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Genetic Variability Parameters in Indian Bean (*Lablab purpureus* L.)

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ABSTRACT

Fifty diverse genotypes of Indian bean were evaluated in a Randomized Block Design with three replications to the study of genetic variability parameters during late kharif 2016-17. The analysis of variance revealed that mean square due to genotypes was highly significant for all seventeen characters studied. A wide range of variation was observed for green pod yield per plant, 10-green pod weight, seed yield per plant, plant height and number of pods per plant. High phenotypic and genotypic coefficient of variations, high heritability coupled with high genetic advance as per cent of mean was observed for 10-green pod weight, green pod yield per plant, number of pods per plant, seed yield per plant, pod width, 100-seed weight, pod length and plant height..

Key words: *Genetic variation and Indian bean.*

INTRODUCTION

Lablab purpureus L. (Syn. *Dolichos lablab* L., 2n=22) is one of the important legumes as well as vegetable crops cultivated in the tropical region of Asia, Africa and America. As most of the species of Indian bean are endemic to Africa and only few are native in India, most probably Africa is the main centre and India is the secondary centre of origin for this crop[8]. Although its largest agro-morphological diversity occurs in South Asia, its origin appears to be Africa[9]. It is commonly called Hyacinth bean, Bonavist bean, Field bean, Egiptian bean, Country Bean, Tonga Bean, Lablab Bean, Pendal bean, Pole bean, Butter Bean, Poor's man Bean, Sem and Seim in Hindi, Wal, papadi and Valor in Gujarati, Waby bean in English, Pavta and Wal in Marathi, Avare, Chapparadavare and Chikkadikai in Kannada, Avari and Mochai in Tamil, Chikkudu in Telugu, Avara and Mochakotta in Malayalam, Shim in Bengali and Sin bean in Assamese. The crop has multipurpose use. It is one of the excellent pod vegetable crops grown in India. The green pods and tender leaves are popular vegetables. It is one of the major sources of protein in the dietary of working class especially of whole Gujarat.

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Indian bean would be good for digestive system and helps in relieving constipation due to good fiber contain. It also helps in weight loss. In addition to high nutritional value, Indian bean fodder is also palatable and the cattle are nourished well. Incorporating this crop into pastures improves the quality, palatability and digestibility of pastures. This crop can be used as an excellent green manure, as a nitrogen fixing crop, as a cover crop for effective control of soil erosion and soil protection. Being a legume, it can fix atmospheric nitrogen to the extent of 170 kg/ha[13].

To develop high yielding varieties for a systematic breeding programme, information on genetic variability is basic pre-requisite. The success of any breeding programme depends upon the amount of genetic variability present in the available germplasm of a particular crop. Wider the genetic variability, more are the chances of improvement through selection. Pod yield and seed yield is governed by polygenic system and is highly influenced by the fluctuations in the environments. Hence, selection of plants based directly on pod yield would not be very much reliable in many cases. Therefore, the present study was conducted to estimate genetic variability, heritability and genetic advance for pod yield and yield contributing characters.

MATERIAL AND METHODS

The present investigation was conducted to assess the genetic variability and selection indices in Indian bean. The trial was conducted at the Instructional Farm, College of Agriculture, Junagadh Agricultural University, Junagadh during late *kharif* 2016-17. Junagadh is situated at 21.5^0 N latitude and 70.5^0 E longitude with an elevation of 82.92 meters above the mean sea level. The soil of experimental site is medium black with pH 7.8. Fifty genotypes of Indian bean were sown on 27th September, 2016 in a randomized block design with three replications. Each line had ten plants of single genotype which was sown with a spacing of 75 cm × 45 cm. Data were recorded for days to first flowering, days to 50 per cent flowering, days to maturity on plot basis as well as reproductive phase duration, days to first picking, days to last picking, number of picking, plant height, number of branches per plant, number of pods per plant, pod length, pod width, 10-green pod weight, green pod yield per plant, number of seeds per pod, 100-seed weight and seed yield per plant on five randomly selected competitive plants from each entry. Selected plants were tagged before the emergence of first flower. There were two sets of plants in each entry. First five plants were used for recording observations on green pod and the remaining plants were kept for recording observations based on seed related traits and their averages were used in the statistical analysis. The analysis of variance for randomized block design (RBD) was done for each character as per Panse and Sukhatme[15]. Phenotypic co-efficient variation (PCV) and genotypic co-efficient variation (GCV) was calculated as per the formula suggested by Burton and De Vane[4]. Heritability and genetic advance was estimated using the formula suggested by Allard[2].

RESULTS AND DISCUSSION

Analysis of Variance

The analysis of variance for all the characters under studied is presented in Table 1. The analysis of variance revealed that mean square due to genotypes was highly significant for all the 17 characters indicating the presence of sufficient amount of variability in the experimental material used. This result was in accordance with several past workers[19,18,14,1,11,17,5,12,6,10].

Variability parameters

The result for genetic variability parameters was furnished in Table 2.

(1.) Range of variation

Green pod yield per plant recorded widest phenotypic range of variation followed by 10-green pod weight, seed yield per plant, plant height and number of pods per plant. The moderate phenotypic range of variation was observed for 100-seed weight, pod length, pod

width, number of picking, reproductive phase duration, days to 50 per cent flowering and days to first flowering. Days to last picking, number of seeds per pod, days to maturity, days to first picking and number of branches per plant were noted narrow range of variation.

(2.) Genopypic and phenotypic coefficient of variation

The highest genotypic coefficient of variation and phenotypic coefficient of variation was observed for 10-green pod weight followed by green pod yield per plant, number of pods per plant, seed yield, 100-seed weight, pod width, pod length and plant height. The high genotypic coefficient of variation indicated the presence of wide variation for the characters under study to allow selection for individual traits. In the present study moderate genotypic and phenotypic coefficient of variation was observed for number of picking, days to first flowering, days to 50 per cent flowering and reproductive phase duration. In addition to these four characters, two characters namely number of branches per plant and number of seeds per pod exhibited moderate phenotypic coefficient of variation. Number of seeds per pod and number of branches per plant had low magnitude of genotypic coefficient of variation only.

Table 1: Analysis of variance for 17 characters in 50 genotypes of Indian bean

Sr. No.	Variables	Mean square for		
		Replication (df = 2)	Treatment (df = 49)	Error (df = 98)
1	Days to first flowering	49.57**	233.55**	3.49
2	Days to 50% flowering	35.61**	232.58**	3.88
3	Days to maturity	8.78	458.51**	4.62
4	Reproductive Phase Duration	39.88**	481.57**	7.95
5	Days to first picking	2.43	145.96**	6.86
6	Days to last picking	11.84	351.93**	11.9
7	Number of picking	0.4	7.52**	0.4
8	Plant height	581.57**	3219.27**	83.45
9	Number of branches per plant	1.62**	0.40*	0.25
10	Number of pods per plant	3017.05	14071.32**	1049.05
11	Pod length	0.70**	14.25**	0.07
12	Pod width	0.0028	0.46**	0.01
13	10-green pod weight	104.90**	526.52**	8.26
14	Green pod yield per plant	39088.14**	154138.86**	5107.21
15	Number of seed per pod	0.02	0.40**	0.09
16	100-seed weight	70.98**	288.19**	7.19
17	Seed yield per plant	570.68	4237.59**	262.48

While, days to maturity, days to first picking and days to last picking exhibited low magnitude of both genotypic and phenotypic coefficient of variation. Close relationship between genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) was observed for all the characters. The magnitude of PCV was slightly greater than GCV[7,18,1,16,20,3] revealed a very little influence of environmental variation for their expression and phenotypic variability may be considered as reliable measure of genotypic variability.

Table 2: Phenotypic range, Coefficient of range, Genotypic (GCV%) and Phenotypic (PCV%) coefficient of variation, Heritability, Genetic advance and Genetic advance expressed as per cent of mean for various characters of Indian bean

Characters	Phenotypic Range	Coefficient of range (%)	Mean ± S.E.	GCV (%)	PCV (%)	Heritability in broad sense (%)	Genetic Advance-ment	GA (as percent of mean)
Days to first flowering	42.20 -83.06	32.62	66.76 ±1.07	13.12	13.41	95.60	17.64	26.43
Days to 50 per cent flowering	42.33 -85.33	33.68	66.75 ±1.12	13.08	13.41	95.20	17.54	26.28
Days to maturity	116.00-184.66	22.84	168.44±1.23	07.30	07.41	97.00	24.96	14.82
Reproductive phase duration	66.66 -141.00	35.79	101.75±1.61	12.34	12.65	95.20	25.26	24.82
Days to first picking	70.00 -102.00	18.60	88.13 ±1.49	07.72	08.28	87.10	13.09	14.85
Days to last picking	103.60-172.00	24.78	155.44±1.97	06.84	07.20	90.50	20.86	13.42
Number of picking	5.33 -13.66	43.86	10.05 ±0.36	15.32	16.59	85.40	02.93	29.17
Plant height (cm)	39.73 -197.80	66.54	136.50±5.22	23.68	24.61	92.60	64.09	46.95
Number of branches per plant	3.86 -5.53	17.73	4.61 ±0.29	04.81	12.02	16.00	00.18	03.97
Number of pods per plant	88.67 -436.60	66.24	185.14±18.51	35.58	39.65	80.50	121.80	65.79
Pod length (cm)	3.60 -13.36	57.54	8.45 ±0.16	25.70	25.92	98.40	04.44	52.53
Pod width (cm)	0.66 -2.33	55.85	1.42 ±0.04	27.29	27.96	95.30	00.78	54.90
10- green pod weight (g)	9.96 -77.33	77.17	27.16 ±1.64	48.38	49.53	95.40	26.45	97.37
Green pod yield per plant (g)	109.43-1138.86	82.47	485.60±40.84	45.89	48.20	90.70	437.22	90.03
Number of seeds per pod	3.03 -4.90	23.53	4.19 ±0.18	07.62	10.67	51.00	68.51	11.20
100- seed weight (g)	17.30 -67.33	59.12	35.65 ±1.53	27.14	28.17	92.90	00.47	53.88
Seed yield per plant (g)	44.66 -229.14	67.38	109.25±9.26	33.32	36.47	83.50	19.21	62.71

(3.) Heritability and Genetic advance

In present study, high heritability in broad sense estimates were observed for all the characters (except number of seeds per pod had moderate heritability and number of branches per plant had low heritability estimate). High heritability for these characters would be useful to the plant breeders for making effective selection strategies. The value of genetic advance expressed as percentage of mean was found high for 10-green pod weight, green pod yield per plant, number of pods per plant, seed yield per plant, pod width, 100-seed weight, pod length, plant height, number of picking, days to first flowering, days to 50 per cent flowering and reproductive phase duration. Moderate genetic advance expressed as percentage of mean was found for days to first picking, days to maturity, days to last picking and number of seeds per pod. On the other hand, number of branches per plant showed low genetic advance expressed as percentage of mean.

CONCLUSIONS

The characters like, ten green pod weight, green pod yield per plant, number of pods per plant, seed yield per plant, pod width, 100-seed weight, pod length and plant height had high estimate of variability parameters and were governed by additive gene action. For obtaining higher yielding lines, maximum weightage should be given to these attributes while making selection.

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