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Correlation and path analysis study in dolichos bean (*Lablab purpureus* L.)

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Abstract

The investigation was laid out in RBD with three replication during *kharif*- 2016 at the Horticulture research farm, Department of Horticulture SHUATS, Allahabad located in South-East part (Zone 4) of Uttar Pradesh. Green pod yield per plant was significantly positive correlated with 100 seed weight, pod length, pod width, pod per inflorescence, seeds per pod, pod weight, vine length, number of green pod picking and days to last green pod harvest, at genotypic as well as phenotypic level. Hence direct selection for these traits may lead to the development of high yielding genotypes of dolichos bean. The data revealed that 100 seed weight showed highest direct positive effect on green pod yield per plant followed by number of pods per inflorescence, days to last green pod harvest, pod length, days to first flowering, vine length, pod width and seed per pod. YBMV incidence % showed indirect effect on 100 seed weight, number of pods per inflorescence, pod length, pod weight, pod width, number of green pod pickings, vine length and number of seeds per pod.

Keywords: Dolichos bean (*Lablab purpureus* L.), pod and seed yield, correlation and path analysis

Introduction

Dolichos bean i.e., *Dolichos lablab* L. ($2n = 2x = 22$) is also known as field bean, kidney bean, garden bean or Indian bean, is one of the most important leguminous vegetables grown for its tender fleshy green pods, shelled green seeds and also dry beans. It has anti-diabetic property and is good for natural cure of bladder burns and cardiac problems, diarrhea, sciatica and tenesmus. It is botanically known as *Dolichos lablab* Linn.

“Dolichos” is a Greek word meaning “long” and “lablab” is an Arabic or Egyptian name meaning “dull rattle of the seed inside the dry pod” (Chaudhury, 1972). Vavilov (1939) had considered India as the primary centre of origin of Dolichos bean and wild forms are found in many parts of the country. The yield components may not always be independent in their nature but may be interlinked. The degree of association between independent and dependent variables was first suggested by Galton (1888) [5], its theory was developed by Pearson (1904) [10] and their mathematical utilization at phenotypic, genotypic and environmental levels was described by Searle (1961) [11]. The phenotypic correlations were normally of genetic and environmental interaction which provided information about the association between the two characters. Path coefficient analysis is an important tool for partitioning the correlated coefficients into the direct and indirect effects of independent variables on a dependent variable with the inclusion of more variables in correlated study.

Materials and Methods

The experiment will be carried out at the Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad. Thirty genotypes of dolichos bean were grown in a randomized block design with three replications. The experiment was conducted in Randomized Block Design having thirty genotypes in three replications. The allocation of treatments of the individual plots using random number in each replications. The experimental material (38 genotypes) of dolichos bean was collected from different sources given information below in (Table 1).

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Table 1: Source of genotypes of dolichos bean

S. No	Genotypes	No. of genotypes	Source of Genotypes
1.	CG 1, CG 2,CG 5,CG 6	4	Lundra Surguja CG
2.	CG 7, CG 8, CG 9	3	Ambikapur Surguja CG
3.	CG 3, CG 4.	2	Bilha, Bilashpur, CG
4.	CG 10, CG 11, CG 12, CG 13, CG 14, CG 15, CG 16.	7	Udaipur Surguja CG
5	CG. 17, CG 18.	2	Udagi Surajpur CG
6	CG 19, CG 28.	2	Lailunga Raigarh, CG
7	CG 20, CG 21, CG 22,	3	Ramanujnagar Surajpur CG
8	CG 23.	1	Bhaiyathan Surajpur CG
9	CG 24, CG 25, CG 26, CG 27.	4	Pathalgaon Jashpur CG
10	CG 29, CG 30,CG 31,CG 32,CG 33,CG 34,CG 35,CG 36	8	Reewagahan, Rajnandgaon CG
11	VRSEM-186	1	IIVR Varanasi,U.P.
12	PUSA SEM-2	1	IARI, Delhi

Result

The results of the analysis of variance for different quantitative characters for 15 genotypes of dolichos bean are presented in (Table 1). Analysis of variance presented in showed that the genotypes differed significantly for all the 17 characters and the mean performance of 38 genotypes. These findings are in general agreement with the findings of Pandita *et al.* (1980) ^[1, 8], Wahabuddin *et al.* (1986) ^[14], Borah *et al.* (1992) ^[3], Bendal *et al.* (2008) ^[2], Upadhyay (2008) ^[12] and Patel (2010) ^[9].

Correlation Coefficient Analysis

Days to first flowering exhibited highly significant and positively correlated with days to 50% flowering (0.9970) followed by days to first green pod harvest (0.9768). Days to 50% flowering exhibited highly significant and positively correlated with days to first green pod harvest (0.9697). Inflorescence length exhibited highly significant and positively correlated with number of flowers per inflorescence (0.3116) and days to last green pod harvest (0.2009).

Number of flowers per inflorescence exhibited highly significant and positively correlated with number of pods per inflorescence (0.7583). Days to first green pod harvest is non-significant and positively correlated with days to last green pod harvest (0.1641) and vine length (0.0546). Days to last green pod harvest is highly significant and positively correlated with 100 seed weight (0.3456) and vine length (0.2224). Number of green pod pickings is highly significant and positively correlated with number of seed per pod (0.3800), vine length (0.3598) and Green pod yield per plant (0.2588). Pod length is highly significant and positively correlated with number of seed per pod (0.7321), pod weight (0.5292), 100 seed weight (0.5097), Green pod yield per plant (0.5083) and vine length (0.3284). Pod width is highly significant and positively correlated with pod weight (0.6024) and green pod yield per plant (0.4631). Pod weight is highly significant and positively correlated with number of seeds per pod (0.5297) green pod yield per plant (0.4849), vine length (0.1984). Number of seeds per pod is highly significant and positively correlated with Green pod yield per plant (0.5962), 100 seed weight (0.3922) and vine length (0.3555). Vine length is highly significant and positively correlated with Green pod yield per plant (0.3613) and 100 seed weight (0.2296). 100 seed weight is highly significant and positively correlated with green pod yield per plant (0.3492). Green pod yield per plant was significantly positive correlated with seeds per pod (0.59), pod length (0.50), pod weight (0.48), pod width (0.46), pod per inflorescence (0.39), vine length (0.36), 100 seed weight (0.34) and number of green pod picking (0.25). Similar result was observed by Patel *et al.*,

(2014) for pod length, number of seeds per pod, 100 seed weight, and days to last green pod harvest. The experimental findings on correlated coefficient analysis are in general agreement with the result reported by Baswana *et al.*, (1980) ^[1], Pandita *et al.*, (1980) ^[1, 8], Pandey *et al.*, (1980) ^[7], Dahiya *et al.*, (1991) ^[4], Upadhyay *et al.*, (2011) ^[13] and Kiran *et al.*, (2014) ^[6].

Path Coefficient Analysis

The path coefficient analysis (presented in table 3) which splits total correlated coefficient of different characters into direct and indirect effects on fruit yield per plant in such a manner that the sum of direct and indirect effects is equal to total genotypic correlated.

Data revealed that 100 seed weight (0.38) showed the highest direct positive effect on green pod yield per plant followed by number of pods per inflorescence (0.2154), days to last green pod harvest (0.2617), pod length (0.2566), days to first flowering (0.047), vine length (0.1571), pod width (0.065) and number of seeds per pod (0.071). Patel *et al.*, (2014) observed similar result that pod weight, number of seeds per pod, 100 seed weight, pod width expressed a higher positive direct effect on green pod yield per plant. Singh *et al.*, (2015) ^[15] also observed that pod width expressed a higher positive direct effect on green pod yield per plant. Kiran *et al.*, (2014) ^[6] also reported that pod weight showed a higher positive direct effect on green pod yield per plant.

Days to first flowering showed indirect positive effect on days to first green pod harvest (0.4716) followed by number of flowers pre inflorescence (0.1511), YBMV incidence % (0.1385), number pods per inflorescence (0.0516), vine length (0.0603) and days to last green pod harvest (0.0483).

Inflorescence length showed indirect positive effect on days to first flowering (0.0003) and pod length (0.0001) and 100 seed weight (0.0007).

Number of pods per inflorescence showed indirect positive effect on number of green pod pickings (0.999), vine length (0.908), number of flowers per inflorescence (0.0726), pod length (0.0675), 100 seed weight (0.1056), inflorescence length (0.0341), days to first green pod harvest (0.0312), days to first flowering (0.0234), days to last green pod harvest (0.0155) and pod weight (0.0126).

Pod length showed indirect effect on 100 seed weight (0.093), number of green pod pickings (0.), number of seeds per pod (0.0953), number of pods per inflorescence (0.0804), pod weight (0.0727) and vine length (0.0601).

Pod width showed indirect positive effect on pod weight (0.4149), number of seeds per pod (0.1143) and inflorescence length (0.0949).

Pod weight showed indirect positive effect on number of flowers per inflorescence (0.0915), days to first flowering (0.0841), days to first green pod harvest (0.0831), YBMV incidence % (0.0742), days to last green pod harvest (0.0484) and vine length (0.0058).

Number of seeds per pod showed indirect effect on pod length (0.0264), number of green pickings (0.0208), 100 seed weight (0.0214), pod weight (0.0176), days to last green pod harvest (0.0143), pod width (0.0124), vine length (0.0047) and inflorescence length (0.004).

100 seed weight showed indirect positive effect on number of green pod pickings (0.2575), pod length (0.2204), number of pods per inflorescence (0.1895), days to last green pod harvest (0.1467), number of seeds per pod (0.1168), pod weight (0.0937) and vine length (0.0866).

YBMV incidence % showed indirect effect on 100 seed weight (0.1094), number of pods per inflorescence (0.1073), pod length (0.0772), pod weight (0.0657), pod width (0.0420), number of green pod pickings (0.0278), vine length (0.0252) and number of seeds per pod (0.0155).

Table 1: Genotypic Correlations coefficient of yield and its attributing traits of dolichos bean

S. No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1.000	0.995**	-0.028	0.317	0.108	0.991**	0.101	-0.084	0.126	-0.353	-0.013	-0.298	-0.264	-0.133	0.291	-0.196
2		1.000	-0.013	0.306	0.118	0.996**	0.115	-0.069	0.143	-0.362*	-0.029	-0.319	-0.261	-0.143	0.295	-0.207
3			1.000	0.534**	0.158	-0.0009	0.223	0.158	0.268	-0.012	0.144	0.156	0.056	-0.065	0.322	-0.041
4				1.000	0.337	0.302	0.183	0.166	0.139	-0.168	-0.115	-0.325	-0.187	-0.101	0.281	-0.179
5					1.000	0.144	0.072	0.463**	0.421*	0.313	-0.087	0.058	-0.041	0.490**	-0.430*	0.374*
6						1.000	0.111	-0.060	0.154	-0.340	-0.032	-0.295	-0.261	-0.120	0.289	-0.202
7							1.000	0.702**	0.339	-0.044	-0.260	-0.172	0.201	0.379*	0.241	0.014
8								1.000	0.400*	0.391*	-0.140	0.214	0.292	0.666**	-0.111	0.228
9									1.000	0.234	-0.139	-0.020	0.066	0.224	-0.101	0.240
10										1.000	-0.025	0.283	0.371*	0.570**	-0.309	0.485**
11											1.000	0.633**	0.1745	-0.066	-0.168	0.459**
12												1.000	0.247	0.242	-0.263	0.328
13													1.000	0.302	-0.062	0.337
14														1.000	-0.439*	0.573**
15															1.000	-0.604**
16																1.000

1. Days to first flowering, 2. Days to 50% Flowering, 3. Inflorescence length, 4. No. of flowers per inflorescence, 5. No. of pods per inflorescence, 6. Days to first green pod harvest, 7. Days to last green pod harvest, 8. No. of green pod Picking, 9. Vine length, 10. Pod length, 11. Pod width, 12. Pod weight, 13. No. of seeds per Pod, 14. 100 seed Weight, 15. YBMV incidence, 16. Green pod yield per plant

Table 2: Phenotypic correlation of coefficient of pod yield and its contributing traits of dolichos bean

S. No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	1.000	0.992**	-0.029	0.302	0.101	0.988**	0.101	-0.080	0.119	-0.350	-0.013	-0.297	-0.216	-0.132	0.266	-0.182
2		1.000	-0.013	0.293	0.110	0.994**	0.114	-0.058	0.135	-0.360	-0.029	-0.314	-0.215	-0.142	0.269	-0.192
3			1.000	0.500**	0.142	-0.001	0.224	0.142	0.239	-0.013	0.143	0.152	0.045	-0.065	0.295	-0.026
4				1.000	0.303	0.291	0.175	0.123	0.122	-0.158	-0.110	-0.303	-0.134	-0.098	0.252	-0.179
5					1.000	0.134	0.072	0.331	0.353	0.283	-0.081	0.052	0.0003	0.451*	-0.390*	0.319
6						1.000	0.109	-0.051	0.142	-0.338	-0.032	-0.292	-0.209	-0.119	0.264	-0.188
7							1.000	0.592**	0.312	-0.042	-0.259	-0.170	0.162	0.375*	0.215	0.007
8								1.000	0.271	0.334	-0.119	0.193	0.258	0.568**	-0.109	0.193
9									1.000	0.213	-0.130	-0.023	0.054	0.212	-0.101	0.213
10										1.000	-0.025	0.277	0.305	0.565**	-0.279	0.447*
11											1.000	0.626**	0.143	-0.066	-0.154	0.430*
12												1.000	0.216	0.239	-0.255	0.299
13													1.000	0.240	-0.064	0.2970
14														1.000	-0.405*	0.540**
15															1.000	-0.548**
16																1.000

1. Days to first flowering, 2. Days to 50% Flowering, 3. Inflorescence length, 4. No. of flowers per inflorescence, 5. No. of pods per inflorescence, 6. Days to first green pod harvest, 7. Days to last green pod harvest, 8. No. of green pod Picking, 9. Vine length, 10. Pod length, 11. Pod width, 12. Pod weight, 13. No. of seeds per Pod, 14. 100 seed Weight, 15. YBMV incidence, 16. Green pod yield per plant

Table 3: Genotypic path coefficient of green pod yield and its attributing traits in dolichos bean

S. No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.4756	-0.0133	0.1511	0.0516	0.4716	0.0483	-0.0403	0.0603	-0.1681	-0.0066	-0.1422	-0.1256	-0.0635	0.1385	0.4756
2	0.0003	-0.0112	-0.0060	-0.0018	0.0000	-0.0025	-0.0018	-0.0030	0.0001	-0.0016	-0.0017	-0.0006	0.0007	-0.0036	0.0003
3	-0.0251	-0.0422	-0.0791	-0.0267	-0.0239	-0.0145	-0.0132	-0.0110	0.0133	0.0092	0.0257	0.0148	0.0080	-0.0222	-0.0251
4	0.0234	0.0341	0.0726	0.2154	0.0312	0.0155	0.0999	0.0908	0.0675	-0.0188	0.0126	-0.0090	0.1056	-0.0928	0.0234
5	-0.5886	0.0005	-0.1794	-0.0859	-0.5936	-0.0659	0.0360	-0.0918	0.2019	0.0192	0.1753	0.1551	0.0712	-0.1721	-0.5886
6	0.0266	0.0584	0.0481	0.0189	0.0291	0.2617	0.1838	0.0888	-0.0116	-0.0682	-0.0450	0.0527	0.0993	0.0631	0.0266
7	0.0299	-0.0561	-0.0590	-0.1640	0.0215	-0.2482	-0.3535	-0.1415	-0.1383	0.0495	-0.0757	-0.1035	-0.2354	0.0394	0.0299
8	0.0199	0.0421	0.0219	0.0662	0.0243	0.0533	0.0629	0.1571	0.0368	-0.0220	-0.0032	0.0105	0.0352	-0.0159	0.0199
9	-0.0907	-0.0032	-0.0432	0.0804	-0.0873	-0.0114	0.1004	0.0601	0.2566	-0.0066	0.0727	0.0953	0.1463	-0.0795	-0.0907
10	-0.0091	0.0949	-0.0758	-0.0571	-0.0212	-0.1707	-0.0917	-0.0915	-0.0167	0.6548	0.4149	0.1143	-0.0436	-0.1104	-0.0091

11	0.0841	-0.0440	0.0915	-0.0164	0.0831	0.0484	-0.0602	0.0058	-0.0798	-0.1784	0.2815	-0.0697	-0.0682	0.0742	0.0841
12	-0.0187	0.0040	-0.0133	-0.0030	-0.0186	0.0143	0.0208	0.0047	0.0264	0.0124	0.0176	0.0710	0.0214	-0.0044	-0.0187
13	-0.0516	-0.0252	-0.0391	0.1895	-0.0464	0.1467	0.2575	0.0866	0.2204	-0.0258	0.0937	0.1168	0.3867	-0.1697	-0.0516
14	-0.0726	-0.0804	-0.0701	0.1073	-0.0723	-0.0601	0.0278	0.0252	0.0772	0.0420	0.0657	0.0155	0.1094	-0.2492	-0.0726
15	-0.1965	-0.0415	-0.1799	0.3746	-0.2024	0.0149	0.2284	0.2406	0.4859	0.4592	0.3289	0.3375	0.5730	-0.6046	-0.1965

1. Days to first flowering, 2. Inflorescence length, 3. No. of flowers per inflorescence, 4. No. of pods per inflorescence, 5. Days to first green pod harvest, 6. Days to last green pod harvest, 7. No. of green pod Picking, 8. Vine length, 9. Pod length, 10. Pod width, 11. Pod weight, 12. No. of seeds per Pod, 13. 100 seed Weight, 14. YBMV incidence, 15. Green pod yield per plant

Table 4: Phenotypic path analysis of green pod yield and its attributing traits in dolichos bean

S. No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.409	-0.0055	0.1204	0.0452	0.4073	0.0469	-0.0238	0.055	-0.147	-0.0121	-0.1286	-0.0882	-0.0582	0.1104	0.409
2	-0.001	0.0813	0.0407	0.0116	-0.0001	0.0182	0.0116	0.019	-0.001	0.0117	0.0124	0.0037	-0.0053	0.0240	-0.001
3	-0.038	-0.0652	-0.1303	-0.0395	-0.0379	-0.022	-0.0161	-0.015	0.0206	0.0144	0.0395	0.0175	0.0128	-0.0329	-0.038
4	0.008	0.0105	0.0223	0.0736	0.0099	0.0053	0.0244	0.026	0.0209	-0.0060	0.0038	0.0000	0.0332	-0.0288	0.008
5	-0.484	0.0006	-0.1420	-0.0656	-0.4876	-0.053	0.0248	-0.069	0.1652	0.0157	0.1424	0.1022	0.0582	-0.1287	-0.484
6	-0.0005	-0.0010	-0.0008	-0.0003	-0.0005	-0.004	-0.0026	-0.001	0.0002	0.0012	0.0008	-0.0007	-0.0017	-0.0010	-0.0005
7	0.0032	-0.0078	-0.0068	-0.0182	0.0028	-0.032	-0.0551	-0.014	-0.018	0.0066	-0.0107	-0.0142	-0.0313	0.0061	0.0032
8	0.0180	0.0318	0.0162	0.0469	0.0189	0.0416	0.0360	0.1328	0.0284	-0.0173	-0.0032	0.0073	0.0282	-0.0134	0.0180
9	-0.0593	-0.0022	-0.0261	0.0467	-0.0557	-0.006	0.0551	0.0352	0.1644	-0.0042	0.0456	0.0502	0.0930	-0.0460	-0.0593
10	-0.0188	0.0916	-0.0707	-0.0517	-0.0206	-0.165	-0.0760	-0.083	-0.016	0.6376	0.3996	0.0917	-0.0424	-0.0988	-0.0188
11	0.1224	-0.0595	0.1181	-0.0203	0.1138	0.0666	-0.0754	0.0093	-0.108	-0.2443	0.3898	-0.0843	-0.0935	0.0996	0.1224
12	-0.0203	0.0043	-0.0127	0.0000	-0.0198	0.0153	0.0244	0.0052	0.0288	0.0136	0.0204	0.0944	0.0227	-0.0061	-0.0203
13	-0.0594	-0.0273	-0.0410	0.1884	-0.0498	0.1569	0.2374	0.0886	0.2362	-0.0277	0.1002	0.1004	0.4175	-0.1691	-0.0594
14	-0.0712	-0.0780	-0.0668	0.1032	-0.0697	-0.057	0.0290	0.0267	0.0738	0.0409	0.0675	0.0169	0.1070	-0.2641	-0.0712
15	-0.1925	-0.0265	-0.1793	0.3199	-0.1889	0.0079	0.1938	0.2139	0.4473	0.4301	0.2999	0.2970	0.5402	-0.5487	-0.1925

1. Days to first flowering, 2. Inflorescence length, 3. No. of flowers per inflorescence, 4. No. of pods per inflorescence, 5. Days to first green pod harvest, 6. Days to last green pod harvest, 7. No. of green pod Picking, 8. Vine length, 9. Pod length, 10. Pod width, 11. Pod weight, 12. No. of seeds per Pod, 13. 100 seed Weight, 14. YBMV incidence, 15. Green pod yield per plant

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