IJNRD.ORG ISSN : 2456-4184
INTERNATIONAL JOURNAL OF NOVEL RESEARCH AND DEVELOPMENT (IJNRD) | IJNRD.ORG
An International Open Access, Peer-reviewed, Refereed Journal

"Genetic variability studies in thirty two genotypes of Greengram [*Vigna radiata* (L.) Wilczek]"

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Abstract : Greengram [*Vigna radiata* (L.) Wilczek] is a crucial pulse crop in India and Central Asia, valued for its nutritional benefits and role in soil health. This study assessed genetic variability in 30 Greengram genotypes, including two standard cultivars, focusing on eleven traits such as seed yield and plant height. Conducted during the kharif season at Dr. Sharadchandra Pawar College of Agriculture, the experiment used a Randomized Block Design. Results showed significant genetic variation across traits, with seed yield per plant and number of pods per plant exhibiting the highest genotypic and phenotypic coefficients of variation. Broad-sense heritability estimates ranged from 46.65% to 96.18%, with the highest heritability for the number of pods per plant. Genetic advance was highest for plant height and seed yield, and genetic advance as a percentage of the mean was notably high for seed yield and number of pods. These findings, consistent with previous studies, highlight the potential for targeted breeding to enhance Greengram productivity and resilience.

Key words **- Greengram, Variabilty, GCV, PCV, Heritability, GA, GA as a % of mean..**

I.INTRODUCTION

Greengram [*Vigna radiata* (L.) Wilczek], also known as mungbean, is an important pulse crop belonging to the family Papilionaceae (Leguminosae). Predominantly cultivated in India and Central Asia, Greengram is a diploid (2n = 22) and self-pollinated crop that plays a vital role in Indian agriculture. It contributes to both nutrition and soil health improvement through nitrogen fixation. India, the largest producer of Greengram, cultivates it on around 36 lakh hectares, producing 17 lakh tonnes annually, with an average yield of 500 kg/ha. Major producing states include Maharashtra, Rajasthan, and Andhra Pradesh (Perala *et al.*, 2022).

Greengram's short growth cycle, adaptability, and high-yielding varieties make it suitable for various agro-ecological zones, especially in semi-arid and sub-humid tropical regions. However, its yield in India remains below potential due to biotic and abiotic stresses (Reddy *et al.*, 2019). Its ability to fix atmospheric nitrogen, its role in green manuring, and compatibility with multiple cropping systems make it essential for sustainable agriculture (Singh *et al.*, 2018).

Beyond agronomy, Greengram is nutritionally important, with 23.4% protein and key minerals like potassium, phosphorus, and magnesium, making it crucial for nutritional security in areas with limited animal-based protein (Paul *et al.*, 2011). Improving its yield and resilience is vital for food security and sustainability.

This research aims to assess genetic variability studies for traits affecting Greengram seed yield. Insights from this study will inform breeding strategies to improve productivity and stress tolerance, enhancing its performance across different environments.

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II.Material and Methods

The experiment was conducted during *kharif*, 2023 at Agricultural botany farm, Dr. Sharadchandra Pawar College of Agriculture, Baramati. Thirty genotypes collected from NBPGR, New Delhi with two standard check cultivars Phule Chetak and Phule Vaibhav collected from PORS, Pandharpur were sown in Randomized Block Design in two rows of 3 m length by keeping spacing of 30 cm x 10 cm. Standard cultural practices, including weeding, irrigation, and plant protection measures, were carried out as needed throughout the crop's growth period. The data was collected for eleven characters *viz.*, days to 50 % flowering, days to maturity, plant Height (cm), number of pods per plant, number of primary branches per plant, number of secondary branches per plant, number of seeds per pod, 100 seeds weight, crude protein (%), carbohydrate content (%), seed yield per plant. Observations were taken from five randomly selected plants per genotype in each of the two replications, and the mean value was calculated. Genetic variability was estimated as suggested by Panse and Sukhatme (1985). Various genetic parameters, including ECV, GCV, PCV, heritability, and GAM, were calculated using the formulas provided by Johnson *et al.* (1955).

III. Results and Discussion

The analysis of variance (**Table 1**) indicated that the significant genotypic differences for all eleven characters investigated which shows a broad genetic variation among the 32 Greengram genotypes for investigated traits. **Table 2** summarizes the genetic variability parameters, including range, GCV, PCV, heritability (broad sense), genetic advance, and genetic advance as a percentage of the mean. Generally, GCV values were lower than PCV values for all traits. Seed yield per plant had the highest GCV (28.97), followed by number of pods per plant (25.91) and 100-seed weight (23.05), while days to maturity had the lowest GCV (2.38). For PCV, seed yield per plant was highest (30.07), with days to maturity having the lowest PCV (3.48). The higher PCV compared to GCV suggests that environmental factors significantly influenced trait expression. The findings are consistent with Bisti *et al.* (2022), who reported higher PCV than GCV for all traits and moderate to high GCV and PCV for traits like seed yield per plant and number of pods. Nayak *et al.* (2022) noted low GCV and PCV for days to 50% flowering and days to maturity. Varma *et al.* (2022) also observed high GCV and PCV for number of primary branches, pods per plant, seed yield, and plant height.

Broad-sense heritability estimates ranged from 46.65% (days to maturity) to 96.18% (number of pods per plant), with the highest heritability for number of pods per plant (96.18%) and the lowest for days to maturity (46.65%). These results align with Nayak *et al.* (2022), who found high heritability for plant height, number of pods, seed yield, and 100-seed weight. Sabatina *et al.* (2021) and other studies also reported high heritability for similar traits.

Plant height showed the highest genetic advance (11.33), followed by the number of pods per plant (9.41), while 100-seed weight had the lowest (1.35). This is consistent with Thakur *et al.* (2022) and Wesley *et al.* (2020), who reported low genetic advance for traits like days to 50% flowering, days to maturity, seeds per pod, 100-seed weight, and seed yield.

High genetic advance as a percentage of the mean was found for seed yield per plant (57.47%), number of pods per plant (52.34%), and 100-seed weight (44.51%). Lower values were observed for days to maturity (3.35%). These results align with Vadivel *et al.* (2020), Nalajala *et al.* (2022), and Mohammed *et al.* (2020), who reported significant genetic advance for traits like seed yield, number of pods, plant height, and 100-seed weight.

IV.Conclusions

The analysis of variance revealed highly significant differences among the thirty two Greengram genotypes for all the traits studied, indicating sufficient variability among the genotypes for these traits.

For all the characters under study, the phenotypic coefficient of variation was slightly higher than the corresponding genotypic coefficient. Both high genotypic and phenotypic coefficients of variation were recorded for number of pods per plant, number of primary branches per plant, number of seeds per pod, plant height and 100 seeds weight.

High heritability estimates coupled with a high genetic advance as a percentage of the mean were observed for seed yield, followed by the number of pods per pod, plant height, the number of primary branches per plant, and the weight of 100 seeds. This indicates that additive gene action predominantly controls these traits, making selection for them effective

Sr. No.	Character	Mean sum of squares		
		Replications (2)	Treatment (32)	Error (64)
1	Days to 50 % flowering	9.77*	8.90**	1.86
2	Days to Maturity	18.06*	7.80**	2.84
3	Plant Height (cm)	115.32**	72.52**	4.34
4	No. of Pods per plant	10.35**	44.25**	0.86
5	No. of primary branches per plant	2.24**	2.04**	0.13
6	No. of secondary branches per plant	8.14**	3.15**	0.52
7	No. of seeds per pod	6.92**	4.99**	0.53
8	100 seeds weight	1.14**	1.05**	0.07
9	Crude Protein (%)	8.85*	6.68**	1.91
10	Carbohydrate content (%)	35.39*	29.24**	6.55
11	Seed yield per plant	4.47**	13.95**	0.52

* and ** denotes significant at P = 5 and P = 1 per cent level of significance, respectively

Table 3.1: Analysis of Variance (M.S.S.) for eleven characters of thirty two Greengram genotypes

Sr. No.	Character	Range	General Mean	GCV %	PCV %	Heritability (bs)	Genetic Advance	G. A. as per cent of mean
1.	**Days to 50 % flowering**	36.50-44.00	40.53	4.63	5.72	67.39	3.13	7.71
2.	**Days to maturity**	62.00-70.00	66.19	2.38	3.48	46.65	2.22	3.35
3.	**Plant height (cm)**	50.89-70.81	59.10	9.88	10.49	88.71	11.33	19.17
4.	**No. of pods/plant**	12.00-28.10	17.98	25.91	26.42	96.18	9.41	52.34
5.	**No. of primary branches/plant**	2.70-6.70	4.37	22.30	23.82	87.62	1.88	42.99
6.	**No. of secondary branches/plant**	6.92-11.43	9.12	12.57	14.85	71.68	1.99	21.93
7.	**No. of seeds/pod**	8.00-13.13	9.99	14.94	16.63	80.77	2.76	27.67
8.	**100-Seed weight (g.)**	2.13-4.50	3.04	23.05	24.59	87.86	1.35	44.51
9.	**Crude protein (%)**	18.25-26.82	20.89	7.39	9.91	55.53	2.37	11.35
10.	**Carbohydrate content (%)**	38.17-52.70	43.31	7.78	9.77	63.38	5.52	12.75
11.	**Seed yield/plant (g.)**	5.87-14.08	8.94	28.97	30.07	92.77	5.14	57.47

Table 3.2: Estimates of variability parameters for seed yield and its contributing characters in thirty two Greengram genotypes

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