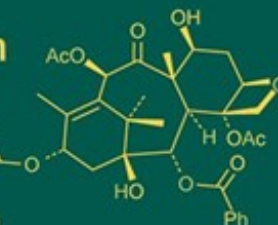


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating (2026): 5.29
Indexing: Embase
IJABR 2026; SP-10(9): 2003-2008
www.biochemjournal.com
Received: 22-07-2026
Accepted: 21-08-2026
Published: 22-09-2026

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Correlation and path coefficient analysis for yield and yield- contributing characters in pole -type *Dolichos* bean (*Lablab purpureus* L.)

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DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i9Sy.10103>

ABSTRACT

The present investigation was conducted to study the correlation and path coefficient analysis for yield and its contributing characters among different pole-type dolichos bean genotypes. Seventeen pole-type dolichos bean genotypes were evaluated during Rabi 2025-26 at the Horticultural Research cum Instructional Farm, Department of Vegetable Science, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh). The experiment was conducted in a randomized block design with three replications. Fresh pod yield per hectare showed significant positive association with several growth and yield-related traits, with the strongest genotypic correlation observed for number of pods per cluster (0.810), followed by flowers per inflorescence (0.788), primary branches per plant (0.619) and inflorescence length (0.480). Path analysis revealed the highest positive direct effects of number of pods per cluster (0.740), days to first flowering (0.716), inflorescence length (0.626) and primary branches per plant (0.517). The low residual effect (0.0445) indicated adequate explanation of yield variation by the traits studied. Hence, number of pods per cluster, inflorescence length and primary branches per plant may serve as important selection criteria for improving fresh pod yield in pole-type dolichos bean.

Keywords: Pole- type dolichos bean, Correlation, Path coefficient, Pod yield

Introduction

Dolichos bean (*Lablab purpureus* L. Sweet; $2n = 22$) is an important Leguminous vegetable crop belonging to the family Fabaceae and is widely recognized for its adaptability and multipurpose utility. The crop is commonly known as Indian bean, hyacinth bean, field bean and lablab bean. It is considered one of the ancient cultivated legumes and is believed to have originated in Africa, from where it spread to Asia, with India emerging as an important centre of diversity (Maass *et al.*, 2010) [1]. The crop is widely cultivated in tropical and subtropical regions because of its adaptability to diverse agro-climatic conditions. In India, it is mainly grown in Karnataka, Tamil Nadu, Andhra Pradesh, Telangana, Maharashtra, Gujarat and parts of Central India, where it contributes to vegetable production, farm income and nutritional security.

Dolichos bean is a versatile crop cultivated for immature green pods, mature dry seeds, fodder, green manure and ornamental purposes. The immature pods are consumed as vegetables, while mature seeds are used as pulses in various traditional dishes (Sultana *et al.*, 2021) [2]. The seeds are nutritionally rich and contain considerable amounts of protein, carbohydrates, dietary fibre, vitamins and minerals. The crop therefore has an important role in improving dietary diversity and nutritional security. In addition to its nutritional value, dolichos bean is capable of

performing satisfactorily under relatively low rainfall and marginal soil conditions (Ewansiha *et al.*, 2016) [3]. Being a legume, it forms symbiotic association with *Rhizobium* bacteria and contributes to biological nitrogen fixation, thereby improving soil fertility and supporting sustainable crop production (Reddy *et al.*, 2019) [4].

Despite its nutritional, economic and agricultural importance, dolichos bean remains comparatively under-utilized and has received less research attention than major vegetable crops. Limited availability of improved varieties, inadequate quality seed, poor market linkages and insufficient breeding efforts are some of the major constraints affecting its productivity. Farmers often depend on traditional genotypes that show considerable variation in yield and pod quality. Therefore, systematic evaluation of available genetic resources and development of superior varieties with desirable growth, yield and quality traits are essential for increasing the productivity and wider adoption of this crop (Mabhaudhi *et al.*, 2024) [5].

Genetic variability is the basic requirement for successful crop improvement because the presence of sufficient variation provides opportunities for effective selection and development of superior genotypes (Verma *et al.*, 2014) [6]. Estimation of genotypic coefficient of variation,

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phenotypic coefficient of variation, heritability and genetic advance provides useful information about the magnitude and nature of genetic variation present in a population. High heritability coupled with high genetic advance indicates the predominance of additive gene action and suggests greater effectiveness of selection. Previous studies in dolichos bean have reported considerable variability and heritability for important yield and yield-related traits, indicating their potential use in breeding programmes (Afsan *et al.*, 2019) [7].

Yield is a complex quantitative trait influenced by several interrelated characters. Hence, selection based only on yield may not always be effective. Correlation analysis helps to determine the degree and direction of association between yield and its component characters (Dhillon *et al.*, 2015) [8]. However, correlation does not distinguish between direct and indirect effects of individual traits. Path coefficient analysis further partitions the correlation coefficients into direct and indirect effects and helps in identifying important yield-contributing characters (Patel *et al.*, 2022) [9]. Most previous studies have concentrated on bush-type dolichos bean, whereas comparatively limited information is available on pole-type genotypes. Pole-type genotypes possess vigorous climbing growth, prolonged harvesting period and continuous pod-bearing habit, making them promising for commercial vegetable production (Gangadhara *et al.*, 2023) [10]. Therefore, systematic evaluation of pole-type genotypes for genetic variability and character association is essential for identifying superior genotypes and developing effective selection strategies.

Materials and methods

The present investigation was conducted to assess variability and character association among 17 genotypes of pole type *Dolichos* bean (*Lablab purpureus* L. Sweet) at the Horticultural Research cum Instructional Farm, Department of Vegetable Science, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.), during 2025-26. The experimental site is located at approximately 21°16' N latitude and 81°36' E longitude at an elevation of 289.56 m above mean sea level. The soil of the experimental field was clay loam in texture, locally known as "dorsa", with a pH of 7.2. The experiment was laid out in a Randomized Block Design (RBD) with three replications using 17 genotypes obtained from AICRP on Vegetable Crops, IGKV, Raipur. The crop was sown on 8 August 2025 with a spacing of 1.5 m × 0.75 m, and recommended fertilizers and cultural practices were followed. Each plot consisted of three rows of 4.5 m length with a plot size of 4.5 m × 3.0 m. Five competitive plants were randomly selected and tagged from each plot for

recording observations on growth, flowering, pod, yield and quality characters as per the NBPGR descriptor for germplasm and varietal evaluation of vegetable crops.

The recorded data were subjected to analysis of variance following Panse and Sukhatme (1967) [11]. Phenotypic and genotypic coefficients of variation were estimated following Burton and De Vane (1953) [12], heritability in broad sense following Hanson *et al.* (1956) [13] and genetic advance following Johnson *et al.* (1955) [14]. Genotypic and phenotypic correlation coefficients were estimated following Miller *et al.* (1958) [15], while path coefficient analysis was carried out following Wright (1921) [16] and Dewey and Lu (1959) [17] to determine the direct and indirect effects of component characters on fresh pod yield per plant.

Results

Correlation coefficient analysis

Perusal of data (Table 1) showed that at the phenotypic level, fresh pod yield per hectare showed significant positive association with plant height at 30 and 75 DAS, number of primary branches per plant, number of flowers per inflorescence, inflorescence length, number of pods per cluster, pod length, pod width and weight of 100 seeds. Days to first flowering, days to 50% flowering, days to first pod initiation and days to first pod harvest showed negative associations with fresh pod yield per hectare.

At the genotypic level, fresh pod yield per hectare showed highly significant positive association with number of flowers per inflorescence (0.788) and significant positive associations with number of pods per cluster (0.810), number of primary branches per plant (0.619), inflorescence length (0.480), pod length (0.438), plant height at 30 DAS (0.436), plant height at 75 DAS (0.403), pod width (0.403) and 100-seed weight (0.311). Days to first flowering and days to 50% flowering showed significant negative associations with yield. Overall, genotypic correlations were generally higher than phenotypic correlations.

PH_{30} DAS - Plant height at 30 DAS (m), PH_{75DAS} - Plant height at 75days (m), PH_H - Plant height at harvest (m), NP_B - No. of primary branches per plant, DT_{1F} - Days to first flowering, 50%F - Days to 50% flowering, DT_{1PI} - Days to first pod initiation, NFI - No. of flowers per inflorescence, I_L - Inflorescence length (cm), NP_C - No. of pods per cluster, P_L - Pod length (cm), P_W - Pod width (cm), DT_{1H} - Days to first pod harvest, 100SW - Weight of 100 seeds (g), 10APW - 10 Average weight of pod, Y_H - Fresh pod yield per hectare.

Table 1. Genotypic Correlation coefficients of yield attributing traits in *Dolichos* bean

PH30 DAS	PH75 DAS	PHH	NPB	DTIF	50 %F	DT1PI	NFI	IL	NPC	PL	PW	DTIH	100SW	10AWP	YH
PH 30	1	0.481**	0.037	0.402*	-0.507**	-0.523**	0.119	0.085	0.474**	0.243	0.481**	-0.512**	0.248	-0.059	0.436*
DAS															
PH 75	1	0.274*	0.297*	-0.393*	-	-0.414*	0.493**	-0.055	-	-0.054	0.612**	-0.361*	-0.147	0.139	0.403*
DAS					0.541**				0.742**						
PHH		1	0.227	-0.139	-0.130	-0.161	0.284*	0.354*	-0.293*	0.111	0.274*	-0.236	-0.149	0.419*	0.247
NPB			1	0.031	0.029	0.074	0.614**	-0.090	0.725**	0.423*	0.297**	-0.023	0.282*	00.211	0.619**
DTIF				1	0.79**	0.711**	-0.016	-	-0.204	-0.369*	-0.393	0.687**	0.040	-0.089	-0.262*
								0.408*							
50%F					1	0.701**	-0.130	-	-0.254*	-0.357*	-	0.67**	-0.009	0.031	-0.321*
								0.437*			0.541**				
DT1PI						1	-0.154	-	-0.225	-0.382*	0.493**	0.692**	-0.044	-0.041	-0.235
								0.411*							
NFI							1	0.231	0.642**	0.255*	-0.055	-0.180	0.243	0.144	0.788**
IL								1	0.351*	0.737**	0.317*	-0.461**	0.373*	0.338*	0.480**
NPC									1	0.291*	0.150	-0.246	0.362*	-0.080	0.810*
PL										1	1.000	-0.37*	0.386*	0.59**	0.438*
PW											1	-0.246	-0.147	0.139	0.403*
DTIH												1	-0.100	-0.001	-0.245
100SW													1	0.384*	0.311*
10AWP														1	0.117
YH															1

* Significant at 5% and ** at 1% level of significance, respectively

(continued on next page)

Table 2. Phenotypic Correlation coefficients of yield attributing traits in *Dolichos* bean

PH30 DAS	PH75 DAS	PHH	NPB	DTIF	50 %F	DT1PI	NFI	IL	NPC	PL	PW	DTIH	100SW	10AWP	YH
PH30 DAS	1	0.451*	0.199	-	-0.408*	-0.397*	-0.282*	0.109	0.337*	0.226	0.451*	-0.326*	0.217	-0.042	0.332*
DAS				0.386*											
PH75 DAS	1	0.207	0.151	-0.332*	-0.300*	-0.340*	-0.479**	-0.018	0.203	0.135	0.580**	-0.236	-0.166	0.081	0.377*
PHH		1	0.088	-0.050	-0.101	-0.136	-0.082	0.199	0.012	0.363*	0.207	-0.078	-0.14	0.311*	0.157
NPB			1	0.005	-0.031	0.003	0.564**	-0.137	0.366*	0.161	0.151	0.103	0.221	0.131	0.485**
DTIF				1	0.611**	0.697**	0.050	-0.314*	-0.107	-0.334*	-0.332*	0.759**	0.022	-0.044	-0.244
50%F					1	0.637**	-0.135	-0.292*	-0.193	-0.264*	-0.3*	0.78**	-0.067	0.018	-0.181
DT1PI						1	-0.049	-0.237	-0.171	-0.29*	-0.34*	0.565**	-0.081	-0.002	-0.206
NFI							1	0.190	0.582**	0.228	0.373*	-0.071	0.186	0.14	0.623**
IL								1	0.272*	0.429**	-0.018	-0.306*	0.29*	0.282*	0.346*
NPC									1	0.269*	0.203	-0.197	0.314*	-0.044	0.775**
PL										1	0.135	-0.282*	0.317*	0.556**	0.378*
PW											1	-0.236	-0.166	0.081	0.377*
DTIH												1	-0.106	0.002	-0.193
100SW													1	0.344*	0.259*
10AWP														1	0.087
YH															1

* Significant at 5% and ** at 1% level of significance, respectively

PH₃₀ DAS - Plant height at 30 DAS (m), PH₇₅DAS - Plant height at 75days (m), PH_H - Plant height at harvest (m), NP_B - No. of primary branches per plant, DT_{1F} - Days to first flowering, 50%F - Days to 50% flowering, DT_{1PI} - Days to first pod initiation, NF_I - No. of flowers per inflorescence, I_L - Inflorescence length (cm), NP_C - No. of pods per cluster, P_L - Pod length (cm), P_W - Pod width (cm), DT_{1H} - Days to first pod harvest, 100SW - Weight of 100 seeds (g), 10APW - 10 Average weight of pod, Y_H - Fresh pod yield per hectare.

Path coefficient analysis

Path coefficient analysis (Table 3) revealed that the highest positive direct effect on fresh pod yield per hectare was exerted by number of pods per cluster (0.740), followed by days to first flowering (0.716),

inflorescence length (0.626), number of primary branches per plant (0.517), average weight of pod (0.266), plant height at 75 DAS (0.105), pod width (0.105) and days to 50% flowering (0.048). Negative direct effects were recorded for days to first pod harvest (-0.446), 100-seed weight (-0.422), plant height at harvest (-0.265), days to first pod initiation (-0.182), number of flowers per inflorescence (-0.161), pod length (-0.155) and plant height at 30 DAS (-0.028). The residual effect was 0.0445, indicating that the characters included in the path analysis explained a substantial proportion of the variation in fresh pod yield per hectare.

Table 3. Genotypic path coefficients analysis of yield attributing traits in *Dolichos* bean

	PH30	PH75	PHH	NBP	DT1F	50%F	DT1PI	NFI	IL	NPC	PL	PW	DT1H	100SW	10AWP	rg
PH30	-0.028	0.051	-0.010	0.208	-0.363	-0.025	0.098	-0.019	0.053	0.351	-0.038	0.051	0.228	-0.105	-0.016	0.436*
PH75	-0.013	0.105	-0.073	0.153	-0.281	-0.026	0.075	-0.079	-0.034	0.235	-0.023	0.105	0.161	0.062	0.037	0.403*
HH	-0.001	0.029	-0.265	0.117	-0.099	-0.006	0.029	-0.046	0.222	0.031	-0.073	0.029	0.105	0.063	0.111	0.247
NB.P	-0.011	0.031	-0.060	0.517	0.022	0.001	-0.013	-0.099	-0.057	0.340	-0.031	0.031	0.010	-0.119	0.056	0.619**
DT1F	0.014	-0.041	0.037	0.016	0.716	0.049	-0.184	0.003	-0.256	-0.151	0.057	-0.041	-0.440	-0.017	-0.024	-0.262*
DFP	0.015	-0.057	0.034	0.015	0.735	0.048	-0.190	0.021	-0.274	-0.188	0.055	-0.057	-0.490	0.004	0.008	-0.321*
DT1PI	0.015	-0.043	0.043	0.038	0.724	0.050	-0.182	0.025	-0.257	-0.167	0.059	-0.043	-0.503	0.018	-0.011	-0.235
NFI	-0.003	0.052	-0.075	0.317	-0.011	-0.006	0.028	-0.161	0.145	0.475	-0.039	0.052	0.080	-0.102	0.038	0.788**
IL	-0.002	-0.006	-0.094	-0.047	-0.292	-0.021	0.075	-0.037	0.626	0.260	-0.114	-0.006	0.205	-0.157	0.090	0.48**
N.P.C	-0.013	0.033	-0.011	0.238	-0.146	-0.012	0.041	-0.103	0.220	0.740	-0.045	0.033	0.110	-0.153	-0.021	0.81**
PL	-0.007	0.016	-0.125	0.105	-0.264	-0.017	0.070	-0.041	0.462	0.216	-0.155	0.016	0.169	-0.163	0.157	0.438*
PW	-0.013	0.105	-0.073	0.153	-0.281	-0.026	0.075	-0.079	-0.034	0.235	-0.023	0.105	0.161	0.062	0.037	0.403*
DT1H	0.014	-0.038	0.063	-0.012	0.706	0.053	-0.206	0.029	-0.288	-0.182	0.059	-0.038	-0.446	0.042	0.000	-0.245
SW	-0.007	-0.015	0.040	0.146	0.029	0.000	0.008	-0.039	0.233	0.268	-0.060	-0.015	0.044	-0.422	0.102	0.311*
10AWP	0.002	0.015	-0.111	0.109	-0.063	0.001	0.008	-0.023	0.211	-0.059	-0.091	0.015	0.000	-0.162	0.266	0.117

Residual effect 0.0445

* Significant at 5% and ** at 1% level of significance, respectively

PH₃₀ DAS - Plant height at 30 DAS (m), PH₇₅DAS - Plant height at 75days (m), PH_H - Plant height at harvest (m), NP_B - No. of primary branches per plant, DT_{1F} - Days to first flowering, 50%F - Days to 50% flowering, DT_{1PI} - Days to first pod initiation, NF_I - No. of flowers per inflorescence, I_L - Inflorescence length (cm), NP_C - No. of pods per cluster, P_L - Pod length (cm), P_W - Pod width (cm), DT_{1H} - Days to first pod harvest, 100SW - Weight of 100 seeds (g), 10PW - 10 Average weight of pod, r_g - Genotypic correlation coefficient.

Discussion

Correlation coefficient analysis

The magnitude of genotypic correlation coefficients was generally higher than the corresponding phenotypic correlation coefficients, indicating that environmental effects influenced the expression of these associations. Particularly strong positive genotypic associations were observed for number of flowers per inflorescence, number of pods per cluster, number of primary branches per plant and inflorescence length, suggesting their importance in determining fresh pod yield. Overall, the correlation analysis indicated that number of pods per cluster, number of flowers per inflorescence, number of primary branches per plant, inflorescence length, plant height at 30 and 75 days after sowing, pod length, pod width and weight of 100 seeds were important traits positively associated with fresh pod yield per hectare, particularly at the genotypic level. Therefore, these characters may be given greater emphasis during selection for improving fresh pod yield in *Dolichos* bean.

Correlation analysis showed that fresh pod yield per hectare had significant positive associations with number of flowers per inflores-

cence, number of pods per cluster, number of primary branches per plant, plant height, inflorescence length, pod length, pod width and weight of 100 seeds. Genotypic correlations were generally higher than phenotypic correlations, indicating the masking effect of environmental factors. Similar results were reported by Shubha *et al.* (2024) [18] and Thasneem *et al.* (2022) [19] in *dolichos* bean. The strong positive association of number of pods per cluster, number of flowers per inflorescence, number of primary branches per plant and inflorescence length with yield indicates their potential as useful selection criteria for improving fresh pod yield (Chaitanya *et al.*, 2014) [20].

Path coefficient analysis

Overall, number of pods per cluster, days to first flowering, inflorescence length and number of primary branches per plant may be given greater emphasis in selection for improving fresh pod yield in pole-type *dolichos* bean. The present findings on path coefficient analysis were largely in agreement with the observations reported by Mishra (2019) [21], Singh *et al.* (2024) [22], Bansod *et al.* (2021) [23], Chaitanya *et al.* (2014) [20] and Noorjahan *et al.* (2019) [24], who also reported significant direct and/or indirect contributions of yield-associated traits towards pod yield in *dolichos* bean. The present study, however, differed from the findings of Geetha and Divya (2021) [25]. Such differences in the magnitude and direction of direct and indirect effects may be attributed to differences in the genetic constitution of the genotypes, environmental conditions, experimental material and growing seasons.

The high positive direct effects observed for number of pods per cluster, days to first flowering, inflorescence length and number of primary branches per plant suggest their potential importance in selec-

tion for fresh pod yield. Average weight of pod, plant height at 75 days after sowing, pod width and days to 50 per cent flowering also showed positive direct effects and may contribute to yield improvement. Therefore, these characters may be considered while formulating selection strategies for improving fresh pod yield in pole-type dolichos bean.

Conclusion

Based on the present investigation, it can be concluded that substantial association exists among yield and yield-contributing characters in pole-type dolichos bean. Fresh pod yield per hectare showed significant positive genotypic association with number of pods per cluster (0.810), number of flowers per inflorescence (0.788), number of primary branches per plant (0.619), inflorescence length (0.480), pod length (0.438), plant height at 30 DAS (0.436), plant height at 75 DAS (0.403), pod width (0.403) and 100-seed weight (0.311). Path coefficient analysis revealed the highest positive direct effects of number of pods per cluster (0.740), days to first flowering (0.716), inflorescence length (0.626) and number of primary branches per plant (0.517), with a low residual effect of 0.0445. Therefore, number of pods per cluster, inflorescence length and primary branches per plant may be considered important selection criteria for improving fresh pod yield in pole-type dolichos bean.

Acknowledgments

The authors acknowledge the Department of Vegetable Science and Horticultural Research cum Instructional Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh, India for providing the necessary facilities for this study.

Funding

No external funding was received for this research work. The research expenses were borne by the author.

Conflict of Interest

The author declares that there is no conflict of interest related to this work.

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How to cite this article: Pradhan K, Singh B, Mishra S, Pradhan K. Correlation and path coefficient analysis for yield and yield-contributing characters in pole -type *Dolichos* bean (*Lablab purpureus* L.). *International Journal of Advanced Biochemistry Research*. 2026;SP-10(9):2003-2008. doi: <https://www.doi.org/10.33545/26174693.2026.v10.i9Sy.10103>