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Research Article

Studies on genetic variability created through fullsib mating in greengram (*Vigna radiata* L.Wilczek)

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Abstract
Inter mating was attempted in the F2 population of two greengram crosses *viz.*,LGG 410 x LGG 450 and RMG 406 x MGG 330 and compared with the F3 bulk population of the respective crosses. Fullsib progenies recorded higher mean values compared to F3 bulk population in addition to that, it was also observed that the lower and upper limits of range of variation in the full sib progenies was far below and the above limits in F3 bulk populations. Variance was found to be higher for most of the characters in full sib progenies than their corresponding F3 bulk populations and may be attributed to increased magnitude of variability in the desired direction.

Key words
Fullsib progenies, greengram

Introduction
Greengram is one of the most important pulse crop of India due to its low flatulence nature. Its short duration coupled with photo and thermo insensitive nature make it easily fit in different cropping systems. It is predominantly a self pollinated crop. Autogamous species place a restriction on genetic recombination because of the fact that selfing leads to fixation of linked genes, precludes free exchange of favourable genes and also prevents emergence of desirable gene constellations, thereby limiting variability. However, genetic variability is the most essential requirement for the success of any crop improvement programme. As such, fullsib mating systems are suggested to overcome the defects of conventional methods of breeding, as it helps in elevating population mean and to retain a large reservoir of variation through several cycles of selection with an idea of selecting best plants in the advanced generations with higher frequencies. It also improves the characters of occurrence of potentially useful segregants resulting in stable and widely adopted genotypes. Hence, the present study was undertaken in greengram with LGG 410 x LGG 450 and RMG 406 x MGG 330 crosses in F2 generation and their F3 bulk populations to compare the magnitude of variability, heritability and genetic advance between full sib progenies and F3 bulk populations.

Material and methods
The present experiment was conducted at the wet land farm, S.V.Agricultural College, ANGRAU, Tirupati and the experimental material consisted of 30 full sib progenies developed in F3 generation of two intervarietal crosses *viz.*, LGG 410 x LGG 450 and RMG 406 x MGG 330 through full sib mating and their corresponding bulk populations. The material was evaluated in a randomized block design with three replications and the observations were recorded for days to 50% flowering, days to maturity, plant height (cm), number of clusters per plant, number of pods per plant, number of pods per cluster, number of seeds per pod, pod length (cm), 100- seed weight (g), harvest index (%) and seed yield per plant (g). Healthy crop was raised using recommended agronomic practices and need based plant protection measures. Data were recorded on 10 random, competitive plants for eleven quantitative traits and subjected to statistical analysis. Statistical analysis was done for all the traits following the standard procedures for coefficients of variability (Burton, 1952), heritability, genetic advance and genetic advance as per cent of mean (Hanson, 1963),

Results and discussion
Results on various variability parameters *viz.*, mean, range, coefficient of variation, heritability, genetic advance and genetic advance as per cent of mean for the full sib progenies of the two crosses *viz.*, LGG 410 x LGG 450 (FS I) and RMG 406 x MGG 330 (FS II) and corresponding bulk population (C I and CII) are furnished in Table 1 and Table 2 respectively. Comparison of the mean values indicated that the mean performance of full sib progenies are slightly more than the corresponding F3 bulk of the traits like days to 50% flowering, days to maturity, pods per cluster, seeds per pod and test weight in both the full sibs (FS I and FS II) and pods per plant, harvest index and seed yield in the FS I. Such higher proportion of mean values were also reported by Sudharani *et al* (1997) and Nagaraj Kampli *et al* (2002). Higher mean values of the Full sib progenies could be attributed to the advantage of increased heterozygosity at many loci for the said characters compared to the F3 bulk populations, so also the pushing of mean values towards positive side could be of immense value in throwing superior segregants in the advanced generations . these

results were in agreement with the earlier reports of Anuradha and Lakshmi Kantha Reddy (2004)

Comparison of the range of variation in full sibs with that of F3 bulk populations indicated that in both the full sib progenies, upper limit increased in recombination of latent variability that trends to remain locked under linkage. Higher proportion of PCV and GCV for the traits days to 50% flowering, plant height, number of clusters per plant, pod length, test weight and seed yield in both the full sib progenies than that corresponding F3 bulk may be due to breaking of linkages mostly I repulsion phase and uncovering of hidden genetic variability. These results are in agreement with the earlier reports of Aher and Dahat (1999) and Joseph and Santhosh Kumar (2000).

Estimates of heritability, genetic advance and genetic advance as per cent of mean were high for all the traits studied suggesting that selection would be effective in improving the yield. Results on the variability, heritability and genetic advance in biparental progenies suggest that the biparental progenies serve a good purpose when desirable genes are linked. As such, it can be concluded that use of full sib mating in an early segregating generation of any appropriate cross could be of much use in widening variability and consequently in making the improvement in productivity.

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Table 1. Variability parameters in the full sib progenies (LGG 410x LGG 450 and RMG 406 x MGG 330) and F3 bulk populations (CI & CII) for 11 quantitative traits in greengram

Character	Population	Mean	Range	Coefficient of variation
Days to 50% flowering	FSI	46.04	37.00-51.33	6.46
	CI	43.83	34.83-52.02	1.81
	FSII	46.95	41.66-51.00	4.99
	CII	40.66	40.26-50.85	3.94
Days to maturity	FSI	70.37	66.33-75.00	3.25
	CI	69.08	67.23-74.82	1.20
	FSII	71.13	68.33-74.66	2.23
	CII	70.79	67.65-71.26	2.17
Plant height (cm)	FSI	26.87	22.82-33.30	9.56
	CI	37.00	28.45-37.63	2.35
	FSII	26.75	21.57-31.79	9.74
	CII	37.08	29.65-38.44	5.61
Number of clusters per plant	FSI	7.67	5.90-11.33	17.19
	CI	8.25	6.23-12.33	14.60
	FSII	7.43	5.39-10.54	18.10
	CII	8.91	6.24-12.48	8.17
Number of pods per plant	FSI	43.13	27.59-57.47	17.11
	CI	38.29	32.44-54.28	18.32
	FSII	39.93	27.66-65.40	22.31
	CII	53.58	48.44-65.72	11.59
Number of pods per cluster	FSI	6.21	4.45-10.61	20.43
	CI	4.62	4.32-6.78	24.49
	FSII	6.12	3.77-7.48	15.71
	CII	6.00	3.56-7.12	17.05
Number of seeds per pod	FSI	9.15	7.89-11.52	13.25
	CI	7.54	6.54-8.45	16.18
	FSII	9.17	7.73-11.98	12.04
	CII	8.16	6.98-10.94	8.16
Pod length (cm)	FSI	6.85	5.47-7.70	6.41
	CI	9.96	7.89-11.34	6.41
	FSII	6.73	5.51-7.59	6.48
	CII	6.84	5.84-7.99	4.16
100-seed weight (g)	FSI	3.83	2.91-5.59	11.77
	CI	3.62	2.85-4.98	1.22
	FSII	3.77	3.21-4.16	6.30
	CII	3.67	3.45-4.65	1.91
Harvest index (%)	FSI	22.86	21.44-24.79	3.22
	CI	22.00	21.54-24.38	4.71
	FSII	22.19	19.99-24.36	4.67
	CII	23.10	21.23-25.64	3.13
Seed yield (g)	FSI	14.70	9.56-19.12	16.66
	CI	10.52	8.56-11.34	10.58
	FSII	13.34	8.68-23.66	25.95
	CII	15.62	7.94-25.89	14.23

Table 2. Genetic parameters in the fullsib progenies (LGG 410x LGG 450 and RMG 406 x MGG 330) for 11 quantitative traits in greengram

Character	Population	Coefficient of variation		Heritability (h^2)	Genetic Advance (GA)	Genetic advance as % of mean
		Phenotypic (PCV)	Genotypic (GCV)			
Days to 50% flowering	FSI	6.46	4.52	48	3.00	6.52
	C I	1.81	1.60	77	1.27	2.91
	FSII	4.99	4.54	82	3.99	8.50
	C II	3.94	3.59	62	2.37	6.75
Days to maturity	FSI	3.25	2.87	77	3.68	5.23
	C I	1.20	0.97	65	1.12	1.62
	FSII	2.23	1.60	52	1.70	2.39
	C II	2.17	1.92	54	2.06	3.50
Plant height (cm)	FSI	9.56	8.56	80	4.24	15.77
	C I	2.35	2.12	81	1.46	3.95
	FSII	9.74	9.20	89	4.79	17.93
	C II	5.61	5.38	79	3.65	10.62
Number of clusters per plant	FSI	17.19	16.36	90	2.46	32.09
	C I	14.60	12.30	70	1.76	21.34
	FSII	18.10	17.75	96	2.66	35.87
	C II	8.17	5.93	27	0.56	8.86
Number of pods per plant	FSI	17.11	16.35	91	13.89	32.20
	C I	18.32	18.28	99	18.32	18.28
	FSII	22.31	22.15	98	18.09	45.30
	C II	11.59	11.42	91	12.06	23.17
Number of pods per cluster	FSI	20.43	19.71	93	2.43	39.19
	C I	24.49	22.44	83	1.95	42.35
	FSII	15.71	15.44	96	1.91	31.26
	C II	17.05	15.16	55	1.39	27.75
Number of seeds per pod	FSI	13.25	12.05	82	2.06	22.58
	C I	16.18	14.68	82	2.06	27.43
	FSII	12.04	12.00	99	2.26	24.64
	C II	8.16	5.34	20	0.40	7.20
Pod length (cm)	FSI	6.41	6.26	95	0.86	12.60
	C I	6.41	5.93	85	0.78	11.31
	FSII	6.48	6.10	88	0.79	11.84
	C II	4.16	3.83	64	0.43	7.26
100-seed weight (g)	FSI	11.77	8.08	47	0.43	11.44
	C I	1.22	0.76	38	0.03	0.97
	FSII	6.30	6.22	97	0.47	12.68
	C II	1.91	1.86	85	0.13	3.72
Harvest index (%)	FSI	3.22	2.62	66	1.00	4.40
	C I	4.71	3.52	55	1.19	5.42
	FSII	4.67	4.31	85	1.82	8.20
	C II	3.13	2.84	61	1.05	5.31
Seed yield (g)	FSI	16.66	16.21	94	4.78	32.51
	C I	10.58	10.01	89	2.05	19.50
	FSII	25.95	25.73	98	7.01	52.55
	C II	14.23	14.04	92	4.35	28.56