDH 1	PKV Suvarna	Fibre fineness/ Micronaire (µg/inch) M.P. Heterosis (%)	B.P. Heterosis (%)	% Standard heterosis over PKVDH 1	PKV Suvarna	Fibre strength (g/tex) M.P. Heterosis (%)	B.P. Heterosis (%)	% Standard heterosis over PKVDH 1	PKV Suvarna
1.	PA 832 X NDLA 3047	2.55	-14.43**	-4.74*	3.16	-3.57	-23.94**	0.00	-1.82	3.75**	1.15	2.73	1.94
2.	PA 778 X JLA 0716	0.56	-3.57	-1.46	6.72**	-4.95	-11.11**	-11.11**	-12.73**	6.61**	3.40*	7.03**	5.81**
3.	PA 807 X NDLA 3047	14.05**	-1.43	0.73	9.09**	-12.20**	-23.94**	0.00	-1.82	4.35**	1.93	3.13*	2.33
4.	PA 778 X CNA 1013	-2.88	-3.57	-1.46	6.72**	-0.99	-7.41	-7.41	-9.09*	-0.57	-0.75	2.73	1.94
5.	PA 832 X ARBAS 1401	7.23**	-0.33	10.95**	20.16**	6.38	-5.66	-7.41	-9.09*	4.20**	3.41*	6.64**	5.81**
6.	PAIG 62 X NDLA 3047	11.06**	-1.88	-4.74*	3.16	-19.67**	-30.99**	-9.26*	-10.91**	1.78	-0.77	0.78	0.00
7.	PAIG 62 X CNA 1013	10.70**	8.70**	9.49**	18.58**	-12.38**	-14.81**	-14.81**	-16.36**	-2.29	-3.03*	0.00	-0.78
8.	PAIG 62 X JLA 0716	0.19	-1.50	-4.38*	3.56	2.86	0.00	0.00	-1.82	4.52**	2.31	3.91*	3.10*
9.	PA 832 X JLA 0716	-3.56*	-11.15**	-1.09	7.11**	13.68**	0.00	0.00	-1.82	4.52**	2.31	3.91*	3.10*
10.	PA 785 X CNA 1013	5.77**	2.90	3.65	12.25**	-5.66	-7.41	-7.41	-9.09*	-0.19	-1.14	1.95	1.16
11.	PA 800 X CNA 1013	-5.13**	-6.16**	-5.47**	2.37	-8.74*	-12.96**	-12.96**	-14.55**	-1.88	-2.61	1.95	1.16
12.	PA 800 X NDLA 3047	9.28**	-4.07	-5.47*	2.37	-15.00**	-28.17**	-5.56	-7.27	-0.58	-4.48**	0.00	-0.78
	S.E.±	0.477	0.551	0.551	0.551	0.168	0.195	0.195	0.195	0.319	0.368	0.368	0.368

Table 2 contd...

Table 2 contd...

Sr. No.	Hybrids	Uniformity ratio (%)				Ginning outturn (%)			
		M.P. Heterosis (%)	B.P. Heterosis (%)	% Standard heterosis over		M.P. Heterosis (%)	B.P. Heterosis (%)	% Standard heterosis over	
				PKVDH 1	PKV Suvarna			PKVDH 1	PKV Suvarna
1.	PA 832 X NDLA 3047	1.27	-3.61**	-1.23	1.27	-10.11**	-15.73**	-8.78**	-4.90**
2.	PA 778 X JLA 0716	0.62	0.00	0.00	2.53*	-2.30*	-5.55**	-13.38**	-9.70**
3.	PA 807 X NDLA 3047	3.85**	0.00	0.00	2.53*	1.47	0.91	-4.42**	-0.36
4.	PA 778 X CNA 1013	0.00	-1.20	1.23	3.80**	7.87**	6.44**	-6.39**	-2.41**
5.	PA 832 X ARBAS 1401	1.22	0.00	2.47*	5.06**	-9.81**	-18.21**	-11.47**	-7.70**
6.	PAIG 62 X NDLA 3047	1.91*	-2.44*	-1.23	1.27	-7.53**	-11.42**	-16.10**	-12.53**
7.	PAIG 62 X CNA 1013	1.82*	1.20	3.70*	6.33**	0.10	-0.59	-12.57**	-8.85**
8.	PAIG 62 X JLA 0716	2.47**	1.22	2.47*	5.06**	10.45**	7.46**	-1.45	2.74**
9.	PA 832 X JLA 0716	-1.84*	-3.61**	-1.23	1.27	-4.99**	-12.25**	-5.01**	-0.97
10.	PA 785 X CNA 1013	-0.61	-2.41*	0.00	2.53*	1.43	-3.32**	-14.97**	-11.36**
11.	PA 800 X CNA 1013	0.61	-1.20	1.23	3.80**	1.11	-2.51*	-7.65**	-3.73**
12.	PA 800 X NDLA 3047	3.23**	0.00	-1.23	1.27	-8.03**	-8.04**	-12.89**	-9.18**
	S.E.±	0.641	0.741	0.741	0.741	0.303	0.349	0.349	0.349

* and ** indicate significance of values at P=0.05 and 0.01, respectively

check PKV Suvarna (-7.14%) (Table 2). Significant negative heterosis for earliness was also reported by Deosarkar *et al.* (2009); Patel *et al.* (2010) and Jaiwar *et al.* (2012).

High number of sympodia per plant with minimum number of monopodial branches is an indication of higher productivity. The cross PA 832 x NDLA 3047 (24.14%, 23.66% and 36.71%) exhibited highest significant positive heterosis over mid parent, better parent, and standard check PKV Suvarna. Heterosis for this trait was reported by the earlier workers. Guvercin (2011); Tuteja *et al.* (2011); Balu *et al.* (2012); Ashokkumar *et al.* (2013) and Badhe *et al.* (2015).

The cross combination PA 832 x NDLA 3047 exhibited significantly highest positive heterosis over mid parent (31.07%), better parent (28.89%) and standard check (48.72%) for number of bolls per plant followed by PA 778 x CNA 1013. The results are in agreement with thw reports of Guvercin (2011); Basal *et al.* (2011); Tuteja *et al.* (2011); Balu *et al.* (2012) and Saifullah *et al.* (2014).

In case of boll weight the cross combination PA 778 x JLA 0716 record**e**d significant positive heterosis over mid parent (10.86%), better parent (10.62%) and standard check (4.17%) followed by PA 807 x NDLA 3047 and PAIG 62 x JLA 0716. With regards to plant height the cross combination PA 800 x CNA 1013 record**e**d significant positive heterosis over mid parent (89.84%), better parent (43.89%) and standard check (46.57%) followed by PAIG 62 x NDLA 3047 and PA 832 x NDLA 3047.

For days to maturity highest significant negative heterosis was displayed by the cross combination PAIG 62 x CNA 1013 over mid parent (-3.80%), better parent (-5.29%) and standard check (-4.86%) followed by the crosses PA 832 x NDLA 3047 and PA800 x NDLA 3047 over standard checks. The results are in agreement with the reports of Dawod and Al-Guboory (2010); Guvercin (2011); Patel *et al.* (2015); Jaiwar *et al.* (2012); Lalge *et al.* (2011); Patil *et al.* (2012) and Kumar *et al.* (2013).

The cross combination PA 778 x CNA 1013 exhibited significantly highest positive heterosis over mid parent (20.55%), better parent (20.55%) and standard check (25.17%) for lint index followed by PAIG 62 x ARBAS 1401 and PAIG 62 x NDLA 3047.

In case of seed index the cross combination PAIG 62 x JLA 0716 record**e**d significant positive heterosis over mid parent (13.46%), better parent (9.06%) and standard check (48.12%) followed by PA 778 x JLA 0716 and PA832 x JLA 0716 over standard checks. The cross combination PA 807 x NDLA 3047 exhibited significantly highest positive heterosis for 2.5 % span length over mid parent (14.05%), while PAIG 62 x CNA 1013 over better parent (8.70%) and over standard check by PA 832 x ARBAS 1401 (20.16%) followed by PA 785 x CNA 1013 . for number of bolls per plant followed by PA 778 x CNA 1013. The results are in agreement with the reports of Patil *et al.* (2011); Tuteja *et al.* (2011); Balu *et al.* (2012); Jaiwar *et al.* (2012); Patil *et al.* (2012); Sekhar *et al.* (2012); Kumar *et al.* (2013); Singh *et al.* (2013) and Madhuri *et al.* (2014).

With regards to fibre fineness the cross combination PAIG 62 x NDLA 3047 recorde d significant negative heterosis over mid parent (-19.67%), over better parent by PA 785 x NDLA 3047 (-23.94%) and standard check by PAIG 62 x CNA 1013 (-16.36%) followed by PA 800 x CNA 1013 and PA 778 x JLA 0716. For fibre strength highest significant positive heterosis was displayed by the cross combination PA 778 x JLA 0716 over mid parent (6.61%) as well as standard check (7.03%), while over better parent by cross PA 832 x ARBAS 1401 (3.41%). followed by the crosses PA 832 x ARBAS 1401 and PA 832 x NDLA 3047 over standard checks. The results are in agreement with the reports of Tuteja *et al.* (2011), Patil *et al.* (2013); Ranganatha *et al.* (2013) and Bayyapu Reddy *et al.* (2015) .

In case of uniformity ratio the cross combination PA 807 x NDLA 3047 recorded significant positive heterosis over mid parent (3.85%), over better parent by PAIG 62 x JLA 0716 (1.22%) and over standard check PAIG 62 x CNA 1013 (6.33%) followed by PA 832 x ARBAS 1401 and PAIG 62 x JLA 0716. Heterosis for this trait was reported by Bloek *et al.* (2010) and Basal *et al.* (2011).

For ginning out turn the cross combination PAIG 62 x JLA 0716 recorded significant positive heterosis over mid parent (10.45%), over better parent (7.46%) and over standard check PAIG 62 x CNA 1013 (2.74%) followed by PA 807 x NDLA 3047. Similar results were reported by Dawod and Al-Guboory (2010); Khan *et al.* (2010); Geddam *et al.* (2011); Tuteja *et al.* (2011) and Balu *et al.* (2012).

Seed cotton yield is a complex trait, dependent on many other component traits, such as boll number and boll weight. The cross combination PA 778 x JLA 0716 showed significantly highest positive heterosis over mid parent (41.26%) and better parent (38.62), while the cross combination PA 832 x NDLA 3047 recorded significant positive heterosis over both standard checks *viz.*, PKVDH 1 (13.83%), PKV Suvarna (53.52%) for seed cotton yield per plant. Which was followed by PA 778 x JLA 0716 (47.09%) and PA 807 x NDLA 3047 (41.28%). Three crosses showed significant positive heterosis over standard check PKVDH 1, while eighteen crosses recorded significant positive heterosis over standard check PKV Suvarna, respectively.

On the basis of this study it is concluded that the crosses having highly significant standard heterosis can be exploited for heterosis and heterosis breeding would be rewarding with further testing of these crosses for many seasons at multilocations. These findings are in accordance with the results obtained by Patel *et al.* (2010); Tuteja *et al.* (2011); Jaiwar *et al.* (2012); Patil *et al.* (2012); Sekhar *et al.* (2012); Kumar *et al.* (2013); Singh *et al.* (2013); Ranganathan *et al.* (2013); Abro *et al.* (2014); Muhammad *et al.* (2014); Patel *et al.* (2015) and Kannan and Saravanan (2016).

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