Indian J. Pl. Genet. Resources 13(2): 134-137, 2000

GENETIC DIVERGENCE AMONG FIELD BEAN (*Lablab purpureus* L Sweet) CULTIVARS OF SOUTHERN KARNATAKA

P. S. BASAVARAJAPPA AND M. BYRE GOWDA[1], AICRP on Pulses, University of Agricultural Sciences, GKVK Campus, Bangalore 560 065 (Karnataka)

A total of 144 collections of field bean belonging to southern Karnataka revealed considerable diversity. The accessions were grouped into 15 clusters. The genetic diversity observed was not related to geographic diversity. Grain yield, pods per plant, inflorescence per plant, branches per plant and days to 50% flowering were the most potential traits contributing to the total divergence. Clusters XV and VIII were important because they comprised accessions with high yield, pod number, inflorescence per plant and branches per plant (cluster XV) and early duration and photoinsensitivity (cluster VIII). By utilizing these accessions desirable segregants may be evolved through hybridization.

Key words : Field bean, *Lablab purpureus*, divergence, clusters

Lablab purpureus L. Sweet, commonly referred to as field bean or Dolichos bean or Lablab bean is an important legume crop of Karnataka grown for both grain and fodder purpose. Southern Karnataka is by far the largest field bean producing region of the India. The majority of field bean grown are local land races and only a few released cultivars available to farmers. Attempts are therefore, being made for developing desirable high yielding field bean genotypes for increased productivity and production under the agroclimatic conditions of Southern Karnataka. In the present study, an attempt has been made to identify genetically divergent parents which can be utilized in hybridization programme.

MATERIALS AND METHODS

The experimental material comprised of 144 germplasm collections of field bean from Southern Karnataka. The accessions were grown in a 12 × 12 simple lattice design with two replications during Kharif 1998 at GKVK Farm, University of Agricultural Sciences, Bangalore. Each germplasm line of 5.0 metre length was sown with spacing of 90 cm between rows and 20 cm with in the row. Observations were recorded on five plants choosen at random in each replication for 14 growth and yield component characters viz., days to 50% of flowering, days to maturity, plant height (cm), branches per plant, inflorescence per plant, fruiting nodes per inflorescence, pods per plant, pod length (cm), pod width (cm), seeds per pod, pod weight (g), grain yield per plant (g), 100 seed weight (g) and shelling per cent. Genetic divergence was determined using Mahalanobis D^2 statistics (Mahalanobis, 1936) and the genotypes were grouped into clusters according to Tocher's method (Rao, 1952). The inter and intra cluster distances were also calculated following the method of Singh and Chaudhary (1977).

RESULTS AND DISCUSSION

The analysis of variance revealed highly significant differences among the genotypes for all the 14 characters studied. Based on D^2 values,

the 144 field bean genotypes were grouped into 15 clusters by Tocher's method (Table 1). The cluster I included maximum number (78 genotypes). Among other clusters, 16 genotypes were grouped in cluster II, 15 in cluster III, 8 in cluster IV, 6 each in cluster VI and VIII, 4 in cluster VII, 3 in cluster V and 2 in cluster X, respectively. The remaining six clusters are mono genotypic. The clustering pattern of cultivars, as they are of the same geographical origin, might have resulted from genetic drift followed by selection (Murthy and Arunachalam, 1960). Similar observations were also made by Baswana *et al.* (1980), Pandey *et al* (1983), Nayar (1984) and Singh (1991) in field bean. As a consequence, the character constellation that might be associated with particular region, in nature loose their individually under human interference. This suggested to choose diverse parents based on D^2 analysis rather geographical isolation for hybridization.

Table 1. Distribution of 144 field bean genotypes in different clusters

Cluster No.	No. of Genotypes	Accession Number (GA numbers)
I	78	GA 49, 54, 31, 41, 34, 122, 130, 130, 102, 94, 46, 51, 127, 58, 33, 55, 115, 134, 105, 91, 135, 95, 133, 131, 99, 136, 109, 22, 120, 29, 53, 63, 8, 68, 72, 64, 67, 37, 132, 36, 35, 93, 92, 59, 38, 17, 21, 89, 77, 90, 103, 126, 9, 86, 42, 108, 57, 90, 74, 16, 47, 12, 116, 26, 65, 52, 28, 15, 106, 48, 137, 100, 40, 25, 96, 18 and 32.
II	16	GA 43, 129, 14, 88, 87, 111, 39, 113, 114, 128, 27, 84, 119, 104, 112 and 24
III	15	GA 62, 83, 82, 66, 75, 73, 125, 50, 3, 6, 1, 123 and 56, 14 and 78.
IV	8	GA 11, 124, 110, 118, 45, 85, 69 and 76
V	3	GA 60, 23 and 121
VI	6	GA98, 79, 13, 10, 70 and 2
VII	4	GA 5, 71, 61 and 7
VIII	6	GA 143, 144, 139, 141, 142 and 140
IX	1	GA 117
X	2	GA 107 and GA 20
XI	1	GA 4
XII	1	GA 97
XIII	1	GA 138
XIV	1	GA 101
XV	1	GA 19

The intra and inter D^2 values on pooled basis are presented in Table 2. The clusters IX, XI, XII, XIII, XIV and XV showed zero magnitude of intra-cluster distance being solitary. The cluster VI had maximum intra-cluster divergence (160.90). The other intra-cluster differences lying between these two values. Genotypes grouped into the same cluster would diverge very little than those grouped in different clusters. Therefore, it would be desirable to attempt crosses between genotypes belonging to different clusters for getting desirable recombinations. In the present study, the inter cluster distance was maximum between cluster VIII and XV (2313.60), suggesting that the genotypes from these clusters were highly divergent from each other. Similarly cluster XI and XV were also quite diverse (2046.1). The minimum intercluster distance was observed between cluster II and V (150.00) indicating close relationship among the genotypes contained in them.

The cluster means for 14 characters on pooled basis (Table 3) indicated that the solitary cluster CV with genotype GA 19 had the highest mean in respect of grain yield per plant, branches per plant and pods per plant. The cluster VIII exhibited lowerst means for days to 50 per cent flowering, days to maturity and inflorescence per plant. Hence, it could be concluded that significant genetic diversity exist among 144 genotypes for most of the important characters. This could be attributed to long term selection in different directions by both natural and human forces. In

Table 2. Inter-cluster (above diagonal) and intra-cluster (diagonal) D2 values for 15 clusters in field bean

Clusters	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV
I	115.97	213.49	165.57	223.76	162.5	182.53	280.78	744.63	229.24	547.47	390.03	497.14	498.68	617.3	1001.12
II		120.68	295.97	394.43	150	341.02	573.41	1084.5	500.78	208.32	767.77	531.51	802.84	316.88	558.59
III			103.35	216.93	236.52	172.68	259.18	535.43	399.48	621.05	358.08	430.14	325.49	616.54	966.09
IV				136.39	318.85	280.07	422.4	904.36	496.1	321.87	283.09	501.09	501.96	647.87	1081.92
V					136.73	257.95	398.19	872.46	302.29	356.14	558.74	605.81	658.96	525.04	801.49
VI						160.9	393.36	797.82	437.48	603.62	522.59	377.15	501.96	820.7	811.91
VII							102.86	329.48	208.67	1096.35	171.42	938.5	239.47	1312.69	1759.68
VIII								115.1	797.59	1643.99	397.63	1508.99	221.12	1904.34	2313.6
IX									0	1001	349.86	913.82	632.42	1239.3	1718.1
X										141.31	1374.85	854.48	1370.19	256.51	353.13
XI											0	785.93	269.45	1458.65	2046.17
XII												0	959.69	388.77	841.94
XIII													0	1415.16	1804.54
XIV														0	215.86
XV															0

Table 3. Means for 14 quantitative characters of 15 clusters in field bean

Cluster	Days to 50% flowering	Days to maturity	Plant height (cm)	Branches per plant	Inflorescence per plant	Fruiting nodes per inflorescence	Pods per plant	Pod length (cm)	Pod width (cm)	Seeds per pod	Pod yield per plant (g)	Grain yield per plant (gm)	100 seed weight (g)	Shelling per cent
I	102.12	141.38	56.95	7.21	15.85	6.47	62.11	4.40	1.65	3.72	62.25	43.83	25.41	70.52
II	107.12	146.72	58.93	7.15	16.58	6.70	78.86	4.56	1.71	3.77	81.41	49.16	26.78	59.88
III	87.97	136.07	61.25	7.00	15.57	7.22	69.52	4.48	1.67	3.74	65.75	44.81	24.96	71.49
IV	105.25	144.43	59.89	7.65	14.61	7.61	68.71	4.37	1.29	3.78	63.96	42.88	25.05	69.09
V	109.33	147.16	60.60	6.65	16.00	6.30	65.19	4.54	1.69	3.75	73.49	45.52	25.53	60.79
VI	99.58	141.25	62.45	7.10	15.91	7.71	84.26	4.49	1.68	3.72	80.17	61.78	26.86	74.12
VII	86.12	133.12	62.18	6.29	13.28	7.30	32.65	4.72	1.69	3.69	33.97	26.84	26.06	78.73
VIII	49.83	113.08	57.23	6.68	7.91	6.99	28.72	4.46	1.68	3.80	33.03	26.72	23.02	80.80
IX	118.00	158.00	51.80	6.32	16.35	6.95	30.30	4.50	1.68	3.64	33.57	25.93	27.99	77.09
X	108.75	149.75	59.55	7.32	17.12	7.-5	94.25	4.79	1.76	3.91	103.20	56.20	27.04	54.48
XI	81.50	130.00	72.20	6.20	13.90	6.65	27.55	4.49	1.32	3.34	23.16	16.38	23.40	70.55
XII	113.00	153.50	73.20	8.80	16.30	6.25	105.10	4.39	1.34	3.76	87.07	63.14	21.25	72.50
XIII	62.00	122.00	92.40	9.70	13.00	8.15	47.35	4.48	1.67	3.61	44.92	34.93	25.23	77.77
XIV	113.00	157.00	61.50	6.90	18.10	8.00	123.00	4.45	1.65	3.67	116.56	72.20	24.69	61.91
XV	103.00	143.00	66.85	12.20	29.35	6.42	157.40	4.48	1.65	3.80	169.22	117.64	27.92	67.43
Mean	96.44	141.03	64.79	7.00	15.99	7.05	17.66	4.51	1.61	3.71	71.45	48.53	25.41	66.28
SE	5.05	3.25	2.49	0.41	1.14	0.16	9.66	0.03	0.04	0.03	9.89	6.37	0.46	3.80
CV (%)	20.30	8.93	15.12	21.12	27.61	8.65	52.19	2.93	9.32	3.23	53.61	50.37	7.03	23.04

this context, grain yield, pods per plant, inflorescence per plant, branches per plant and days to 50% flowering are the important characters contributed substantially to the genetic divergence.

Crosses among genetically diverse genotypes are likely to yield desirable recombinants. Therefore, a crossing programme between the genotypes belonging to divergent clusters might be useful for identifying such recombinants. Among the six possible crosses between cluster VIII and XV, three crossing programmes viz., GA141 × GA19, GA142 × GA19 and GA143 × GA19 appeared to be most promising to combine duration and high yield potential as the D^2 value between these clusters was very high. All the three genotypes, GA 141, GA 142 and GA 143 from cluster VIII were characterized by early duration and photo insensitiveness, the two most important characters for developing varieties for growing field bean throughout the year. Moreover, GA 19 from the cluster XV was characterized by high pod number, inflorescence per plant and branches per plant, the most important yield components in field bean. Therefore, it is possible that, the three crossing programmes involving parents material on the basis of genetic divergence might lead to an overall improvement in yield combining with early maturity and photo insensitivity in field bean.

REFERENCES

K.S. Baswana, M.L. Pandita, P.S. Partap and B.S. Dhankar. 1990. Genetic divergence for yield and its components in Indian Bean (*Dolichos lablab* var Lignosur L.). *Haryana J. Hort. Sci.*, 9 (3-4): 184-187.

P.C. Mahalanobes. 1936. On the generalised distance in statistics. *Proc. Nat. Acad. Sci., (Indian)* 12: 49-55.

B.R. Murty and V. Arunachalam. 1966. The nature of genetic divergence in relation to breeding systems in crop plants. *Indian J. Genet.* 25: 46-56.

K.M.D. Nayar. 1984. Studies on genetic divergence and breeding behaviour of few inter-varietal crosses in field bean (*Lablab purpureus* (L) Sweet). *Mysore J. Agri. Sci.*, 16(4): 486.

R.P. Pandey, B.M. Assawa and J.P. Tiwari. 1983. Genetic divergence in *Dolichos lablab* (Linn). *JNKVV Res. J.*, 17(1-2): 66-70.

K.R. Rao. 1952. Advanced Statistical Methods in Biometrical Research. John Wiley and Sons, Inc., New York.

S.P. Singh. 1991. Genetic divergence and canonical analysis in hyacinth bean (*Dolichos lablab). J. Genet. Breeding*, 45(1): 7-11.

Singh R.K. and R.D. Choudhury. 1977. Biometrical Methods in Quantitative Genetic Analysis, Kalyani publishers, New Delhi, p. 229-252.