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Evalution of mung bean germ plasm for yield and other quantative traits

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Abstract
Eighteen mung bean genotypes were evaluated for studying the variability. Ranges, mean, genotypic variances showed sufficient variability for plant height branches per plants, pods per plant and single plant yield. Heritability was high for 100 seed weight, grain yield, biological weight and no. of seeds per plant. It was low for other characters. Genetic advance was high for biological weight.

Keywords: Mungbean, vignaradiata, variability.

Introduction
Mungbean (vigna radiate L.) popularly known as green gram is one of the six major legume cultivated in the country. It occupies third position among pulses crop. It is considered an important catch crop to fit into the follows after wheat or kharif maize.

Pulses are an important food crop in India
Mungbean will be there in three or four crops sequence. It has become possible because of short duration crop with maturity period of 70-60 days. The average yield is lower than all the grain legumes. The breeding work on this crop is still neglected. The initial step is collection and evolution of germplasm. Genetic studies of quantative characters centers around the study of its variation. The relative magnitude and association of these components determine the genetic properties of population. In this present study variability in existing Germplasm was worked out which can be suitable utilized in further breeding Program.
It is rich in vitamin E and regarded as remedy for beri-beri. It contains high protein (24%) which is higher than other pulses. It has also higher content of lysine being third after pea and gram. It forms an important part in our destroy program and put to variety of use. It is easy to digestible food for infants and is recommended as a medicinal diet to the sick persons.
In the present study an attempt was made to evaluate mungbean germplasm/varieties of different sources, for recommendation as high yielding varieties and to know the trend of heritability and variability characters association to ascertain the yield component for utilization as breeding materials for diverse proposes with the objectives.

1. To study genotypic and phenotypic variability.
2. To study heritability and genetic advance in board sense.
3. To study important character association in them for selection criteria.

Materials and Method
Eighteen genotypes of mungbean were procured from the department of plant-breeding of Dr Rajendra Prasad Central Agricultural University (Pusa, Samastipur) replications in the month March.The net plot size was of 7.5 $m^2$with a row to row spacing of 25 cm and plant to plant spacing of 5.8 cm. Observation on 5 randomly selected plants from each replication and every treatment were taken. Observations on economic characters viz; Plant height, Primary branches, Number of pods per plant, Length of pods (cm), Number of seeds per plant, Biological weight(g),100 seed weight, days to flowering, days to maturity, Sowing to maturity and grain weight per plant(g) were accordingly taken. Mean, range, Variances, phenotypic co-efficient of variation (PCV), genotypic co-efficient of variation, heritability, genetic advance

and genetic advance as percent of mean were calculated.

Statistical Analysis
Mean value of all observed 11 characters mentioned above were used for statistical analysis.

Coefficient of Variability
Genotypic and phenotypic coefficient of variability were calculated as follows:

$$\text{Genetypic C.V.} = \frac{o^g}{X} \times 100$$

$$\text{Phenotypic C.V.} = \frac{o^p}{X} \times 100$$

Heritability and genetic advance
For elimination of heritability and expected genetic advance from variance components, the following formulae were used

$$\text{Heritability } (h^2) \text{ in broad scene} = \frac{o^2_g}{X^2_p} \times 100$$

Character Association
Ten observation per genotype comprising to all four replications on 11 characters were recorded and the correlation coefficient at genotypic and phenotypic were estimated using covariance analysis techniques.

$$R(X_1X_2) = \frac{Cov\ X1X2}{\sqrt{V(x1) \times V(x2)}}$$

Results and Discussion
The performance of germplasm in respect of different characters are given in table-1 and the mean and range of the characters in table-2 and the phenotypic, genotypic variance and related aspect have been mentioned in table-3.
Plant height ranged from 21.19 to 41.87 cm with mean value of 31.78 (table-2) and among the germplasms SML 32 (41.87) showed quick growth followed by RMG 56(41.18). Phenotypic and genotypic variances, heritability and genetic advance were high to moderately high. This shows that sufficient variability exists for this character. High heritability accompanied with high genetic advance indicated the greater scope for selection. The present study confirms the study made by Sinha *et al*. (1996) [6]
The number of primary branches in the genotype is considered to be a main character in selection of the genotype as it bears in more number of flowers, pods and number of seeds per plant. It ranged between 4.87 to 7.90 with a mean of 6.08 (table-1). The germplasm RMG 106 exhibited highest primary branches (7.90) followed by 11/33(7.77) and G_2(7.25). The heritability and genetic advance was moderate to low for this character. Singh and Malhota (1970) [5] observed low heritability with high genetic advance for this character in green gram. The result of the present study is nearly similar to past work of Jha *et al*. (1981) [2]. This shows that there is scope for Improvement through selection.
Pods per plant is the singly most important trait determining the yield. It ranged from 16.75 to 38.22 with a mean of 23.41. The genotype G_2 had highest number of pods (38.22) followed by 12/33(31.57) (table-1). Heritability as well as genetic advance in percent mean for character was recorded which is in confirmily with earlier report made by Singh and Malhota (1970) [5] and Sah and Patel (1981).
Length of pod differed between 3.87 to 8.89 with a mean or 6.83 GCV and PCV were very low. The high heritability with low genetic advanced as indicates that length of pod is not an important character for selection of the genotype.
Number of seed per plant varied between 120 to 318.75 with mean of 243.37. The genotype G_2 had highest number of seeds per plant (318.75) followed by K 851 (296.50). GCV and PCV as well as heritability and genetic advance were comparatively very high. This particular character has important role in the selection of the genotype. The study is on confirmily to the observation made by Singh and Malhota (1970) [5] and Dabas *et al*. (1982) [3].
Biological weight indicate the total utilization or radiant energy as well as cumulative effects of gene action to the specific genotype. It varied from 42.66 to 60.77 g with a common mean of 51.0 g. The genotype RMG 56 had highest biological weight followed by 12.2/33. The genotype G_2 exhibited moderate biological weight. Heritability as well as genetic advance as percent mean are high. Allard (1960) [1]. Has advocated high heritability with high genetic advance for a better scope for crop improvement in subsequent generations.
The study is in good agreement with the results or Dabas *et al*. (1982) [3]. 100- seed weight gives an indication of boldness of seed. Bolder seeds fetch higher market value. The breeders are always trying to have a variety of higher 100-seed weight with high yield. The mean value was 2.94 which ranged in between 2.26 to 3.60. The genotype Pusa 107 found to have the highest 100 grain weight (3.60 g) followed by G_2 (3.52 g). This is probably due to the higher number of primary branches, higher number of pods per plant and higher biological weight. Jha *et al*. (1981) [2] and Sah and Patel (1981) support the results of the present study.
The variety earliest to flower was in 32 days and latest to flowering 40 days with a mean of 36 days. Phenotypic and genotypic variances was moderate however the flowering was influenced to some extent by the environment. Lower genetic advance indicated lower gain after selection.
Flowering to maturity varied between 35 to 40 days with a mean of 37.5 days. The genotype G_2 possess this character indicated to be earliest which is one of main character in selection of the genotype.
Sowing to maturity differed from 66 to77 days with a mean of 71 days. The GCV and PCV were low but the heritability was moderately high. This character shows to be influenced by the environment.
Grain yield is a complex character as it the resultant action of various characters and their interaction with the environment. Range for this character was wider i.e. 3.14 to 11.29 g with mean value of 7.14. genotype and phenotypic variances were moderate. Heritability was moderately higher which indicated the influence of environment on this character. Genetic advance as percent of mean was high due to lower mean value.
From this study it has been inferred that sufficient variability exists for most of the important yield attributes which can be utilized in breeding programs. Among the genotype G_2 has found to be superior for most of the favorable economic character as well as yield.

Table 1: Value of different characters ofmungbean (Vigne radiate)

Sl. No.	Strain's Name	Plant Height (cm)	Primary branches	No. of pods/plant	Length of pod (cm)	No.of seeds/plant	Biological Weight (g)	100-seed weight (g)	Sewing to flower (days)	Flowering to maturity (days)	Sowing to maturity (days)	Economic yield per plant (g)
1	MH 309-1	29.66	6.90	18.55	7.10	209.25	42.66	3.39	36.67	37.50	74.50	6.90
2	12/33	28.18	7.77	31.57	6.48	284.25	71.08	2.67	37.17	37.52	74.00	7.07
3	11/99	30.52	5.87	20.62	6.67	219.50	39.50	3.41	37.12	38.42	76.00	7.40
4	Pusa-103	35.32	6.84	26.62	6.77	269.50	44.35	3.11	37.10	38.60	75.75	8.32
5	Pusa-104	30.37	5.86	26.42	6.72	258.75	46.45	3.24	37.39	38.62	76.00	8.24
6	Pusa-107	27.35	6.15	27.25	7.27	290.25	63.15	3.60	37.22	38.02	75.50	10.29
7	SML-32	41.87	6.65	21.90	7.00	184.26	70.27	2.46	37.32	38.17	76.25	6.12
8	SML-64	21.19	5.05	16.75	6.85	183.50	35.10	2.47	37.70	38.25	74.25	4.72
9	SML-70	32.54	4.87	21.45	6.05	224.75	36.55	2.62	36.77	37.07	73.75	5.48
10	MG-119	32.70	5.97	18.40	6.67	198.00	25.74	2.54	36.82	37.92	74.75	4.98
11	PDM-11	31.38	6.17	23.12	6.85	263.75	54.47	2.54	36.37	37.40	73.75	6.71
12	PDM-12	35.50	5.71	20.69	7.01	236.75	39.76	3.14	36.67	36.32	73.00	7.15
13	K-82	33.13	4.99	22.91	6.64	244.00	39.86	3.01	37.17	38.82	74.00	7.58
14	K-851	37.99	6.51	25.87	7.25	296.50	45.16	3.31	38.22	38.38	75.75	9.70
15	G-2	33.19	7.25	38.22	8.84	318.75	64.93	3.52	39.81	37.73	76.50	11.29
16	RMG-56	41.18	6.67	28.47	6.95	284.00	71.55	2.96	36.35	37.62	73.75	8.61
17	RMG-106	22.05	7.90	22.07	6.02	208.25	66.72	2.26	31.60	34.75	65.75	4.68
18	PS-16	28.21	4.97	21.65	5.87	120.00	60.77	2.65	30.05	40.27	75.00	3.14
	Mean	31.78	6.08	23.41	6.83	242.27	31.00	2.94	35.46	37.78	74.34	7.14

Table 2: Mean, range values, Co-efficient of variance and C.D. values of different characters of mungbean varieties

Sl. No.	Name of the character	Mean	Range	C.V (%)	C.D. (P=0.05)
1	Plant height (cm)	31.78	21.19-41.87	12.33	5.56
2	Primary branches(m)	6.08	4.87-7.90	10.77	0.95
3	No. of pods	23.41	16.75-38.21	13.92	4.74
4	Length of pods(cm)	6.83	5.87-8.89	6.26	0.60
5	No. of seed per plant	243.37	120-318.75	12.17	41.94
6	Biological weight(g)	51.00	42.66-60.77	11.79	8.53
7	100-seed weight (g)	2.94	2.26-3.60	2.78	0.11
8	Sowing to flowering days 35.46	25.46	31.60-39.31	3.22	1.68
9	Flowering to maturity days	37.78	34.75-40.27	3.31	1.78
10	Sowing to maturity days	71.34	65.75-76.50	2.46	2.60
11	Economic yield per plant	7.14	3.14-11.29	11.94	1.21

Table 3: Co-efficient of variation, heritability and genetic advance for different characters of mungbean varieties

S. No.	Characters	Genotypic variance (GCV)	phenotypic variance (RCV)	Heritability% (h^2)	GA	GA as % mean	C.V.%
1	Plant height(cm)	26.78	42.15	63.53	8.49	26.71	12.33
2	Primary branches	0.74	1.19	62.18	1.39	22.86	10.77
3	No. of pods	24.51	35.71	68.63	8.45	35.92	13.92
4	Length of pods(cm)	0.38	0.56	67.85	1.06	15.52	6.26
5	No.of seeds per plant	2125.81	2999.18	70.88	79.96	32.86	12.17
6	Biological weight(g)	199.43	235.64	84.63	26.76	52.47	11.79
7	100-seed weight(g)	0.17	0.18	94.44	0.83	28.23	2.78
8	Flowering to maturity days	0.91	2.48	36.69	2.17	5.74	3.31
9	Sowing to maturity days	4.89	8.25	59.27	3.49	4.69	2.46
10	Grain yield(g)	4.25	4.98	85.34	3.92	54.90	11.94

The character primary branches in significantly and positively associated with character number of seeds per plant, highly significant and positive for the character biological weight. The yield has a significant positive association with 100-seed weight as well as to the primary branches and biological weight.

The present study supports the results of Singh/*et al*. (1973) [8] and Parida (1982) [7] with a minor fluctuation in the intensity of values. This indicates that primary branches as well as number of pods per plant is most important for selecting superior Genotype (Table IV)

Table 4: Character association at genotypic level under study

Characters	Plant height	Primary branches	No. of pods/plant	Pods length	No. of seeds/plant	Biological weight (g)	100-seed weight	Days to flowering	Days flowering to maturity	Days sowing to maturity	Grain yield
Plant height	-	0.056	0.258	0.307	-0.418	0.103	0.225	0.229	0.219	0.477	0.412
Primary branches		-	0.535	-0.667*	0.642*	0.825**	-0.657*	-0.197	-0.295	-0.863*	0.141
No. of pods per plant			--	0.642*	0.811**	0.631*	0.431	0.436	-0.029	0.068	0.309
Pod length				-	0.710	0.148	0.485	-0.338	0.773**	-0.012	0.319
No. of seeds per plant					-	0.367	0.493	0.493	0.568	-0.243	0.358
Biological weight						-	0.029	-0.229	-0.189	-0.020	0.504
100- seed weight								-0.163	0.902**	0.576	0.333
Days to flowering								-	0.472	0.548	0.267
Days flowering to maturity									-	-	0.002
Days sowing to maturity										-	0.247
Grain yield											-

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