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Research Article

Effect of Irradiation and Recombination on Genetic Enhancement of Boll Weight, Boll Number, Fiber Length and Fiber Strength among the Progenies in Desi Cotton – An Innovative Approach to Improve in Desi Cotton

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Abstract: A study was carried out to grasp the importance of hybridization, irradiation and their combination in enhancing boll weight, boll number, seed cotton yield, fiber length and strength in desi cotton. A 202 progenies comprising of F_4M_4, M_4, F_4 and double cross F_3 were evaluated at MARS UAS, Dharwad to obtain information on mean, variance, range, genetic variability, heritability and genetic advance for 13 traits. The mean, range and variance among progenies, F_4M_4 progenies exhibited relatively higher progeny mean performance and wider range of values for most the traits. The high estimates of PCV and GCV were recorded for M_4 generation for boll weight, seed cotton yield, ginning out turn and 2.5% span length indicates simple irradiation helps to improve these traits. The high heritability coupled with high genetic advance for seed cotton yield and yield components as well as fiber quality traits among progenies. The superior progenies varied considerably across the traits, F_4M_4 contributed higher number of superior progenies followed by F_4 progenies produced higher number of superior progenies compared to others.

Keywords: Boll, Desi, Irradiation, Length, Progenies, Recombination and Strength.

INTRODUCTION

The cultivation of desi cotton was restricted to a few pockets because of low yield level and non preference of modern textile mills due to their low fiber length and strength. But desi cultivars have immense potential for adaptation to any of the soil types and climatic conditions. By improving seed cotton yield level and fiber quality, these cultivars can become good choice in present day fluctuating climatic conditions in rainfed areas of south zone.

Among desi cotton, cultivar, Jayadhar which belongs to *G. herbaceum* species released during 1950 and has been under commercial cultivation in Karnataka as a popular variety till date. There is need to improve Jayadhar with reference to its yielding ability and to enhance fiber quality mainly fiber length and strength.

Hence, any programme to improve productivity of desi cotton is through component traits like boll weight and boll number traits. Mohan and Sharma [1] experimentally demonstrated in pea, that additional variation could be generated in the F_2 by irradiation at F_1 stage. Kajjidoni *et al.*, [2] have developed new improved variety in black gram by utilizing both gamma rays induced and hybridization. Hence, in present investigation, irradiation in combination with hybridization involving adapted parent and selected donors for boll weight, boll number and fibre quality traits to generate different progenies and to study extent of variability and isolation of superior progenies for seed cotton yield and fibre quality traits.

MATERIAL AND METHODS

The experimental material was developed by using four donor parents *viz.*, 9749 (boll weight), RDC-88 (fiber fineness), MDL-2582 (boll number) and DLSA-17 (fiber length and strength). The widely adapted cultivar Jayadhar was used as a female parent and donors were used as male parents to generate three single crosses (Jayadhar x MDL-2582), (Jayadhar x DLSA-17) and (Jayadhar x RDC-88), two hundred fifty seeds of each crosses along with Jayadhar (75 seeds) were subjected for gamma irradiation (50 Gy) at BARC Mumbai. Three double crosses were generated using four single crosses, keeping (Jayadhar x 9749) as female parent; the three double crosses were made. Radiation helps both in increasing crossing over and inducing interchanges. In the present investigation, 202 progenies comprising of F_4M_4 (45), M_4 (13), F_4 (52) and three double cross F_3 [DC-1 (38), DC-2 (31) and DC-3 (23)] generations was used as experimental

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material to study the variability for seed cotton yield and fiber quality traits and to make comparative assessment the role of irradiation and recombination in inducing variability for quantitative traits in desi cotton. These progenies were advanced in their previous generation based on seed cotton yield and fiber length traits considering Jayadhar as check. The data on the plant height, number of bolls per plant, boll weight, seed cotton yield per plant, ginning outturn, lint index, seed index, 2.5% span length, uniformity ratio, micronaire, maturity, tenacity and fiber elongation was recorded. Fiber quality was estimated by HVI instrument, at ARS, Heballi farm, UAS, Dharwad. The variability was estimated according to Burton and Devane [3] and were categorized as low, moderate and high a indicated by Sivasubramanian and Menon [4].

RESULTS AND DISCUSSION

The mean and variance were estimated for seed cotton yield, yield attributing and fiber quality traits in single cross irradiated (F_4M_4), irradiated Jayadhar (M_4), single cross (F_4), three double crosses *viz.*, DC-1 (F_3), DC-2 (F_3) and DC-3 (F_3) and the results obtained are discussed in further paragraphs.

Seed cotton yield and component traits

Mean range and variance

When a comparison was made across six different progenies (Table 1a), F_4M_4 progenies were superior based on overall mean seed cotton yield and number of bolls per plant indicating advantage of irradiation of single cross over double cross progenies without irradiation however, double cross progenies exhibited superior mean for boll weight compared to other progenies.

Among the progenies of single cross irradiated (F_4M_4) and Jayadhar irradiated (M_4) versus single cross (F_4) progenies, the F_4M_4 progenies recorded better mean values followed by M_4 and F_4 progenies for seed cotton yield, number of bolls per plant and plant height traits, except for boll weight for which F_4 progenies recorded high mean boll weight (Table 1a).

Among the three double cross progenies, DC-1 exhibited superior mean for seed cotton yield per plant followed by DC-2 for number of bolls per plant and DC -3 for boll weight (Table 1a) traits.

Variability parameters

The variability as measured by phenotypic coefficient of variability (PCV) and genotypic coefficient of variability (GCV) indicate the relative amount of variability present in six types of progenies. Since variations are influenced by the magnitude of different traits, a measure of coefficient of variability is more useful in comparing between progenies. Among all the six types of progenies, the PCV estimate was higher than the GCV for seed cotton yield and all its component traits, for this we understand that the environment plays a major role on expression of these traits.

The high PCV and GCV estimates were recorded in M_4 progenies for boll weight followed by F_4 progenies and remaining progenies having on par PCV and GCV values for this trait. When a comparison was made only between F_4M_4, and M_4 vs. F_4 progenies the PCV and GCV estimates were on par between M_4 and F_4 progenies for boll weight trait. These results are in the tune of results reported by Basu [5] where they observed that M_2 population had high coefficient of variation boll weight trait.

The highest variability estimates were recorded for seed cotton yield indicating the presence of significant amount of genetic variability for this character. Among the progenies M_4 recorded highest estimates of PCV and GCV for seed cotton yield followed by remaining progenies.

The PCV and GCV estimates for number of bolls per plant across six progenies were of higher magnitude where as DC-2 and DC-3 progenies recorded as high as 37.31 and 33.25 percent respectively, however F_4M_4 progenies also had higher estimate among remaining four progenies. Similar trends of result were reported earlier by Mukhov [6] in *G. hirsutum*, he observed wide variation in number of bolls per plant in the M_2 population when exposed to gamma rays at 10, 15 and 20 kr.

The heritability and genetic advance as percentage mean (GAM) estimates are the true indicators of genetic potentiality of the progenies which can be selected and tested for stability and stable performing progenies can be advanced and further used as a tool for selection. High heritability coupled with high GAM were recorded for all the six categories of progenies for number of bolls per plant, boll weight, seed cotton yield and plant height traits. The priority should be given to those traits which have recorded higher estimates of heritability with GAM for realizing better gain through selection. Neelima and Potduckhe [7] evaluated cotton genotypes under rainfed condition and reported high heritability coupled with high genetic advance were obtained for yield and most of the yield components.

Economic traits

The ginning out turn (GOT) (which is an important trait next to seed cotton yield and it has significance in processing), lint index and seed index were considered as economic traits, most of progenies did not exhibited much differences for these traits based on their overall mean values (Table 1b). However, among irradiated progenies, M_4 (Jayadhar) recorded highest seed index progeny mean compared to

remaining progenies and similarly F_4M_4 progeny mean was superior over F_4.

The variability estimates ranged from low to moderate among the six progenies for GOT and seed index. Irradiated Jayadhar (M_4) progenies exhibited moderate PCV and GCV values for GOT, where as F_4M_4 progenies for seed index and meanwhile F_4 progenies exhibited high PCV and GCV values for lint index indicating irradiation has induced much variability compared to hybridization alone.

Among double crosses, DC-2 progenies exhibited moderate to high PCV and GCV estimates for GOT, seed index and lint index traits indicating there is greater scope for selection to improve these characters involving Jayadhar, 9749 and DLSA-17 parents.

The high heritability coupled with moderate to high GAM were recorded for most of progenies for ginning out turn, seed index and lint index traits indicating selection can be resorted for the improvement of these traits in the future crop improvement programme.

Fiber quality traits

Improvement in fiber quality especially fiber length and fiber strength is essential in desi cotton since, desi cotton are poor in quality traits as mentioned above. The emphasis is given to improve fiber length and strength through irradiation and recombination ways, the attempt was made to improve these fiber qualities in different categories of progenies. Overall comparison was made higher mean values were recorded in double cross compared to other progenies. All other traits like uniformity, maturity index and elongation recorded on par mean values in six different categories of progenies.

The M_4 progenies recorded higher mean followed by F_4 and F_4M_4 progenies for 2.5% span length trait while DC-2 progenies recorded high mean span length compared to DC-1 and DC-3 progenies (Table 1c).

A comparison was made between six categories of progenies; the overall mean recorded was high in double cross progenies followed by other progenies indicating that hybridization alone can improve the fiber length by involving good donor parent for fiber length during hybridization programme.

Another important fiber quality trait i.e. fiber strength or tenacity was studied in present investigation and the mean performance was high in double cross progenies compared to other progenies and among these DC-2 progenies exhibited superior mean fiber strength. The progeny mean of fiber strength was on par among progenies of M_4, F_4 and F_4M_4 generations.

The recorded mean values were high in single cross irradiated progenies (F_4M_4) followed by single cross (F_4) and irradiated Jayadhar (M_4) for micronaire trait. When the mean performance was recorded among the double cross progenies high mean values were noticed in DC-1 followed by DC-2 and DC-2 for micronaire traits suggest that the superior genes might have transferred from donor parent.

The results reveal that majority of progenies exhibited low to moderate PCV and GCV values for all most all the fiber quality traits as mentioned in Table 2c indicating a narrow range of variability for these characters. It was interesting to note that DC-2 progenies exhibited moderate values for tenacity it could be due to the involvement of the DLSA-17 parent as one of the donor parent for fiber strength. Similar trend of results were recorded by Katageri *et al.*, [8] who evaluated F_4 recombinant lines of cross DS-28 X SB (YF)-425, they noticed the increase in fiber length and fiber strength traits.

Six progenies exhibited recorded high heritability estimates with variable GAM from low (uniformity ratio), moderate (2.5% span length, maturity ratio, tenacity and elongation traits) tohigh (micronaire trait) GAM values. A high genetic gain along with high heritability would suggest suitable conditions for making effective selection.

Table-1a: Table for mean, range and variance values for seed cotton yield and its component traits in F_4M_4, M_4, single cross F_4 and double cross F_3 progenies of desi cotton

Progenies	N	Plant height (cm)			Number of bolls/plant		
		Mean + SE	Range	Variance	Mean + SE	Range	Variance
SINGLE CROSS IRRADIATED (F_4M_4)	45	161.2±0.71	107-230	926.9	62.77±0.44	25-96	365.58
SINGLE CROSS (F_4)	52	156.4±0.48	92.5-200	616.8	46.64±0.26	30-86	183.39
IRRADIATED JAYADHAR (M_4)	13	159.3±1.8	112-195	726.3	50.60±1.09	21-74	265.26
DOUBLE CROSS-1 (DC-1) (F_3)	38	162.3±0.95	92-257	1314.9	52.29±0.41	29-95	236.91
DOUBLE CROSS-2 (DC-2) (F_3)	31	164.6±1.22	110-232	1433.79	57.35±0.75	25-113	543.7
DOUBLE CROSS-3 (DC-3) (F_3)	23	152.3±1.22	102-200	793.7	43.09±0.7	21-80	261.54
Progenies	**N**	**Boll weight (g)**			**Seed cotton yield/plant (g)**		
		Mean + SE	**Range**	**Variance**	**Mean + SE**	**Range**	**Variance**
SINGLE CROSS IRRADIATED (F_4M_4)	45	1.30±0.01	0.81-1.6	0.05	60.89±0.35	32-96	228.72
SINGLE CROSS (F_4)	52	1.35±0.01	0.67-1.85	0.07	46.25±0.21	30-81.6	122.52
IRRADIATED JAYADHAR (M_4)	13	1.20±0.02	0.7-1.6	0.06	59.85±1.71	17-104	654.21
DOUBLE CROSS-1 (DC-1) (F_3)	38	1.36±0.004	1-1.6	0.02	54.76±0.47	30-92	314.98
DOUBLE CROSS-2 (DC-2) (F_3)	31	1.35±0.01	1-1.7	0.03	53.75±0.5	31-89	238.83
DOUBLE CROSS-3 (DC-3) (F_3)	23	1.50±0.01	0.97-1.85	0.05	48.06±0.56	31-77	168.57

Table 1b: Table for mean, range and variance values for economic traits in F_4M_4, M_4, single cross F_4 and double cross F_3 progenies of desi cotton

Progenies	N	Ginning out turn (%)			Seed index (g)			Lint index (g)		
		Mean ± SE	Range	Variance	Mean ± SE	Range	Variance	Mean ± SE	Range	Variance
SINGLE CROSS IRRADIATED (F_4M_4)	45	35.65±0.08	27-42	10.86	5.46±0.01	3.2-6.5	0.37	3.05±0.01	1.7-4.2	0.34
SINGLE CROSS (F_4)	52	35.08±0.06	24.7-38.9	8.19	5.28±0.01	4-6.2	0.24	2.94±0.01	1.6-4.6	0.33
IRRADIATED JAYADHAR (M_4)	13	32.84±0.25	25-39.8	14.1	5.65±0.03	4.6-6.3	0.25	2.79±0.04	1.9-4.1	0.32
DOUBLE CROSS-1 (DC-1) (F_3)	38	34.12±0.09	26-39.8	10.86	5.60±0.02	4-6.8	0.37	3.04±0.02	1.8-4.1	0.76
DOUBLE CROSS-2 (DC-2) (F_3)	31	32.05±0.17	21-38.1	26.85	5.50±0.3	1.6-7.5	1.08	2.83±0.03	0.6-4.9	0.97
DOUBLE CROSS-3 (DC-3) (F_3)	23	32.52±0.15	26-38.5	10.43	5.32±0.02	4.5-6.2	0.18	2.59±0.02	1.9-3.4	0.15

Table-1c: Table for mean, range and variance values for fiber quality traits in F_4M_4, M_4, single cross F_4 and double cross F_3 progenies of desi cotton

Progenies	N	2.5% Span length (mm)			Uniformity Ratio (%)		
		Mean ± SE	Range	Variance	Mean ± SE	Range	Variance
SINGLE CROSS IRRADIATED (F_4M_4)	45	21.18±0.03	19-25	1.76	53.48±0.04	50-58	2.97
SINGLE CROSS (F_4)	52	22.17±0.02	20-26	1.5	50.90±0.03	44-53.6	2.66
IRRADIATED JAYADHAR (M_4)	13	22.83±0.09	21-26	1.82	51.97±0.09	49-54	1.9
DOUBLE CROSS-1 (DC-1) (F_3)	38	22.31±0.03	18-24.9	1.45	51.05±0.04	45-54	2.79
DOUBLE CROSS-2 (DC-2) (F_3)	31	23.29±0.06	20.5-27.6	3.26	50.41±0.05	47-52	2.87
DOUBLE CROSS-3 (DC-3) (F_3)	23	21.73±0.05	19-22.9	1.13	51.55±0.05	50-53.7	1.09
Progenies	**N**	**Micronaire value (µg/in)**			**Maturity Ratio (%)**		
		Mean ± SE	Range	Variance	Mean ± SE	Range	Variance
SINGLE CROSS IRRADIATED (F_4M_4)	44	4.55±0.01	2.9-5.7	0.39	0.78±0.001	0.64-0.88	0.003
SINGLE CROSS (F_4)	36	4.56±0.01	3.2-5.6	0.29	0.77±0.001	0.65-0.9	0.003
IRRADIATED JAYADHAR (M_4)	8	4.74±0.07	3.8-5.9	0.56	0.77±0.01	0.6-0.86	0.005
DOUBLE CROSS-1 (DC-1) (F_3)	29	4.28±0.02	3-5.7	0.48	0.75±0.002	0.6-0.85	0.003
DOUBLE CROSS-2 (DC-2) (F_3)	27	4.37±0.02	2.8-5	0.36	0.76±0.002	0.64-0.85	0.002
DOUBLE CROSS-3 (DC-3) (F_3)	13	4.81±0.03	4.3-5.4	0.11	0.78±0.003	0.7-0.8	0.002
Progenies	**N**	**Tenacity(g/t)**			**Elongation (%)**		
		Mean ± SE	Range	Variance	Mean ± SE	Range	Variance
SINGLE CROSS IRRADIATED (F_4M_4)	44	15.98±0.02	14-19	1.07	5.47±0.01	4.6-6.3	0.18
SINGLE CROSS (F_4)	36	16.39±0.03	14.6-20	0.98	5.22±0.01	4.57-5.9	0.1
IRRADIATED JAYADHAR (M_4)	8	16.26±0.09	14.9-17.7	0.86	5.11±0.02	4.8-5.3	0.03
DOUBLE CROSS-1 (DC-1) (F_3)	29	17.19±0.04	14-18.8	1.38	5.28±0.01	4-5.8	0.1
DOUBLE CROSS-2 (DC-2) (F_3)	27	17.90±0.07	15-22	3.59	5.36±0.01	4.9-6	0.09
DOUBLE CROSS-3 (DC-3) (F_3)	13	16.17±0.05	15-17	0.46	5.36±0.01	5-5.7	0.02

Table-2a: Genetic variability parameters for seed cotton yield and its component traits in F_4M_4, M_4, single cross F_4 and double cross F_3 progenies of desi cotton

Progenies	N	Plant height (inch)					Number of bolls/plant				
		PCV(%)	GCV(%)	h^2(%)	GA	GAM(%)	PCV(%)	GCV(%)	h^2(%)	GA	GAM(%)
SINGLE CROSS IRRADIATED (F_4M_4)	45	18.88	18.02	95.43	59.85	37.12	30.46	28.11	92.28	36.35	57.9
SINGLE CROSS (F_4)	52	15.87	14.77	93.04	47.6	30.43	29.04	24.36	83.9	23.41	50.18
IRRADIATED JAYADHAR (M_4)	13	16.91	15.39	90.99	50.52	31.7	32.19	25.81	80.19	26.9	53.17
DOUBLE CROSS-1 (DC-1) (F_3)	38	22.34	21.35	95.57	71.39	43.99	29.44	25.92	88.06	27.92	53.4
DOUBLE CROSS-2 (DC-2) (F_3)	31	23	22.03	95.76	74.69	45.38	40.65	37.31	91.77	44.08	76.86
DOUBLE CROSS-3 (DC-3) (F_3)	23	18.5	16.76	90.59	57.57	34.52	37.53	33.25	88.59	29.51	68.5
Progenies	**N**	**Boll weight (g)**					**Seed cotton yield/plant (g)**				
		PCV(%)	GCV(%)	h^2(%)	GA	GAM(%)	PCV(%)	GCV(%)	h^2(%)	GA	GAM(%)
SINGLE CROSS IRRADIATED (F_4M_4)	45	16.7	15.98	95.74	0.43	32.93	24.84	22.35	89.96	28.03	46.03
SINGLE CROSS (F_4)	52	19.4	18.83	97.07	0.52	38.8	23.93	19.21	80.25	18.3	39.57
IRRADIATED JAYADHAR (M_4)	13	20.82	20.29	97.46	0.5	41.8	42.74	40.66	95.13	50.12	83.76
DOUBLE CROSS-1 (DC-1) (F_3)	38	11.2	10.45	93.29	0.29	21.53	32.41	29.19	90.08	32.93	60.14
DOUBLE CROSS-2 (DC-2) (F_3)	31	13.01	12.3	94.59	0.34	25.34	28.75	25.71	89.41	28.46	52.96
DOUBLE CROSS-3 (DC-3) (F_3)	23	14.33	13.77	96.11	0.42	28.37	27.01	23.71	87.77	23.47	48.84

Table-2b: Genetic variability parameters for economic traits in F_4M_4, M_4, single cross F_4 and double cross F_3 progenies of desi cotton

Progenies	N	Ginning out turn (%)					Seed index (g)					Lint index (g)				
		PCV(%)	GCV(%)	h^2(%)	GA	GAM(%)	PCV(%)	GCV(%)	h^2(%)	GA	GAM(%)	PCV(%)	GCV(%)	h^2(%)	GA	GAM(%)
SINGLE CROSS IRRADIATED (F_4M_4)	45	9.24	7.8	84.34	5.73	16.06	11.2	10.29	91.91	1.16	21.2	19.24	17.84	92.73	1.12	36.75
SINGLE CROSS (F_4)	52	8.16	6.41	78.56	4.63	13.2	9.34	8.15	87.28	0.89	16.79	19.54	18.05	92.39	1.09	37.18
IRRADIATED JAYADHAR (M_4)	13	11.43	8.67	75.87	5.87	17.87	8.83	8.15	92.3	0.95	16.79	20.42	18.15	88.9	1.04	37.4
DOUBLE CROSS-1 (DC-1) (F_3)	38	9.66	8.12	84.62	5.74	16.83	10.88	10.27	94.42	1.19	21.16	28.7	27.38	95.4	1.72	56.41
DOUBLE CROSS-2 (DC-2) (F_3)	31	16.17	15.02	92.89	9.92	30.94	18.93	18.66	98.54	2.11	38.43	34.8	33.77	97.03	1.97	69.56
DOUBLE CROSS-3 (DC-3) (F_3)	23	9.93	8.87	87.28	5.81	17.86	7.91	6.78	85.69	0.74	13.96	15.15	12.19	80.47	0.65	25.11

Table-2c: Genetic variability parameters for fiber quality traits in F_4M_4, M_4, single cross F_4 and double cross F_3 progenies of desi cotton

Progenies	N	2.5% Span length (mm)					Uniformity Ratio (%)				
		PCV(%)	GCV(%)	h^2(%)	GA	GAM(%)	PCV(%)	GCV(%)	h^2(%)	GA	GAM(%)
SINGLE CROSS IRRADIATED (F_4M_4)	45	6.26	5.56	88.69	2.42	11.44	3.22	2.55	79.13	2.81	5.25
SINGLE CROSS (F_4)	52	5.53	4.79	86.59	2.19	9.86	3.2	2.44	76.3	2.56	5.03
IRRADIATED JAYADHAR (M_4)	13	5.9	5.1	86.43	2.4	10.51	2.65	1.77	66.73	1.89	3.65
DOUBLE CROSS-1 (DC-1) (F_3)	38	5.4	4.82	89.22	2.21	9.92	3.27	2.49	75.92	2.61	5.12
DOUBLE CROSS-2 (DC-2) (F_3)	31	7.75	7.28	93.95	3.49	15	3.36	2.77	82.44	2.88	5.71
DOUBLE CROSS-3 (DC-3) (F_3)	23	4.89	4.27	87.4	1.91	8.8	2.02	1.44	71.39	1.53	2.97
Progenies	**N**	**Micronaire value (µg/in)**					**Maturity Ratio (%)**				
		PCV(%)	GCV(%)	h^2(%)	GA	GAM(%)	PCV(%)	GCV(%)	h^2(%)	GA	GAM(%)
SINGLE CROSS IRRADIATED (F_4M_4)	44	13.64	13.13	96.28	1.23	27.06	7	5.43	77.56	0.09	11.18
SINGLE CROSS (F_4)	36	11.75	11.16	94.97	1.05	22.99	6.83	5.17	75.64	0.08	10.64
IRRADIATED JAYADHAR (M_4)	8	15.73	15.21	96.65	1.48	31.33	9.02	8.2	90.89	0.13	16.9
DOUBLE CROSS-1 (DC-1) (F_3)	29	16.26	15.94	98.06	1.4	32.84	7.8	6.2	79.51	0.1	12.77
DOUBLE CROSS-2 (DC-2) (F_3)	27	13.76	12.98	94.33	1.17	26.74	6.55	5.42	82.74	0.09	11.17
DOUBLE CROSS-3 (DC-3) (F_3)	13	7	6.36	90.85	0.63	13.1	5.2	4.03	77.64	0.06	8.31
Progenies	**N**	**Tenacity(g/t)**					**Elongation (%)**				
		PCV(%)	GCV(%)	h^2(%)	GA	GAM(%)	PCV(%)	GCV(%)	h^2(%)	GA	GAM(%)
SINGLE CROSS IRRADIATED (F_4M_4)	44	6.46	4.79	74.05	1.58	9.86	7.84	7.66	97.74	0.86	15.79
SINGLE CROSS (F_4)	36	6.04	4.31	71.28	1.45	8.87	6.18	5.93	95.97	0.64	12.22
IRRADIATED JAYADHAR (M_4)	8	5.72	5.3	92.61	1.77	10.91	3.41	2.79	81.72	0.29	5.74
DOUBLE CROSS-1 (DC-1) (F_3)	29	6.83	6.54	95.82	2.32	13.48	5.88	5.62	95.62	0.61	11.57
DOUBLE CROSS-2 (DC-2) (F_3)	27	10.59	9.86	93.13	3.64	20.31	5.73	5.52	96.41	0.61	11.37
DOUBLE CROSS-3 (DC-3) (F_3)	13	4.19	3.02	72.1	1.01	6.22	2.82	2.33	82.65	0.26	4.8

Table-3a: Frequency of superior progenies for seed cotton yield and its component traits in desi cotton

Progenies	N	Number of bolls/plant	Boll weight (g)	Seed cotton yield/plant(g)	Common progenies across the seed cotton yield and component traits
SINGLE CROSS IRRADIATED (F_4M_4)	45	8(17.8)	10(22.2)	6(13.3)	2
SINGLE CROSS (F_4)	52	9(17.3)	8(15.4)	9(17.3)	2
IRRADIATED JAYADHAR (M_4)	13	1(7.7)	3(23.1)	1(7.7)	0
DOUBLE CROSS-1 (DC-1) (F_3)	38	6(15.8)	7(18.4)	8(21.1)	1
DOUBLE CROSS-2 (DC-2) (F_3)	31	6(19.4)	6(19.4)	4(12.9)	0
DOUBLE CROSS-3 (DC-3) (F_3)	23	4(17.4)	3(13.0)	3(13.0)	1
Total		**34**	**37**	**31**	**6**

Table-3b: Frequency of superior progenies for fiber quality traits in desi cotton

Progenies	N	2.5% Span length (mm)	N	Tenacity (g/t)	Micronaire value (µg/in)	Common progenies across the fiber quality traits
SINGLE CROSS IRRADIATED (F_4M_4)	45	7(15.5)	44	4(9.1)	37(84.1)	2
SINGLE CROSS (F_4)	52	6(11.5)	36	4(11.1)	31(86.1)	1
IRRADIATED JAYADHAR (M_4)	13	4(30.8)	8	2(25.0)	2(25.0)	0
DOUBLE CROSS-1 (DC-1) (F_3)	38	5(13.2)	29	8(27.6)	24(82.8)	1
DOUBLE CROSS-2 (DC-2) (F_3)	31	6(19.4)	27	4(14.8)	24(88.9)	3
DOUBLE CROSS-3 (DC-3) (F_3)	23	4(17.4)	13	3(23.1)	12(92.3)	0
Total		**32**		**25**	**82**	**7**

Frequency of superior progenies

The number and frequency of superior progenies for seed cotton yield and its component traits is given in Table 3a and for important fiber quality traits is given in Table 3b. The assessment of progenies based on their means and variability, alone will not indicate the worth of progenies for identification of superior progeny. In present study an attempt to identify potential progenies for seed cotton yield, its component traits and similarly for fiber quality traits based on mean plus one standard deviation criteria.

In an attempt made to identify superior progenies for seed cotton yield and its major components, as many as 31 progenies were superior for seed cotton yield as against 37 for boll weight and 34 for number of bolls per plant. Among different progenies, F_4M_4 followed by F_4 contributed higher number of superior progenies for bolls per plant and boll weight traits, where as for seed cotton yield. DC-1 (F_3) followed by F_4 progenies produced higher number of superior progenies compared to others. The similar approach of work was made earlier by Talwar and Kajjidoni [9] where they observed higher number of superior progenies for number of bolls per plant, seed cotton yield per plant and tenacity. It is interesting to note that out of 102, there were only six progenies which were common for three traits.

In a similar comparison for fiber quality considering fiber length, tenacity and micronaire values, as many as 82 superior progenies were scored for micronaire followed by fiber length (32) and fiber strength (25) traits when a comparison was made between different progenies for these traits, F_4M_4 followed by F_4 exhibited more number of superior progenies for fiber length and micronaire value, whereas for tenacity DC-3 (F_3) progenies were superior in producing as many as 8 progenies suggesting these progenies as base material for improvement of fiber strength. There were as many as seven superior progenies across fiber quality traits.

When a comparison between number of superior common progenies for seed cotton yield and fiber quality and their component traits, it is interesting to note that, F_4M_4 and F_4 produced common number of superior progenies for seed cotton yield and F_4M_4 and DC-2 (F_3) for fiber quality traits. These results amply support role of F_4M_4 in producing better progenies for both seed cotton yield and fiber quality traits. Hence there is greater advantage in irradiation of F1s to enhance variability and isolation of superior progenies, as compared to irradiation of parental lines. This evidenced by performance of progenies of irradiated Jayadhar by way of nil contribution to common superior progenies for both seed cotton yield and fiber quality traits.

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