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## Correlation and path coefficient analysis in Dolichos bean (*Lablab purpureus* L.)

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### Abstract

Twenty-one genotypes were used to study the correlation and path coefficient analysis for growth and yield related traits during *rabi*, 2020-21. Green pod yield per plant had positive and significant association with traits like number of flowers per inflorescence, number of pods per vine, pod length and average weight of 10 fresh pod at both genotypic and phenotypic level. Since, these associations of characters are in the desirable direction, it indicates that simultaneous selection for these characters would be rewarding for improving the green pod yield per plant. Path analysis revealed that the traits like days to first harvest, number of pods per vine, number of flowers per inflorescence, vine length at 120 DAS, days to final harvest, days from flowering to pod maturity, pod width and number of branches per plant at 120 DAS exhibited direct positive effect on green pod yield per plant. This indicates true relationship between the traits and green pod yield per plant. Therefore, direct selection for these traits would reward for improvement in yield.

**Keywords:** Correlation, path coefficient, green pod yield

### Introduction

Dolichos bean (*Lablab purpureus* L.) is one of the most ancient crop among cultivated vegetables belongs to the family Leguminosae (Fabaceae) with a chromosome number  $2n=22$ . It has various vernacular names such as Hyacinth bean, Indian bean, Bonavist bean, Field bean, Seim bean, Egyptian bean, Sem, Wal in Maharashtra and Avare in Karnataka state. It is originated from India and then it was introduced to other countries like China, Egypt and Sudan. Dolichos bean is multipurpose vegetable crop. It is mainly grown for fresh pods, dried seeds and fodder purpose. Both green pods and dry seeds are used in various food preparations. Both bush and pole types can be cultivated. The pole types are photosensitive whereas, bush types are photo-insensitive. In India, it is cultivated as fodder crop for livestock. In USA, it is grown as ornamental plant for its beautiful dark green purple veined leaves and large spikes clustered with violet and white pea like blossom.

Dry hyacinth beans recommended for daily allowance of protein. 100 g of edible portion of dolichos bean contains 86.10 g moisture, 3.80 g Protein, 0.70 g Fat, 6.70 g Carbohydrates, 68.00 mg Phosphorus, 1.70 mg Iron and 210.00 mg Calcium. It also contains traces of Niacin 0.70 mg, Thiamine 0.10 mg and Ribo-flavin 0.06 mg. It is gluten free vegetable. The green tender pods are excellent source of vitamin C, which helps in wound healing and tissue repair. The fresh tender pods are also rich source of vitamin A (617.0 I.U.) which is powerful antioxidant helps in mucosal generation (Bose *et al.*, 2003) [4]. Dolichos bean have its major roles in fixing the nitrogen in the soil, source of nutrition for human and animal, adaption to the stress conditions and providing agricultural production systems with sustainability.

Dolichos bean being cultivated in India since long time. This crop remained underexploited and very little efforts have been made for its improvement. There is need to frame a certain breeding objectives like uniform maturity with higher yields, faster growth, photo-insensitivity and disease-pest resistance varieties. To increase the productivity of this crop, development and cultivation of new improved varieties have to be done. To achieve this target using genetic improvement, it is important to find out the genetic variability in available germplasm of dolichos bean crop for yield and yield contributing components.

Yield is a complex trait resulting from interactions between various yield components. Therefore, breeders are interested in correlation studies between yield and other traits in planning the hybridization programme and evaluating the individual plants in segregating populations. Path analysis splits the correlation coefficient into measures of direct and indirect effects, thus gives an idea about the direct and indirect contribution of each character towards yield.

Knowledge of correlation between yield and its attributing characters are basic and most endeavour to find out guidelines for plant selection but path analysis permits the understanding of cause and effect of related characters (Wright, 1921) [19].

Keeping the above facts in view, the present studies entitled "Correlation and path coefficient analysis in dolichos bean (*Lablab purpureus* L.)" has been framed for yield and its contributing characters in 21 genotypes of dolichos bean.

### Material and Methods

The study was conducted at Regional Horticultural Research and Extension Centre (RHREC), Kumbapur, Dharwad, University of Horticultural Sciences (UHS), Bagalkot (Karnataka), during *rabi* season 2020-2021. Twenty genotypes collected from RHREC, Dharwad and one from IIHR, Bangalore were taken for investigation.

Experiment was laid out in randomized complete block design (RCBD) with three replications. The healthy seeds were directly sown in the experimental field at spacing of 1.5 m from row to row and 0.75 m from plant to plant.

The observations were recorded in all randomly tagged five plants in each replication for different traits *viz.*, vine length at 120 DAS, number of branches per plant at 120 DAS, days to first flowering, days to 50 per cent flowering, days to first harvest, days to final harvest, length of inflorescence, days from flowering to pod maturity, number of flowers per inflorescence, number of pods per vine, pod length, pod width, average weight of 10 fresh pod, green pod yield per plant, green pod yield per plot, green pod yield per hectare, number of seeds per pod, 100 dry seed weight, protein content, crude fibre content in seed, pod shelling (%), germination (%) and seedling vigour index. The average values were computed as treatment means under each replication.

The correlation coefficient analysis was done by using AI-Jibouri *et al.* (1958) [2] and path coefficient was estimated according to the formulae suggested by Dewey and Lu (1959) [7].

### Results and Discussion

The genotypic and phenotypic correlation coefficient among growth and yield, parameters is presented in Table 1 and 2. In the present investigation, Number of flowers per inflorescence showed highly significant (both at  $p=0.05$  and  $p=0.01$ ) and positive correlation with pod length, green pod yield per

plant, average weight of 10 fresh pod and number of pods per vine both genotypically and phenotypically. Number of pods per vine showed highly significant (per both at  $p=0.05$  and  $p=0.01$ ) and positive correlation with green pod yield per plant, average weight of 10 fresh pod and pod length both genotypically and phenotypically. Pod length showed highly significant (both at  $p=0.05$  and  $p=0.01$ ) and positive correlation with green pod yield per plant and average weight of 10 fresh pod both genotypically and phenotypically. Average weight of 10 fresh pod showed highly significant (both at  $p=0.05$  and  $p=0.01$ ) and positive correlation with green pod yield per plant both genotypically and phenotypically.

Positive association of green pod yield per plant with number of flowers per inflorescence reported by Bahadur *et al.* (2013) [3] and Ravinaik *et al.* (2014) [14]. Positive association of green pod yield per plant with number of pods per vine and pod length reported by Bahadur *et al.* (2013) [3], Kiran *et al.* (2014) [8], Madhukiran *et al.* (2014) [9], Ravinaik *et al.* (2014) [14], Verma *et al.* (2014) [18], Das *et al.* (2015) [6], Singh *et al.* (2015) [17], Reddy *et al.* (2018) [15] and Noorjahan *et al.* (2019) [10]. Positive association of green pod yield per plant with average weight of 10 fresh pod reported by Noorjahan *et al.* (2019) [10]. These specific traits are in the desired direction, indicating that simultaneous selection for these traits would be useful in improving pod yield in dolichos bean.

Out of the 13 traits which were selected for path analysis (Table 3 and 4), days to first harvest, number of pods per vine, number of flowers per inflorescence, vine length at 120 DAS, days to final harvest and pod width had shown positive direct effect on green pod yield per plant and were positively significant associated with green pod yield per plant. This indicates true relationship between the traits and green pod yield per plant. Therefore, direct selection for these traits would reward for improvement in yield. High positive direct effect on green pod yield through days to first harvest was supported by findings of Anand and Dharendra (2013) [1], Sharma *et al.* (2014) [16] and Pallavi *et al.* (2021) [11]. High positive direct effect on green pod yield through number of pods per vine was supported by findings of Ravinaik *et al.* (2014) [14], Sharma *et al.* (2014) [16], Das *et al.* (2015) [6], Singh *et al.* (2015) [17], Verma *et al.* (2015) [18] and Patil *et al.* (2017) [12]. High positive direct effect on green pod yield through number of flowers per inflorescence and vine length at 120 DAS was supported by findings of Ravinaik *et al.* (2014) [14]. High positive direct effect on green pod yield through days to final harvest was supported by findings of Chaudhari *et al.* (2013) [5]. High positive direct effect on green pod yield through pod width was supported by findings of Ravinaik *et al.* (2014) [14], Sharma *et al.* (2014) [16], Singh *et al.* (2015) [17], Verma *et al.* (2015) [18], Rambabu *et al.* (2016) [13] and Pallavi *et al.* (2021) [11].

**Table 1:** Estimates of genotypic correlation coefficients for growth and yield parameters in dolichos bean genotypes

3	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1	-0.0149	0.5995**	0.6022**	0.5958**	0.2740*	-0.0359	0.3376**	-0.0098	-0.0397	-0.1926	-0.3755**	0.2481*	0.1112
2		1	-0.1388	-0.1901	-0.1357	-0.1277	0.1849	-0.0048	0.0327	-0.2700*	-0.0202	-0.0225	-0.0963	-0.0574
3			1	0.9898**	0.9993**	0.5739**	-0.0770	0.4031**	0.1784	0.1248	-0.0253	0.0673	0.2728*	0.0844
4				1	0.9913**	0.5764**	-0.0475	0.4693**	0.1982	0.0850	-0.0053	-0.0045	0.2534*	0.0335
5					1	0.6026**	-0.0990	0.3891**	0.1805	0.1167	-0.0085	0.0598	0.2802*	0.0787
6						1	-0.0750	0.0738	0.2090	0.0308	0.0760	0.1033	0.5419**	0.1612
7							1	0.2102	0.3446**	-0.0887	0.1234	-0.1239	0.0304	-0.1136

8							1	0.2916*	-0.0869	0.1812	-0.2126	0.0752	-0.0527
9								1	0.4978**	0.6756**	-0.0544	0.5103**	0.5870**
10									1	0.4992**	0.2012	0.5686**	0.8663**
11										1	-0.2440	0.3452**	0.4317**
12											1	0.2239	0.1961
13												1	0.6760**
14													1

Critical rG value at 5% =0.2480 critical rG value at 1% =0.3222 \* and \*\* designated significant at 5% and 1% probability level respectively.

- |  |  |                                    |
|--|--|------------------------------------|
| 1. Vine length at 120 DAS                  | 6. Days to final harvest               | 11. Pod length                     |
| 2. Number of branches per plant at 120 DAS | 7. Length of inflorescence             | 12. Pod width                      |
| 3. Days to first flowering                 | 8. Days from flowering to pod maturity | 13. Average weight of 10 fresh pod |
| 4. Days to 50 per cent flowering           | 9. Number of flowers per inflorescence | 14. Green pod yield per plant      |
| 5. Days to first harvest                   | 10. Number of pods per vine            |                                    |

**Table 2:** Estimates of phenotypic correlation coefficients for growth and yield parameters in dolichos bean genotypes

Traits	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1	-0.0211	0.4915**	0.4948**	0.5046**	0.2573*	-0.0104	0.2017	-0.0161	-0.0341	-0.1662	-0.3423*	0.2310	0.1139
2		1	-0.0804	-0.1236	-0.0834	-0.1122	0.1564	0.0359	0.0271	-0.2440	-0.0164	-0.0112	-0.0860	-0.0440
3			1	0.9898**	0.9952**	0.5078**	0.0707	0.3775**	0.1613	0.1019	-0.0578	0.0699	0.2629*	0.0802
4				1	0.9870**	0.5051**	0.0438	0.4216**	0.1794	0.0663	-0.0427	0.0032	0.2453*	0.0414
5					1	0.5313**	0.0923	0.3679**	0.1609	0.0880	-0.0390	0.0597	0.2722*	0.0746
6						1	-0.0528	0.0819	0.1952	0.0970	0.0553	0.1093	0.4939**	0.1291
7							1	0.1444	0.3345**	-0.0673	0.1103	-0.1348	0.0355	-0.0988
8								1	0.1771	-0.0819	0.1120	-0.1806	0.0815	-0.0855
9									1	0.4676**	0.6274**	0.0486	0.4863**	0.5449**
10										1	0.4593**	0.2109	0.5257**	0.7655**
11											1	-0.2121	0.3276**	0.3690**
12												1	0.2108	0.1777
13													1	0.6391**
14														1

Critical rP value at 5% =0.2480 critical rP value at 1% =0.3222 \* and \*\* designated significant at 5% and 1% probability level respectively.

- |  |  |                                    |
|--|--|------------------------------------|
| 1. Vine length at 120 DAS                  | 6. Days to final harvest               | 11. Pod length                     |
| 2. Number of branches per plant at 120 DAS | 7. Length of inflorescence             | 12. Pod width                      |
| 3. Days to first flowering                 | 8. Days from flowering to pod maturity | 13. Average weight of 10 fresh pod |
| 4. Days to 50 per cent flowering           | 9. Number of flowers per inflorescence | 14. Green pod yield per plant      |
| 5. Days to first harvest                   | 10. Number of pods per vine            |                                    |

**Table 3:** Genotypic path coefficient analysis of the component characters on green pod yield per plant in dolichos bean genotypes

Traits	1	2	3	4	5	6	7	8	9	10	11	12	13	rG
1	0.3673	-0.0002	-0.1644	-1.1905	1.0131	0.0692	0.0041	0.0707	-0.0041	-0.0318	0.0335	-0.0326	-0.0231	0.1112
2	-0.0055	0.0112	0.0381	0.3758	-0.2307	-0.0322	-0.0209	-0.0010	0.0137	-0.2164	0.0035	-0.0020	0.0090	-0.0574
3	0.2202	-0.0015	-0.2742	-1.9568	1.6990	0.1449	0.0087	0.0844	0.0750	0.1000	0.0044	0.0058	-0.0254	0.0844
4	0.2212	-0.0021	-0.2714	-1.9770	1.6854	0.1455	0.0054	0.0983	0.0833	0.0681	0.0009	-0.0004	-0.0236	0.0335
5	0.2189	-0.0015	-0.2740	-1.9597	1.7002	0.1522	0.0112	0.0815	0.0759	0.0935	0.0015	0.0052	-0.0261	0.0787
6	0.1006	-0.0014	-0.1574	-1.1395	1.0246	0.2525	0.0085	0.0155	0.0878	0.0247	-0.0132	0.0090	-0.0505	0.1612
7	-0.0132	0.0021	0.0211	0.0939	-0.1683	-0.0189	-0.1129	0.0440	0.1448	-0.0711	-0.0215	-0.0107	-0.0028	-0.1136
8	0.1240	-0.0001	-0.1105	-0.9278	0.6616	0.0186	-0.0237	0.2094	0.1225	-0.0696	-0.0316	-0.0184	-0.0070	-0.0527
9	-0.0036	0.0004	-0.0489	-0.3918	0.3070	0.0528	-0.0389	0.0610	0.4202	0.3989	-0.1176	-0.0047	-0.0476	0.5870**
10	-0.0146	-0.0030	-0.0342	-0.1680	0.1985	0.0078	0.0100	-0.0182	0.2092	0.8014	-0.0869	0.0174	-0.0530	0.8663**
11	-0.0707	-0.0002	0.0069	0.0106	-0.0145	0.0192	-0.0139	0.0379	0.2839	0.4001	-0.1741	-0.0212	-0.0322	0.4317**
12	-0.1379	-0.0003	-0.0185	0.0088	0.1017	0.0261	0.0140	-0.0445	-0.0229	0.1612	0.0425	0.0867	-0.0209	0.1961
13	0.0911	-0.0011	-0.0748	-0.5009	0.4763	0.1368	-0.0034	0.0157	0.2144	0.4556	-0.0601	0.0194	-0.0932	0.6760**

\*\* Significant at 1% level of Significance \* Significant at 5% level of Significance Diagonal value indicate direct effect

R Square =0.9468 Residual effect =0.2308 rG- Genotypic correlation with yield per plant

- |  |  |                                    |
|--|--|------------------------------------|
| 1. Vine length at 120 DAS                  | 6. Days to final harvest               | 11. Pod length                     |
| 2. Number of branches per plant at 120 DAS | 7. Length of inflorescence             | 12. Pod width                      |
| 3. Days to first flowering                 | 8. Days from flowering to pod maturity | 13. Average weight of 10 fresh pod |
| 4. Days to 50 per cent flowering           | 9. Number of flowers per inflorescence |                                    |
| 5. Days to first harvest                   | 10. Number of pods per vine            |                                    |

**Table 4:** Phenotypic path coefficient analysis of the component characters on green pod yield per plant in dolichos bean genotypes

Traits	1	2	3	4	5	6	7	8	9	10	11	12	13	rP
1	0.1583	-0.0017	0.3522	-0.2825	-0.1479	-0.0223	0.0020	-0.0081	-0.0060	-0.0172	0.0210	-0.0006	0.0667	0.1139
2	-0.0033	0.0803	-0.0576	0.0706	0.0245	0.0097	-0.0307	-0.0015	0.0101	-0.1232	0.0021	0.0000	-0.0249	-0.0440
3	0.0778	-0.0065	0.7165	-0.5652	-0.2918	-0.0441	0.0139	-0.0153	0.0600	0.0514	0.0073	0.0001	0.0759	0.0802
4	0.0783	-0.0099	0.7092	-0.5710	-0.2893	-0.0439	0.0086	-0.0170	0.0667	0.0335	0.0054	0.0000	0.0708	0.0414

5	0.0799	-0.0067	0.7131	-0.5636	-0.2932	-0.0461	0.0181	-0.0149	0.0598	0.0444	0.0049	0.0001	0.0786	0.0746
6	0.0407	-0.0090	0.3639	-0.2884	-0.1558	-0.0868	0.0104	-0.0033	0.0726	0.0490	-0.0070	0.0002	0.1427	0.1291
7	-0.0016	0.0126	-0.0507	0.0250	0.0271	0.0046	-0.1963	-0.0058	0.1244	-0.0340	-0.0139	-0.0002	0.0103	-0.0988
8	0.0319	0.0029	0.2705	-0.2408	-0.1079	-0.0071	-0.0283	-0.0404	0.0659	-0.0413	-0.0141	-0.0003	0.0235	-0.0855
9	-0.0025	0.0022	0.1156	-0.1024	-0.0472	-0.0170	-0.0657	-0.0072	0.3719	0.2361	-0.0792	-0.0001	0.1405	0.5449**
10	-0.0054	-0.0196	0.0730	-0.0379	-0.0258	-0.0084	0.0132	0.0033	0.1739	0.5050	-0.0580	0.0003	0.1518	0.7655**
11	-0.0263	-0.0013	-0.0414	0.0244	0.0114	-0.0048	-0.0216	-0.0045	0.2333	0.2319	-0.1263	-0.0003	0.0946	0.3690**
12	-0.0542	-0.0009	0.0501	-0.0018	-0.0175	-0.0095	0.0265	0.0073	-0.0181	0.1065	0.0268	0.0016	0.0609	0.1777
13	0.0366	-0.0069	0.1884	-0.1401	-0.0798	-0.0429	-0.0070	-0.0033	0.1808	0.2655	-0.0414	0.0003	0.2888	0.6391**

\*\* Significant at 1% level of Significance \* Significant at 5% level of Significance Diagonal value indicate direct effect

R Square =0.7656 Residual effect =0.4842 rP- Phenotypic correlation with yield per plant

1. Vine length at 120 DAS

6. Days to final harvest

11. Pod length

2. Number of branches per plant at 120 DAS

7. Length of inflorescence

12. Pod width

3. Days to first flowering

8. Days from flowering to pod maturity

4. Days to 50 per cent flowering

9. Number of flowers per inflorescence

5. Days to first harvest

10. Number of pods per vine

## Conclusion

Green pod yield per plant had positive and significant association with traits like number of flowers per inflorescence, number of pods per vine, pod length and average weight of 10 fresh pod at both genotypic and phenotypic level. Path analysis revealed days to first harvest, number of pods per vine, number of flowers per inflorescence, vine length at 120 DAS, days to final harvest and pod width had shown positive direct effect on green pod yield per plant and were positively significant associated with green pod yield per plant. This indicates true relationship between the traits and green pod yield per plant. Therefore, direct selection for these traits would reward for improvement in yield.

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