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Genetic Variability, Correlation and Path Analysis in Mungbean

Md. Motiar Rohman, [1]A.S.M. Iqbal Hussain,
[2]Md. Saykhul Arifin, [3]Zerin Akhter and [3,4]Mirza Hasanuzzaman
Plant Breeding Division, Bangladesh Agricultural Research Institute,
Joydebpur, Gazipur-1701, Bangladesh
[1]Department of Agronomy, Patuakhali Science and Technology University, Patuakhali, Bangladesh
[2]Department of Agriculture Extension, Bangladesh
[3]Department of Genetics and Plant Breeding, Bangladesh Agricultural University, Mymensingh, Bangladesh
[4]Entomology Division, Bangladesh Rice Research Institute, Joydebpur, Gazipur-1701, Bangladesh

Abstract: Phenotypic and genotypic variance, coefficient of variance, heritability, genetic advances, correlation coefficient and path coefficient analysis were conducted for yield and yield components in 82 genotypes of mungbean. High heritability estimates coupled with high genetic advance were observed for seed yield/plant, 100 grain weight, plant height, seed/pod and days to flowering. Yield was positive and significantly correlated with pod/plant, seed/pod and 100 grain weight. Pod/plant, seed/pod and 100 grain weight contributed maximum positive and direct effect on yield indicating these two traits should be given emphasis while selecting high yielding mungbean cultivar for rainfed conditions.

Key words: Genetic variability, correlation, path, mungbean, Bangladesh

INTRODUCTION

Mungbean (*Vigna radiata* (L.) Wilczek.) ranks fifth position in acreage and production among the pulse crops in Bangladesh (BARI, 2000). Mungbean is one of the most important pulse crops grown in Bangladesh for its easy digestibility, good flavour and high protein content. It may play a vital role to supplement protein, cereal base low protein diets of the people of Bangladesh. But due to the expansion of high yielding varieties of wheat and rice, the acreage and production of this crop are steadily declining (Hassan *et al.*, 1995). Production of high yielding varieties of wheat and winter rice, low inherent yield potential and late maturity habit of existing cultivars of this crop are the probable causes for declining in area and production of mungbean. On the other hand, early maturing photo neutral mungbean genotypes can play a vital role in halting declining of acreage because such type of varieties will be suitable for the existing cropping patterns. To overcome such situation, genetically stable genotype having high yield potential are urgently needed. The traits that contribute to yield and are suitable genetically can be identified by variability, correlation and path coefficient analysis between grain yield and yield components. Knowledge on genetic variability and character association are therefore, prerequisites for the improvement of this crop.

MATERIALS AND METHODS

Eighty two local and exotic genotypes and varieties of mungbean were grown at Bangabhandu Sheik Mujibur Rahman Agricultural University, Salna, Gazipur during the period April to June, 2001. The experiment was conducted under polythene shade to protect rain. The seeds were sown in a RCB design with three replications and a spacing of 30 cm row to row and 5 cm plant to plant. There were 2 rows, each 5m long, within each plot. N, P and K fertilizers were applied as basal at the rate of 40-60-20 kg ha^{-1}, respectively. No irrigation was applied except for germination. Normal intercultural operations were done as and when necessary. Data were recorded from 10 plants randomly selected from the plot of each replication on days to flowering, days to maturity, plant height, number of pod/plant, number of seed/pod, 100 grain weight and seed yield/plant. Genotypic and phenotypic variance and coefficient of variance, heritability, genetic advance, genotype correlation coefficients were estimated using the formula suggested by Singh and Choudhury (1979) and Al-Jibouri *et al.* (1958). Path co-efficient analysis was done following the method used by Dewey and Lu (1959).

RESULTS AND DISCUSSION

Significant differences were found among the genotypes for the characters studied. Relatively higher

Table 1: Estimation of genetic parameters for yield and components in mungbean

Characters	Variance		CV		Heritability	Genetic Advance (1%)	Genetic Advance (1%) in % mean
	Genotypic	Phenotypic	Genotypic	Phenotypic			
Days to flowering	6.87	7.96	7.13	7.67	86.28	6.43	17.48
Days to maturity	6.13	6.67	4.86	5.07	91.86	6.26	12.29
Plant height (cm)	138.68	158.22	16.48	17.61	87.65	29.11	40.74
Pod/plant	10.56	73.94	9.94	26.29	14.29	3.24	9.92
Seed/pod	0.74	1.16	8.42	10.55	63.60	1.81	17.72
100 grain wt (g)	1.13	1.15	26.19	26.34	98.86	2.80	68.70
Seed yield/plant (g)	2.66	2.88	30.01	31.23	92.31	4.13	76.12

Table 2: Genotypic (G) and phenotypic (P) correlations among seven characters in mungbean genotypes

Characters		Days to Maturity	Plant Height cm)	Pod/Plant	Seed/Pod	100 Grain Wt (g)	Seed Yield/Plant (g)
Days to Flowering	G	-0.974**	0.364**	0.043	0.453	-0.284	-0.370
	P	-0.699**	0.336**	0.027	0.358	-0.259	-0.338
Days to Maturity	G		0.475**	-0.116	0.272**	-0.286**	0.0978
	P		0.441**	-0.075	0.212**	-0.274**	-0.067
Plant Height(cm)	G			0.183**	0.107	-0.417**	-0.166**
	P			0.049	0.091	-0.292**	-0.010
Pod/Plant	G				0.566**	-0.008	0.639**
	P				0.372**	-0.007	0.333**
Seed/Pod	G					-0.508**	0.280**
	P					-0.421**	0.107
100 Grain Wt(g)	G						0.401**
	P						0.148*

Table 3: The genotypic path coefficient analysis showing direct (bold) and indirect effects of seven characters in mungbean

Characters	Days to flowering	Days to maturity	Plant height (cm)	Pod/plant	Seed/pod	100 grain wt (g)	Correlation with seed yield (g)
Days to flowering	-0.14957	-0.161591	-0.060303	0.023974	0.0114882	-0.13823	-0.370838**
Days to maturity	0.145725	0.165855	-0.078686	-0.064696	0.068903	-0.139228	0.097873
Plant height (cm)	-0.05443	0.078755	-0.16571	0.101901	0.027166	-0.202792	-0.16646**
Pod/plant	-0.006447	-0.019292	-0.03036	0.556190	0.143485	-0.003838	0.639738**
Seed/pod	-0.067828	0.045111	-0.01777	0.315024	0.253329	-0.247306	0.28056**
100 grain wt (g)	0.042499	-0.047466	0.069076	-0.004388	-0.128780	0.486487	0.400852**

* and ** indicate significant at 5% and 1% level respectively, Residual effect=0.518

value of genotypic variance were found for plant height the genotypic coefficient of variation was the highest for seed yield/plant followed by 100 grain weight and plant height and the lowest for days to maturity (Table 1).

Choudhury *et al.* (1988) reported similar results. The difference in magnitudes in between genotypic and phenotypic variances was high for pod/plant and plant height in comparison to others indicating large environmental influence on these characters. A higher heritability estimate associated with good estimates of genetic advance expected in the next generation for 100 grain weight, seed yield\plant, days to maturity, plant height, days to flowering indicated that these characters are governed by additive gene affects to a greater extent. In case of expected genetic advance at 1% selection intensity expressed in percentage of population mean, the range was 9.92% for pod/plant to 76.12% for seed yield. Higher genetic advance associated with high heritability value indicated additive gene effect in controlling the characters and had considerable value to the breeder for plant selection (Panse, 1957). In the present observation, such characters were: seed yield/plant, 100 grain weight, plant height, days to flowering and seed/pod.

In most of the cases, the genotypic correlation coefficients were slightly higher in magnitude than the phenotypic correlation coefficients indicating a fairly strong association between the characters studied (Table 2). The study was conducted under rainfed conditions therefore, these results are also significant under rainfed condition. Seed yield showed strong positive genotypic and phenotypic correlation with pod/plant, 100 grain weight and seed/pod. Days to flowering had strong positive association with plant height and seed/pod in both genotypic and phenotypic level and also showed strong negative association with days to maturity, 100 grain weight and seed yield in both level. Days to maturity showed significant positive genotypic and phenotypic correction with plant height and negative association with 100 grain weight and also showed positive genotypic association with seed/pod. Plant height showed negative correlation with 100 grain weight in both genotypic and phenotypic levels. Same result was reported by Rahman *et al.* (2002). Significantly positive genotypic and phenotypic correlation was observed with pod/plant. The strong genotypic correlation may be attributed to the close linkage of genes controlling recessive characters (Mather and Harrison, 1949). Negative significant association was observed between seed weight and number of seed/pod. Similar result was reported by Ahmed *et al.* (1981), Shamsuzzaman *et al.* (1963); Ali and Shaikh (1987); Sandhu *et al.* (1997) and Hassan *et al.* (1995). Ahmed *et al.* (1981) found number of pods/plants and secondary branches/plant positively and significantly correlated with seed yield. Shamsuzzaman *et al.* (1983) showed that number of pods/plant, primary branches/plant and number of seeds/pod had significant positive correlation with yield/plant, while days to maturity and 100 seed weight were negatively correlated with seed yield.

The genotypic correlation coefficients were partitioned into direct and indirect effects by various yield contributing characters (Table 3). Coefficient analysis showed that pod/plant had maximum direct effect (0.556190) followed by 100 grain weight (0.486487), seed/pod (0.253329) and days to maturity (0.165855) on seed yield. Hassan *et al.* (1995) reported positive direct effect on seed yield with days to flowering, days to maturity, number of pods/plant number of seeds/pod and seed weight. Days to flowering (-0.14957) and plant height (-0.16571) showed negative direct effect on yield. The negative correlation of both the characters with grain yield was largely a reflection of negative indirect effect through most of the causal variables. Days to maturity showed positive direct effect (0.165853). The indirect effect of days to maturity through 100 grain weight and days to flowering inhibit each other. The highly significant and positive correlation of pod/plant was found with seed yield due to their highest positive direct effect and indirect positive effect via seed/pod and seed/pod respectively. 100 grain yield showed medium positive direct effect and their genotypic correlation with seed yield was significant.

Considering the interrelationships studied and path analysis of various component characters with seed yield and among themselves, it is clear that pod/plant, 100 grain weight, seed/pod and days to maturity weight are important traits for yield improvement of mungbean.

The value (0.518) of the residual effect is high because the experiment was conducted under rainfed condition. Similar result was also reported by Ashraf *et al.* (2002).

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