

## GENETIC DIVERGENCE ANALYSIS IN DOLICHOS BEAN (*DOLICHOS LABLAB* L.)

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**Abstract:** An experiment was carried out to identify suitable genotypes for commercial cultivation in Chhattisgarh. Sixty three genotypes of Dolichos bean were evaluated during *kharif* and *Rabi* season of 2009-10. Wide range of variability was observed for all the characters *viz.*, leaf length, leaf width, inflorescence length, number of flower per inflorescence, number of pod per inflorescence, pod length, pod width, number of pod per plant, hundred seed weight and pod yield. The analysis of variance revealed that the high genotypic and phenotypic coefficient of variation were recorded for leaf length (cm), leaf width (cm), inflorescence length (cm), number of flower per inflorescence, pod length (cm), pod width (cm), number of pod per plant, hundred seed weight (g) and pod yield per plant (kg). It was also revealed that relative magnitude of phenotypic coefficient of variation was higher than the genotypic coefficient of variation under the study. Higher heritability coupled with high genetic advance as percent of mean were observed for pod length followed by pod width, length of inflorescence, hundred seed weight, number of flower per inflorescence and number of pods per inflorescence. Correlation and path analysis revealed that number of pod per plant influenced the green pod yield per plant (kg) with high direct effect and significant positive correlation. Through  $D^2$  analysis, all the genotype could be grouped into six clusters and inflorescence length, number of pod per inflorescence, number of pod per plant and green pod yield per plant were found to be major characters

**Keywords:** Genetic divergence, Correlation, Path analysis,  $D^2$  analysis, Dolichos bean

### INTRODUCTION

**D**olichos bean or Hyacinth bean or Egyptian bean or Sem (*Dolichos lablab* L.) is an important vegetable crop throughout India and especially in Chhattisgarh due to its local acceptability by the people. It is grown on almost all types of soil of average fertility as in case of other beans (Nath, 1976). Gupta *et al.* (1995) reported that Eastan M.P. (Now Chhattisgarh State) has wide genetic variability for various traits like plant habit, branching habit, stem pigmentation, leaf venation, flower colour, pod colour, pod characters, *viz.*, shape, size, weight and seeds per pod etc. Hitherto, very little attention is given by the workers on systematic crop improvement work of Dolichos bean. But the genetic variability in Chhattisgarh provides a better opportunity for crop improvement work. Considering these points a study was undertaken at Department of Horticulture, I.G.K.V. Raipur (C.G.).

### MATERIAL AND METHOD

The experimental material comprised of sixty three diverse genotypes of Dolichos bean. The trials were evaluated during *kharif* and *Rabi* season of 2009-10 at the Department of Horticulture, Horticulture Farm, under All India Coordinated Research Project on Vegetable Crops, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). The experiment was conducted in a Randomized Block Design (RBD) with four replications. Each entry was sown in 3.6x3.0 m<sup>2</sup> plot area with a spacing of 60cm x 30cm. All the standard agronomical practices and plant protection measures were followed timely to raise the

crop successfully. Five plants were selected randomly for recording different yield related traits however green pod yield and days to first picking were recorded on plot basis. After recording data analysis of the genetic diversity and Mahalanobis  $D^2$  analysis was done and genotypes were grouped in various clusters following Torcher's method as suggested by Rao (1952).

### RESULT AND DISCUSSION

Analysis of variance revealed that genotypic differences were significant for all the characters. The variability parameters are given in (Table-1). The range of variation was wider in green pod yield that was from 0.134 kg per plant or 66.78 q/ha to 0.279 kg per plant or 155.09 q/ha. Largest pod length was recorded 15.30 cm, whereas smallest pod length recorded in 4.12 cm. The highest value of genotypic coefficient of variation (GCV) was recorded for pod width (30.68%) followed by pod length (26.07%), number of pods per inflorescence (23.08%), length of inflorescence (23.07%), hundred seed weight (21.76%), number of pod per plant (20.99%), marketable green pod yield per plant (19.27%). Whereas, rest of the traits exhibited moderate genotypic coefficient of variation. The magnitude of phenotypic coefficient of variation (PCV) was higher than the corresponding genotypic coefficient of variation for most of the characters. The highest heritability estimate was observed for hundred seed weight (98.11%) followed by pod length (97.29%), pod width (96.20%), days to first flowering (95.46%), days to 50% flowering (94.79%), length of inflorescence (92.54%), marketable green pod yield

per plant (88.22%), number of pods per inflorescence (78.05%). While, moderate heritability estimates is being recorded in leaf breadth (68.33%) followed by leaf length (60.77%) also low heritability recorded by pedicel length (23.41%) and number of pods per plant (23.40%). Higher heritability estimates coupled with high genetic advance as percent of mean were observed for pod length followed by pod width, length of inflorescence, hundred seed weight, number of flower per inflorescence and number of pods per inflorescence. These above results were supported by Joshi (1971) and Pandita *et al.* (1980).

The estimate the direct and indirect contribution of various traits towards green pod yield is given in (Table-2) maximum positive direct effect on green pod yield per plant was exhibited by number of pod per plant followed by hundred seed weight, number of pod per inflorescence, pod length and leaf width negative direct effect on green pod yield per plant was exhibited by number of flower per Inflorescence, pod width and leaf length.

Phenotypic and genotypic correlation coefficients among ten traits are presented in (Table-3). At phenotypic level, highest correlation with green pod yield per plant was recorded by the character number of flower per inflorescence followed by pod width

and leaf length. At genotypic level high correlation with green pod yield per plant was recorded by the characters number of flower per inflorescence, leaf length and hundred seed weight. These above results were supported by Rai, *et al.* (2008).

In the present study all of the sixty three genotypes could be grouped into six clusters (Table-4). Maximum number of genotypes (17) was retained by cluster III followed by cluster VI (15) genotypes, cluster I and IV almost equal (11) genotypes, cluster V (05) genotypes and cluster II (04) genotypes. Among six cluster the maximum inter cluster distance ( $D^2$  Value) was observed between cluster III and I (4.984), followed by cluster III and VI (2.585), cluster III and I (1.998), cluster IV and III (1.617), cluster V and III (1.781) and cluster VI and II (1.420). These above results were supported by Baswana *et al.* (1980), Borah and Khan (2001) and Golani *et al.* (2007).

In this study, group constellation showed that IS-02, IS-04, IS-28 and IS-38 were highly divergent from all other genotypes and may be used as parents in transgenic breeding programme and may directly be used as a pure line variety for green pod yield and quality characters in Indian bean (*Dolichos lablab* L.) for Chhattisgarh state and country as well.

**Table 1:** Estimation of Mean, Range, GCV, PCV, Heritability and Genetic advance as (%) of mean of different characters of *Dolichos* bean

S. No.	Characters	MEAN	RANGE		GCV (%)	PCV (%)	$h^2$ (bs) (%)	Genetic advance as % of mean
			Min.	Max.				
1.	Leaf length (cm)	11.95	9.37	14.45	8.62	11.05	60.77	13.72
2.	Leaf breadth (cm)	11.15	8.35	13.51	9.89	11.96	68.33	16.86
3.	Length of inflorescence (cm)	18.73	8.90	27.03	23.07	23.98	92.54	45.70
4.	Number of flower / inflorescence	22.36	10.50	29.00	19.51	20.07	94.53	39.08
5.	Number of pod per inflorescence	7.18	4.50	11.75	23.08	26.11	78.05	41.92
6.	Pod length (cm)	9.33	4.12	15.30	26.07	26.43	97.29	52.94
7.	Pod width (cm)	1.79	1.10	3.76	30.68	31.27	96.2	62.01
8.	No. of pods per plant	32.86	21.00	49.77	20.99	22.98	23.40	39.42
9.	Hundred seed weight (g)	38.59	22.58	52.61	21.27	21.97	98.11	44.41
10.	Green pod yield / plant (kg)	0.200	0.134	0.279	19.27	20.52	88.22	40.00

**Table 2:** Direct and indirect effect of developmental characters on pod yield at phenotypic and genotypic level in *Dolichos* bean

Characters Number & Name		Character number										
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Leaf length (cm)	P	0.322*	0.347**	-0.091	-0.031	0.087	-0.061	0.178	-0.014	0.217	0.308*	0.287*
	G	0.433	0.428	-0.089	-0.030	0.085	-0.063	0.272	-0.015	0.232	0.343	0.297
(2) Leaf width (cm)	P		0.459**	-0.098	-0.068	-0.271	-0.088	0.184	0.276*	0.188	0.186	0.277*
	G		0.715	-0.138	-0.103	-0.402	-0.056	0.293	0.358	0.241	0.209	0.362
(3) Length of Inflorescence (cm)	P			-0.070	-0.079	-0.315	-0.060	0.084	0.140	0.125	0.128	0.278*
	G			-0.078	-0.095	-0.387	-0.059	0.109	0.178	0.128	0.199	0.332
(4) Number of Flower/ inflorescence	P				0.679**	0.349**	0.333*	0.053	-0.088	-0.310	0.080	-0.172
	G				0.730	0.425	0.365	0.054	-0.089	-0.332	0.088	-0.179
(5) Number of	P					0.375**	0.297*	0.013	-0.167	-0.179	0.060	-0.185

pod /inflorescence	G	0.430	0.340	0.038	-0.174	-0.187	0.066	-0.193
(6) Number of	P		0.049	0.040	-0.187	-0.106	0.009	-0.234
Pod/ plant	G		0.096	0.045	-0.218	-0.119	-0.011	-0.267
(7) Number of	P			-0.001	-0.076	0.021	0.249	-0.341
Seeds/ pod	G			-0.002	-0.090	0.027	0.229	-0.377
(8) Pod length	P				0.350	-0.061	0.332**	0.309*
(cm)	G				0.564	-0.131	0.599	0.501
(9) Pod width (cm)	P					0.055	0.355**	0.464**
	G					0.056	0.378	0.474
(10) Marketable	P						-0.048	-0.011
green pod	G						-0.052	-0.014
yield /plant (kg)								
(11) Hundred	P							0.415**
seed weight (g)	G							0.447

\*: Significant at 0.05%, \*\*: Significant at 0.01%, P=Phenotypic; G=Genotypic

**Table 3:** Genotypic correlation of green pod yield and its development characters in Dolichos bean

Characters	Leaf length (cm)	Leaf width (cm)	Inflorescence length (cm)	Number of flower per Inflorescence	Number of pod per Inflorescence	Pod length (cm)	Pod width (cm)	Number of pod / plant	Hundred seed weight (g)	Yield per plant (kg)
Leaf length (cm)	<b>-0.017</b>	-	0.003	0.002	0.007	-0.006	-	0.001	-0.006	0.213
Leaf width (cm)	0.074	<b>0.103</b>	-0.008	-0.008	-0.040	0.018	0.013	-0.006	0.034	0.202
Inflorescence length (cm)	-0.006	-	<b>0.047</b>	0.047	0.020	-0.004	-	0.017	-0.008	0.088
Number of flower per Inflorescence	0.014	0.008	-0.107	<b>-0.107</b>	-0.045	0.009	0.035	-0.039	0.019	0.089
Number of pod / Inflorescence	-0.071	-	0.076	0.075	<b>0.178</b>	-0.039	-	0.017	-0.048	-
Pod length (cm)	0.063	0.031	-0.016	-0.015	-0.038	<b>0.176</b>	0.009	-0.016	0.084	0.371
Pod width (cm)	-0.018	-	0.025	0.025	0.009	-0.004	<b>0.076</b>	-0.002	0.001	-
Number of pod per plant	-0.025	-	0.169	0.168	0.044	-0.041	0.012	<b>0.547</b>	-0.174	0.226
Hundred seed weight (g)	0.201	0.180	-0.100	-0.099	-0.148	0.261	-	-0.206	<b>0.461</b>	0.449

Residual value: 0.0839,

Diagonal and bold underline figures shows direct effect on pod yield

**Table 4:** Distribution of sixty three Genotypes of Dolichos bean on the basis of Mahalanobis D<sup>2</sup> statistics

Cluster Number	Number of genotypes included	Genotypes
I	<b>11</b>	IS-05, IS-13, IS-14, IS-15, IS-16, IS-22, IS-25, IS-31, IS-47, IS-53, IS-61.
II	<b>04</b>	IS-02, IS-04, IS-28, IS-38.
III	<b>17</b>	IS-06, IS-07, IS-08, IS-19, IS-21, IS-32, IS-34, IS-36, IS-39, IS-46, IS-49, IS-54, IS-55, IS-56, IS-57, IS-58, SwarnaUtkrishti (St. Check)
IV	<b>11</b>	IS-01, IS-03, IS-09, IS-10, IS-18, IS-20, IS-23, IS-37, IS-40, IS-44, IS-52.
V	<b>05</b>	IS-29, IS-45, IS-48, IS-50, IS-60.
VI	<b>15</b>	IS-11, IS-12, IS-17, IS-24, IS-26, IS-27, IS-30, IS-33, IS-35, IS-41, IS-42, IS-43, IS-59, IS-62, IS-63.

## REFERENCES

- Baswana, K.S., Pandita, M.L., Partap, P.S. and Dhankhar, B.S. (1980). Genetic divergence for yield and its components in Indian bean (*Dolichos lablab* var. *lignosus* L.). *Haryana J. Hort. Sci.*, **9** (3/4):, 184-187.
- Borah, H.K. and Khan, A.K.F. (2001). Genetic divergence in fodder cowpea (*Vigna unguiculata* (L.) Walp.). *Madras Agri. J.*, **88**(10/12): 625-628.
- Golani, I.J., Mehta, D.R., Naliyandhara, Patel, R.K. and Kanzariya, M.V. (2007). Genetic variability, correlation and path analysis for green pod yield and its characters in Hyacinth bean. *Orissa journal of Horticulture*. **35**(1):71-75.

**Gupta, P.N., Kochhar, S.** (1995). Significance of vegetable crops germplasm in relation to cropping pattern and climatic changes. *In* R.S. Rana, P.N. Gupta, M. Rai and S. Kochhar (eds.). Genetic Resources of Vegetable Crops: Management, Conservation and Utilization. NBPGR, New Delhi, p: 40 – 49.

**Joshi, S.N.** (1971). Studies on genetic variability for yield and its components in Indian beans, *Dolichos lablab* var. *lignosus*. *Madras Agric. J.*, 58:367-371.

**Nath, P.** (1976). Vegetable for the Tropical Region, ICAR, New Delhi.

**Pandey, R.P., Assawa, B.M. and Assawa R.K.** (1980). Correlation and path-coefficient analysis in *Dolichos lablab* L. *Indian J. Agri. Sci.*, **50**(6):481-484.

**Rai, N., Singh, P. K., Verma, A., Lal, H., Yadav, D. S. and Rai, M** (2008). Multivariate characterization of Indian bean [*Lablab purpureus* (L.) Sweet] genotypes. *Ind. J. Pl. Gen. Res.* **21** (1): 42-45.

**Rao, C.R.** (1952). Advance statistical method in Biometrics Research. John Willey & Sons, New York.