



# VARIABILITY, HERITABILITY AND GENETIC ADVANCE IN INDIGENOUS DOLICHOS BEAN (*DOLICHOS LAB LAB* L. VAR *TYPICUS*) GENOTYPES

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## Abstract

Thirty four genotypes of dolichos bean were evaluated for genetic variability among characters. Genetic and phenotypic coefficient of variation, heritability and genetic advance as per cent of mean were estimated for fifteen yield and yield contributing characters. The differences between PCV and GCV were low for days to first flowering, days to 50% flowering, inter node length (cm), days to first pod harvest, pod length (cm), pod width (cm), pod weight (g), plant height (cm) and number of seeds per pod indicating that these traits are less influenced by environment and the effect of heritable components was high. High heritability coupled with high genetic advance as per cent of mean was recorded by all the characters except for leaf width (cm), leaf length (cm) and number of pods per plant indicating additive action of genes controlling them.

**Key words:** Dolichos bean, genetic variability, heterosis, genetic advance.

## Introduction

Indian bean is an important vegetable crop of Indian origin. It occupies unique position for vegetable purpose among the legume vegetable (Bijju *et al.*, 2001). It is a good source of protein, minerals and vitamins (Golani *et al.*, 2007). The progress in breeding for yield and its contributing characters of any crop is polygenetically controlled, environmentally influenced and determined by the magnitude and nature of their genetic variability. The estimation of an amount of heritability indicates the extent to which a character is transmitted from parent to off spring. Most of the quantitative characters, which are of economic value, are highly influenced by environment. As such highly heritable characters associated with yield are influenced to a lesser degree by environment, which serve as an indicator of yield in selection programme.

The heritability is a measure of efficiency of selection system in separating genotypes. Heritable variation can be determined with greater accuracy, when heritability is studied along with genetic advance (Swarup and Chaughale, 1962).

## Materials and Methods

The material consists of thirty four pole type genotypes of dolichos bean collected from different places of Andhra Pradesh, India. The experiment was conducted in a RBD with three replications during *rabi*, 2010-11 at the NBPGR Regional Station, Hyderabad (Andhra Pradesh), India. Ten plants of each genotype were sown with the row length of five meter accommodating with a spacing of two meter between rows and one meter between plants with three replications. The plants were trained onto a pandal. In each replication, five plants were selected randomly for recording observations. The characters *viz.*, plant height (cm), number of primary branches per plant, leaf length (cm), leaf width (cm), days to first flowering, days to 50% flowering, internode length (cm), days to first pod harvest, days to last pod harvest, pod length (cm), pod width (cm), pod weight (g), number of seeds per pod, number of pods per plant and marketable pod yield per plant (g). Range, mean, standard error of mean and critical difference for each character were computed. Analysis of variance was carried out as per the procedure given by Panse and Sukhatme (1967). Genotypic and phenotypic coefficients of variation were

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**Table 1 :** Estimates of variability, heritability and genetic advance as percent of mean for fifteen characters in dolichos bean genotypes.

S. no.	Character	Variance		PCV (%)	GCV (%)	h <sup>2</sup> (%)	Genetic advance	GA as per cent of mean
		Phenotypic	Genotypic					
1.	Plant height (cm)	13014.18	12314.33	47.44	46.15	94	222.36	92.48
2.	No. of primary branches per plant	0.328	0.202	17.81	13.98	61	0.72	22.61
3.	Leaf length (cm)	0.428	0.217	8.77	6.25	50	0.685	9.18
4.	Leaf width (cm)	0.190	0.050	6.33	3.24	26	0.236	3.43
5.	Internode length (cm)	0.266	0.225	18.75	17.23	84	0.898	32.63
6.	Days to first flowering	112.26	107.12	15.00	15.35	95	20.82	30.18
7.	Days to 50 per cent flowering	120.65	110.74	14.97	14.34	91	20.76	28.30
8.	Days to first pod harvest	142.49	131.573	12.35	11.87	92	22.70	23.50
9.	Pod length (cm)	3.085	2.93	23.72	23.14	95	3.44	46.48
10.	Pod width (cm)	0.060	0.053	13.45	12.71	89	0.44	24.74
11.	Pod weight (g)	2.59	2.43	36.08	34.99	94	3.11	69.92
12.	No. of seeds per pod	0.426	0.361	15.96	14.68	84	1.138	27.81
13.	Number of pods per plant	8219.78	1900.69	134.24	64.55	23	43.18	63.94
14.	Days to last pod harvest	241.21	164.89	11.11	9.18	68	21.87	15.64
15.	Marketable pod yield per plant (g)	9665.54	8492.24	44.06	41.30	87	177.94	79.75

computed according to Burton and De Vane (1953) based on the estimates of genotypic and phenotypic variances as follows. Heritability and genetic advance as percentage of mean were calculated as per Johnson *et al.* (1955).

### Results and Discussion

In the present study, phenotypic coefficient of variation in general were higher than genotypic coefficient of variation for all the traits, but the difference was very low, indicating low environment effect on the expression of all the traits and is suggestive of the heritable nature of the traits. These results were similar with the findings of Ganesh *et al.* (2005). The estimates of various genetic parameters are given in table 1 and figs. 1 and 2.

High PCV and GCV were observed for marketable pod yield per plant (g), number of pods per plant, plant height (cm), pod weight (g) and pod length (cm) indicating the higher magnitude of variability for these traits and consequently more scope for their improvement through selection. Similar results were reported by Savitha (2008) and Upadhyay and Mehta (2010) for marketable pod yield per plant (g), Savitha (2008) for number of pods per plant.

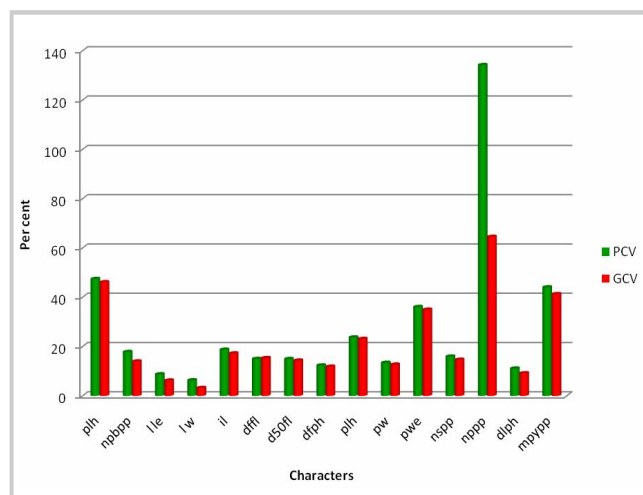
PCV and GCV estimates were moderate for number of primary branches per plant, days to first flowering, days to 50% flowering, inter node length (cm), days to first pod harvest, number of seeds per pod, plant height

(cm), pod width (cm). This implied equal importance of additive and non additive gene action. These results were in confirmation with the findings of Golani *et al.* (2007) for number of primary branches per plant and days to first flowering.

Low GCV and moderate PCV estimates were recorded for days to last pod harvest. These results were in confirmation with the findings of Golani *et al.* (2007). Low GCV and low PCV estimates were recorded for leaf length and leaf width.

The differences between PCV and GCV were low for days to first flowering, days to 50% flowering, inter node length, days to first pod harvest, pod length, pod width, pod weight, plant height and number of seeds per pod indicating that these traits are less influenced by environment and the effect of heritable components was high. Similar kind of results was observed by Ganesh *et al.* (2005) and Rai *et al.* (2008).

Number of primary branches per plant, leaf length, leaf width, number of pods per plant, days to last pod harvest and pod yield per plant recorded wider difference between PCV and GCV values indicating dominant role played by the environment in the expression of these traits. Similar observations were also reported by Upadhyay and Mehta (2010).



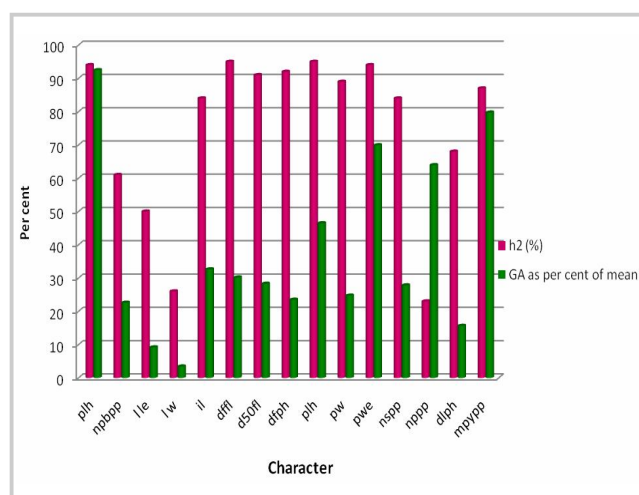
**Fig. 1 :** Genotypic and phenotypic coefficient of variability for 15 characters in dolichos bean.

All the yield and yield components showed moderate to high PCV and GCV values except leaf length and leaf width and among these traits the difference between PCV and GCV values was minimum indicating that these traits are less influenced by the environment and indicate a high degree of genetic variability present in these characters and thus a greater scope for effective selection as these characters are less influenced by the environment.

In the present study, high heritability coupled with high genetic advance as per cent of mean was recorded by all the characters except for leaf width, leaf length and number of pods per plant. These results indicate that these characters are under the influence of additive gene action. Present results were similar with the findings of Rai *et al.* (2006) and Savitha, (2008) for marketable pod yield per plant, Ganesh (2005) for days to 50% flowering, Rai *et al.* (2006) and Savitha (2008) for number pods per plant, Bendale *et al.* (2004), Ganesh (2005) for pod length, Ganesh (2005) for plant height.

High heritability and moderate GA as percent mean values were observed for the characters days to last pod harvest. This indicates the influence of non additive gene action and considerable influence of environment on the expression of these traits. These traits could be exploited through manifestation of dominance and epistatic components through heterosis.

In conclusion, it can be said from these estimates of genetic variability that individual plant selection for characters viz., marketable pod yield per plant, number of pods per plant, pod length and pod weight showing high values of heritability, genetic advance, GCV and PCV



**Fig. 2 :** Heritability estimate and genetic advance over mean (%) for 15 characters in dolichos bean.

concomitantly, would directly effective in the progeny of dolichos bean.

Hence, the breeder should adopt suitable breeding methodology to utilize both additive and non additive gene effects simultaneously, since varietal and hybrid development will go a long way in the breeding programmes especially in case of dolichos bean.

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