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Path co-efficient analysis in dolichos bean [*Dolichos lablab* (Roxb.) L. var. *typicus*]

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ABSTRACT : An investigation was conducted at Vegetable unit, Department of Horticulture, Faculty of Agriculture, Annamalai University, Chidambaram during 2011-12, with a view to identify superior genotypes in garden bean. The experiment was laid out by collecting 27 genotypes from various sources in a randomized block design with three replications for two seasons. The observations on various growth and yield parameters were recorded and analyzed for identifying the superior genotype. Path analysis revealed the existence of high magnitude of positive direct effect of pod weight, number of pods per inflorescence, number of branches per plant on yield of pods per plant in season I. In season II, the traits like pod weight, number of branches per plant, number of days taken for fruit setting and number of pods per plant had highly significant and positive direct effect on yield of pods in season II.

KEY WORDS : Dolichos bean, Direct effect, Indirect effect, Growth and yield characters, Path analysis

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Dolichos bean (or) garden bean botanically called as *Dolichos lablab* (Roxb.) L. var *typicus* is an important leguminous vegetable. It is commonly called as hyacinth bean, bonavist bean, Indian bean, etc. In India, two botanical varieties are recognized and are sometime considered as distinct species. They are *Dolichos lablab* var *typicus* (L.) Prain, is a twining herb treated as an annual and *Dolichos lablab* var *lignosus* (L.) Prain, a busy perennial (Purseglove, 1968). There are two distinct groups based on growth habit, one is pole type and the other is bush type. The pole types are perennial and photo sensitive, whereas the bush types are photo insensitive and annual in habit. The crop is best suited for cultivation in tropical and subtropical regions as it is susceptible to frost (Veeraragavathantham *et al.*, 1998). The merits of this legume are due to its versatility richness in protein content and vigorous nodulating habit and these characters makes it fit for kitchen gardening (Binu and Krishna Kumary, 2002). This crop is grown in almost all the districts of Tamil Nadu. In any crop improvement programme, evaluation of genetic variability in the germplasm deserves considerable importance from the point of view of identifying improved genotypes. Yield being a complex polygenic character, direct selection may not be a reliable approach on account of being highly influenced by environmental factors. Therefore, it becomes essential to identify that component characters through which yield improvement could be obtained. Though correlation give information about the components of a complex character like yield, but it could not provide an exact picture of relative importance of the direct and indirect contributions of the component characters to yield. In this context, the technique of path co-efficient was used to study the direct and indirect effects of an independent variable on dependence variable.

RESEARCH METHODS

The study was conducted at the experimental field of the vegetable unit, Department of Horticulture, Faculty of Agriculture, Annamalai University, Tamil Nadu during 2010-12. The experiment was carried out in a Randomized Block Design with three replications in two seasons (Season I (July – September, 2011) and Season II (January – March, 2012). The experiment was carried out with 27 genotypes collected from diverse sources. Among the 27 genotypes COGB – 14 was collected form Coimbatore, Arka Jai and Arka Vijay were collected from IIHR, four genotypes *viz.*, Goldy 24, Goldy, Deepalakshmi and Dhoni were collected from Theni, Nandini and LG-545 were collected from Bangalore and

remaining 17 were collected form different districts *viz.*, Cuddalore (4 local genotypes), Villupuram (3 local genotype), Theni (1 local genotypes), Salem (1 local genotype), Kerala (2 local genotypes), Andhra (1 local genotype), Trivannamalai (1 local genotype), Thanjavur (1 local genotype), Trichy (1 local genotype), Karnataka (1 local genotype) and Coimbatore (1 local genotype). The main field was prepared in to plots of 2 m x 2 m size and the seeds were sown at spacing 60 cm x 60 cm, respectively. The required intercultural operation and plant protection measures were carried out as per the requirement of the crop. Observations were recorded on various characters *viz.*, plant height, number of branches per plant, days to 50 % flowering, number of racemes per plant, raceme length, number of nodes per plant, number of days taken for fruit set, number of pods per inflorescence, number of pods per plant, days to first pod harvest, pod length, pod width, pod weight and pod yield per plant.

The direct and indirect contribution of various characters to yield were calculated through path co-efficient analysis as suggested by Wright (1921) and elaborated by Dewey and Lu (1959).

RESEARCH FINDINGS AND DISCUSSION

Path analysis helps in measuring the direct effect of each trait as well as its indirect effect through other characters contributing to yield. This analysis was used in the present investigation by partitioning the direct and indirect effects that contribute to yield. The data on direct and indirect effects of various yield contributing characters are presented in Table 1 and 2 for both seasons.

Among the direct effect on yield, number of pods per inflorescence showed the highest positive direct effect in season I (Table 1). The direct effect on yield in season II (Table 2)is with plant height, number of branches per plant followed by number of pods per plant and number of pods per inflorescence. This is in agreement with the findings of Bendale *et al.* (2004), Bendale *et al.* (2008) and Rai *et al.* (2009) for pod weight; Shinde and Dumbre (2010) and Rafi and Nath (2004) for pod yield per plant; Rai *et al.* (2008) and Upadhayay and Mehta (2010) in dolichos bean.

The characters *viz.*, raceme length, number of flower buds per raceme, number of nodes per plant, number of pods per plant and days to first pod harvest, pod length and pod width in season I showed marked negative direct effect on pod yield per plant. In season II, the negative direct effect was on pod yield per plant, plant height, number of racemes per plant, raceme length, number of nodes per plant, number of flower buds per inflorescence and pod length. This is in agreement with the results of Upadhyay and Mehta (2010) in Dolichos bean. Similar findings were also reported by Rai *et al.* (2008) and Kamaluddin and Shahid Ahmed (2011) in common bean.

Table 1 : Path co-efficient analysis depicting the direct (Bold) and indirect effect of various characters on yield per plant in dolichos bean (Season I)

Characters	Plant height (cm)	No. of branches per plant	Days to 50% flowering	No. of racemes per plant	Raceme length (cm)	No. of flower buds per raceme	No. of nodes per plant	No. of days taken for fruit set	No. of pods per inflorescence	No. of pods per plant	Days to first pod harvest	Pod length (cm)	Pod width (cm)	Pod weight (g)
Plant height (cm)	**0.196**	0.153	-0.063	0.149	-0.008	-0.183	-0.109	-0.192	0.288	-0.344	0.452	-0.243	-0.084	0.211
No. of branches per plant	0.122	**0.246**	-0.058	0.138	-0.011	-0.180	-0.173	-0.120	0.237	-0.266	0.351	-0.197	-0.083	0.007
Days to 50% flowering	-0.126	-0.146	**0.098**	-0.081	0.002	0.158	0.097	0.188	-0.267	0.328	-0.644	0.272	0.113	-0.020
No. of racemes per plant	0.127	0.149	-0.035	**0.230**	-0.010	-0.291	-0.072	0.015	0.172	-0.207	0.267	-0.308	-0.038	0.011
Raceme length (cm)	0.083	0.149	-0.013	0.121	**-0.018**	0.065	-0.083	-0.150	0.072	-0.186	0.057	0.002	-0.089	0.120
No. of flower buds per raceme	0.106	0.130	-0.046	0.197	0.003	**-0.339**	-0.087	0.012	0.200	-0.185	0.330	-0.275	-0.038	0.011
No. of nodes per plant	0.122	0.244	-0.055	0.095	-0.009	-0.168	**-0.175**	-0.034	0.192	-0.270	0.311	-0.164	-0.082	0.004
No. of days taken for fruit set	-0.130	-0.102	0.064	0.012	0.010	0.001	0.021	**0.289**	-0.176	0.217	-0.382	0.063	0.092	-0.211
No. of pods per inflorescence	0.158	0.163	-0.073	0.110	-0.004	-0.190	-0.094	-0.142	**0.357**	-0.398	0.479	-0.247	-0.107	0.025
No. of pods per plant	0.162	0.157	-0.077	0.114	-0.008	-0.150	-0.113	-0.150	0.340	**-0.418**	0.470	-0.217	-0.094	0.021
Days to first pod harvest	-0.143	-0.139	0.102	-0.099	0.002	0.181	0.088	0.178	-0.276	0.316	**-0.621**	0.281	0.122	-0.022
Pod length (cm)	0.129	0.130	-0.072	0.190	0.000	-0.251	-0.077	-0.049	0.237	-0.244	0.469	**-0.372**	-0.081	0.019
Pod width (cm)	0.113	0.141	-0.076	0.061	-0.011	-0.088	-0.098	-0.184	0.262	-0.269	0.522	-0.207	**-0.145**	-0.007
Pod weight (g)	0.158	0.039	-0.322	-0.012	-0.114	-0.118	0.005	0.037	0.087	0.047	0.412	0.026	0.045	**0.559**

Residual effect= 0.47102

Table 2 : Path co-efficient analysis depicting the direct (Bold) and indirect effect of various characters on yield per plant in dolichos bean (Season II)

Characters	Plant height (cm)	No. of branches per plant	Days to 50% flowering	No. of racemes per plant	Raceme length (cm)	No. of flower buds per raceme	No. of nodes per plant	No. of days taken for fruit set	No. of pods per inflorescence	No. of pods per plant	Days to first pod harvest	Pod length (cm)	Pod width (cm)	Pod weight (g)
Plant height (cm)	-0.506	0.535	-0.162	-0.312	0.006	-0.120	-0.014	0.336	-0.451	0.514	0.098	0.095	-0.014	-1.049
No. of branches per plant	-0.376	0.721	-0.203	-0.272	-0.127	-0.126	-0.159	0.337	-0.452	0.514	0.098	0.096	-0.014	-0.704
Days to 50% flowering	0.309	-0.552	0.265	0.149	0.121	0.111	0.127	0.303	-0.488	0.465	0.137	0.130	0.032	0.534
No. of racemes per plant	-0.383	0.475	-0.096	-0.412	-0.091	-0.145	-0.056	-0.281	0.364	-0.468	-0.116	-0.161	-0.001	-0.536
Raceme length (cm)	0.008	0.215	-0.075	-0.088	-0.425	0.025	-0.016	0.199	-0.334	0.354	0.057	0.151	0.047	-0.187
No. of flower buds per raceme	-0.323	0.481	-0.157	-0.318	0.056	-0.189	-0.076	0.187	-0.173	0.242	0.021	0.019	0.022	-0.049
No. of nodes per plant	-0.056	0.917	-0.271	-0.186	-0.055	-0.115	-0.125	0.180	-0.336	0.316	0.093	0.171	0.021	-0.468
No. of days taken for fruit set	0.427	-0.548	0.187	0.206	0.200	0.085	0.063	0.200	-0.275	0.238	0.398	0.058	-0.046	0.785
No. of pods per inflorescence	-0.393	0.605	-0.166	-0.237	-0.126	-0.109	-0.059	-0.399	0.502	-0.569	-0.133	-0.098	-0.032	-1.039
No. of pods per plant	-0.422	0.543	-0.201	-0.236	-0.167	-0.096	-0.048	0.344	-0.581	0.557	0.077	0.100	0.055	-0.433
Days to first pod harvest	0.276	-0.549	0.171	0.130	0.050	0.098	0.276	0.367	-0.525	0.617	0.089	0.086	0.028	0.491
Pod length (cm)	-0.200	0.389	-0.177	-0.258	-0.034	-0.133	-0.030	-0.296	0.250	-0.306	-0.180	-0.132	0.011	0.512
Pod width (cm)	0.131	0.416	-0.004	-0.345	-0.169	-0.070	0.103	0.162	-0.241	0.219	0.098	0.241	0.027	-0.252
Pod weight (g)	-0.567	-1.265	0.654	1.224	-0.189	-2.000	0.110	-0.368	-0.558	0.497	0.157	-0.213	0.067	2.051

Residual effect= 0.24250

Although pod weight had the highest direct effect on pod yield per plant, the indirect effect was found to be positive via plant height, number of branches per plant, number of nodes per plant, number of days taken for fruits setting, number of pods per inflorescence, number of pods per plant, days to first pod harvest, pod length and pod width. Similarly the positive significant effect due to number of pods per inflorescence might have played indirectly by influencing the characters like plant height, number of branches per plant, number of racemes per plant and days to first pod harvesting in season I.

In season II, the number of branches per plant had the highest direct effect on pod yield per plant, the indirect effect was found to be positive via number of days taken for fruit setting, number of pods per plant, days to first pod harvest and pod length. Similarly the positive significant effect due to number of pods per plant might have played indirectly by influencing the characters strike number of branches per plant, number of days taken for fruit setting, days to first pod harvest, pod length and pod width.

Even though the direct effect due to raceme length was negative it had indirectly the yield by having positive indirect effect on plant height, number of branches per plant, number of raceme per plant, number of flower buds per raceme, number of pods per inflorescence, and days to first pod harvest. The similar trend was observed in the case of number of flower buds per raceme had influenced the yield per plant mainly through its indirect effect on plant height, number of branches per plant, number of racemes per plant, raceme length, number of flower buds per raceme, number of nodes per plant, number of days taken for fruit setting, number of pods per inflorescence, days to first pod harvest, pod length and pod width in season I.

In season II, the direct effect due to plant height was negative, it had indirectly the yield by having positive individual effect on number of branches per plant, raceme length, number of days taken for fruit setting, number of pods per plant, days to first pod harvest and pod length. The similar trend was observed in case of raceme length which had influenced the yield per plant mainly through its indirect effect on plant height, number of branches per plant, number of flower buds per raceme, number of days taken for fruit setting, number of pods per plant, days to first pod harvest, pod length and pod width. Similar findings were also reported by Thankur *et al.* (1997) and Priyanka (2011) in dolichos bean.

Improvement in dolichos bean thus may be enhanced through the diret selection of genotypes (to be used in breeding programme) for the above mentioned characters exhibiting high positive direct and indirect effects with positive correlation.

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