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YIELD COMPONENT ANALYSIS IN FIFTEEN LABLAB BEAN CULTIVARS

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Abstract

Genetic variability and correlation analysis for yield and its components were studied in 15 strains of lablab bean (*Lablab purpureus* L.) having diverse origin at National Agricultural Research Centre, Islamabad. Highly significant differences were observed for all the characters indicating a high degree of variability in the material. Genotypic coefficients of variability were generally lower than phenotypic coefficients of variability indicating the influence of environment on characters. High heritability coupled with high genetic advance and genetic coefficient of variability was observed for grain yield indicating the presence of additive genetic variation. For days to flowering, high heritability was associated with low genetic gain and genotypic coefficient of variation, which is an expression of dominant and epistatic nature of inheritance. In most cases, genoytpic correlations were relatively higher than phenotypic correlations in magnitude, revealing the importance of genetic effects. These studies revealed that pods per bunch, pod length and seeds per pod were positively correlated with yield while days to flower, pod breadth and 100-seed weight showed negative association with grain yield.

Introduction

Lablab bean [*Lablab purpureus* (L.) Sweet] extensively cultivated as fodder and food legume in India is very little known in Pakistan. It is reported to produce twice the herbage of cowpea and 1.5 to 4.0 tonnes of dry seeds per hectare (Wildin, 1974). Lablab leaves are rich in protein and are one of the best sources of iron (155 mg per 100 g of leaves). The seeds contain 20 to 28% crude protein. The National Academy of Sciences, USA (Anon., 1979) has identified it as a promising source for the future for tropical areas. Lablab bean is well suited to arid and warm climates where rainfall during the growing season is around 600 mm (Cobley & Steele, 1976). It can be grown economically even on poor sandy to medium loam soils.

The evaluation of germplasm for yield components is the pre-requisite for developing high yielding varieties that could respond well to improved cultural practices. Very little work has been reported on the genetic diversity in lablab bean germplasm through an effective quantitatve approach. Therefore, the present studies were carried out to, a) evaluate available germplasm of lablab bean for yield and other agronomic traits; b) study the relative importance of each seed yield component and its contribution to final yield; c) measure the degree of genetic diversity of lablab bean strains based on quantitative measurements and d) identify lines with desirable traits.

Materials and Methods

A field study was conducted on 15 lablab bean lines of diverse origin possessing wide range of variability at National Agricultural Research Centre, Islamabad during kharif, 1988. The experiment was laid out in randomized complete block design having 3 replications. The plots were four rows, 5m long, having row to row distance of 75 cm while within a row plant to plant distance was 30 cm. At the time of maturity, 5 competitive plants from each genotype in each replication were randomly selected for recording observations on 7 genetic parameters namely days to flowering, pods/bunch, pod length, pod breadth, seeds/pod, 100-seed weight and grain yield/plant.

The mean values of each character for each entry were used for statistical analysis. The coefficients of variation, heritability (in broad sense), genetic advance (5% selection intensity) and correlation coefficient were computed according to the methods suggested by Singh & Chaudhry (1979).

Results and Discussion

Analysis of variance revealed highly significant differences among 15 genotypes of lablab bean for all the characters, suggesting that there was a high degree of genetic variability in the material for various characters. (Table 1) ILCA-11610 (116.67 days) and ILCA-6529 (156.67 days) were found to be the earliest and latest in flowering, respectively. On the basis of type to flowering 4 strians viz., ILCA-6930, 11610, 11616 and Highworth were selected as early maturing while rest of the genotypes were medium or late maturing. Number of pods per bunch ranged from 4.00 - 6.09. The maximum pods/

Table 1. Mean values for 7 different characters in Lablab bean.

S. No.	Strains	Days to flowering	Pods/ bunch	Pod length (cm)	Pod breadth (cm)	Seeds/ pod	100-Seed wt. (gm)	Yield/plant (kg)
1.	ILCA-147	125.67	4.80	4.78	1.51	3.97	18.17	0.71
2.	ILCA-6529	156.67	4.00	4.82	1.51	3.99	16.64	0.40
3.	ILCA-6930	119.00	4.63	8.14	0.54	5.72	27.22	0.59
4.	ILCA-7379	122.67	5.17	4.74	1.36	3.65	19.10	0.91
5.	ILCA-11609	125.67	5.09	5.11	1.55	3.63	18.72	0.76
6.	ILCA-11610	116.67	5.36	8.65	0.87	5.47	22.13	1.02
7.	ILCA-11612	127.33	5.30	5.13	1.65	4.17	17.91	0.82
8.	ILCA-11614	126.67	6.04	4.92	1.55	3.73	19.51	1.42
9.	ILCA-11616	117.33	5.83	7.48	0.68	5.92	21.48	1.29
10.	ILCA-11618	144.33	4.44	4.90	1.64	3.96	17.75	0.49
11.	ILCA-11619	128.00	5.80	4.80	1.62	4.10	19.78	1.25
12.	IKCA-11620	131.33	5.37	4.89	1.59	4.00	17.58	1.12
13.	ILCA-11634	137.33	4.73	4.95	1.64	4.17	17.85	0.65
14.	ILCA-11640	121.67	5.73	4.88	1.55	4.29	16.93	1.17
15.	High worth	117.67	6.09	5.12	1.45	3.96	17.72	1.47

bunch were recorded in Highworth which was at par with ILCA-11614 while minimum pods were obtained in ILCA-6529. Significant variation was also observed for seeds per pod. Maximum seeds per pod was found in ILCA-11616 and minimum in ILCA-11609. The pod length and breadth also varied significantly (Table 2). Hundred seed weight varied from 16.64 - 27.22 gram in ILCA-6529 and 6930, respectively. Highworth gave maximum grain yield of 1.470 kg per plant followed by ILCA-11614 (1.420 kg), 11616 (1.290 kg) and 11619 (1.250 kg) whereas ILCA-6529 was the lowest yielding (0.400 kg). Thus, the lines which showed higher mean values for yield and its components can be tested for combining ability and could be utilized in the hybridization programme.

The F-ratios, general means, range, coefficients of variability, heritability (in broad sense) and expected genetic advance (5% selection intensity) are presented in Table 2. A wide range of variation was observed among 15 strains of lablab bean for all the characters. Phenotypic coefficients of variability are somewhat higher than genotypic coefficients of variability indicating the influence of environment on these characters. Similar results have also been found by Sandhu *et al.*, (1978) and Malik *et al.*, (1988). The genetic coefficient of variation ranged from 8.50 for days to flowering to 36.05 for yield per plant in differnet strains. Highest coefficient of genetic variability for grain yield revealed that this character is less influenced by environment and desired types can be selected. Contrary to this, chances of improvement were low for days to flower having low genetic coefficient of variability. These findings are in agreement with that of Singh *et al.*, (1979, 1985) and Malik *et al.*, (1988) for days to flower and yield per plant. All the characters indicated high values of heritability varying from 84% for pods/bunch to 98% for pod length and breadth. Heritability, however, indicates only the effectiveness with which selection of genoytpe can be based on the phenotypic performance, but it fails to indicate the genetic progress. High heritability associated with high genetic gain, if considered together are more useful than heritability alone (Johnson *et al.*, 1955). Therefore, high heritability does not always mean greater genetic advance. Inspite of high heritability of all the traits, genetic advance in percent of mean varied from 2.66 for days to flowering to 9.00 for grain yield per plant. It is true that additive gene effects are probably important, when high heritability is associated with high genetic gain. In the present investigation high heritability for days to flowering and pod length was not associated with high genetic gain, indicating the influence of dominant and epistatic genes and less scope for imporvement by selection for these characters. However, in case of yield per plant high heritability was coupled with higher genetic advance and genotypic coefficient of variability, indicating the presence of additive genetic variation in determining this character. These results confirm the findings of Singh *et al.*, (1979) and Das & Dana (1982).

With a few exceptions, the genotypic correlation coefficients were generally higher than the phenotypic and environmental correlation coefficients, which could be due to modifying effects of environment on association of characters at genic level (Table 3). Though, there were positive environmental correlations between several variables, negative environmental associations were also noticed in a few instances. Grain yield per plant was positively correlated with pods per bunch, pod length and seeds per pod at both

Table 2. F-ratios, General mean, Range, Genotypic coefficient of variability, Phenotypic coefficient of variability, Heritability (in broad sense) and Expected genetic advance for 7 agronomic traits in Lablab bean.

Characters	"F" ratio	Mean±S.E.	Range	Genotypic variance	Phenotypic variance	Genotypic coefficient of variability	Phenotypic coefficient of variability	Heritability	Expected Genetic Advance*	GA in % of mean
Days to Flowering	37.99**	127.87±1.79	112-158	118.11	127.68	8.50	8.84	0.93	3.41	2.66
Pods/Bunch	17.23**	5.23±0.15	3.65-6.45	0.36	0.42	11.45	12.46	0.84	0.26	4.95
Pod Length	181.82**	5.55±0.10	4.45-8.70	1.78	1.81	24.01	24.21	0.98	0.20	3.62
Pod Breadth	149.43**	1.38±0.03	0.49-1.70	0.13	0.14	26.51	26.78	0.98	0.06	4.39
Seeds/Pod	43.22**	4.32±0.11	3.36-6.20	0.54	0.58	17.10	17.70	0.93	0.22	5.08
100-Seed Weight	34.71**	19.23±0.46	15.79-28.52	7.08	7.71	13.83	14.43	0.92	0.87	4.50
Yield/Plant	61.95**	0.94±0.04	0.38-1.65	0.11	0.12	36.05	36.93	0.95	0.08	9.00

**Significant at 1% level of probability, * Genetic advance (5% selection intensity).

Table 3. Genotypic (G), Phenotypic (P) and Environmental (E) Correlation coefficients among different pairs of characters in Lablab bean.

Characters		Pods/Bunch	Pod Length	Pod Breadth	Seeds/Pod	100-Seed Weight	Yield/Plant
Days to Flowering	(G)	-0.7298**	-0.5043	0.5233*	-0.4463	-0.5134*	-0.6404**
	(P)	-0.6442**	-0.4710	0.4968	-0.4078	-0.4914	-0.5951*
	(E)	0.0049	0.2867	-0.0380	0.0979	-0.2331	0.1040
Pods/Bunch	(G)		0.0376	-0.0346	0.0559	0.0130	0.9915**
	(P)		0.0335	-0.0227	0.0533	0.0134	0.9542**
	(E)		-0.0151	0.1565	0.0363	0.0173	0.7590**
Pod Length	(G)			-0.9292**	0.9405**	0.8459**	0.0278
	(P)			-0.9187**	0.9021**	0.8107**	0.0288
	(E)			-0.3475	0.0240	0.1846	0.0658
Pod Breadth	(G)				-0.9213**	-0.8815**	-0.0448
	(P)				-0.8928**	-0.8483**	-0.0434
	(E)				-0.3145	-0.2982	-0.0022
Seeds/Pod	(G)					0.7849**	0.0492
	(P)					0.7308**	0.0559
	(E)					0.0544	0.1708
100-Seed Wt.	(G)						-0.0124
	(P)						-0.0062
	(E)						0.0878

*, ** significant at 5 and 1% levels of probability respectively.

genotypic and phenotypic levels, indicating that selection for these traits will be an improvement in yield. Sandhu *et al.*, (1978) also reported similar results. Days to flowering, pod breadth and 100-seed weight showed negative association with grain yield. The correlation coefficients showed that yield per plant and pods per bunch had the maximum significant and positive association followed by pod length seed/pod. pod length x 100-seed weight and seeds/pod x 100-seed weight. Selection could be practiced on any of the characters without adversely affecting the others. It would suggest that pods/bunch, pod length and seeds/pod should be given priority.

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