

GENETIC VARIABILITY, CORRELATION AND PATH ANALYSIS IN MUNGBEAN (*Vigna radiata* (L.) WILCZEK)

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ABSTRACT

The estimates of genotypic coefficient of variability, heritability and genetic advance were high for seed yield per plant, 100-seed weight, number of seeds per pod, number of pods per plant and number of nodes on main stem. The estimates of correlation revealed that seed yield had positive and significant correlation with number of pods per plant, 100-seed weight, days to first picking maturity, primary branches per plant and number of pods per cluster. Path coefficient analysis indicated that number of pods per plant, number of seeds per pod, number of clusters per plant had maximum direct contribution on seed yield.

KEYWORDS : Mungbean, genetic variability, heritability, path analysis

Mungbean (*Vigna radiata* (L)Wilczek) is an important pulse crop of India grown in an area of 2.53 m. ha with 0.86 m.t. production and productivity 340 kg/ha (Anonymous, 2003). Yield is a complex character associated with various contributing characters which are interrelated among themselves. For developing suitable selection strategy the knowledge of genetic variability present in the available germplasm for yield and its associated characters is important. To accumulate optimum contribution of yield contributing characters, it is essential to know the association of various characters along with path coefficients. The present study was undertaken to examine the nature and magnitude of genetic variability and association among characters in mungbean.

MATERIALS AND METHODS

The experimental material comprising of 64 genotypes (8 Parents viz. Pusa baisakhi, Pant mung-2, Pant M-3, Pusa bold (visal), Pusa-105, ML-613, Narendra mung-1 and P.S.-16 and their diallel F1 cross and F2) were grown in a randomized block design with three replications at Crop Research Farm, Post Graduate College, Ghazipur, U.P. India, during Kharif 2011-2012. Each plot consisted of two rows of three meter length with plant to plant and row to row 10 cm and 30 cm respectively. Data were recorded on five randomly selected plants in each row for the characters viz. days to 50% flowering, days to first picking maturity, plant height (cm), primary branches per plant, number of nodes on main stem, number of clusters per plant, number of pods per cluster, pod length (cm), number of pods per plant,

number of seeds per pod, 100-seed weight (g), protein content in seeds and seed yield per plant (g). The mean values were used for estimation of genotypic and phenotypic coefficients of variation, heritability in broad sense and genetic advance as percentage of mean according to Johnson et al., (1955). Correlation and path analysis according to Dewey and Lu,(1959).

RESULTS AND DISCUSSION

The analysis of variance revealed highly significant differences among all the genotypes for all characters. Johnson et al., (1955) has suggested that GCV together with heritability would give best picture of amount of advance to be expected from selection. Seed yield per plant, 100 seed weight, number of seeds per pod, number of pods per plant, 100-seed weight, number of seeds per pod, number of pods per plant and number of nodes on main stem exhibited high estimates of GCV, PCV heritability, genetic advance and genetic advance as percentage of mean (Table,1). These traits can be used for selection as they respond well because of their high genetic variability. Parameswarappa, (2005) indicating that mungbean seed yield expressed high genetic advance coupled with high heritability and genotypic coefficient of variation. High heritability with low GCV, PCV and genetic advance were observed for days to 50% flowering and days to first picking maturity (Table,1). High heritability with moderate genetic advance, GCV, PCV for number of nodes on main stems, clusters per plant, plant height and number of pods per cluster indicate their limit scope in the improvement

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Table 1: Estimation of grand mean, range, coefficient of variation. Heritability, Genetic advance and genetic advance as percentage of mean for different characters of mungbean

Character	Grand Mean	Range	Coefficient of variation		Heritability	Genetic advance	Genetic advance at % of Mean
			GCV	PCV			
Days to 50% Flowering	37.19	34.33 - 42.67	4.36	4.76	0.839	3.06	8.22
Day to first picking maturity	69.61	62.89 - 73.11	2.83	3.16	0.803	3.64	5.22
Plant height	40.92	39.44 - 44.78	2.42	2.95	0.675	1.68	4.10
Primary branches/ plant	3.13	2.22 - 3.89	11.74	16.33	0.517	0.54	17.25
No. of Nodes on main stem	6.82	5.44 - 8.22	8.46	10.69	0.626	0.94	13.78
No. of Clusters/ plant	14.81	11.89 - 17.33	7.14	8.61	0.689	1.81	12.22
No. of Pods/ Cluster	4.11	2.89 - 5.34	12.36	16.70	0.548	0.77	18.73
Pod length	7.11	6.33 - 7.90	4.53	7.69	0.347	0.39	5.48
No. of Pods/ plant	57.25	42.00 - 63.88	9.45	9.62	0.966	10.96	19.14
No. of Seeds/ pod	6.52	5.21- 8.33	10.33	13.30	0.604	1.08	17.28
100 seed weight	3.18	2.00-4.13	11.31	14.18	0.637	0.59	18.55
Protein content in seed	21.21	20.16 - 22.67	2.75	3.64	0.571	0.91	4.29
Seed yield/ plant	12.97	06.93 -16.40	18.10	18.78	0.929	4.66	35.92

through selection due to presence of moderate variability.

Table,2 represents the genotypic and phenotypic correlations between all pairs of characters. It was observed that genotypic correlations were greater than phenotypic correlations in all most the cases indicating that the environmental influences were not marked enough to alter the degree of association all the characters. Seed yield per plant possessed highly significant positive correlation with number of pods per plant, 100 seed weight, days to first picking maturity, primary branches per plant and number of pods per cluster. Days to 50% flowering showed positive significant correlation with days to first picking maturity. Similarly protein content had negative and significant correlation with number of clusters per plant; number of pods per plant with days to 50% flowering, days to first picking maturity and pod length; number of clusters per plant with days to 50% flowering. Similar result have been reported by Rahman et al,(2003) ;Ahmed et al. ,(1981);Prakash ,(2006); Verma and Garg (2007).

Path coefficient analysis revealed that the trait, number of pods per plant had high positive direct effect on seed yield followed by number of seeds per pod and days to 50% flowering (Table-3). These traits also recorded strong positive correlation with seed yield per plant which are in accordance with the result of Rao et al., (2006). The residual effect is low (0.214) indicating appropriateness of characters chosen. Number of clusters per plant, pod length, days to first picking maturity and protein content had negative direct effects.

Days to First picking maturity, plant height, primary branches per plant, number of pods per cluster, 100 seed weight, protein content in seed recorded high positive indirect effect on seed yield via number of pods per plants. These findings are in agreement with Rao et al. (2006), Verma and Garg (2007), Prakash (2006). Hence number of pods per plant, days to first picking maturity, primary branches per plant, number of pods per cluster and 100-seed weight are the most important yield contributing

Table 2: Genotypic(G) and Phenotypic (P) correlation among the 13 characters in mungbean

Character	Days to first picking maturity	Plant height	Primary branches/plant	No. of nodes on main stem	No. of Clusters/plant	No. of Pods/cluster	Pod length	No. of Pods/plant	No. of Seeds/pod	100 seed weight	Protein content in seed	Seed yield / Plant
Days to 50% Flowering	G	-0.001	-0.217	0.174	-0.475**	-0.247*	0.341**	-0.372**	0.006	0.151	0.188	-0.252*
	P	0.395**	-0.114	0.135	-0.364**	-0.191	0.236	-0.335**	0.001	0.124	0.119	-0.216
Days to first picking maturity	G	-0.187	-0.276*	0.291*	0.039	-0.205	0.377**	-0.564**	-0.025	0.428**	0.038	0.558**
	P	-0.133	-0.163	0.216	0.034	-0.191	0.156	-0.497**	0.002	0.318*	0.048	0.454**
Plant height	G		0.239	0.140	-0.196	0.300*	0.260*	0.263*	0.138	-0.083	0.203	0.286*
	P		0.129	0.135	-0.127	0.119	0.075	0.209	0.097	-0.035	0.126	0.243
Primary branches/plant	G			0.097	0.074	0.386**	-0.036	0.302*	0.050	-0.199	0.106	0.402**
	P			0.080	0.091	0.200	0.091	0.215	0.020	-0.111	0.045	0.265*
Number of nodes on main stem	G				0.076	0.168	0.437**	-0.159	0.289*	0.198	-0.082	-0.064
	P				0.062	0.045	0.208	-0.123	0.133	0.096	-0.050	-0.027
No. of Cluster/plant	G					0.211	-0.244	0.065	-0.164	0.034	0.371**	-0.024
	P					0.144	-0.116	0.060	-0.051	0.044	0.262*	-0.038
No. of Pods/cluster	G						0.128	0.305*	0.065	-0.175	-0.059	0.361**
	P						0.090	0.225	0.029	-0.097	-0.065	0.265*
Pod length	G							-0.452**	-0.101	0.418**	-0.197	0.369**
	P							-0.252*	-0.010	0.126	-0.124	-0.216
No. of Pods/plant	G								-0.016	0.489**	0.203	0.905**
	P								-0.017	0.379**	0.147	0.854**
No. of Seeds/pod	G									0.054	0.018	0.176
	P									0.086	0.011	0.151
100 seed weight	G										-0.156	0.470**
	P										-0.06	0.344**
Protein content in seed	G											0.217
	P											0.148

* Significant at 5% level of significance, ** Significant at 1% level of significance

Table 3: Direct and indirect effects among their characters towards seed yield in mungbean

Characters	Days to 50% Flowering	Days to first picking maturity	Plant height	Primary branches/plant	No. of nodes on main stem	No. of Clusters/plant	No. of Pods/cluster	Pod length	No. of Pods/plant	No. of Seeds/pod	100 seed weight	Protein content in seed	G & P Correlation with yield/plant
Days to 50% Flowering	G	0.160	0.000	-0.025	-0.005	-0.023	-0.011	0.035	-0.328	0.001	-0.004	0.008	-0.252*
	P	0.078	0.000	-0.009	0.008	0.027	-0.013	-0.013	-0.273	0.001	-0.003	-0.001	-0.216
Days to first picking maturity	G	0.078	0.012	-0.032	-0.008	0.002	-0.009	0.039	0.497	-0.005	-0.012	0.002	0.558**
	P	0.031	-0.045	-0.013	0.013	-0.003	-0.013	-0.008	0.405	0.000	-0.008	0.000	0.454**
Plant height	G	0.000	0.024	0.028	-0.004	-0.009	0.014	0.027	0.232	0.029	0.002	0.009	0.286*
	P	0.000	0.006	0.021	0.010	0.008	0.008	-0.004	0.170	0.015	0.001	-0.001	0.243
Primary branches/plant	G	-0.035	0.035	0.115	-0.003	0.004	0.018	-0.004	0.226	0.011	0.005	0.005	0.402**
	P	-0.009	0.007	0.003	0.077	0.005	-0.007	-0.005	0.175	0.003	0.003	0.000	0.265*
Number of nodes on main stem	G	0.028	-0.037	0.011	-0.026	-0.004	0.008	0.045	-0.140	0.061	-0.005	-0.004	0.064
	P	0.011	-0.010	0.003	0.058	-0.005	0.003	-0.011	-0.100	0.020	-0.002	0.000	-0.027
No. of Cluster/plant	G	-0.076	-0.005	0.013	-0.002	0.048	0.010	-0.025	0.057	-0.035	-0.001	-0.016	-0.024
	P	-0.029	-0.002	-0.003	0.004	-0.074	0.010	0.006	0.049	-0.008	-0.001	0.002	-0.038
No. of Pods/cluster	G	0.040	0.026	-0.020	-0.004	0.010	0.046	0.013	0.268	0.014	0.005	-0.003	0.361**
	P	-0.015	0.009	0.003	0.003	-0.010	0.070	-0.005	0.180	0.004	0.002	0.000	0.256*
Pod length	G	-0.055	-0.048	-0.017	-0.011	-0.012	0.006	0.103	-0.399	-0.022	-0.012	-0.009	-0.369**
	P	-0.019	-0.007	0.002	0.012	0.009	0.006	-0.054	-0.205	-0.002	-0.003	0.001	-0.216
No. of Pods/plant	G	-0.060	0.072	-0.017	0.004	0.003	0.014	-0.046	0.881	-0.003	0.014	0.009	0.905**
	P	-0.026	0.022	0.004	0.016	-0.007	-0.004	0.014	0.841	-0.003	0.009	-0.001	0.854**
No. of Seeds/pod	G	0.001	0.003	-0.009	0.006	-0.008	0.003	-0.010	-0.014	0.213	-0.001	0.001	0.176
	P	0.000	0.000	0.002	0.002	0.004	0.002	0.001	-0.014	0.149	-0.002	0.000	0.151
100 seed weight	G	0.024	-0.054	0.005	-0.005	0.002	-0.008	-0.043	0.431	0.011	-0.028	-0.007	0.470**
	P	0.010	-0.014	-0.001	-0.008	0.006	-0.003	-0.007	0.308	-0.013	0.024	0.000	0.344**
Protein content in seed	G	0.030	-0.005	-0.013	0.002	-0.018	-0.003	-0.020	0.179	0.004	0.004	0.044	0.217
	P	0.009	-0.002	0.003	-0.003	0.019	-0.005	0.007	0.119	0.002	0.001	-0.006	0.148

Residual (G) = 0.1057 Residual (P) = 0.2147

* significant at 5% level of significance, ** significant at 1% level of significance

Bold diagonal figures are the direct effects;

components as they recorded high direct and indirect effects towards seed yield in mungbean.

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