Characterization of Mutant Lines of Mungbean [*Vigna radiata* (L) Wilczek]

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Mutation breeding is relatively quicker method for improvement of crops. The experiment comprised 32 (31 mutant lines + one parent line) lines of mungbean cv. Pusa 9072 in M_8 generation, which were isolated through appropriate selection procedure after mutagenic treatment. The analysis of variance showed significant differences for all eight morphological characters under study. The mutant AAIMM-10 recorded to be the best performer for seed yield per plant, while the mutant AAIMM-24 was taken 58 days to maturity. The higher magnitude of genotypic coefficient of variation and phenotypic coefficient of variation were recorded for seed yield per plant while moderate estimates for plant height and number of clusters per plant. The characters showed highest heritability for pod length and days to 50 per cent flowering. High genetic advance as per cent of mean was observed for seed yield per plant while moderate estimates for plant height and number of clusters per plant. It is concluded in present study that sufficient variability present in the mutant lines and there is an ample scope for genetic improvement through selection in mungbean.

Key Words: Mungbean, Mutant lines, GCV, PCV, Heritability , Genetic advance

Introduction

The pulses production of India is 15.9 million tones which is still deficit of the present consumption, *i.e.*, 17.65 million tones (Ali and Kumar, 2008). The requirements of pulses is expected to rise further mainly due to ever-increasing population and preference for pulses as the cheapest source of dietary protein. Among the pulses, mungbean [*Vigna radiata* (L.) Wilczek syn. *Phaseolus aureus* Roxb*; P. radiatus* L.] is the most important crop. It is also known as greengram and is the most widely distributed among the six Asiatic *Vigna* species. Mungbean is rich in protein (25.9%), fat (1.0-1.5%), fibre (3.5-4.5%), ash (4.5-5.5%) and carbohydrate (59-65%) and provides 334-344 k cal energy (Srivastava and Ali, 2004).

Improvement of the cultivated plants largely depends on the extent of genetic variability available within the species. Mungbean is considered rather wild as it gives low seed yield (<1 t/ha), with uneven maturity. The major constraints in achieving higher yields of this crop are due to lack of genetic variability, absence of suitable ideotypes for different cropping systems, poor harvest index and susceptibility to diseases. Broad spectrum genetic variability is pre requisite for any successful breeding programme. Besides natural genetic variation available in mungbean germplasm collections, mutagenesis as a modern device has proven useful in obtaining novel traits and creating genetic variability (Sangsiri *et al.*, 2005). Therefore, an attempt has been made to create additional genetic variability for quantitative traits in present study.

Materials and Methods

The experiment comprised 32 (31 mutant lines + one parent line) mutant lines of mungbean cv. Pusa 9072 in M_8 generation which were isolated through appropriate selection procedure after mutagenic treatment. The experiment was carried out at Allahabad Agricultural Institute-Deemed University, Allahabad during *zaid,* 2008 in randomized block design in three replications. Each genotype was grown in a plot size of 4 m^2 area with 30 x 10 cm spacing. The recommended cultural practices were adopted for the proper growth and stand of the crop. The observations were recorded on 10 randomly selected plants from each replication of each genotype for days to 50 per cent flowering, plant height (cm), number of clusters per plant, pod length (cm), number of seeds per pod, days to maturity, 100-seed weight (g) and seed yield per plant (g). The mean values were used for computation. Phenotypic coefficient of variation and genotypic coefficient of variation calculated after Burton (1952), heritability in broad sense (h^2) after Burton and Devane (1953), and genetic advance, *i.e.*, the expected genetic gain by using the procedure given by Johnson *et al.* (1955).

Results and Discussion

The analysis of variance (Table 1) showed significant differences for all eight morphological characters under

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Table 1. Analysis of variance for quantitative characters of mutants of mungbean

Characters	Mean sum squares		
	Replication (df=02)	Treatment (df=31)	Error (df=62)
Days to 50% flowering	26.84	23.41*	2.24
Plant height	27.30	196.60*	23.47
No. of cluster per plant	10.68	21.97**	4.42
Pod length	0.27	1.51*	0.13
Seeds per pod	4.61	3.75**	0.82
Days to maturity	4.13	19.53*	2.19
Seed yield per plant	5.26	105.77*	11.36
100-seed weight	0.26	0.55**	0.06

* **

study. All the characters under study indicated that there is ample scope for isolation of promising lines from present mutant lines for yield improvement. The data presented in Table 3 for mean performance of 31 mutant lines and the parent variety (Pusa-9072) for eight characters, *i.e.*, days to 50% flowering, plant height, clusters per plant, pod length, seeds per pod, days to maturity, seed yield/plant and 100-seed weight. The highest variability (Vp and Vg) was recorded for plant height (81.2 and 57.7) and seed yield per plant (42.8 and 31.5). While lowest values were observed for 100-seed weight (0.22 and 0.16), pod length (0.59 and 0.45), seeds per pod (1.79 and 0.97), days to maturity (7.97 and 5.77), and days to 50% flowering (9.29 and 7.05). The minimum variance between genotypic variance and phenotypic variance was estimated for 100-seed weight which revealed that this character is less influenced by environmental effect. Similar observations were reported by Idrees *et al* (2006).

In general estimates of phenotypic coefficient of variation (PCV) were higher than their corresponding genotypic coefficient of variation (GCV) however good correspondence was observed between GCV and PCV for all characters. A wide range of PCV was observed

Table 2. Mean performance of mutant lines derived from parent (Pusa 9072) for different characters

Accession No.	Days to 50% flowering	Plant height	No. of cluster/plant	Pod length	No. of seeds/pod	Days to maturity	100-seed weight (g)	Seed yield/ plant(g)
AAIMM-1	39.33	30.05	7.65	4.05	9.13	62.50	2.80	7.52
AAIMM-2	38.33	53.40	11.68	6.66	10.98	60.00	3.67	10.25
AAIMM-3	37.33	49.30	13.38	5.48	11.10	65.50	3.23	19.63
AAIMM-4	35.00	46.73	18.20	7.08	10.70	64.00	3.70	16.83
AAIMM-5	39.67	40.10	16.60	6.55	10.70	63.00	3.88	14.83
AAIMM-6	34.33	63.20	14.76	6.62	10.50	64.50	3.72	25.57
AAIMM-7	34.33	60.53	13.38	7.39	12.10	63.00	3.38	20.14
AAIMM-8	38.00	49.09	19.33	7.69	12.00	59.50	4.40	12.33
AAIMM-9	34.67	57.37	13.80	6.97	12.30	62.00	3.65	26.12
AAIMM-10	41.00	54.60	12.90	7.02	10.00	60.00	4.21	33.08
AAIMM-11	39.33	60.22	19.20	7.91	10.90	66.50	3.50	20.33
AAIMM-12	39.67	54.00	20.94	7.71	12.10	66.00	5.25	19.25
AAIMM-13	35.00	47.73	15.33	7.19	10.60	65.00	3.76	25.10
AAIMM-14	38.00	45.97	16.15	7.24	12.90	62.50	3.63	19.64
AAIMM-15	33.00	33.40	11.10	6.20	8.40	68.00	3.78	13.44
AAIMM-16	36.33	40.93	12.17	7.53	10.95	65.50	3.35	16.50
AAIMM-17	36.67	46.43	12.18	6.72	9.85	69.50	3.46	14.43
AAIMM-18	33.33	43.73	13.20	6.84	10.20	65.00	3.61	18.71
AAIMM-19	35.00	38.13	15.38	6.62	9.70	63.50	3.84	15.12
AAIMM-20	36.33	42.90	13.60	6.46	10.50	65.50	3.25	25.84
AAIMM-21	34.33	44.15	17.20	7.21	11.70	64.00	3.95	17.95
AAIMM-22	33.33	37.45	12.70	6.23	10.00	63.00	3.34	23.08
AAIMM-23	34.33	35.05	15.69	6.69	9.65	62.00	3.90	12.15
AAIMM-24	31.67	39.20	12.80	7.00	10.00	58.50	4.00	20.52
AAIMM-25	34.00	42.42	15.53	6.81	12.80	69.00	3.55	25.35
AAIMM-26	32.67	43.27	15.35	6.82	10.70	64.00	3.70	23.26
AAIMM-27	31.33	47.57	12.70	6.46	9.10	63.00	3.40	16.84
AAIMM-28	32.67	49.53	16.80	6.35	11.90	66.00	3.42	30.33
AAIMM-29	32.00	37.37	11.98	6.25	9.25	65.00	3.78	20.23
AAIMM-30	33.00	44.80	13.70	6.36	9.80	65.00	3.16	26.09
AAIMM-31	32.00	41.83	14.00	6.58	10.90	64.50	3.24	25.00
Parental	31.67	53.40	14.10	7.15	11.50	66.50	3.68	26.52

Table 3. Estimates of variance and genetic parameters for quantitative characters of mutant lines of mungbean

Characters		Variance						
	σ^2g	σ^2p	σ^2e	GCV	PCV	h^2 (bs)%	GA	GG
Day to 50% Flowering	7.05	9.29	2.24	7.54	8.65	75.9	4.76	13.53
Plant height	57.71	81.18	23.47	16.49	19.56	71.1	13.19	28.64
No. of cluster/plant	5.84	10.27	4.42	16.69	22.13	56.9	3.75	25.95
Pod length	0.45	0.59	0.14	10.02	11.45	76.6	1.21	18.06
Seeds/pod	0.97	1.79	0.82	9.22	12.50	54.4	1.50	14.00
Days to maturity	5.77	7.97	2.19	3.75	4.40	72.5	4.21	6.57
100 seed weight	0.16	0.22	0.06	11.11	13.00	73.1	0.71	19.58
Seed yield/plant	31.46	42.83	11.36	28.13	32.81	73.5	9.90	49.66

*h^2 (bs) = Heritability broad sense, σ^2g= Genotypic variance, σ
σ

for traits ranging from 4.40 per cent for days to maturity to 32.81 per cent for seed yield per plant. Higher magnitude of PCV was recorded for seed yield per plant (32.81 %) and followed by number of clusters per plant (22.13%). While moderate estimates observed for plant height (19.56 %), and low estimates of 100-seed weight (13.00%), seeds per pod (12.50%), pod length (11.45%), days to 50% flowering (8.65%) and days to maturity (4.40%). GCV ranged from 3.75% (days to maturity) to 28.13 (seed yield per plant). Higher magnitude of GCV was recorded for seed yield per plant (28.13%) while moderate estimates for plant height (16.49 %) and number of clusters per plant (16.69 %). The low estimates of GCV values was observed in days to maturity (3.75 %), days to 50 per cent flowering (7.54%), seeds per pod (9.22%), pod length (10.02%) and 100-seed weight (11.11). Relatively low magnitudinal differences were observed between GCV and PCV for 100-seed weight, days to 50 per cent flowering, pod length, seeds per pod and days to maturity. This indicates less environmental influence in the expression of these attributes. Relatively high differences between GCV and PCV were observed for seed yield per plant, and number of clusters per plant. These findings suggested that greater influence of the environment in the expression of these traits. Rao *et al.* (2006) reported that the high magnitudinal differences between GCV and PCV for seed yield per plant and number of clusters per plant, whereas, environmental coefficient of variation contributed more in the expression of these characters.

High heritability was observed for traits *viz*. pod length (76.6%) and days to 50 per cent flowering (75.9%). According to Panse (1957) such characters governed predominantly by additive gene action and could be improved through individual plant selection. Similar results were reported by Anwari and Sochendi (1999), Kumar *et al.* (2003), Idrees *et al.* (2006). The values of genetic advance as percent of mean were observed for plant height (13.19%), seed yield per plant (9.90%), days to 50 per cent flowering (4.76%), days to maturity (4.21%), Number of clusters per plant (3.75%), seeds per pod (1.50%), pod length (1.21%) and 100-seed weight (0.71%). All the characters studied showed the low genetic advance. A character exhibiting high heritability may not necessarily give high genetic advance. Johnson *et al.* (1955) reported that high heritability should be accompanied by high genetic advance to arrive at more reliable conclusion. Highest genetic advance as per cent of mean was observed for seed yield per plant (49.66) while moderate for plant height (28.64%) and number of clusters per plant (25.95%). The 100-seed weight, pod length, seeds per pod, days to 50 per cent flowering and days to maturity have low estimates of genetic advance as per cent of mean.

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