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National Academy of Agricultural Science (NAAS) Rating : 3.03

Assessment of Genetic Variability, Heritability and Genetic Advance for Yield and Yield Attributing Traits in Blackgram (*Vigna mungo* (L.) Hepper) Genoptypes

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ABSTRACT: *The study was conducted at Agricultural Research station Bidar, Department of Genetics and Plant Breeding, University of Agricultural Sciences, Raichur during Kharif 2014. The planting material were grown in 8 x 8 simple lattice design with two replications to estimate variability parameters for grain yield and their attributing characters in 64 genotypes of blackgram. The higher estimate of PCV were observed for all the traits when compare to GCV. However, GCV was found to be high for plant height. High heritability per cent in broad sense was observed for all the characters. High heritability coupled with high genetic advance as per cent of mean observed for 50 per cent flowering, plant height, branches per plant, cluster per plant, pods per plant, grain yield per plant, grain yield per hectare, specific leaf weight and chlorophyll content. These results indicated additive with epistatic effect for the phenotypic expression of the character and there by suggesting selection on the basis of phenotype for improvement of these characters.*

Key words: *Blackgram, Genetic variability, heritability, Genetic advance and Genetic advance as per cent of mean*

INTRODUCTION

Blackgram (*Vigna mungo* (L.) Hepper) is an important pulse crop occupying unique position in Indian Agriculture. Urdbean occupies an important position due to its high seed protein (25-26%, carbohydrates (60%), fat (1.5%), minerals, amino acids and vitamins and ability to restore the soil fertility through symbiotic nitrogen fixation [1]. Improvement of urdbean, being an important pulse crop of India, is an important task for pulses breeders. It is grown in various agro-ecological conditions and cropping systems with diverse agricultural practices [2] and also it has been identified as a potential crop in number of countries, but no systematic research information is available on crop improvement using biometrical techniques except few reports in the recent years [3]. To strengthen ongoing program, study of available natural genetic variation (collection, evaluation and management) is of immense importance [4]. The study of inheritance of various developmental and productive traits through the estimation of different genetic parameters like components of variances, genotypic and phenotypic coefficients of variability, heritability and genetic advance is helpful for framing the effective breeding programme [5].

Therefore, present study was planned to investigate the genetic parameters like components of variance, genotypic and phenotypic coefficient of variability, heritability, genetic advance and genetic advance as per cent of mean to identify the best traits to be used for future exploitation.

MATERIALS AND METHODS

In present study, 64 genotypes of blackgram collected from different research stations of the country were grown in a 8 x 8 simple lattice design with two replications. Each genotypes was sown in three rows of three meters length with a spacing of 30 cm between rows and 10 cm between plants has sown during *kharif* 2014 at Agriculture research Station, Bidar (Karnataka). All the recommended practices were followed to raise good crop of blackgram. Observation were recorded on five randomly selected plants from each genotype each replication for days to 50 per cent flowering, days to maturity, plant height (cm), branches per plant, clusters per plant, pods per plant, seeds per pod, pod length (cm), 100 seed weight

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(g), grain yield per plant (g), grain yield per hectare (kg/ha), chlorophyll content, specific leaf weight (g) and seed volume weight (g/100ml) and characters were analyzed to estimate genetic variability parameters. Genetic variability was measured and subjected to statistical analysis as suggested by [6]. Heritability (broad sense), genetic advance (GA) and genetic advance as a percent over mean (GAM) were worked by following the method suggested by [7] and [8].

RESULTS AND DISCUSSION

The mean sums of squares due to various sources for different traits are presented in Table 1. The analysis of variance indicated highly significant differences for all the characters except one character *viz* specific leaf weight among 64 germplasm lines suggesting substantial to moderate genetic variability. The variation due to replication was non significant for all characters. The genotypic and phenotypic coefficient of variability, heritability and genetic advance as presented in Table 2 and Figure 1 & 2. The variation for range was moderate to high in all the characters observed. Among the fourteen quantitative characters, grain yield per hectare (710 to 1205 kg) had maximum variation followed by plant height (27 to 65.5 cm), chlorophyll content (37.4 to 65.8), days to 50 per cent flowering (33.5 to 44.5) and days to maturity (70.5 to 81.5), seed volume weight (80.25 to 88.50), pods per plant (14.4 to 22.20) showed moderate variation. The variation for these traits can be exploited for yield improvement in breeding programme. On the other hand, low variation was observed for specific leaf weight, branches per plant, seeds per pod and 100 seed weight. Improvement of these traits through simple selection might be limited from germplasm used in the present study. Hence, the genes for these important traits should be explored from other sources through more collections from the area of maximum diversity or acquisition of germplasm from other sources [9].

Moderate phenotypic coefficient of variability and genotypic coefficient of variability was observed for branches per plant, cluster per plant, pods per plant, grain yield per plant, grain yield per hectare, days to 50 per cent flowering, chlorophyll content and specific leaf weight. These results conformed to the findings of [10]. However, in contrast, low phenotypic and genotypic coefficient of variability observed for days to maturity, seeds per pod, pod length, 100 seed weight and seed volume weight. These probably due to the fact that the chosen genotypes for the study though were diverse in nature, were all productive types. These results are similar with findings of [11]. Whereas, plant height exhibited high phenotypic and genotypic coefficient of variability. Difference between GCV and PCV values for all the traits was very narrow indicating lesser influence of the environment on the expression of the traits.

The high heritability coupled with high genetic advance as per cent mean was observed by days to 50 per cent flowering, plant height, branches per plant, clusters per plant, pods per plant, grain yield per plant, grain yield per hectare, specific leaf weight and chlorophyll content. Thus, these traits were controlled by additive gene action and hence these traits can be fixed since they respond better to selection. These findings were in accordance with earlier reports of [12], [11], and [13]. These results imply that within a given environment, the influence of environment on the genotypes was not high. Whereas, seed volume weight recorded low genetic advance as per cent of mean revealing certain degree of non additive gene action in the control of these traits.

Table 1
Analysis of variance for yield and yield attributing characters in blackgram genotypes

Source of variation	*Degrees of freedom*	*DFF*	*DM*	*PHT*	*BPP*	*CPP*	*PPP*	*SPP*	*PL*	*HSW*	*GYPP*	*GY (ha/kg)*	*CC (%)*	*SLW*	*SVW*
Replication	1	0.500	0.633	1.958	0.018	0.011	0.080	0.150	0.020	0.006	0.173	393	549	0.000	0.125
Genotypes	63	18.083**	16.460**	151.838**	0.086**	2.26**	5.95**	0.288**	0.077**	0.212**	0.481**	28604**	62.11*	0.00005	4.748**
Blocks	14	0.491	0.182	0.634	0.002	0.042	0.732	0.016	0.012	0.008	0.068	1236	16.51	0.000	0.766
Error (Intra block)	49	0.380	0.435	0.606	0.026	0.130	0.903	0.058	0.029	0.016	0.088	2785	48.55	0.00003	1.422
Total	127	9.17	8.35	75.64	0.053	1.93	3.363	0.168	0.050	0.242	0.112	154403.5	55.69	0.0003	2.98

DFF- Days to 50 per cent flowering | DM- Days to maturity | PHT- Plant height | BPP- Branches per plant
CPP- Cluster per plant | PPP- Pods per plant | SPP- Seeds per plant | PL- Pod length
HSW- Hundred seed weight | GYPP- Grain yield per plant | GY (kg/ha)-Grail yield per hectare
CC (%)- Chlorophyll content | SLW- Specific leaf weight | SVW- Seed volume weight

Table 2
Estimates of variability parameters of fourteen quantitative traits in blackgram genotypes

Sl. No.	*Characters*	*Range*		*Mean*	*Variance*		*GCV(%)*	*PCV(%)*	$h^2_{BS\ (\%)}$	*GA(%)*	*GAM(%)*
		Min	*Max*		σg^2	σp^2					
1	DFF	33.5	44.5	37.92	4.23	4.274	11.15	11.27	98.95	8.71	22.97
2	DM	70.5	81.5	75.75	4.03	4.083	5.32	5.39	98.68	8.3	10.96
3	PHT	27	65.5	43.59	12.3	12.33	28.24	28.29	99.8	25.35	58.17
4	BPP	2.1	2.8	2.46	0.27	0.314	10.98	12.79	85.87	0.556	22.56
5	CPP	4.6	9.5	7.78	1.481	1.524	19.04	19.59	97.16	3.05	39.22
6	PPP	14.4	22.2	17.74	2.344	2.53	13.21	14.26	92.67	4.83	27.22
7	SPP	5.3	7.1	6.19	0.508	0.563	8.221	9.09	96.39	1.04	16.93
8	PL	3.95	4.98	4.48	0.25	0.302	5.58	6.75	82.64	0.515	11.49
9	HSW	3.82	5.5	4.75	0.451	0.469	9.5	9.87	96.29	0.93	19.58
10	GYPP	5	7.3	6.28	0.661	0.724	10.52	11.53	91.23	1.36	21.68
11	GY(kg/ha)	710	1205	889.89	164.9	173.1	18.53	19.46	95.24	339.81	38.18
12	CC (%)	37.4	65.8	45.89	6.15	9.29	13.4	20.25	66.18	12.67	27.61
13	SLW	0.034	0.049	0.041	0.005	0.008	14.42	19.66	73.37	0.012	29.72
14	SVW	80.25	88.5	82.55	2.009	2.33	2.43	2.83	85.99	4.13	5.013

The present investigation revealed high heritability coupled with high genetic advance as per cent of mean for days to 50 per cent flowering, plant height, branches per plant, cluster per plant, pods per plant, grain yield per plant, grain yield per hectare, specific leaf weight and chlorophyll content, indicating the presence of considerable additive gene effects. Hence, improvement of these characters could be effective through simple phenotypic selection.

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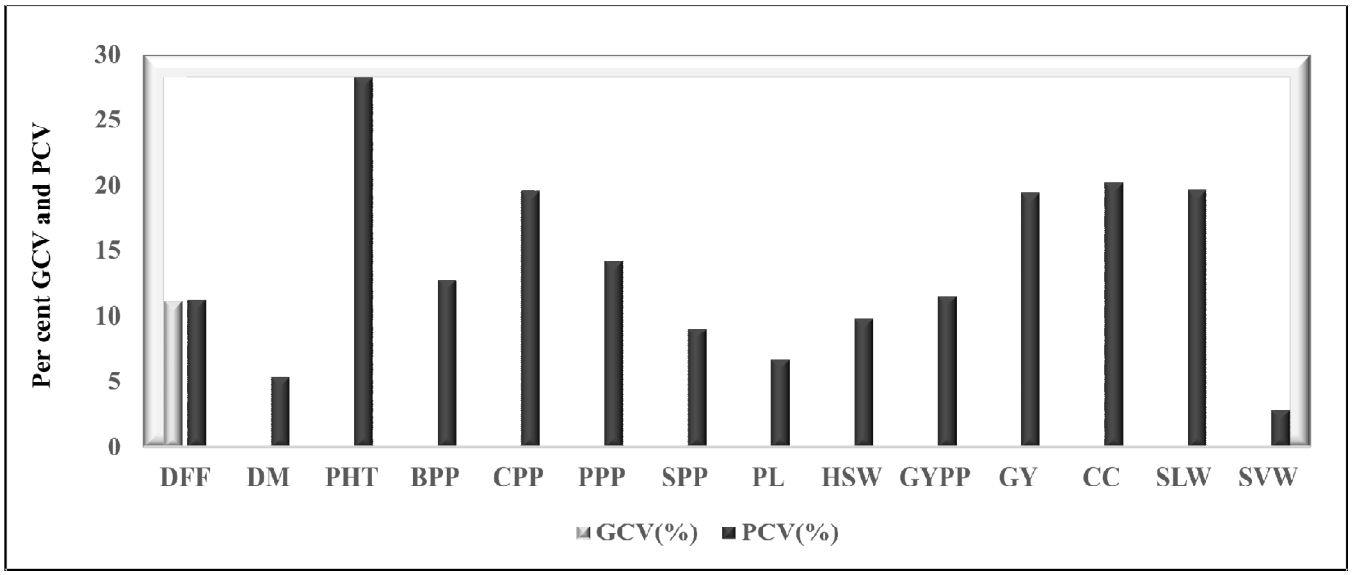

Figure 1: Phenotypic and genotypic coefficient of variation for fourteen characters in blackgram genotypes

DFF- Days to 50 per cent flowering DM- Days to maturity PHT- Plant height BPP- Branches per plant
CPP- Cluster per plant PPP- Pods per plant SPP- Seeds per plant PL- Pod length
HSW- Hundred seed weight GYPP- Grain yield per plant GY (kg/ha)-Grail yield per hectare
CC (%)- Chlorophyll content SLW- Specific leaf weight SVW- Seed volume weight

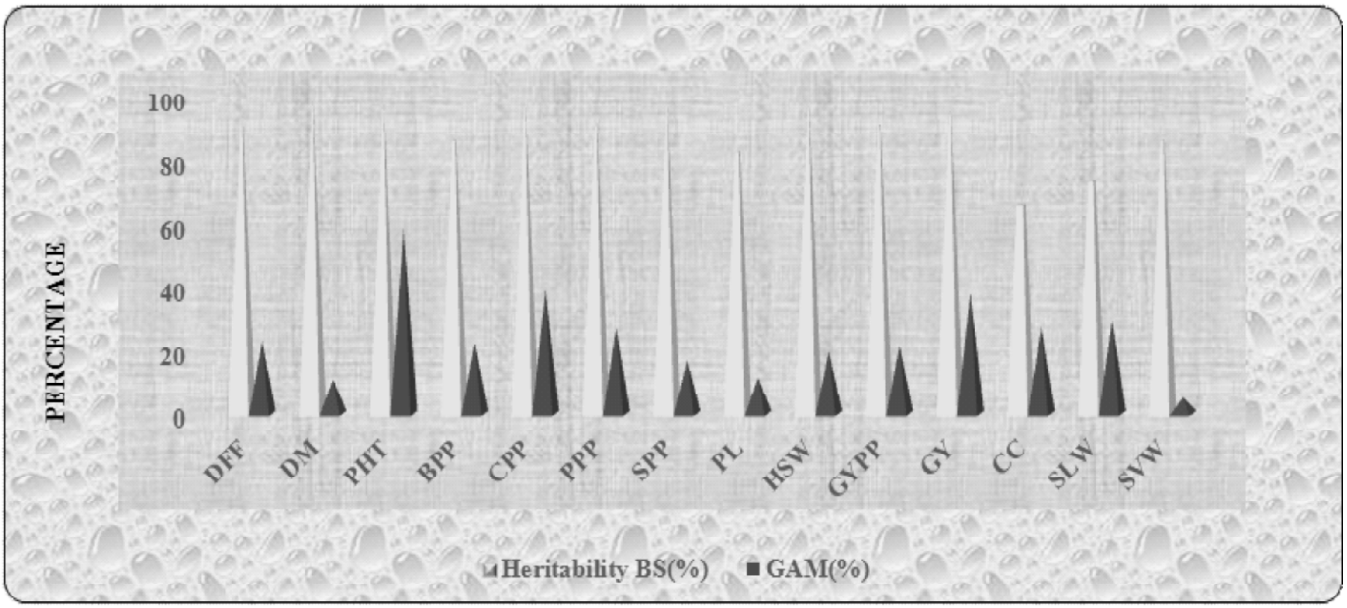

Figure 2: Heritability estimated and genetic advance as per cent mean for fourteen characters in blackgram genotypes

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