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Genetic Variability for Yield and Yield Attributing Traits in F_5 Generation of Lablab Bean (*Lablab purpureus* L. Sweet) Genotypes

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An investigation was undertaken to evaluate forty three progenies from F_5generation of Lablab bean along with one local check for estimation of genetic variability, heritability and genetic advance. A wide range of variation was observed for yield and its component traits among the progenies under study. Highest and lowest coefficient variation was noticed in the seed yield per plant and days to maturity respectively. The traits days to initiation of flowering, days to fifty per cent flowering, days to maturity and plant height showed narrow differences between PCV and GCV. In general PCV was higher in magnitude than GCV. The traits *viz*; seed yield per plant, peduncles per plant, primary branches per plant, hundred seed weight, number of pods per plant and plant height recorded high magnitude of GCV and PCV along with moderate to high heritability. High estimates of heritability coupled with high genetic advance as per cent of mean was observed for seed yield per plant, peduncles per plant, primary branches per plant, plant height and hundred seed weight indicating additive gene expression and more reliable for effective selection in improvement of these traits. Based on mean performance, the genotypes*viz;*G-9, G-36, G-14, G-10, G-40, G-4, G-41, G-22, and G-42 were found promising for the important yield component traits.

Introduction

Lablab bean (*Lablab purpureus* L. Sweet) 2n=22 belongs to family leguminaceae, is one of the most ancient legume species widely distributed in Indian sub-continent, Africa and South East Asia. In India, it is cultivated through the country where as major growing states are Maharashtra, Madhya Pradesh, Tamil Nadu, and North eastern states. Lablab bean is mainly grown for its young pods, green and immature seeds for vegetable purpose while the dry seeds are used in many food preparations. In Maharashtra, a special spicy curry, known as "walachebirde", is often used during fasting festivals. India is major pulse growing country in the world. India ranks first in the world in terms of pulse production (25 per cent total worlds production) (FAOSTAT, 2015).In India, the area under *rabi* pulses cultivation during year 2015, was 190.4 lakh hectares with 124 lakh

tones. Total production of pulses and productivity was 651.2 kg per hectare (Anonymous, 2015). Maharashtra had 1,125 thousand hectare area and 2,268 million tonnes total pulses production with 743 kg per hectare productivity of pulses which is low as compared to other states and national average. Grain legumes occupy a unique position in world agriculture by virtue of their high protein content and their capacity of fixing atmospheric nitrogen. Indians, as they prefer vegetarian food, pulses are the main source of proteins. In Maharashtra, especially in coastal konkan zone it is taken on residual moisture immediately after paddy harvest. Being economic crop of the region, the research on 'Wal' has its own significance and need to put on priority. In Konkan region, the lablab bean local types are of long duration generally (135-145 day) and being grown on residual moisture of rice crop, without tillage operation. Hence, the crop is generally subjected to water stress during reproductive and pod development period.

The biotic and abiotic stresses thus ultimately cause the poor grain yield (4-5 q/ha.). Hence, there is prime need to develop short duration and high yielding lablab genotypes. In any crop improvement programme, study of amount of variability present in crop species is a pre-requisite as it provides basis for effective selection and also for selecting desirable genotypes towards crop improvement. A clear understanding of variability in various quantitative characters existing in the breeding material helps plant breeder for selecting superior genotypes on the basis of different genetic parameters such as genotypic variation, heritability, genetic gain etc. to understand the nature and magnitude of variation available in population. Hence, it is necessary to estimate the relative amount of genetic and non-genetic variability exhibited by the traits under the study. Keeping this background in view, the present investigation was carried out to estimate variability, heritability and genetic advance as per cent of mean among the forty three lablab bean genotypes along with one local check.

Materials and Methods

The present investigation was carried out at Research and Education Farm, College of Agriculture, Dapoli, Dist. Ratnagiri during the period November, 2015 to March, 2016.The material for the present study comprised of selected promising forty three progenies of Lablab bean derived from different fourteen crosses and one local check 'Konkan Wal-2'. The experiment was conducted in Randomized Block Design with three replications. Each progeny was accommodated in a plot of two rows of 3 m length at spacing of 45 x 30 cm. Recommended package of practices and plant protection measures were followed so as to keep healthy crop condition. Observations were recorded on all the plants of progeny in each replication for different eleven characters *viz;* days to initiation of flowering, days to fifty per cent flowering, days to maturity, plant height, number of primary branches, number of peduncles per plant, number of pods per plant, pod length, number of seeds per pod, hundred seed weight and seed yield per plant. Mean values from each progenies and each replication were used for analysis. The data recorded on different characters were statistically analysed using software WINDOSTAT version 9.2 from indostat services, Hyderabad, India. The analysis of variance was carried out by adopting method suggested by Panse and Sukhatme, (1985).The various variability components were estimated as per Burton (1952). The broad sense heritability and genetic advance was computed according to Lush, (1949) and Johnson *et al.*, (1955) respectively.

Results and Discussion

Seed yield is the most complex character governed by polygene. It is generally difficult to make selections for such a complex character directly. Therefore, greater variability among the component characters is of vital importance in formulating effective selection programme.

Analysis of variance

The analysis of variance revealed that, highly significant differences were found among the progenies for all the traits under study (Table 1) indicated the sufficient variability existed among the genotypes. High significant variability was exhibited for plant height followed by days to fifty per cent flowering, days to initiation of flowering, days to maturity, hundred seed weight, seed yield per plant and number of pods per plant. Thus, the presence of variability in present investigation indicated the ample scope of selection for these traits. These results are in conformity with Shinde (2011), Salim *et al., (*2011), Kambale *et al.,* (2015) and Varma *et al.,*(2015). Existence of such wider genetic variation might be due to diverse source of material derived from different crosses and influence of environment.

Mean performance

Mean performance of different genotypes revealed that, (Table 2) the superior genotype for seed yield per plant (g/plant) was G- 9 (16.17 g). It was highest yielder and similarly promising for important yield components like plant height and number of primary branches per plant followed by G-36 (15.41 g). Lowest seed yield was recorded by the G-37 (6.07 g). Character days to initiation of flowering also had very much importance in lablab bean,as this crop grown on residual moisture after paddy harvest. Hence, in the present investigation, attempt was also made to find out early matured progenies as these would help in drought escape mechanism by completing life span in shorter period. Hence, least short period for the 50 per cent flowering early will be the maturity and least will be the water stress.

G- 38 (56.33 days) were the earliest for 50 per cent flowering followed by G-37 (58.67 days) and G-28 (57.00 days).These progenies were also best performed for earliest in days to maturity, G-38 (96.33 days) followed by G-37 (96.67) and G-28 (99.67 days) whereas genotypes *viz*; G-39 (110.67 days), G-40 (110.33 days) and G-11 (110.00 days) found to be too late as these genotypes took maximum days to fifty per cent flowering and maturity. These results are in accordance with the results of Lad *et al.,* (2007). Considerable variation was recorded for number of primary branches per plant and number of peduncles per plant.

G-26 (7.10 and 7.12) recorded maximum primary branches per plant and number of peduncles per plant followed by progeny G-7 (6.03 and 6.97) while a minimum primary branch per plant was recorded by progenyG-37 (3.20). Shinde (2011), Sharma *et al., (*2014) also found similar result in lablab bean. The best promising genotypes for number of pods per plant was G-35 (23.27) followed by G-31 (22.57),G-15 (22.50),G-22 (22.20), G-43 (21.57), G-21 (21.37) while G-27 (12.47) recorded minimum number of pods per plant. These findings were in confirmation with Sharma *et al., (*2014).

The best promising genotype for hundred seed weight was G-41 (27.60 g) followed by G-28 (26.83 g) G-29 (26.39 g), G-24 (25.87 g), G-39 (25.33 g) andG-40 (25.27 g) while minimum hundred seed weight was observed in G-2 (14.33 g). Similar findings were also reported by Bapat (1999).

Components of variation

Estimates of genetic parameters *viz;* variability, heritability and genetic advance are presented in (Table 3). The magnitude of phenotypic coefficient of variation was higher than genotypic coefficient of variation for all the characters under study indicates the influence of environment on these characters. These results are in accordance with Choudhary *et al.,* (2013).

High magnitude of PCV and GCV were observed for the traits *viz;* seed yield per plant and number of peduncles per plant suggesting presence of high genetic variability among the population under study. A close proximity between PCV and GCV was noticed for Days to maturity, days to initiation of flowering and days to fifty per cent flowering indicates least influence of environment on these traits. This was in confirmation with the results reported by Kambale *et al., (*2015). Moderate PCV and GCV was observed for number of primary branches, hundred seed weight, number of pods per plant and plant height whereas minimum PCV and GCV was observed for days to maturity, days to initiation of flowering, days to fifty per cent flowering, pod length and number of seeds per pod indicated that response of these traits for selection would be lesser than that of other traits. Similar findings were reported by Magalingam *et al.,* (2013), Gondhalekar (2013) and Gadakh (2014) and Kambale *et al.,* (2015) in lablab bean.

Heritability and genetic advance

Genotypic coefficient of variation with heritability estimates would give better picture of advance to be expected by selection. High estimates of heritability exhibited by almost all the traits except, pod length and number of seeds per pod which indicates that these traits might be governed by additive gene action. Moderate heritability was observed for pod length and number of seeds per pod.

Table.1 Analysis of variance for different characters in F_5 generation of Lablab bean

Sr. No.	Characters	Mean sum of squares		
		Replication df=2	Treatments df=43	Error df=86
1.	Days to initiation of flowering	5.12	52.90**	1.72
2.	Days to 50 per cent flowering	12.21	75.85**	3.94
3.	Days to maturity	1.28	39.024**	4.01
4.	Plant height (cm)	4.32	318.89**	13.34
5.	Number of primary branches per plant	0.11	1.52**	0.16
6.	Number of peduncles per plant	0.20	4.22**	0.37
7.	Number of pods per plant	5.87	15.78**	3.02
8.	Pod length (cm)	0.065	0.22**	0.096
9.	Number of seeds per pods	0.056	0.215**	0.086
10.	Hundred seed weight (g)	1.68	26.75**	4.34
11.	Seed yield per plant (g)	0.694	19.46**	0.96

* Significant at 5 % level ** Significant at 1 % level

Table.2 Mean performance of F_5 generation of Lablab bean for different quantitative characters

Sr. No	Genotypes	Days to First Flowering	Days to 50% Flowering	Days to Maturity	Plant height (cm)	Primary branches / Plant	Peduncles/ Plant	Pods/ plant	Pod length (cm)	Seeds / Pod	100 Seed weight (g)	Seed yield/ Plant (g)
1.	G1	63.00	65.33	105.33	102.20	4.30	5.77	20.50	3.93	3.30	19.53	8.72
2.	G2	59.00	69.00	107.33	79.90	4.43	7.23	21.07	3.84	3.53	14.33	9.66
3.	G3	58.33	70.33	104.67	85.67	4.00	5.73	17.03	3.86	3.37	16.14	5.80
4.	G4	55.33	66.67	107.00	92.67	3.87	6.13	17.17	3.95	3.90	23.47	12.62
5.	G5	61.00	69.00	102.67	84.47	4.23	6.20	22.50	3.73	3.70	22.63	9.89
6.	G6	57.67	68.67	105.33	97.47	4.37	6.73	19.57	3.83	3.67	22.81	11.09
7.	G7	56.67	62.67	105.00	91.47	6.03	6.97	19.87	3.76	3.60	21.95	8.57
8.	G8	61.33	65.00	99.33	86.40	3.93	6.17	19.43	3.69	3.77	21.41	11.31
9.	G9	56.00	69.67	99.33	100.53	4.47	7.47	18.53	3.92	3.50	21.20	16.17
10.	G10	59.33	68.00	105.00	78.67	3.97	4.77	17.37	3.83	3.20	23.53	14.28
11.	G11	58.00	64.33	110.00	81.00	4.77	5.93	18.10	3.70	3.67	21.03	11.28
12.	G12	63.00	63.33	107.67	99.93	3.53	5.63	19.90	3.60	3.53	20.17	9.08
13.	G13	62.00	69.67	105.67	100.00	3.40	5.43	18.37	4.13	3.87	19.87	5.60
14	G14	61.00	68.33	105.33	105.60	3.87	6.17	21.33	3.83	3.33	21.83	14.70
15	G15	62.67	77.67	97.00	100.87	4.60	12.20	20.67	3.91	3.67	20.03	6.99
16	G16	59.33	68.00	103.00	81.53	3.87	5.87	19.57	4.47	3.50	23.13	11.37
17	G17	60.00	65.67	102.00	91.57	3.83	5.93	19.97	3.60	3.83	20.38	8.57

Sr. No	Genotypes	Days to First Flowering	Days to 50% Flowering	Days to Maturity	Plant height (cm)	Primary branches / Plant	Peduncles/ Plant	Pods/ plant	Pod length (cm)	Seeds / Pod	100 Seed weight (g)	Seed yield/ Plant (g)
18	G18	60.33	65.67	109.67	81.53	4.60	6.53	20.63	3.83	3.30	24.33	8.75
19	G19	53.33	64.00	106.33	86.20	4.50	6.73	19.50	3.80	3.67	22.37	8.70
20	G20	59.00	68.67	104.67	97.53	5.03	6.40	21.13	4.73	3.63	22.10	10.10
21	G21	61.33	66.67	107.00	84.87	3.63	6.57	21.37	3.70	4.80	21.90	9.17
22	G22	63.00	68.33	108.00	84.00	3.90	6.43	22.20	4.02	3.52	23.17	11.49
23	G23	66.00	73.33	106.67	83.60	3.50	6.13	18.10	3.83	3.53	22.63	7.13
24	G24	63.67	70.00	107.33	92.73	4.00	6.50	16.23	3.97	3.47	25.87	8.70
25	G25	50.67	56.33	104.00	109.40	4.27	5.40	13.50	4.30	3.60	23.50	10.70
26	G26	49.67	55.67	109.67	82.20	7.10	7.12	19.43	4.03	3.37	18.68	11.10
27	G27	51.67	58.33	100.67	76.20	4.40	6.79	12.47	3.87	3.63	18.00	6.03
28	G28	54.67	57.00	99.67	75.20	5.43	7.20	18.27	4.43	3.67	26.83	8.43
29	G29	51.67	61.33	108.67	80.80	4.23	5.90	19.00	4.06	3.80	26.39	10.31
30	G30	59.00	65.67	104.00	112.27	4.07	5.10	17.27	3.93	3.80	22.23	10.26
31	G31	61.00	68.00	106.67	91.93	4.23	8.00	22.57	4.43	3.70	22.93	7.85
32	G32	55.00	61.67	107.33	78.33	4.47	4.33	16.57	4.07	4.00	18.00	10.04
33	G33	61.00	56.67	106.67	92.37	5.47	5.83	16.60	3.83	3.77	17.96	8.63
34	G34	56.00	67.67	106.00	77.53	4.47	6.03	16.93	4.06	3.37	17.30	8.78

Sr. No	Genotypes	Days to First Flowering	Days to 50% Flowering	Days to Maturity	Plant height (cm)	Primary branches / Plant	Peduncles/ Plant	Pods/ plant	Pod length (cm)	Seeds / Pod	100 Seed weight (g)	Seed yield/ Plant (g)
35	G35	56.33	61.67	101.00	108.60	4.63	6.63	23.27	4.77	3.73	19.76	7.45
36	G36	51.00	56.67	103.00	104.53	4.17	7.40	20.60	4.13	3.70	19.31	15.41
37	G37	54.67	58.67	96.67	94.93	3.20	5.67	16.53	3.73	3.70	17.94	6.07
38	G38	48.67	56.33	96.33	85.87	4.67	6.10	18.40	3.97	3.03	22.70	11.40
39	G39	59.00	68.00	110.67	84.47	4.17	5.07	16.17	3.89	3.63	25.33	8.89
40	G40	64.00	70.33	110.33	86.67	3.87	5.13	16.67	4.34	3.60	25.27	14.01
41	G41	62.00	70.33	104.67	94.87	5.13	6.43	18.63	3.83	3.33	27.60	12.48
42	G42	60.67	65.00	105.33	102.40	3.67	5.93	18.27	4.00	3.60	18.63	11.51
43	G43	60.00	63.67	102.67	106.33	3.77	6.20	21.57	3.93	3.50	20.15	8.83
44	KokanWal 2 (c)	56.67	63.33	105.33	76.07	3.70	7.67	19.07	3.63	3.77	16.40	6.73
General mean		58.27	65.23	104.79	90.71	4.31	6.35	18.91	3.97	3.62	21.38	9.88
Range	Min.	48.67	55.67	96.33	75.20	3.20	4.33	12.47	3.60	3.03	14.33	5.60
	Max.	66.00	77.67	110.67	112.27	7.10	12.20	23.27	4.77	4.80	27.60	16.17
S.E.		0.76	1.15	1.16	2.11	0.24	0.35	1.00	0.18	0.17	1.20	0.57
C.D. at 5%		2.13	3.23	3.25	5.93	0.67	0.99	2.82	0.50	0.48	3.38	1.60
C.V. (%)		2.54	3.05	1.91	4.03	9.55	9.58	9.20	7.82	8.13	9.75	9.96

Table.3 Estimates of genetic parameters for various characters of F_5 generation of Lablab bean

Sr. No.	Characters	PCV (%)	GCV (%)	h^2bs (%)	GA	GAM (%)
1.	Days to initiation of flowering	7.43	7.08	90.81	8.10	13.92
2.	Days to 50 per cent flowering	8.09	7.50	85.86	9.34	14.32
3.	Days to maturity	3.77	3.26	74.39	6.06	5.79
4.	Plant height (cm)	11.83	11.12	88.82	19.54	21.55
5.	Number of primary branches per plant	18.29	15.60	72.76	1.18	27.43
6.	Number of peduncles per plant	20.23	17.82	77.60	2.05	32.35
7.	Number of pods per plant	14.27	10.90	58.41	3.24	17.18
8.	Pod length (cm)	9.38	5.18	30.53	0.22	5.90
9.	Number of seeds per pods	9.94	5.72	33.15	0.24	6.79
10.	Hundred seed weight (g)	16.07	12.78	63.24	4.47	20.94
11.	Seed yield per plant (g)	27.03	25.13	86.43	4.75	48.14

Higher estimates of genetic advance as per cent of mean were observed for seed yield per plant, number of peduncles per plant, number of primary branches per plant and hundred seed weight whereas moderate to low heritability were observed for number of pods per plant, days to fifty per cent flowering, days to initiation of flowering, number of seeds per plant, pod length and days to maturity. These results are in accordance with the results of Gadakh (2014) in lablab bean.

Heritability alone does not provide true indication of genetic potentiality of the genotype, as the scope is restricted by their interaction with environment. High heritability estimates accompanied with high genetic advance as per cent of mean exhibited in the trait, plant height (88.82, 21.55), seed yield per plant (86.43, 48.14), number of peduncle per plant (77.60, 32.35), number of primary branches per plant (72.76, 27.43) and hundred seed weight (63.24, 20.94). These characters had also high GCV which indicates the presence of additive gene action and scope for improvement through simple selection.

High heritability accompanied with moderate to low genetic advance as per cent of mean was observed for days to initiation of flowering, days to fifty per cent flowering, number of pods per plant, pod length and number of seeds per pod, indicate the expression of these traits were governed by non-additive gene action and presence of environmental influence, hence selection would be ineffective. These results are in confirmation with the results reported by Pawar and Prajapati (2013) in lablab bean.

From present investigation it can be concluded that, presence of wide variability among the genotypes and all the characters under study. On the basis of overall performance, genotypes, G-9, G-36, G-14, G-10, G-40, G-4, G-41, G-22 and G-42 were found to be superior for high seed yield. Wide variability was observed for seed yield per plant, number of peduncles per plant, hundred seed weight, plant height and number of pods per plant. These characters also had higher estimates of heritability accompanied with high genetic advance as per cent of mean which can be utilized for further improvement through selection.

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