



Heterosis in diploid cotton (*Gossypium arboreum* L.) under rainfed conditions

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ABSTRACT : The investigation was undertaken to estimate heterosis with an objective of exploring possibilities of its commercial utilization under rainfed conditions. The experimental material comprised of 9 crosses along with one standard check (JLA505), grown at Mahatma Phule Krishi Vidyapeeth, Oilseeds Research Station, Mamurabad Farm, Jalgaon in randomized block design with three replications. Observations were recorded for characters namely, seed cotton yield (kg/ha), bolls/plant, average boll weight(g) and ginning percentage. The standard heterosis was calculated over standard check variety JLA505. Marked economic heterosis was observed for most of the characters studied. Among all the cross combinations the maximum heterosis for seed cotton yield of JLA0603 x CINA363(55.28%), bolls /plant JLA505 x Phule Anmol (46.67%), for average boll weight JLA0603 x CINA-363(14.29%), For ginning percentage none of the cross recorded positive heterosis. However, the cross JLA802 x Gbav 109 recorded at par ginning percentage as compare to standard check. Wherever cross combination involving JLA505 and JLA0603 as a female parent, recorded significant positive heterosis for most of the yield contributing characters. Thus, the female parent JLA505 and JLA0603 may be used for exploitation of heterosis under rain fed conditions. There are several diploid hybrids and varieties under cultivation, this indicates there are much more scope of development of hybrids in diploid cotton and efforts are being taken through this study.

Key words : *Gossypium arboreum* L., heterosis, , quantitative traits, seed cotton yield

In recent past cotton has proved to be the most remunerative cash crop. Therefore, other traditional crops like oilseeds, pulses, cereals are being replaced by cotton. It is mostly by Bt cotton hybrids. However desi(diploid) cotton varieties and hybrids are also maintaining its importance due to its low cost of cultivation and thrives well under rainfed situation., Marginal farmers are preferring the diploid cotton varieties and hybrids. Looking to the increasing trend of diploid cotton cultivation, work on development of diploid cotton hybrids is going on at Oilseeds Research Station, Mamurabad farm, Jalgaon.

Nine specific crosses were evaluated during *kharif*, 2015-2016 by using standard check JLA505 under rainfed conditions. The experimental material was grown at Mahatma Phule Krishi Vidyapeeth, Oilseeds Research Station, Mamurabad farm, Jalgaon in randomized block design with three replications under rain fed condition. Each hybrid was sown in one row in each replication with 20 dibbles / row. The row length was 6.00 m. The spacing was 60 cm between rows and 30 cm between plant to plant.

Observations were recorded on seed

cotton yield (kg/ha), bolls/plant, boll weight (g), and ginning percentage. The heterotic effect in terms of percent increase or decrease over standard check (useful heterosis) was estimated for all the characters as per the standard procedure suggested by Rai (1978).

Mean performance and heterosis over best check JLA505 for four characters is presented in Table 1. The result indicated that the phenomenon of heterosis was of general occurrence; however, its magnitude varied with characters. The range of mean values among the cross combination for seed cotton yield varied from 1060 kg/ha JLA505(Check) to 1646 kg/ha (JLA0603 x CINA363). For bolls/plant highest was observed in JLA505 x Phule Anmol (22 bolls/plant) and lowest in JLA505(15bolls/plant). Highest average boll weight 2.4 g/boll was observed in one cross combination JLA0603 x CINA363 while 1.9 g/boll weight was found in (JLA802 x JLA505) cross combinations. Highest Ginning percentage 36.21 per cent (JLA802 x Gbav109 and standard check JLA505). High magnitude of significantly positive heterosis

over check hybrid was observed for seed cotton yield in cross *viz.* JLA0603 x CINA363 (55.28%), JLA505 x PA760(44.34%), JLA505 x Phule Anmol (43.4%), JLA0611 x Paig8/1(41.6%) and JLA505 x AKA2005-3(32.92%) These five crosses showed positive and high magnitude of heterosis due to the diversity in the test hybrids these results are in agreement with the Patel *et.al.*, (2003) and Sonawane *et al.*, (2015)

For average bolls per plant mean range varies from 15 to 22. The significant highest positive heterosis for bolls/plant was found in cross combination JLA505 x P.Anmol (46.67%) also other eight crosses recorded significant positive heterosis for bolls/plant, most of them recorded significant high heterosis for seed cotton yield and these are in agreement with the result reported by Kajjidoni and Patil (2003), Patel *et al.*, (2003) and Sonawane *et al.*, (2015). The mean value for average boll weight ranged from 1.9 to 2.4. Only one cross JLA0603 x CINA363 (14.29) recorded positive heterosis for average boll weight. Kumar *et al.*, (2003) and

Table 1. *Per se* performance and estimates of heterosis in promising crosses of *G. arboreum* crosses

Sr. No.	Name of the cross	Seed cotton yield (kg/ha)		Bolls / plant		Boll wt.(g)		Ginning percentage	
		Mean	Heterosis	Mean	Heterosis	Mean	Heterosis	Mean	Heterosis
1	JLA 505 x P.Anmol	1520*	43.4	22*	46.67	2.0	-4.76	35.68	-1.46
2	JLA 0603 x CINA 363	1646*	55.28	18*	20.0	2.4*	14.29	35.27	-2.60
3	JLA 0611 x Paig8/1	1501*	41.6	21*	40.00	2.0	-4.76	35.64	-1.57
4	JLA 802 x JLA 505	1199	13.11	18**	20.00	1.9	-9.52	34.54	-4.61
5	JLA 802 x Gbav 109	1193	12.55	16	6.67	2.0	-4.76	36.21	0.0
6	JLA 0715 x AKA 2010-4	1206	13.77	17*	13.33	2.0	-4.76	35.54	-1.85
7	JLA 505 x AKA 2005-3	1409*	32.92	20*	33.33	2.0	-4.76	35.41	-2.21
8	JLA 505 x PA 760	1530*	44.34	21*	40.00	2.0	4.76	34.99	-3.37
9	JLA 505 x AKA 2010-6	1301	22.74	19*	26.67	2.2	-4.76	35.64	-1.57
10	JLA 505©	1060		15		2.1		36.21	
	Mean	1366		18.7		2.06		35.51	

Table 2. Trait specific crosses in cotton (*G.arboreum* L.)

SN.	Name of the cross	Identified characters
1.	JLA 505 x Phule Anmol	Seed cotton yield, bolls / plant
2.	JLA 0603 x CINA 363	Seed cotton yield, bolls / plant, boll weight (g)
3.	JLA 0611 x Paig8/1	Seed cotton yield, bolls / plant
4.	JLA 802 x JLA 505	Bolls / plant
5.	JLA 802 x Gbav 109	Ginning percentage
6.	JLA 0715 x AKA 2010-4	Bolls / plant
7.	JLA 505 x AKA 2005-3	Seed cotton yield, bolls / plant
8.	JLA 505 x PA 760	Seed cotton yield, bolls / plant
9.	JLA 505 x AKA 2010-6	Seed cotton yield, bolls / plant

Sonawane *et al.*, (2015) have also recorded similar findings for these trait in *G. arboreum* hybrids. The ginning percentage is important character. The range of ginning percentage varied from 34.54 to 36.21 per cent. The amount of heterosis recorded for this trait is very low. The highest ginning per cent cross were JLA802 x Gbav109 (36.21%) and also check JLA505 (36.21%). None of the cross recorded positive heterosis for this character, however the cross JLA802 x Gbav109 recorded *at par* ginning percentage with standard check JLA505. The cross combination involving JLA505 and JLA0603 as a female parent, recorded significant positive heterosis for most of the yield contributing characters. Thus, the female parent JLA505 and JLA0603 may be used for exploitation of heterosis under rainfed conditions. There are several diploid hybrids and varieties under cultivation, this indicates there are much more scope of development of hybrids in diploid cotton and efforts are being taken through this study

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