Original Research Article

Estimates of genetic variability for seed yield and its component characters in ~~rainfed~~ green gram [*Vigna radiata* (L.) R. Wilczek, Fabaceae]

Abstract

Sixteen genotypes of green gram (*Vigna radiata*) were evaluated under RBD with three replications for genetic variability, heritability and genetic advance for eight characters. The analysis of variance revealed significant difference among genotypes for all the characters. Analysis of variance indicated that experimental material possess good amount of variability for all the characters under study. High magnitude of GCV was observed for seed yield per plot, seed yield per hectare, plant height, days to flowering and test weight while moderate GCV was recorded for no. of seeds per pod, pod length and days to maturity suggesting the possibility of their improvement by selection. High heritability coupled with high genetic gain as per cent of mean was observed for test weight, seed yield per hecta~~o~~re, seed yield per plot, plant height and days to flowering while high heritability and moderate genetic gain was recorded for days to maturity, pod length and number~~o.~~ of seeds per pod suggesting that these characters were controlled by additive gene action hence, selection may be effective. High heritability coupled with high genetic gain and high GCV has been exhibited by the characters *viz.*, seed yield per hecta~~o~~res, seed yield per plot, plant height, test weight and days to flowering. There is a substantial scope for improvement of these characters. Hence emphasis should be given to improve these characters in future breeding programme to enhance seed yield of green gram.

Key word: Genetic variability, GCV, PCV, heritability, genetic gain, green gram.

Introduction

Green gram or Mung bean [~~(~~*Vigna radiata* (L.) R. Wilczek]~~)~~ is one of dry edible seeds of plants in the legume family. It is an~~the~~ important pulse crops in arid region because of its short growth duration, adaptation to low water requirement and low soil fertility. It is favored for consumption due to its easy digestibility and low production of flatulence (Shil & Bandopadhya, 2007; Dadepeer *et al.*, 2009). Pulses are

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extensively grown in tropical regions of the world as a major protein rich crop bringing considerable improvement in human diet. Average protein content in the seed is around 24 per cent. The protein is comparatively rich in the amino acid lysine but predominantly deficient in cereal grains (Baskaran *et al.*, 2009; ~~and~~ Dhanajay *et al.*, 2009). Presently, the yield of green gram is well below the optimum level compare to other pulses. The average yield of greengram is very low not only in India (425 kg/ha) but in entire tropical and sub-tropical Asia. India is the largest producer of greengram in the world and accounts for 65 per cent acreage and 54 per cent production (Pratap *et al.*, 2012 and Kumar *et al.*,2005).

To develop high yielding varieties a systematic breeding approach has to be adopted. Assessment of genetic variability is a first step in any breeding programme. Greater the diversity in the material better are the chances of improvement, provided the heritability is high and genetic gain is more. Further, the selection is more effective when it is practiced simultaneously for the characters which have desired nature of association with the characters of ultimate interest. Our objective was…………… under taken to study the different parameters of variability

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Materials and Methods

~~The present investigation entitled "Estimates of genetic variability for seed yield and its component characters in rainfed green gram [*Vigna radiata* (L.) Wilczek]" was under taken to study the different parameters of variability.~~ Sixteen genotypes of greengram were raised in randomized block design with three replications during *Kharif*, 2019 at research farm of Agricultural Research Station, Fatehpur-Shekhawati, Sikar (Rajasthan) under rainfed conduction. These genotypes of greengram were obtained from All India Coordinated Research Project on MULLaRP, RARI, Durgapur (Jaipur). Each genotype was given in a four row plot of 4 m length with a spacing of 30 cm between rows and 10 cm between plants. Ten plants were selected at random from each plot and data were recorded on eight~~8~~ characters viz., plant height, pod length, number of seeds per pod, t~~T~~est weight, seed yield per plot and seed yield per ha~~ectors~~ whereas for days to 50% flowering and days to maturity. The data were recorded on whole plot basis. The data so obtained were subjected to analysis of variance and estimation of different variability parameters.

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Statistical methods

(i) Analysis of variance (Panse and Sukhatme, 1985).

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(ii) Variability parameters.

a) Phenotypic Coefficient of variability= PCV (Burton, 1952).

b) Genotypic Coefficient of variability= GCV (Burton, 1952).

c) Heritability (Burton and D~~d~~e-vane, 1953).

d) Genetic gain (Johnson *et al*., 1955).

Results and Discussion

The analysis of variance revealed highly significant differences among the treatments for all the characters, suggesting the presence of high degree of genetic variability in the experimental material (Table_1). In general, the estimates of PCV for all the characters were higher than the GCV indicating the environmental influence over the expression (Table_2). This finding was in accordance with Mehandi *et al.* (2013), Raturi *et al.* (2015), Hemavathy *et al.* (2015) and Anand *et al.* (2015) in greengram. Characters (Table 2) viz., seed yield per plot (23.21%) had highest ~~genotypic coefficient of variation (~~GCV~~)~~ followed by seed yield per ha~~ector~~ (23.04%), plant height (8.61%), days to flowering (5.84%) and test weight (5.01%). Similar results were reported by Gadakh *et al.* (2013), Raturi *et al.* (2015), Garg *et al*. (2017) and Muthuswamy *et al.* (2019) in greengram. Moderate estimates of GCV were observed for no. of seeds per pod, pod length and days to maturity indicating the limited scope of selection for these characters. Similar results were reported by Makeen *et al.* (2007); Mehandi *et al*. (2013) ~~and Makeen *et al*. (2007)~~ in greengram.

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Selection of characters based on heritability and genetic gain as percent of mean is of great importance (Mehandi *et al*., 2013;~~ and~~ Narasimhulu *et al*., 2013~~a~~). Highest heritability estimate (Table 2) was recorded for test weight (90.90%) followed by seed yield per ha~~ector~~ (89.80%), seed yield per plot (89.70%), plant height (87.90%), days to flowering (87.20%) and days to maturity (60.10%) suggesting these characters are governed by additive genetic effect to great extent and improvement of these characters would be effective through phenotypic selection. Similar findings were also observed by Makeen *et al*. (2007), Mehandi *et al*. (2013), Prasanna *et al.* (2013), Sowmini and Jayamani (2013), ~~Prasanna *et al.* (2013),~~ Hemavathy *et al.* (2015), Rashid and~~&~~ Biswas (2015), ~~Hemavathy *et al.* (2015)~~ and Garg *et al.* (2017). The high heritability with high genetic gain for test weight, seed yield per hectare~~or~~, seed yield per plot, plant height and days to flowering were due to additive gene effects. The characters, pod length and no. of seeds per pod exhibited moderate heritability

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indicated non additive gene action and environmental influence on the expression of characters, where selection is ineffective and could be better exploited through recombination breeding. Similar results were reported by Mehandi *et al.* (2013) for pod length and Makeen *et al*. (2007) for number of seeds per pod in greengram (Figure ~~-~~1).

In Table 2, g~~G~~enetic gain per cent of mean was observed highest for seed yield per plot (45.29%) followed by seed yield per ha~~ector~~ (45.00%), plant height (16.64%), days to flowering (11.23%), test weight (9.85%) and no. of seeds per plant (5.38%). Comparatively moderate values of genetic gain were recorded for days to maturity and pod length displayed moderate genetic gain as per cent of mean suggesting that all these characters were governed by non-additive genes and selection will be rewarding for improvement of such characters. Similar results were reported by Mishra and Yadav (1992), Dashora and Nagda (2002), Rahim *et al.* (2010) and Srivastava and~~&~~ Singh (2012).

The characters having higher quantum of genetic variability along with high heritability and greater genetic gain can be easily improved through selection (Johnson *et al*., 1955). Panse (1957) also suggested that the characters which have high heritability with higher genetic gain are expected to have greater proportion of genetic effects. High heritability coupled with high genetic gain and high GCV has been exhibited by the characters *viz*., seed yield per hecta~~o~~re~~s~~, seed yield per plot, plant height, test weight and days to flowering indicating control of additive gene action for these characters. Similar~~,~~ results were reported by Jain and Ramgiry (2000), Singh *et al.* (2000) and Degefa *et al.* (2014).

In conclusion, h~~H~~igh GCV coupled with high heritability and genetic gain of a character provides good selection advantage. In the present study the characters, seed yield per ha~~ectors~~, seed yield per plot, plant height, test weight and days to flowering indicating that the variation in the characters were most likely due to additive gene effects, hence, simple directional selection may be effective to improve these characters in green gram.

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Table -1: Analysis of variance showing values of mean squares for different characters in green gram (*Vigna radiata*).

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Characters	Source o variance		
	Replications [2]	**Treatments [15]**	**Error [30]**
Days to flowering	5.395**	17.016*	0.795
Days to maturity	6.812*	7.420*	1.345
Plant height	4.036	41.335**	1.808
Pod length	3.203**	0.216*	0.079
No. of seeds per pod	2.270*	1.516*	0.670
Seed yield per plot	39.062	11758.020**	432.395
Test weight	0.071	8.099**	0.261
Seed yield per ha.	1181.73	89205.532**	3239.501

[ ] = df

***,** significant at 5% level and 1% level, respectively.**

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Table -2: Variability parameters for different characters in green gram (*Vigna radiata*).

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Characters	Coefficient of variation		Heritability (broad sense) (%)	Genetic gain (%)	Genetic gain % of mean
	GCV (%)	PCV (%)			
Days to flowering	5.84	6.25	87.20	4.47	11.23
Days to maturity	2.32	3.00	60.10	2.27	3.71
Plant height	8.61	9.18	87.90	7.01	16.64
Pod length	2.77	4.56	36.80	0.26	3.46
No. of seeds per pod	4.80	8.84	29.60	0.59	5.38
Seed yield per plot	23.21	24.50	89.70	119.89	45.29
Test weight	5.01	5.26	90.90	3.17	9.85
Seed yield per ha.	23.04	24.31	89.80	330.53	45.00

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Figure -1: Genetic parameters [PCV, GAM, GCV and h^2 (broad sense)] for different characters in green gram (*Vigna radiata*).

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