The Pharma Innovation Journal 2022; 11(5): 1310-1313

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(5): 1310-1313

www.thepharmajournal.com
Received: 01-02-2022
Accepted: 08-04-2022

Muthuswamy A
Associate Professor, Department of Pulses, Centre for Plant Breeding and Genetics, TNAU, Coimbatore, Tamil Nadu, India

Jayamani P
Professor, Centre for Plant Breeding and Genetics, TNAU, Coimbatore, Tamil Nadu, India

Kumaresan D
Professor, Centre for Plant Breeding and Genetics, TNAU, Coimbatore, Tamil Nadu, India

Corresponding Author:
Muthuswamy A
Associate Professor, Department of Pulses, Centre for Plant Breeding and Genetics, TNAU, Coimbatore, Tamil Nadu, India

Genetic variability studies for yield related traits in Greengram [*Vigna radiata* (L.) Wilczek]

Muthuswamy A, Jayamani P and Kumaresan D

Abstract
Greengram is the third most important food legume crop in India serving as the major source of low-cost protein to the resource poor people of developing countries. The current investigation of preliminary yield trial on genetic variability involving twenty genotypes were carried out in *Kharif*, 2018 at Department of pulses, TNAU, Coimbatore. The morpho-agronomic traits *viz.,* days to 50 per cent flowering, days to maturity, plant height (cm), number of branches, number of pods per plant, hundred seed weight (g) and grain yield per plot were recorded and genetic parameters *viz.,* PCV, GCV, heritability and genetic advance as per cent of mean were studied. Of the seven traits studied, grain yield, hundred seed weight, plant height, number of pods and number of branches recorded high heritability and genetic advance indicating the selection for the above traits will be effective. COGG-17-03 recorded highest yield followed by COGG-17-16 and COGG-17-01.

Keywords: Variability, related, morpho-agronomic, Greengram, *Vigna radiata* L.

Introduction
Greengram [*Vigna radiata* (L.) Wilczek] is one of the leguminous plant species belongs to the family Fabaceae with the chromosome number of 2n=22. It is the self-fertilized species (Singh *et al.*, 2015) [10] originated from south Asia with the possible progenitor of *Vigna radiata var. sublobata*. Mungbean is in about 4.5 Mha in India. The total annual production of 2.64MT with an average productivity of 548 kg/ha (Anon., 2020-21) [1]. Nutritionally it plays major role in alleviating the malnutrition being rich in protein diet. It also improves the soil fertility by fixing atmospheric nitrogen in the soil. Therefore, the succeeding cereal crops will require one fourth less nitrogen supply (Mbeyagala *et al.*, 2017) [6]. Being a hardy nature and short duration of this crop, it is being cultivated in dry conditions as rainfed, intercrop and rice fallow. Initiation of breeding program to increase the productivity of mungbean requires the better understanding of genetic variability parameters. In the present study, twenty greengram accessions were evaluated for seven quantitative traits. The genetic variability parameters *viz*., range, mean, phenotypic coefficient of variation, genotypic coefficient of variation, heritability and genetic advance were calculated and the results are presented in this manuscript.

Materials and Methods
The field experiment was conducted in the Department of Pulses, Tamil Nadu Agricultural University, Coimbatore during *Kharif* 2018. Twenty advanced cultures of greengram including popular varieties were evaluated in randomized block design with two replications. The presence of variation is the foremost prerequisite for the effective breeding program. Analysis of variance for all the characters were calculated. The genetic variability parameters *viz.*, phenotypic and genotypic coefficient of variation (PCV and GCV), heritability and genetic advance as per cent of mean for the following traits days to 50 per cent flowering, days to maturity, plant height (cm), number of branches, number of pods per plant, hundred seed weight (g) and grain yield per plot (plot size- 4.8 sq m) were analyzed to make the effective selection. The variability parameters PCV and GCV were estimated following the method given by Burton (1952) and they were classified as low, medium and high as proposed by Sivasubramanian and Menon (1973) [11]. Heritability is the index of transmission of traits from parents to offsprings. The broad sense heritability for all the traits were calculated by dividing genotypic variance by phenotypic variance and expressed in percentage (Lush, 1949) [5]. The per cent improvement in the genotypic value of the trait by selection analyzed by calculating the genetic advance as per cent of mean (Johnson *et al.*, 1955) [4]. High heritability coupled with high genetic advance as per cent of mean portrays the genetic value in the selection

program. Hence, the present study was framed to analyze the genetic variability parameters to make the selection process effective.

Results and Discussion

Analysis of variance

The analysis of variance showed significant variations for the traits plant height, number of branches, number of pods, hundred seed weight and grain yield (Table.1). The presence of these variations is sufficient to start the selection process.

Range and mean performance for seven biometrical traits

The mean performance is the direct criteria to select the ideal genotypes from the diverse population. The mere selection based on the yield related traits may also improve the yield of the population. The trait wise mean performance is furnished in the table 2.

Days to 50 per cent flowering was ranged from 33.50 (COGG 17-06, COGG 17- 08, COGG 17- 11, COGG 17- 12, COGG 17- 15, COGG 17- 16 and COGG 17- 17) to 35.00 (COGG-17-03, COGG 17- 05, COGG 17- 09, COGG 17- 13, COGG 17- 14, COGG 17-18 and CO(Gg) 7) with the mean value of 34.08. Days to maturity was valued as minimum of 63.00 (COGG-17-04) to maximum of 65.50 (COGG-17-09 and COGG-17-13). The mean days to maturity was 64.15. The maximum and minimum value of plant height were 21.45cm (COGG-17-12) and 67.15cm (COGG-17-09) respectively with the mean performance of 39.64cm. The range of number of pods per plant were varied between 1.15 (COGG-17-15) and 3.30 (COGG-17-09) with the average of 2.21. The number of pods per plant varied from 16.65 (COGG-17-12) to 56.80 (COGG-17-09). The mean value for this trait was 32.11. The value of hundred seed weight ranged between 3.5g (COGG-17-06) and 5.6g (COGG-17-14) with an average weight of 4.34g. The grain yield per plot was ranged from 135g (COGG-17-14) to 405g (COGG-17-03) with the average yield of 240.25g.

Phenotypic (PCV) and genotypic coefficient of variation (GCV)

To estimate the extent of variability, phenotypic and genotypic coefficient of variations are the reliable parameters which will give us the idea of heritable and non heritable portions of the variability. The difference between phenotypic and genotypic coefficient of variations shows the per cent of environmental influence on the variability showed by the genotypes. In the present study, the higher values of PCV than GCV proves the influence of environment on all the biometrical traits. The coefficients of variation were given in the table 3.

The high phenotypic coefficient of variation (PCV) was found for the characters grain yield (37.28), number of pods (33.13), number of branches (31.12) and plant height (25.58). It was medium for the trait hundred seed weight (14.32). The low PCV was noticed in the characters *viz.,* days to 50 per cent flowering (3.16) and days to maturity (1.54). The genotypic coefficient of variation (GCV) was high for the characters grain yield (35.54), number of pods (27.20), plant height (22.79) and number of branches (20.16). The trait hundred seed weight (13.63) showed the medium range of GCV and the low GCV was observed in the traits days to 50 per cent flowering (0.30) and days to maturity (0.67). These observations are in agreement with the findings of Raturi *et al.* (2015) [7], Hemavathy *et al.* (2015) [3] and Sineka *et al.* (2021) [9].

It was found that there is a higher variation between PCV and GCV observed for the number of branches followed by number of pods and plant height. So, it was confirmed that these traits are highly influenced by environment. Based on the coefficient of variations, the traits grain yield, number of pods, plant height and number of branches were recorded high GCV which gives a hope for the improvement of these traits through efficient selection. Hence, these traits could be considered during the selection process for yield improvement.

Heritability (h^2) and genetic advance as per cent of mean (GAM)

Heritability estimates explains the transmissibility of the traits from one generation to next which governs the resemblance between parents and offsprings. For any selection program heritability must be higher for the traits to have a same kind of phenotypic expression in the progenies of selected individuals. But, the heritability alone not useful for the genetic improvement of the traits. It should also have the considerable amount of genetic advance which is the index of improvement in the particular trait through proper selection process. Hence, the selection will be effective only if high heritability is coupled with high genetic advance as per cent of mean for the genetic improvement of the traits. Heritability and genetic advance values were provided in the table 3.

In the present study, heritability is higher for the characters grain yield (90.86), hundred seed weight (90.66), plant height (79.41) and number of pods (27.2). It was moderate in number of branches (41.97) and low in the characters days to 50 per cent flowering (0.91) and days to maturity (19.14). The genetic advance as per cent of mean for the characters grain yield (69.79), number of pods (46.02), plant height (41.84), number of branches (26.91) and hundred seed weight (26.74) were high. The characters days to 50 per cent flowering (0.06) and days to maturity (0.61) were recorded low genetic advance as per cent of mean. The similar kind of results were also reported by Yusafzai *et al.* (2017), Garg *et al.* (2017) [2] and Sabatina *et al.* (2021) [8].

High heritability coupled with high genetic advance was observed in the characters *viz*., grain yield, hundred seed weight, plant height and number of pods. It indicates that the heritability of these four traits is due to additive gene effects and the selection for these characters may be effective for the genetic improvement. For the trait number of branches, genetic advance as per cent of mean is high but low in case of heritability. The selection for this trait also may be effective. The low heritability was obtained due to the high environmental influences. Hence, in the selection program, the following traits grain yield, hundred seed weight, plant height, number of pods and number of branches could be considered for the genetic improvement of the yield.

Table 1: Analysis of variance for seven quantitative traits of greengram genotypes.

Sl. No.	Characters	Mean sum of squares		
		Replication	Genotype	Error
1	Days to 50 per cent flowering (DFF)	0.625	1.172	1.151
2	Days to maturity (DM)	0.000	1.163	0.789
3	Plant height (PH) (cm)	22.350	184.464**	21.168
4	Number of branches per plant (NB)	0.930	0.670*	0.274
5	Number of pods per plant (NP)	136.161	189.452**	36.856
6	Hundred seed weight (HSW) (g)	0.025	0.736**	0.036
7	Grain yield per plot (GYP) (g)	22.500	15313.026**	733.026

* Significance at 0.05 probability level; ** Significance at 0.01 probability level

Table 2: Mean performance of twenty greengram genotypes for seven quantitative traits.

Sl. No.	Genotype	DF	DM	PH	NB	NP	HSW	GYP
1	COGG-17-01	34.00	65.00	40.15	2.70	45.80	4.05	345.00
2	COGG-17-02	34.00	64.00	41.85	2.35	26.15	4.00	335.00
3	COGG-17-03	35.00	64.00	38.00	2.00	33.65	4.10	405.00
4	CO(Gg) 7	35.00	63.50	46.15	2.15	27.85	5.25	275.00
5	COGG-17-04	34.00	63.00	37.35	2.65	30.15	4.25	200.00
6	COGG-17-05	35.00	64.00	37.50	2.00	44.65	4.60	240.00
7	COGG-17-06	33.50	64.00	39.95	1.85	31.30	3.50	180.00
8	COGG-17-07	33.50	65.00	31.15	2.30	26.50	5.60	175.00
9	COGG-17-08	33.50	65.00	39.15	2.15	37.65	4.65	270.00
10	COGG-17-09	35.00	65.50	67.15	3.30	56.80	4.25	225.00
11	COGG-17-10	34.00	64.00	40.30	1.85	38.30	4.95	155.00
12	COGG-17-11	33.50	64.00	37.30	2.45	37.30	4.00	165.00
13	CO 8	32.50	63.50	42.15	1.50	27.45	4.00	340.00
14	COGG-17-12	33.50	65.00	21.45	1.35	16.65	3.85	170.00
15	COGG-17-13	35.00	65.50	33.60	2.30	17.10	3.55	140.00
16	COGG-17-14	35.00	63.00	29.10	1.50	27.45	5.60	135.00
17	COGG-17-15	33.50	63.50	33.95	1.15	20.00	3.95	205.00
18	COGG-17-16	33.50	63.50	36.30	2.80	31.30	4.25	390.00
19	COGG-17-17	33.50	64.00	42.80	2.65	32.50	3.90	145.00
20	COGG-17-18	35.00	64.00	57.50	3.15	33.65	4.50	310.00
G Mean		34.08	64.15	39.64	2.21	32.11	4.34	240.25
S.E.		0.76	0.63	3.25	0.37	4.29	0.13	19.14

DFF-Days to 50 per cent flowering, DM-Days to maturity, PH-Plant height (cm), NB-Number of branches per plant, NP-Number of pods per plant, HSW-Hundred seed weight (g) and GYP-Grain yield per plot (g)

Table 3: Genetic variability parameters for seven quantitative traits of greengram genotypes

S. No.	Character	Range	Mean	PCV	GCV	h^2	GAM
1	DFF	32.50-35.00	34.08	3.16	0.30	0.91	0.06
2	DM	63.00-65.50	64.15	1.54	0.67	19.14	0.61
3	PH (cm)	21.45-67.15	39.64	25.58	22.79	79.41	41.84
4	NB	1.15-3.30	2.21	31.12	20.16	41.97	26.91
5	NP	16.65-56.80	32.11	33.13	27.20	67.43	46.02
6	HSW (g)	3.5-5.6	4.34	14.32	13.63	90.66	26.74
7	GYP (g/plot)	135-405	240.25	37.28	35.54	90.86	69.79

DFF-Days to 50 per cent flowering, DM-Days to maturity, PH-Plant height (cm), NB-Number of branches per plant, NP-Number of pods per plant, HSW-Hundred seed weight (g) and GYP-Grain yield per plot (g)

Conclusion

Analyzing the mean performance, coefficient of variations, heritability and genetic advance as a per cent of mean of the different characters, grain yield, hundred seed weight, plant height, number of pods and number of branches are suggested to be included in the selection of genotypes for the improvement of these traits. Among the 20 entries, the yield of the COGG-17-03 is higher followed by COGG-17-16 and COGG-17-01. Hence these entries are suggested to be included in the next stage of yield trial.

References

1. Anonymous. Statistical data on green gram crop, area, production and productivity in India, 2020-21. https//:www.Indiastat.com
2. Garg GK, Verma PK, Kesh H. Genetic variability, correlation and path analysis in greengram [*Vigna radiata* (L.) Wilczek]. International Journal of Current Microbiology and Applied Sciences. 2017;6(11):2166-2173.
3. Hemavathy AT, Shunmugavalli N, Anand G. Genetic variability, correlation and path co-efficient studies on yield and its components in mungbean [*Vigna radiata* (L.) Wilczek]. Legume Research. 2015;38(4):442-446.
4. Johnson, Herbert W, HF Robinson, Comstock RE. "Estimates of genetic and environmental variability in soybeans 1." Agronomy Journal. 1955;47(7):314-318.
5. Lush Jay L. "Heritability of quantitative characters in

farm animals." Heritability of quantitative characters in farm animals. 1949, 356-375.
6. Mbeyagala EK, Kwikiriza N, Amayo R, Omadi JR, Okwang D, Obuo JEP. Participatory selection of mungbean genotypes in Uganda. The African Crop Science Journal. 2017;25(2):253-262.
7. Raturi A, Singh S, Sharma V, Pathak R. Genetic variability, heritability, genetic advance and path analysis in mungbean (*Vigna radiata* (L.) Wilczek). Legume Research. 2015;38(2):157-163.
8. Sabatina AS, Lal Ahamed M, Ramana JV, Harisatyanarayana N. Genetic variability studies in mungbean (*Vigna radiata* L.). The Pharma Innovation Journal. 2021;10(6):906-909.
9. Sineka T, Murugan E, Sheeba AC, Vanniarajan GH. Genetic relatedness and variability studies in greengram (*Vigna radiata* (L.) Wilczek). Electronic Journal of Plant Breeding. 2021;12(4):1157-1162.
10. Singh C, Singh P, Singh R. Modern Techniques of Raising Field Crops. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi. 2015, 386.
11. Sivasubramanian S, Menon M. "Heterosis and inbreeding depression in rice." Madras Agricultural Journal. 1973;60(7):1139-1140.
12. Yusufzai Sana A, Pithia M, Raval Lata J, Vora Zarna N. Genetic variability, heritability and genetic advance for seed yield and its components in F2 generations of mungbean [*Vigna radiata* (L.) Wilczek]. Indian Journal of Pure & Applied Biosciences. 2017;5(2):532-535.