

CORRELATION AND PATH COEFFICIENT ANALYSIS OF FOURTEEN DIFFERENT GENOTYPES OF LABLAB BEAN (*Lablab purpureus* L.)

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ABSTRACT

Fourteen genotypes of Lablab bean were studied for sixteen yield and yield contributing characters. The experiment was conducted at Field Laboratory of Department of Genetics and Plant Breeding, Bangladesh Agricultural University, Mymensingh. Seed yield per plant showed positive and significant correlation with days to maturity, number of raceme per plant, raceme length, pod length, green pod yield per plant, green test weight and shelling percentage and significant negative correlation with days to maturity, number of seeds per pod and protein content at both phenotypic and genotypic levels. Path analysis revealed that green pod length exhibited high positive direct effect on number of raceme per plant, raceme length, green pod width, dry test weight and shelling percentage. The direct negative effects on seed yield were observed by days to maturity, number of flower buds per raceme, green pod yield per plant, green test weight and protein content and revealed the importance of these traits for simultaneous selection of plant for yield improvement.

Keywords: Lablab bean; correlation; path coefficient analysis.

INTRODUCTION

Lablab bean (*Lablab purpureus* L.) is an important vegetable crop of Indian origin (Deka and Sarkar, 1990). It occupies unique position for vegetable purpose among the legume vegetables (Biju *et al.*, 2001) and it is a good source of protein, minerals and vitamins (Basu *et al.*, 2002). It is an important vegetable crop for Bangladesh but have a negligible production trend (4.8 t/ha, compared to in global context of 10 t/ha; Hossain *et al.* 2013). However, the country has a huge variability of lablab bean for its various yield contributing characters (Sultana *et al.*, 2009). Eventually, that variability can potentially be used for improving yield of lablab bean. Yield is a polygenically inherited complex character resulting from multiplicative interactions of its number of yield contributing characters (Savitha, 2008). Therefore, correlations between yield and different yield contributing characters are an aspect, which should be kept in mind for planning yield improvement program. Study of correlation coefficient has been widely considered and evaluated in many breeding programs of bean by numerous researchers (Parmar *et al.*, 2013; Rashid *et al.*, 2013; Basu *et al.*, 2002; Ali *et al.*, 2005; Rai *et al.*, 2004; Mohan *et al.*, 2006; Nandi *et al.*, 2000). However, the comparative magnitude of contribution made by various yield contributing characters is not precisely obtained from correlation coefficient analysis. On the contrary, path coefficient analysis is used for partitioning the direct and indirect effects to measure relative importance of all the characters (Nahar and Newaz, 2005). Path coefficient analysis has also been widely considered for designing breeding programs by breeder in many instances (Parmar *et al.*, 2013; Lal *et al.*, 2011; Ali *et al.*, 2005; Rai *et al.*, 2004; Singh *et al.*, 2004; Verma *et al.*,

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2005; Sharma *et al.*, 2011; Sikdar *et al.*, 2005; Gnanesh *et al.*, 2005; Reddi *et al.*, 2006; Lal *et al.*, 2011; Rai *et al.*, 2008; Singh *et al.*, 2010; Yassin *et al.*, 2013; Dutta *et al.*, 2010; Singh *et al.*, 2011; Sabitha *et al.*, 2008). Considering all of the above facts, the present study was taken to investigate the correlation and path coefficient analysis among yield and its contributing characters in 14 genotypes of Lablab bean.

MATERIALS AND METHODS

The field experiment was comprised of fourteen genotypes of Lablab bean growing during rabi season, August 2013 to April 2014 at Field Laboratory, Dept. of Genetics and Plant Breeding, Bangladesh Agricultural University (BAU), Mymensingh; in a Randomized Complete Block Design (RCBD) with three replications. The genotypes studied in the experiment are listed in the Table 1. Seeds were sown on 27 August, 2013. All the recommended package of practices was followed to raise a good crop. For this study of correlation and path coefficient analysis, sixteen yield and yield contributing characters, viz., days to 50 % flowering, days to maturity, number of raceme per plant, raceme length, number of flower buds per raceme, number of nodes per raceme, pod length (cm), pod width (cm), number of seeds per pod, green pod yield per plant (kg), green and dry test weight (g), shelling percentage protein content (%) and dry seed yield per plant (g) were recorded from three randomly selected plants in each replication. The correlation coefficient was worked out as per Weber and Morthy (1952) and path coefficient of various characters was calculated by the formula given by Dewey and Liu (1959).

Table 1. List of genotypes used in the study

Genotypes	Status	Sources
DS-18, DS-52, DS-99, DS-106, DS-112, DS-113, DS-116, DS-164, DS-168, DS-35/A, DS-57	Advanced generation lines	Dept. of Genetics Plant Breeding, Bangladesh Agricultural University (BAU), Mymensingh
ASHINA, KHIRSHAPATI and NOLOK	Local land races	Neighboring villages of BAU, Mymensingh

RESULTS AND DISCUSSION

The analysis of variance (ANOVA) computed from the recorded data (not mentioned here) showed that the genotypes demonstrated significant variation for all the characters. The data considered for analysis of correlation coefficient and path coefficient as presented in Table 2 and 3, respectively.

Correlation coefficient analysis

From Table 3, it was found that genotypic correlation coefficients were observed to be higher than the corresponding phenotypic correlation coefficients for all the characters indicating the superiority of phenotypic expression under the influence of environmental factors (Table 2 and 3). Seed yield per plant exhibited highly significant positive association with days to 50 % flowering, number of raceme per plant, raceme length, green pod length, green pod yield per plant, green test weight and shelling percentage

Table 2. Phenotypic correlation of yield contributing characters on seed yield of 14 Lablab bean genotypes

Traits	DM	NRP	RL	NBR	NNR	GPL	GPW	NSP	GPY	GTW	DTW	S% G	S%D	% P	DSYP
DFL	0.88**	-0.32	0.08	-0.20	-0.40*	-0.02	0.01	-0.23	-0.10	-0.28	-0.40*	-0.28	0.38*	-0.02	0.38*
DM		-0.26	0.10	-0.17	-0.30	-0.15	-0.09	-0.29	-0.17	-0.37*	-0.34	-0.44**	0.25	-0.18	-0.44**
NRP			-0.22	-0.33	-0.11	-0.10	-0.17	0.10	-0.19	0.25	0.60**	0.02	0.08	-0.01	0.60**
RL				-0.21	-0.34	0.52**	0.40*	0.35	0.46**	0.48**	-0.03	0.35	-0.05	0.42**	0.48**
NBR					0.48**	-0.20	-0.14	-0.29	-0.11	-0.28	-0.09	-0.25	-0.02	-0.35	-0.11
NNR						-0.25	-0.41**	-0.06	-0.11	-0.25	0.11	-0.35	-0.23	-0.54**	-0.06
GPL							0.82**	0.65**	0.89**	0.81**	-0.27	0.67**	-0.11	0.68**	0.82**
GPW								0.29	0.81**	0.65**	-0.39*	0.72**	-0.16	0.80**	-0.11
NSP									0.49**	0.53**	-0.01	0.47**	0.09	0.32	-0.39*
GPY										0.77**	-0.23	0.58**	-0.19	0.66**	0.49**
GTW											0.21	0.74**	-0.10	0.74**	0.47**
DTW												-0.03	0.12	-0.08	0.32
S% G													-0.14	0.78**	0.77**
S% D														0.19	0.38*
% P															-0.52**

DFL= Days to 50% flowering , DM= Days to maturity, NRP= Number raceme per plant, RL= Raceme length, NBR= Number of flower buds per raceme, NNR= Number nodes per raceme, GPL= Green pod length, GPW= Green pod width, NSP= Number of seed per pod, GPYP= Green pod yield per plant, GTW= 100 Green seed weight, DTW= 100 Dry seed weight, S%G= Shelling percentage (Green), S%D= Shelling percentage (Dry), %P= Protein content, DSYP = Seed yield per plant

*P<0.05, **P<0.01

Table 3. Genotypic correlation of yield contributing characters on seed yield of 14 Lablab bean genotypes

Traits	DM	NRP	RL	NBR	NNR	GPL	GPW	NSP	GPY	GTW	DTW	S% G	S%D	% P	DSYP
DFL	0.95**	-	0.20	-0.27	-	-0.04	0.03	-0.29	-0.09	-0.32	-	-0.37*	0.46*	-0.01	0.46**
DM		-0.32	0.20	-0.23	-0.38*	-0.17	-0.08	-0.34	-0.16	-	-0.40*	-	0.28	-0.19	-0.54**
NRP			-	-	-0.02	-0.11	-0.20	0.14	-0.23	0.26	0.70**	0.09	0.14	-0.01	0.70 **
RL				-0.22	-0.38*	0.62**	0.50**	0.46**	0.63**	0.59**	0.010	0.53**	-0.07	0.48**	0.59**
NBR					0.62**	-0.26	-0.16	-0.28	-0.10	-0.41*	-0.12	-0.38*	-0.05	-0.43*	-0.10
NNR						-0.30	-	-0.08	-0.21	-0.35	0.23	-	-0.35	-	-0.08
GPL							0.83**	0.76**	0.95**	0.84**	-0.30	0.72**	-0.12	0.69**	0.83**
GPW								0.33	0.87**	0.68**	-	0.78**	-0.17	0.81**	-0.12
NSP									0.51**	0.68**	0.07	0.56**	0.06	0.35	-0.45**
GPY										0.85**	-0.25	0.68**	-0.23	0.69**	0.51**
GTW											0.23	0.82**	-0.07	0.77**	0.56**
DTW												-0.04	0.18	-0.07	0.35
S% G													-0.18	0.86**	0.85**
S% D														0.19	0.46**
% P															-0.51**

*P<0.05, **P<0.01

DFL= Days to 50% flowering , DM= Days to maturity, NRP= Number raceme per plant, RL= Raceme length, NBR= Number of flower buds per raceme, NNR= Number nodes per raceme, GPL= Green pod length, GPW= Green pod width, NSP= Number of seed per pod, GPYP= Green pod yield per plant, GTW= 100 Green seed weight, DTW= 100 Dry seed weight, S%G= Shelling percentage (Green), S%D= Shelling percentage (Dry), %P= Protein content, DSYP = Seed yield per plant

Table 4. Direct and indirect effects of yield contributing characters on seed yield at Phenotypic level of Lablab bean

Traits	DFL	DM	NRP	RL	NBR	NNR	GPL	GPW	NSP	GPY	GTW	DT W	S %G	S %D	% P	Rp
DFL	-0.56	0.55	-0.35	0.10	0.21	-0.15	-0.30	0.86	-0.23	0.01	0.19	-0.07	0.15	0.82	0.15	0.38*
DM	0.50	-0.62	-0.21	-0.33	0.38	-0.10	-0.66	-0.46	-0.13	0.91	0.41	0.11	1.97	0.54	0.68	-0.44**
NRP	1.80	1.25	1.09	-0.34	0.74	0.32	0.52	0.19	-0.85	-0.51	-0.94	-0.10	0.23	-0.67	-0.03	0.60**
RL	-0.45	-1.24	0.27	1.26	0.47	0.31	-1.54	-0.18	-0.34	-0.72	-0.27	0.64	-1.57	-0.11	-0.25	0.48**
NBR	1.13	-0.62	0.57	-0.20	-1.04	0.25	-1.16	-0.94	0.54	-0.43	0.42	0.15	0.67	0.13	0.16	-0.11
NNR	0.22	1.06	0.19	-0.52	0.10	0.38	0.31	-0.43	-0.71	1.45	0.23	-0.18	1.57	-0.5	0.23	-0.06
GPL	-0.14	1.13	0.17	0.79	0.45	0.57	1.54	-0.11	-0.04	-0.12	-0.42	0.46	-0.02	-0.24	-0.94	0.82**
GPW	1.04	-0.56	0.29	-0.12	0.31	0.78	0.05	0.86	-0.03	-0.17	0.66	-0.12	-0.55	-0.35	-0.37	-0.11
NSP	-1.58	1.29	0.56	0.54	0.65	0.11	-0.43	-0.44	1.01	-0.97	-0.38	0.56	-0.95	0.15	-0.36	-0.39*
GPY	-0.69	0.56	0.33	0.71	0.25	0.21	-0.65	-0.50	-0.77	-0.14	0.17	0.69	-0.49	-0.41	-0.44	0.49**
GTW	-1.93	1.57	1.06	0.11	0.51	0.21	-0.14	-0.54	0.70	-0.10	-0.67	-0.35	0.09	-0.22	0.54	0.47**
DTW	0.27	0.22	0.21	-0.21	0.44	0.15	0.27	-0.97	-0.35	0.58	0.30	0.18	0.13	0.26	-0.16	0.32
S% G	-1.93	1.57	-0.22	0.54	0.56	0.66	0.17	-0.97	-0.35	-0.23	0.82	0.20	-0.54	-0.36	-0.49	0.77**
S% D	0.26	-0.31	-0.14	0.58	0.65	0.27	0.58	0.30	-0.16	0.54	0.66	-0.11	0.67	0.21	0.17	0.38*
% P	-0.14	0.22	0.23	0.64	0.79	1.02	-0.35	0.54	-0.67	-0.14	0.27	0.13	-0.85	0.41	-0.74	-0.52**
Residual value									0.50							

*P<0.05, **P<0.01; Diagonal and bold figures indicate direct effect on yield

DFL= Days to 50% flowering, DM= Days to maturity, NRP= Number raceme per plant, RL= Raceme length, NBR= Number of flower buds per plant, NNR= Number nodes per plant, GPL= Green pod length, GPW= Green pod width, NSP= Number of seed per pod, GPYP= Green pod yield per plant, GTW= 100 Green seed weight, DTW= 100 Dry seed weight, S%G= Shelling percentage (Green), S%D= Shelling percentage (Dry), %P= Protein content, rp = phenotypic correlation

Table 5. Direct and indirect effects of yield contributing characters on seed yield at genotypic level of Lablab bean

	DFL	DM	NRP	RL	NBR	NNR	GPL	GPW	NSP	GPYP	GTW	DTW	S % G	S % D	% P	Rg
DFL	0.48	-0.39	0.84	-0.31	-0.33	-0.54	1.20	0.52	-1.90	0.71	0.56	-0.49	0.54	-1.75	-0.41	0.46**
DM	0.52	-0.41	2.05	0.49	-0.11	-0.24	-1.87	0.53	0.48	0.32	0.11	0.20	0.21	-0.23	0.44	-0.54**
NRP	-0.71	0.54	-2.05	0.40	-0.18	-0.20	-0.23	0.83	0.48	0.46	-0.82	0.27	0.13	0.53	-0.29	0.70**
RL	0.83	-0.27	0.13	0.10	-0.57	0.11	-0.33	1.30	0.14	0.94	-0.39	-0.11	0.77	0.70	-0.50	0.59**
NBR	-1.12	0.36	0.81	0.39	0.49	-1.40	-2.30	0.69	0.45	0.20	1.12	-0.39	-0.40	0.17	-1.41	-0.10
NNR	-0.25	0.72	0.93	0.74	0.3	1.24	-2.10	1.24	0.52	0.42	0.77	0.93	0.66	0.33	-0.52	-0.08
GPL	-0.17	0.53	0.15	0.76	-0.12	1.56	0.11	0.66	0.93	0.14	0.84	0.31	-0.87	0.37	-0.75	0.83**
GPW	0.12	0.32	0.07	0.54	-0.86	0.29	0.27	-1.29	-1.87	-0.60	1.20	0.33	0.80	-0.65	-0.27	-0.12
NSP	-1.21	0.38	1.48	0.23	0.06	0.88	0.44	-0.49	-0.64	-0.43	0.51	-0.77	-0.94	0.23	0.76	-0.45**
GPY	-0.38	0.12	0.14	0.41	-0.96	0.77	0.12	-0.30	-0.61	-2.01	-1.70	1.21	0.90	-0.88	2.27	0.51**
GTW	-0.34	0.12	0.14	0.41	-0.96	-0.35	0.77	0.12	-0.30	-0.61	-0.63	-1.70	1.21	0.18	-0.25	0.56**
DTW	-0.09	0.42	0.61	0.10	-0.29	0.78	-0.32	0.99	0.73	0.5	-0.54	1.54	-0.49	-0.74	0.08	0.35
S% G	-1.55	0.66	0.95	0.47	-0.18	-0.71	-0.20	0.70	0.44	0.19	-2.1	0.44	1.10	0.11	0.28	0.85**
S% D	-0.92	0.49	0.16	-0.71	-0.53	-0.98	0.34	1.09	-0.71	0.46	0.22	-0.51	-1.82	1.09	-0.65	0.46**
% P	-0.41	0.77	-0.10	0.48	-0.21	-0.68	0.75	-0.12	-0.41	-0.13	-0.24	0.77	0.87	0.72	-0.32	-0.51**
Residual value	0.48															

*P<0.05, **P<0.01; Diagonal and bold figures indicate direct effect on yield

DFL= Days to 50% flowering, DM= Days to maturity, NRP= Number raceme per plant, RL= Raceme length, NBR= Number of flower buds per raceme, NNR= Number nodes per raceme, GPL= Green pod length, GPW= Green pod width, NSP= Number of seed per pod, GPYP= Green pod yield per plant, GTW= 100 Green seed weight, DTW= 100 Dry seed weight, S%G= Shelling percentage (Green), S%D= Shelling percentage (Dry), %P= Protein content, rg = genotypic correlation

(green and dry) indicating the importance of these characters in selection for yield improvement. Direct selection based on these traits would result in simultaneous improvement of aforementioned characters and yield in Lablab bean. This is in agreement with the results obtained by Rai *et al.* (2009), Chauhan *et al.* (2007) and Bangar *et al.* (2008) for number of pods per plant, pod weight, pod length, number of seeds per pod and also for seed protein content (Vasanthi and Das, 1996). Thus, the pod yield per plant seems to have predominant effect on seed yield per plant. Hence, there is ample scope in the improvement of yield by selecting a genotype having higher raceme number and green pod length since they are highly correlated. On the contrary, seed yield per plant expressed significant negative correlation with days to maturity, number of seeds per pod and protein content.

Path coefficient analysis

Path coefficient analysis revealed that green pod length per plant exhibited high positive direct effect on number of raceme per plant, raceme length, number of nodes per raceme, pod width, dry test weight and dry shelling percentage at both phenotypic and genotypic levels of significance. Similar results were reported by Rai *et al.* (2009) and Chattopadhyay and Dutta (2010).

Days to 50 percent flowering showed moderate positive direct effect on seed yield per plant, which is in agreement with Bangar *et al.* (2008) and Hingane and Navale (2008) and raceme length recorded low positive direct effect on pod yield per plant. This suggested that direct selection based on these traits will be rewarding for yield improvement in Lablab bean.

Furthermore, number of flower buds showed very high negative direct effect on seed yield. Days to maturity and protein content exhibited low negative direct effect on seed yield per plant. For these two characters similar results was reported by Rai *et al.* (2009). In this situation, the indirect causal factors are to be considered simultaneously for selection. Thus, the path coefficient analysis revealed the importance of characters such as green pod length, Days to 50% flowering, yield per plant and 100 pod weight in selection of superior genotypes for pod yield per plant.

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