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Correlation and Path Coefficient Analysis in Some Promising Lines of Mashbean (*Vigna mungo*)

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Abstract: Correlation and path coefficient in 25 local and exotic genotypes of mashbean (*Vigna mungo* L.) were studied to find important traits contributing towards grain yield. Observations were taken on plant height, number of branches per plant, number of pods per plant, number of seeds per pod, 100-grain weight, biological yield per plant, harvest index and grain yield per plant. All these characters were positively and highly significantly associated with grain yield except harvest index, which showed highly significant but negative correlation with grain yield. Harvest index had maximum direct effect on grain yield followed by biological yield per plant. Direct effect of plant height, number of pods per plant and 100-grain weight on grain yield was small but great indirect effects via biological yield resulted in their highly significant correlation with grain yield. Biological yield as well as all the above traits may be exploited in selecting high yielding cultivars in mashbean.

Key words: Correlation, mashbean, *Vigna mungo*, path analysis, selection criteria, interrelationship

Introduction

Devising the most suitable and accurate selection criteria for the desirable yield components in crop plants is key to improvement in yield. Dewey and Lu (1959) demonstrated the validity of path analysis in effective plant selection that results in selection of desirable genotypes. Yield contributing characters like number of clusters per plants, 1000 grain weight, pods per plant and number of seeds per pod qualify as the indices for selection of genotypes in breeding programme of mungbean (Zubair and Srinives, 1986). In mashbean number of pods per plant,1000-grain weight, pod length and biological yield were considered very important for more grain yield by Kasundra *et al.* (1995). Highest positive direct effects of number of pods per plant and number of seeds per pod towards grain yield per plant were reported by Ram *et al.* (1997). Yaqoob *et al.* (1997) reported number of clusters had maximum effect on seed yield followed by days to flowering and number of pods per plant. Rehman *et al.* (1998) strongly recommended harvest index as selection criterion for highest grain yield in mungbean. Abbas (1999) suggested selection in lentil on the basis of plant height, number of pods per plant and 100 grain weight. The tall varieties may produce high grain yield (Niazi *et al.*, 1999). Sharma (1999) reported number of seeds per plant as major yield contributing character.

Materials and Methods

Twenty five genotypes of mashbean (*Vigna mungo* L.), having local and exotic origin, were grown in a randomized complete block design with 3 replications in experimental fields of the National Agricultural Research Centre, Islamabad. Six rows of 5 m length were planted in each plot by keeping 30 and 10 cm spacings between and within rows, respectively. All cultural practices were followed according to the recommendations. At maturity, data were recorded on plant height (cm), number of branches per plant, number of pods per plant, number of seeds per pod, grain yield per plant (g), 100-grain weight (g), biological yield per plant (g) and harvest index (%) on ten competitive plants selected randomly from four middle rows. The data recorded on the above mentioned characters were statistically analyzed for the variance and covariance using the method given by Steel and Torrie (1980). Duncan's Multiple Range Test (DMRT) was applied to compare the mean values of all the genotypes. Phenotypic and genotypic correlation coefficients were calculated utilizing the procedure described by Kwon and Torrie (1964). Path coefficient analysis was performed according to the method explained by Dewey and Lu (1959) by solving simultaneous equations using genotypic correlations.

Results and Discussion

The analysis of mean squares revealed highly significant ($p < 0.01$) differences for all characters under study (Table 1). Phenotypic and genotypic correlation coefficients between yield and its components and among the components themselves were computed and presented in Table 2. The correlation coefficient of grain yield was highly significant and positive with all the characters except with harvest index where it was negative.

Table 1: Analysis of variance for different characters in mashbean (mean squares)

Source of variance	df	Plant height (cm)	Number of branches plant^{-1}	Number of pods plant^{-1}	Number of seeds pod^{-1}	100-grain weight (g)	Biological yield plant^{-1} (g)	Harvest index (%)	Grain yield per plant (g)
Treatments	24	293.55**	6.131**	84.329**	0.275**	0.928**	129.688**	100.247**	5.329**
Replications	2	21.76	0.323	3.833	0.014	0.044	0.289	31.31	0.384
Error	48	8.48	0.291	6.737	0.015	0.03	1.188	13.881	0.2

* Significant at 5% probability level. ** Significant at 1% probability level.

Table 2: Genotypic (G) and phenotypic (P) correlation among yield and yield components of mashbean

	No. of branches plant^{-1}	No. of pods plant^{-1}	No. of seed pod^{-1}	100-grain weight (g)	Biological yield plant^{-1} (g)	Harvest index (%)	Grain yield per plant (g)
Plant height (cm)	(G)-0.1035	(G)0.1253	(G)0.2272	(G)0.7919**	(G)0.8163**	(G)-0.7293**	(G)0.6291**
	(P)-0.0567	(P)0.1126	(P)0.2059	(P)0.7176**	(P)0.7701**	(P)-0.5475**	(P)0.5807**
No. of branches plant^{-1}		(G)0.1288	(G)0.033	(G)-0.0889**	(G)0.1003**	(G)-0.0971**	(G)0.0227**
		(P)0.0847	(P)0.0317	(P)-0.0841**	(P)0.11**	(P)-0.0932**	(P)0.0282**
No. of pods plant^{-1}			(G)0.0012	(G)0.1228**	(G)0.5483**	(G)-0.1602**	(G)0.6874**
			(P)0.0042	(P)0.141**	(P)0.4802*	(P)-0.0034**	(P)0.6285**
No. of seeds pod^{-1}				(G)0.3155*	(G)0.1162**	(G)0.1632**	(G)0.2476**
				(P)0.2469*	(P)0.1043*	(P)0.1158**	(P)0.2128**
100-grain weight (g)					(G)0.7472**	(G)-0.5299**	(G)0.6438**
					(P)0.6924**	(P)-0.3599**	(P)0.5812**
Biological yield per plant (g)						(G)-0.7584**	(G)0.8332**
						(P)-0.624**	(P)0.7792**
Harvest index (%)							(G)-0.3235**
							(P)-0.0739**

Table 3: Direct (highlighted) and indirect effects of different characters on grain yield per plant in mashbean (*Vigna radiata* L.) genotypes

	Plant height (cm)	No. of branches plant^{-1}	No. of pods plant^{-1}	No. of seeds pod^{-1}	100-grain weight (g)	Biologica yield plant^{-1} (g)	Harvest index (%)	Genotypic correlation with grain yield r(G)
Plant height (cm)	**0.2856**	0.000	0.0389	-0.0134	0.024	0.752	-0.4915	0.6291**
No. of branches plant^{-1}	-0.0285	**-0.003**	0.0297	-0.0019	-0.0016	0.00912	-0.0654	0.0227**
No. of pods plant^{-1}	0.0385	0.000	**0.2394**	-0.0001	0.0072	0.4984	-0.1079	0.6874**
No. of seeds pod^{-1}	0.0626	0.000	0.0003	**-0.0589**	0.0056	0.1057	0.1100	0.2476**
100-grain weight (g)	0.2283	0.000	0.0283	-0.0186	**0.0176**	0.679	-0.3224	0.6438**
Biological yield plant^{-1} (g)	0.02250	0.000	0.1263	-0.0068	0.0132	**0.909**	-0.5111	0.8332**
Harvest index (%)	-0.201	0.000	-0.0369	-0.0096	-0.0092	-0.6894	**0.6739**	-0.3235**

* Significant ** Highly significant

Similar results were reported in mungbean by Ghafoor *et al.* (1990). Plant height had positive and highly significant correlation with biological yield. Number of branches showed highly significant and positive association with biological yield while negative and highly significant with 100-grain weight and harvest index. Ajmal and Hassan (2002) also showed positive and significant correlation between number of branches and biological yield. Number of pods per plant had highly significant, positive correlation with 100-grain weight and biological yield per plant but negative with harvest index. Ghafoor *et al.* (1990) also reported positive and highly significant correlation between number of pods per plant and biological yield per plant. 100-grain weight showed highly significant and positive association with biological weight while highly significant and negative with harvest index. These results were not in conformity with those of Amanullah and Hatam (2000).

The picture became more refined when correlation coefficients were partitioned into direct and indirect effects by path analysis (Table 3). Harvest index had maximum direct effect on grain yield followed by biological yield per plant. The results are in close agreement with those of Ghafoor *et al.* (1990) and Yaqoob *et al.* (1997). Direct effect of plant height, number of pods per plant and 100-grain weight on grain yield was small but great indirect effects via biological yield resulted in their highly significant correlation with grain yield. The results are in harmony with those of Zubair and Srinives (1986) and Abbas (1999). Similarly in case of number of branches per plant, credit of highly significant correlation goes to indirect effects via number of pods and biological yield because direct effect of this character was negative and negligible. Number of seeds per pod had negative direct effect on grain yield, however, large positive indirect effect via biological yield and harvest index had converted the correlation coefficient into positive. All the above facts indicate clearly and emphatically that biological yield should be given maximum importance with close consideration of plant height, number of pods per plant, number of seeds per pod, 100-grain weight and number of branches per plant during the selection procedure aimed at improvement of mashbean crop.

References

Abbas, Z., 1999.Correlation and path analysis in lentil. M.Sc. Thesis, Department of Plant Breeding and Genetic. University of Arid Agriculture, Rawalpindi, Pakistan.

Ajmal, S. and M. Hassan, 2002. Association analysis for certain plant characteristics in some local and exotic strains of mungean (*Vigna radiata* L.). Asian J. Pl. Sci., 1: 697-698

Amanullah and M. Hatam, 2000. Correlation between grain yield and agronomic parameters in mungbean (*Vigna radiata*). Pak. J. Biol. Sci., 3: 1242-1244.

Dewey, D.R. and K.H. Lu, 1959. A correlation and path coefficient analysis of components of crested wheat grass seed production. Agron. J., 51: 515-518.

Ghafoor, A., M. Zubair and B.A. Malik, 1990. Path analysis in mash (*Vigna mungo* L.). Pak. J. Bot., 22: 160-167.

Kasundra, J.K., K.V. Pethani and K.B. Kathiria, 1995. Studies on genetic variability, correlation and path analysis in urdbean. Indian J. Pulses Res., 8: 113-118.

Kwon, S.H. and J.H. Torrie, 1964. Heritability and inter-relationship of traits of two soybean populations. Crop Sci., 4: 196-198.

Niazi, I.U.K., A.A. Khan and A.V. Haq, 1999. Path coefficient analysis of agronomic characters affecting seed yield in *Vigna radiata* (L.) Wilezek J. Gene. Breed., 53: 63-65.

Ram, R.G., R. Rajkumar, P.G. Nayagam and R. Rathanswamy, 1997. Variability and association analysis of yield components in green gram. Madras Agric. J., 84: 469-470.

Rehman, A., M.S. Bhatti, K. Naz and K. Mehmood, 1998. Correlation studies in mungbean. J. Agric. Res., 36: 31-34.

Sharma, R.N., 1999. Heritability and character association in non-segregating population of mungbean (*Vigna radiata*). J. Interacademicia, 3: 5-10.

Steel, R.G.D. and J.H. Torrie, 1980. Principles and Procedures of Statistics. A biometerical approach. 2nd Ed. McGraw Hill Co. New York, pp: 180-190.

Yaqoob, M., H.V. Khan, A.J. Malik, K. Nawab and B.A. Malik, 1997. Path co-efficient analysis in some mungbean [*Vigna radiata* (L.) Wilezek] mutants. Sarhad J. Agric., 13: 277-281.

Zubair, M. and P. Srinives, 1986. Path coefficient analysis in mungbean (*Vigna radiata*). Thai J. Agric. Sci., 19: 181-188.