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Path coefficient analysis study in dolichos bean (*Lablab purpureus* L.)

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Abstract

The path coefficient analysis 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. 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 and path analysis

Introduction

Dolichos bean is multipurpose crop grown for pulse, vegetable and forage. This crop is grown for its green pods, while dry seeds are used in various vegetable food preparations. In some part of country it is cultivated as forage crop for livestock. It is mostly confined to grown and cultivated on large extent in Karnataka, Tamil Nadu, Andhra Pradesh, Maharashtra, Gujrat, Bihar, some part of Uttar Pradesh and West Bengal. Both pole and bush type beans are cultivated for green pods in hills during summer and autumn season. These beans are grown as mono crop in commercialized peri-urban areas using staking for pole types beans. It is long duration crop grown either sole or mix crop with maize. It is major source of protein for households and also cash crop.

It is photosensitive and both short day and long day types are available (Anonymous, 1961) [1]. India is the centre of diversity of Dolichos and large numbers of indigenous strains are available in northern India. Although this crop has originated in India but very little work has been done for the genetic improvement of yield and quality. A great range of variation exists for the plant and pod characters amongst the accessions grown all over the country (Parmar, 2013) [6]. 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. Their indirect association becomes more complex. Two characters may show correlated, just because they are correlated with a common third one. In such circumstances, path coefficient analysis provides an effective means of a critical examination of specific forces action to produce a given correlated and measure the relative importance of each factor. Path coefficient analysis can explain the extent of relative contribution. In this analysis, fruit yield per plant was taken as dependent variable and the rest of the characters were considered as independent variables.

Materials and Methods

The experiment was carried out at the Horticulture Research Farm, Department of Horticulture, Allahabad School of Agriculture, Sam Higginbottom Institute of Agriculture, Technology & Sciences, Allahabad. 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).

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, UP.
12	PUSA SEM-2	1	IARI, Delhi

Result

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) [5], Wahabuddin *et al.*, (1986) [10], Borah *et al.*, (1992) [3], Bendal *et al.*, (2008) [2], Upadhyay (2008) [9] and Patel (2010) [7].

The path coefficient analysis (presented in Table) 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) [8] also observed that pod width expressed a higher positive direct effect on green pod yield per plant. Kiran *et al.*, (2014) [4] 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), 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) 100 seed weight (0.0007).

Number of flowers per inflorescence showed indirect positive effect on pod weight (0.025), number of seeds per pod (0.0148), pod length (0.0133), pod width (0.0092), 100 seed weight (0.008).

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), pod weight (0.0126).

Days to first green pod harvest showed indirect positive effect on pod length (0.2019), pod weight (0.175), number of seeds per pod (0.1551), 100 seed weight (0.0712), number of green

pod pickings (0.036), pod width (0.0192), inflorescence length (0.0005).

Days to last green pod harvest showed indirect positive effect on number of green pod pickings (0.1838), 100 seed weight (0.0993), vine length (0.0888), inflorescence length (0.0584), number of seeds per pod (0.0527), YBMV incidence % (0.0631), number of flowers per inflorescence (0.0481), days to first green pod harvest (0.0291), days to first flowering (0.0266), number of pods per inflorescence (0.0189).

Number of green pod pickings showed indirect positive effect on pod width (0.0495) YBMV incidence % (0.0394), days to first flowering (0.0299), days to first green pod harvest (0.0215).

Vine length showed indirect positive effect on number of pods per inflorescence (0.0662) number of green pod pickings (0.0629), days to last green pod harvest (0.0533), inflorescence length (0.0421), pod length (0.0368), 100 seed weight (0.0352), days to first green pod harvest (0.0243), number of flowers per inflorescence (0.0219), days to first flowering (0.0199), number of seeds per pod (0.0105).

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), vine length (0.0601).

Pod width showed indirect positive effect on pod weight (0.4149), number of seeds per pod (0.1143), 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), 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), 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), 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), number of seeds per pod (0.0155).

Table 1: 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 2: 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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