Electronic Journal of Plant Breeding, 5(4): 820-823 (Sep 2014)
ISSN 0975-928X

Research Note

Association analysis for pod yield and component characters in dolichos bean (*Lablab purpureus* L.)

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(Received: 23 June 2014; Accepted: 19 Oct 2014)

Abstract
The experimental material comprised genotypes of *Lablab purpureus* collected from different parts of India. Correlation coefficient analysis revealed that number of pods plant^{-1}, pod width, pod weight and pod length had positive correlation with pod yield plant^{-1}. The traits like number of branches and leaf length showed positive relation with yield at the same time days to 50% flowering and days to first picking showed negative effect on yield. Hence, direct selection for these characters may lead to the development of high pod yielding Dolichos genotypes. Path analysis revealed that selection based on number of pods plant^{-1}, pod weight could be effective in developing high yielding genotypes of Dolichos bean for Vindhyan Zone.

Key words: Dolichos bean, correlation, path coefficient, association analysis, Vindhyan zone.

Dolichos bean (*Lablab purpureus* L.) is an important leguminous vegetable grown throughout the country and is mainly grown for its green pods, while the dry seeds also used in various vegetable preparations. It is one of the major sources of protein in the preparations in India (Savitha *et al.*, 2012). It is a field crop mostly confined to a large extent in Andhra Pradesh, Tamil Nadu, Karnataka, Chhattisgarh and some parts of Bihar and Uttar Pradesh. Among the quantitative characters, yield is a complex character and is dependent on a number of yield contributing characters. Therefore, the knowledge on the association of yield components and their relative contributions shown by path analysis has practical significance in selection. The study of the association between pairs of characters and yield provides the basis for further breeding programme (Upadhyay *et al.*, 2012). Therefore, the present study was aimed at correlation and path analysis among different characters of Dolichos bean.

The work was conducted during crop season from August to February in 2012-13 at Field Experimentation Centre, Department of Genetics and Plant Breeding, Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad. Sixteen genotypes including one check grown under randomized block design (RBD) with three replications. The experimental field divided into 48 blocks of equal size and each block possesses one genotype. The plot size and spacing were 10.0 sq. m and 1.0 m × 1.0 m, respectively. Three plants were taken for recording observations for 13 quantitative characters *viz.* days to 50% flowering, days to first picking, number of primary branches, leaf length (cm), inflorescence length (cm), number of pods inflorescence^{-1}, pod length (cm), pod width (cm), pod weight (g), number of seeds pod^{-1}, seed index (g), number of pods plant^{-1} and pod yield plant^{-1} (kg). The data was statistically analyzed, correlation coefficient was computed to study inter relationship as suggested by Al-Jibouri *et al.* (1958). Path coefficient analysis was adopted as given by Dewey and Lu (1959).

Correlation analysis clearly revealed that in general the pod yield plant^{-1} showed positive and significant correlation with number of pods plant^{-1}, pod width, pod weight, branches plant^{-1}, leaf length and pod length, such positive association of number of pods plant^{-1} with pod yield in non-Pendal types has been reported by Joshi (1971), Baswana *et al.* (1980) and Dahiya *et al.* (1991). The negative association of days to 50% flowering with number of pods plant^{-1} was also recorded by Singh *et al.* (1979). This may be due to indeterminate growth habit which show continuous flowering throughout their growth period. The length of inflorescence showed non-significant association with pod yield. Similar results also reported by Biju *et al.* (2001) and Savitha *et al.* (2012). The seed index also showed non-significant association with pod yield plant^{-1}. Pod weight and number of seeds pod^{-1} also exhibited positive correlation with pod length. Hence, direct selection for these positively correlated characters may lead to the development of high yielding genotypes of Dolichos bean.

Path analysis revealed that the number of pods plant^{-1} (0.522, 0.605) and pod weight (1.102, 0.283) exercised maximum positive direct effect on

yield plant^{-1}, indicating that these characters are the main contributors to pod yield. These results are in agreement with the findings of Nandi *et al.* (1997), Biju *et al.* (2001), Tikka *et al.* (2003) and Lal *et al.* (2005). The negative direct effects of days to 50% flowering (-2.835, 0.088) on pod yield have been observed. Similar results were found by Upadhyay and Mehta (2010).

The highest indirect effect on pod weight was obtained through pod width (0.826) followed by pod length (0.477), number of branches plant^{-1} (0.219) and raceme length (0.218). The moderate indirect effect of pod plant^{-1} exhibited through leaf length (0.196) and pod length (0.111). High direct of number of pods plant^{-1} that were also reported by Lal, *et al*. (2005), Rai, *et al*. (2008) and Singh, *et al.* (2011) in Indian bean. Very low positive indirect effect of pods raceme^{-1} was obtained through branches plant^{-1} (0.030), pod width (0.030) and seed index (0.024). Pods plant^{-1} showed the moderate indirect effect through leaf length (0.154). On contrary, days to 50% flowering (-2.835) exerted the very high negative direct effect followed by pods raceme^{-1} (-0.626) and pod length (-0.409). Thus, path coefficient analysis revealed the importance of characters such as number of pods plant^{-1}, pod width, pod length and pod weight in selection of superior genotypes for pod yield plant^{-1}.

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Table 1. Phenotypic (r_p), genotypic (r_g) coefficients of correlation for yield and yield components in Dolichos bean

Characters		Days to first picking	Branches/ plant	Leaf length (cm)	Raceme length (cm)	Pods/ raceme	Pod length (cm)	Pod width (cm)	Pod weight (g)	Pods/ plant	Seeds/ pod	Seed index	Pod yield/plant (g)
Days to 50% flowering	r_p	0.91**	-0.06	-0.18	0.17	-0.24	-0.18	-0.04	-0.04	-0.59**	-0.11	0.08	-0.56**
	r_g	0.91**	-0.07	-0.21	0.17	-0.26	-0.18	-0.04	-0.04	0.60**	-0.13	0.08	-0.57**
Days to first picking	r_p	1.00	0.05	-0.10	0.008	-0.41**	-0.17	-0.01	-0.03	-0.47**	-0.12	0.01	-0.37**
	r_g	1.00	0.05**	-0.11	0.01	-0.43**	-0.17	-0.01	-0.03	-0.48**	-0.13	0.01	-0.38**
Branches/ plant	r_p		1.00	-0.01	-0.45**	-0.32*	-0.18	0.05	0.19	0.12	-0.32*	-0.17	0.35**
	r_g		1.00	0.008	-0.47**	-0.33*	-0.18	0.05	0.19	0.13	-0.31*	-0.23	0.37*
Leaf length (cm)	r_p			1.00	0.02	-0.22	0.04	0.17	-0.06	0.31**	-0.29**	0.26*	0.29**
	r_g			1.00	0.04	-0.28	0.04	0.20	-0.07	0.37**	-0.39*	0.32	0.35**
Raceme length	r_p				1.00	0.32*	0.17	0.18	0.19	-0.15	0.33**	0.15	-0.17
	r_g				1.00	0.34*	0.17	0.18	0.19	-0.16	0.38*	0.17	-0.18
Pods/ raceme	r_p					1.00	-0.004	-0.19	-0.04	-0.08	-0.05	0.02	-0.29*
	r_g					1.00	-0.007	-0.20	-0.05	-0.08	-0.11	0.04	-0.30*
Pod length	r_p						1.00	0.07	0.43**	0.21	0.14	0.46**	0.42**
	r_g						1.00	0.07	0.43**	0.21	0.15	0.51**	0.46 **
Pod width	r_p							1.00	0.74**	-0.19	0.14	0.003	0.40**
	r_g							1.00	0.74**	-0.20	0.17	0.01	0.41**
Pod weight	r_p								1.00	-0.20	0.11	0.11	0.47**
	r_g								1.00	-0.20	0.12	0.12	0.48**
Pods/ plant	r_p									1.00	0.01	-0.22	0.64**
	r_g									1.00	0.03	-0.23	0.46**
Seeds/ pod	r_p										1.00	0.005	0.13
	r_g										1.00	0.02	0.17
Seed index	r_p											1.00	-0.02
	r_g											1.00	-0.01

*, ** significant at 5% & 1% levels, respectively.

Table 2. Phenotypic (P), genotypic (G) path coefficients for yield and yield components in Dolichos bean

Character		Days to 50% flowering	Days to first picking	Branches/ plant	Leaf length (cm)	Raceme length (cm)	Pods/ raceme	Pod length (cm)	Pod width (cm)	Pod weight (g)	Pods/ plant	Seeds / pod	Seed index	Correlation coefficient with Pod yield/ plant (g)
Days to 50% flowering	G	**-2.84**	-2.60	0.21	0.60	-0.49	0.74	0.52	0.13	0.12	1.72	0.39	-0.25	-0.57
	P	**0.09**	0.08	-0.01	-0.02	0.02	-0.02	-0.02	0.00	0.00	-0.05	-0.01	0.01	-0.57
Days to first picking	G	0.06	**0.07**	0.00	-0.01	0.00	-0.03	-0.01	0.00	0.00	-0.03	-0.01	0.00	-0.38
	P	0.31	**0.34**	0.02	-0.03	0.00	-0.14	-0.06	0.00	-0.01	-0.16	-0.04	0.00	-0.38
Branches/ plant	G	0.01	0.00	**-0.09**	0.00	0.04	0.03	0.02	-0.01	-0.02	-0.01	0.03	0.02	0.37
	P	-0.02	0.01	**0.22**	0.00	-0.10	-0.07	-0.04	0.01	0.04	0.03	-0.07	-0.04	0.36
Leaf length	G	-0.09	-0.05	0.00	**0.41**	0.02	-0.12	0.02	0.08	-0.03	0.15	-0.16	0.13	0.35
	P	0.00	0.00	0.00	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30
Raceme length	G	-0.03	0.00	0.07	-0.01	**-0.15**	-0.05	-0.03	-0.03	-0.03	0.02	-0.06	-0.03	-0.18
	P	-0.02	0.00	0.05	0.00	**-0.11**	-0.04	-0.02	-0.02	-0.02	0.02	-0.04	-0.02	-0.18
Pods/ raceme	G	0.16	0.27	0.21	0.18	-0.21	**-0.63**	0.00	0.13	0.04	0.05	0.07	-0.03	-0.31
	P	-0.01	-0.01	-0.01	-0.01	0.01	**0.03**	0.00	-0.01	0.00	0.00	0.00	0.00	-0.29
Pod length	G	0.08	0.07	0.08	-0.02	-0.07	0.00	**-0.41**	-0.03	-0.18	-0.09	-0.06	-0.21	0.43
	P	-0.03	-0.03	-0.03	0.01	0.03	0.00	**0.15**	0.01	0.06	0.03	0.02	0.07	0.43
Pod width	G	0.01	0.00	-0.01	-0.03	-0.03	0.03	-0.01	**-0.15**	-0.11	0.03	-0.03	0.00	0.42
	P	-0.01	0.00	0.01	0.04	0.05	-0.05	0.02	**0.26**	0.19	-0.05	0.04	0.00	0.41
Pod weight	G	-0.05	-0.04	0.22	-0.08	0.22	-0.06	0.48	0.83	**1.10**	-0.22	0.14	0.14	0.48
	P	-0.01	-0.01	0.05	-0.02	0.06	-0.01	0.12	0.21	**0.28**	-0.06	0.03	0.03	0.48
Pods/ plant	G	-0.32	-0.25	0.07	0.20	-0.09	-0.04	0.11	-0.11	-0.11	**0.52**	0.02	-0.12	0.66
	P	-0.36	-0.29	0.07	0.19	-0.09	-0.05	0.13	-0.12	-0.12	**0.61**	**0.01**	-0.14	0.65
Seeds/ pod	G	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	0.00	0.17
	P	-0.02	-0.02	-0.05	-0.05	0.05	-0.01	0.02	0.02	0.02	0.00	0.16	0.00	0.14
Seed index	G	0.05	0.01	-0.12	0.16	0.09	0.02	0.26	0.01	0.07	-0.12	0.01	**0.50**	-0.01
	P	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	-0.01	0.00	**0.03**	-0.02

Direct effects (bold); non-diagonal- indirect effects; residual effect: 0.22