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Short communication

Studies on genetic variability in dolichos bean (*Lablab purpureus* L.)

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ABSTRACT

Fifty seven pole-type vegetable dolichos bean [*Lablab purpureus* (L.) Sweet] germplasm lines were evaluated for genetic variability, heritability and genetic advance at the experimental farm of Indian Institute of Horticultural Research, Bangalore, during 2010-12. GCV was comparatively high in days to 50% flowering, days to pod maturity, pod length, pod weight, number of pods per cluster, number of pods per plant, pod yield per plant and pod width. High heritability estimates were observed for number of pods per plant, pod yield per plant, pod weight, days to 50% flowering, pod length, days to pod maturity, pod width and number of pods per cluster. High genetic advance, along with relatively high heritability percent, was observed for number of pods per cluster and pod width. Existence of wide variation along with high heritability and genetic advance for number of pods per cluster, pod length, pod width and pod yield per plant indicate that selection would be effective for these traits. Among the accessions studied, IIHR 177 was early for 50% flowering (43 days) and pod maturity (65 days). IIHR 6 and IIHR 11 had maximum pod length (16.5cm) and pod width (4.1cm), respectively. Ten-pod weight was highest in IIHR 7(122g), while the number of pods per plant was high in IIHR 159 (91.0). Maximum pod yield was seen in IIHR 150 (576.9g per plant). These accessions having green, purple or creamy-white pods can be used in future breeding programmes.

Key words: Dolichos bean, *Lablab purpureus*, genetic variability

Dolichos bean **(***Lablab purpureus* L.), also known as lablab bean, is one of the important indigenous legume-vegetables grown in India for its tender green pods, mature fresh green seeds, and dry seeds. Dolichos bean is a rich source of protein, minerals, vitamins and fibre. India is one of the primary centers of origin and diversity of pole-type vegetable dolichos bean (*Lablab purpureus* var. *typicus*). The present study was undertaken with an objective of assessing extent of genetic variability, heritability and genetic advance available in the 57 pole-type vegetable dolichos bean germplasm lines, since, such information would be useful for improvement in this crop.

The experiment was carried out over two years (2010-12) during September - February at the experimental farm of Indian Institute of Horticultural Research, Bangalore. The crop was raised in two replications at 1.5m x 15cm spacing between rows and plants, respectively. Recommended package of practices was followed. Five plants were selected randomly from each accession and data were recorded for thirteen quantitative characters, viz., number of branches, stem thickness, internodal length, leaflet size, days to 50% flowering, days to pod maturity, pod length, pod width, pod weight, number of pods per cluster, number of pods per plant, pod yield per plant and number of seeds per pod. Average values were arrived at from these five plants for each of the lines in both replications. Data were subjected to analysis of variance to obtain information on variation among accessions (Panse and Sukhatme, 1984). Variability for various quantitative characters, and expected genetic advance at 5% intensity of selection, were calculated as per Burton (1952) and Johnson *et al* (1955), respectively.

Results of analysis of variance are presented in Table 1. Mean sum of squares for various sources with respect to the 13 characters under study revealed that genotypic effects were highly significant for number of branches, internodal length, leaflet size, days to 50% flowering, days to pod maturity, pod length, pod weight, number of pods per cluster, number of pods per plant, pod yield per plant and number of seeds per pod, indicating available variability for the aforementioned characters among germplasm accessions studied. Range of phenotypic variations was high for leaflet size, pod weight, number of pods per plant and pod yield per plant, indicating that these traits to respond positively for selecting desired types. Existence of high variability for

various characters among dolichos bean accessions has also been reported earlier by Baswana *et al* (1980), Singh *et al* (1985), Bendale *et al* (2004) and Nahar and Newaz (2005).

Estimates of genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) provide better comparison of characters regarding extent of genetic variation. Genetic variability parameters, viz., genotypic and phenotypic coefficients of variation (GCV and PCV), heritability (h2) in the broad sense and genetic advance (GA) as percent over mean and range are given in Table 2. GCV was comparatively high in days to 50% flowering, days to pod maturity, pod length, pod weight, number of pods per cluster, number of pods per plant, pod yield per plant and pod width indicating, that, these traits are less affected by environment and would respond positively to selection. Maximum GCV values were recorded for number of pods per plant (49.47) and pod yield (45.79), suggesting a scope for improvement of these characters through selection. The magnitude of differences between GCV and PCV were found to be relatively narrow for internodal length, leaflet size, stem thickness and number of seeds per pod suggesting, that, the above traits are less affected by environment and selection for these traits based on phenotype would be effective. These results are in agreement with findings of Selvi *et al* (2007). PCV was higher than GCV for number of branches, indicating influence of the environment over genotype, and, phenotypic selection for this trait would be less effective. Similar results were obtained in chilli by Sha *et al* (1986).

Table 1. Analysis of variance for thirteen traits in dolichos germplasm

Sl. No.	Source of variance / character	Replication	Genotypes	Error
	Degrees of freedom	1	57	57
1	Number of branches	1.45	0.60**	0.30
2	Stem thickness (cm)	2.79	0.82	0.82
3	Inter nodal length (cm)	3.80	5.14**	1.14
4	Leaflet size (cm^2)	643.25	660.58**	147.14
5	Days to 50% flowering	0.88	63.12**	72.13
6	Days to pod maturity	29.00	114.89	47.98
7	Pod length (cm)	264.61	17.01**	10.54
8	Pod width (cm)	211.95	12.89	10.34
9	Ten-pod weight (g)	452.06	634.90**	7.01
10	Number of pods/ cluster	7.76	5.51**	0.85
11	Number of pods/ plant	1.70	640.63**	2.69
12	Pod yield/ plant (g)	6123.0	30796.46**	302.46
13	Number of seeds/ pod	7.74	0.82**	0.31

**Significant at 5% level

Heritability per cent (broad sense) indicates quantum of genotypic variance present among germplasm. Heritability estimates give the best picture of the extent of advance to be expected by selection (Sha *et al*, 1986; Biradar *et al*, 2007). High heritability estimates were observed for number of pods per plant, pod yield per plant, pod weight, days to 50% flowering, pod length, days to pod maturity, pod width and number of pods per cluster. Similar findings were reported by Singh *et al* (1985) and Ali *et al* (2005). Among the above traits, heritability estimates for number of pods per plant, pod yield per plant and pod weight were 98 to 99%. Heritability for the remaining traits fell in the range of 33 to 54%.

Genetic advance is the quantum of genetic gain expected during a selection process. High genetic advance, along with relatively high heritability per cent, was observed for number of pods per cluster and pod width, indicating that these traits are predominantly controlled by additive genes and, therefore, improvement in these characters can be achieved through selection (Johnson *et al*, 1955; Panse, 1957). High to moderate heritability together, with moderate

Table 2. Range, mean, PCV, GCV, heritability and genetic advance for various quantitative characters in dolichos

Character	Range	Mean	SE	GCV (%)	PCV (%)	Heritability (%)	GA (% of mean)
Number of branches	2.0 – 4.5	3.1	0.39	12.63	17.87	33.33	12.06
Stem thickness (cm)	0.6 – 1.3	0.98	0.08	13.24	12.13	54.00	13.62
Internodal length (cm)	4.3 – 10.8	7.6	0.76	18.54	14.06	64.00	15.67
Leaflet size (cm^2)	65.3 – 153.8	112.8	8.58	14.20	10.75	64.00	14.14
Days to 50% flowering	43.0 – 83.0	62.5	0.80	8.90	1.80	96.00	3.54
Days to pod maturity	65.0 – 100.0	81.8	0.95	5.83	1.64	93.00	3.07
Pod length (cm)	5.8 – 16.5	10.9	0.49	27.25	6.30	95.00	12.03
Pod width (cm)	1.2 – 9.5	2.30	0.21	31.56	13.06	85.00	22.84
10-pod weight (g)	49.5 – 122.0	78.6	1.87	22.53	3.37	98.00	6.81
Number of pods/ cluster	2.0 – 10.0	5.3	0.65	28.79	17.38	73.00	26.10
Number of pods/ plant	10.0 – 91.0	36.1	1.16	49.47	4.54	99.00	9.26
Pod yield/ plant (g)	69.5 – 576.9	269.7	12.30	45.79	6.44	98.00	13.03
Number of seeds/ pod	3.5 – 6.0	4.9	0.39	10.29	11.27	45.00	10.41

Table 3. Mean data of elite dolichos germplasm accessions showing maximum values for pod traits and yield

Days to 50% flowering	Days to pod maturity	Mean pod length (cm)	Pod width (cm)	10-pod weight (g)	No. of pods per plant	Yield per plant (g)	Pod colour		
							Green	Purple	Creamy White
IIHR 177 (43.0)	IIHR177 (65.0)	IIHR 6 (16.5)	IIHR 11 (4.1)	IIHR 7 (122.0)	IIHR159 (91.0)	IIHR 150 (576.90)	IIHR 157	IIHR 149	IIHR 150
IIHR 143(53.5)	IIHR143 (73.5)	IIHR 10 (16.0)	IIHR 160 (4.0)	IIHR 10 (112.0)	IIHR170 (82.5)	IIHR 159 (576.20)	IIHR 177		IIHR 170
IIHR 9 (54.0)	IIHR 9 (74.5)	IIHR154 (16.0)	IIHR 1 (3.9)	IIHR 11 (111.0)	IIHR176 (76.5)	IIHR 177 (535.00)	IIHR 159		
IIHR 16 (54.5)	IIHR 16 (75.0)	IIHR155 (16.0)	IIHR 17 (3.8)	IIHR 174 (111.0)	IIHR177 (75.0)	IIHR 157 (515.20)			
IIHR 19 (55.5)	IIHR 19 (75.0)	IIHR174 (15.8)	IIHR 8 (3.7)	IIHR 155 (109.5)	IIHR142 (73.5)	IIHR 170 (501.00)			
		IIHR163 (15.5)				IIHR 149 (380.50)			

genetic advance, was observed for internodal length, leaflet size, stem thickness, pod yield per plant and pod length suggesting, that, these traits are governed by both additive and non-additive gene action (Ukkund *et al*, 2007). Genetic improvement of the above characters would be effective only on a moderate scale. High heritability along with low genetic advance noticed for days to 50% flowering and days to pod maturity are attributable to non-additive gene action (Vijayalakshmi *et al*, 1989). These traits can be improved through hybridization (Frageria, 1997; Kamruzzahan *et al*, 2000). Number of pods per cluster and pod width recorded high GCV, h2 and GA indicating, that, these traits can be improved through phenotypic selection. Both pod yield per plant and pod length showed high values for heritability, and moderate values for GCV and GA. Selection for these traits would only be moderately effective. Existence of a wide variation for various traits in the dolichos bean germplasm, along with high heritability and genetic advance for certain yield-related traits (namely, number of pods per cluster, pod length, pod width, pod yield per plant) indicate that selection would be effective for these traits.

Of the 57 accessions evaluated, accessions showing maximum values for pod yield and related traits as shown in Table 3. Five accessions were early (50% flowering 43-55.5 days). IIHR 177 was the earliest with 50% flowering in 43 days, followed by IIHR 143 (53.5 days). Similarly, for pod-maturity, IIHR 177 was the earliest (65 days), followed by IIHR 143 (73.5 days). Pod length was highest in IIHR 6 (16.5cm) and pod width in IIHR 11 (4.1cm). Ten-pod weight was maximum in IIHR 7 (122g) and number of pods per plant was high in IIHR 159 (91.0). Maximum pod yield was seen in IIHR 150 (576.9g per plant), followed by IIHR 159 (576.2g). Among accessions with maximum pod yield per plant, three had green pods (IIHR157, IIHR 177, IIHR 159), one purple (IIHR 149) and two had creamy white pods (IIHR 150 and IIHR 170). These elite accessions can be included in future breeding programmes.

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