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Genetic variability, correlation and path analysis for yield and yield components in F_6 families of Greengram (*Vigna radiata* (L.) Wilczek) under rainfed condition.

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Abstract
An experiment was laid out on greengram to study the genetic variability among the yield and yield contributing characters. High genotypic coefficient of variation was exhibited by plant height followed by number of pods per plant and seed yield per plant. The low genotypic coefficient of variation was given by days to 50% flowering. High heritability was shown by seed yield per plant followed by plant height and number of pods. Number of clusters per plant and number of pods per plant are the most important yield contributing components as they recorded high direct and indirect effects along with significant positive correlation towards seed yield in greengram.

Keywords: Greengram, variability, correlation, path coefficient

Introduction

India is the largest producer and consumer of pulses in the world accounting for 37 *per cent* of world area and 28 *per cent* of production. The area under pulses in India is around 23.16 million hectares with a production of 14.60 million tonnes (Anonymous, 2010). In Tamil Nadu, greengram occupies an area of 1.59 lakh hectares with a production and productivity of about 0.47 lakh tonnes and 291 kg/ha respectively, during 2010 (Season and Crop Report, TN, 2010). Greengram is one of the important pulses grown in Virudhunagar District in an area of 10.4 thousand hectares under rainfed situation during Rabi season. There is an urgent need to enhance the genetic potential of greengram for yield. Genetic variability is the basic requirement for making progress in crop breeding. It is essential to understand the genetic architect and nature of gene action governing yield and its component traits. Yield is the resultant product of various morphological and biological components. Studies on the phenotypic and genotypic correlation of the yield components and their contribution to yield through path analysis provide information to design appropriate breeding strategy towards improvement of the crop.

Materials and Methods

The present investigation was carried out in the experimental farm of Regional Research Station, Aruppukotai, Tamil Nadu. The rainfall was 146 mm during the crop period ie *Rabi* 2012. The soil type of the experiment block was vertisol with pH of 8.3. The materials comprised of 26 F6 families, the experiment was laid out in Randomized Block Design with three replications. Row to row and plant to plant distance was 30 and 10 cm respectively and per plot number of rows were 8. Row length was 3 metres. The crop was raised in rainfed condition and followed with all recommended agronomic package of practices to maintain a good crop. Observations were recorded on five competitive and randomly selected plants in each replication for all the genotypes *viz*., days to 50% flowering, plant height (cm), number of clusters per plant, number of pods per plant and seed yield per plant (g).The mean values were used for estimation of genotypic and phenotypic coefficients of variation, heritability in broad sense and genetic advance according to Johnson *et al.*, (1955). Correlation and path analysis were made according to Dewey and Lu (1959).

Results and discussion

The analysis of variance revealed significant difference for all the traits studied. The mean for all the families for all the characters are given in Table 1. The genotypic variance, phenotypic variance, genotypic coefficient of variation, phenotypic coefficient of variation, heritability and genetic advance for the five characters are given in Table 2.The analysis revealed that for all the characters phenotypic coefficient of variation (PCV) was slightly higher than the genotypic coefficient of variation (GCV), so it is evident that in expression of the characters mainly governed by the genotypes itself along with meagre effect of environment. This finding also get corroborated with Venkateswarlu (2001a), Dikshit*et al*. (2002), Reddy *et al*. (2003) and Tejbir*et al*. (2009).High genotypic coefficient of variation was exhibited by plant height (72.38) followed by number of pods

per plant (65.33) and seed yield per plant (38.06). The low genotypic coefficient of variation was given by days to 50% flowering. High heritability was shown by seed yield per plant (97.17) followed by plant height (83.24) and number of pods (80). These characters also showed high genetic advance and genotypic coefficient of variation. Moderate heritability was observed in days to 50% flowering and number of clusters. These findings were corroborated with Dadepeer *et al*. (2009), Dhananjay *et al*. (2009), Rahim *et al*. (2010) and Srivastava and Singh (2012). Kamleshwar *et al* 2012 reported moderate heritability for pods per plant and bunches per plant.

Table 3 represents the genotypic and phenotypic correlations between all pairs of characters. It was observed that genotypic correlations were greater than phenotypic correlations in all most the cases indicating that the environmental influences were not marked enough to alter the degree of association in all the characters. Seed yield per plant possessed highly significant positive correlation with number of pods per plant and number of clusters per plant. Positive and significant correlation for number of pods per plant was observed with grain yield by Rajan *et al* (2000), Venkateshwarlu (2001b), Haritha and Shekhar (2002), Dhuppe*et al*. (2005), Anil and Lokendra (2006), Saxena*et al*. (2007),Dhananjay *et al*. (2009) and Zaid *et al*. (2012).

Path coefficient analysis revealed that the trait, number of clusters per plant had high positive direct effect on seed yield followed by number of pods per plant (Table4). These traits also recorded strong significant positive correlation with seed yield per plant which is in accordance with the result of Rao *et al*., (2006) and Srivastava and Singh (2012). The residual effect is low (0.375) indicating appropriateness of characters chosen. The days to 50% flowering and plant height had negative correlation and negative direct and indirect effects for grain yield indicating that dwarf and early maturing produces higher yield. Number of clusters per plant and number of pods per plant are the most important yield contributing components as they recorded high direct and indirect effects towards seed yield in green gram.

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Table1. Mean values of yield and yield contributing characters in F6 families of green gram

Characters	Days to 50 % flowering	Plant height (cm)	Number of clusters	Number of pods	Seed yield/ plant (Kg)
1	32.7	53.3	13.8	34.8	4.22
2	31.3	54.9	12.1	33.1	3.58
3	29.3	46.9	11.3	27.7	3.50
4	32.3	46.5	7.1	29.7	4.98
5	26.3	45.9	10.5	23.6	3.64
6	28.7	40.9	8.3	19.7	3.78
7	33.0	39.3	10.7	29.9	4.31
8	33.7	41.6	7.7	28.9	5.00
9	30.3	39.1	8.9	27.7	1.31
10	34.7	38.5	11.7	22.9	4.73
11	30.3	43.6	8.7	26.6	3.64
12	32.7	37.2	12.3	33.3	4.90
13	34.7	39.0	7.2	26.7	0.07
14	32.3	44.0	9.7	24.3	3.57
15	33.7	35.4	7.1	23.7	2.51
16	33.3	36.7	11.5	34.5	4.87
17	31.7	47.5	9.2	32.1	3.62
18	33.7	37.1	10.3	35.6	4.16
19	32.3	34.6	10.3	24.7	5.56
20	32.3	42.5	9.1	32.0	3.62
21	28.3	33.1	8.2	25.0	3.16
22	30.3	34.3	7.1	20.0	3.20
23	31.7	35.5	10.5	24.8	5.58
24	32.3	45.1	9.9	26.7	3.20
25	30.7	41.6	11.4	28.9	3.44
26	33.7	37.6	8.7	25.7	3.65

Table2. Parameters of genetic variability for yield and yield contributing characters

Character	Range	Mean	σ^2 G	σ^2 P	GCV	PCV	Heritability	Genetic advance
Days to 50% flowering	26.3-34.7	31.78	3.41	5.53	10.73	17.39	61.67	22.09
Plant height (cm)	33.07-54.93	41.23	29.84	35.85	72.38	86.96	83.24	149.11
Number of clusters	7.07-13.80	9.75	2.96	4.03	30.34	41.30	73.46	62.50
Number of pods	19.73-35.60	27.78	18.15	22.69	65.33	81.66	80.00	134.57
Seed yield/ plant (g)	0.07-5.57	3.76	1.43	1.47	38.06	39.17	97.17	78.40

** Significant at 1% level

Table3. Phenotypic (P) and genotypic (G) correlations among five characters in green gram

Character		Plant height (cm)	Number of clusters	Number of pods	Seed yield/ plant (Kg)
Days to 50% flowering	P	-0.145	0.111	0.191	0.084
	G	-0.165	0.112	0.233	0.100
Plant height (cm)	P		0.220	0.211	-0.022
	G		0.273	0.267	-0.021
Number of clusters/plant	P			0.800**	0.812**
	G			0.890**	0.883**
Number of pods/plant	P				0.741**
	G				0.790**

Table4. Path coefficient analysis showing direct (diagonal) and indirect effects on yield

Character	Days to 50 % flowering	Plant height (cm)	Number of clusters	Number of pods
Days to 50% flowering	-0.07228	0.04971	0.09930	0.02346
Plant height (cm)	0.01194	-0.30093	0.24111	0.02690
Number of clusters	-0.00812	-0.08210	0.88376	0.08957
Number of pods	-0.01685	-0.08045	0.78659	0.10063