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Mahesh RO

M.Sc Student, Dept. of
Vegetable Science, Kittur Rani
Channamma College of
Horticulture, Arabhavi,
Karnataka, India

Shashikanth Evoor

Asst. Prof., Dept. of Vegetable
Science, College of Horticulture,
Bagalkot, Karnataka, India

Basavaraj

Ph.d Scholar Dept. of vegetable
science, Kittur Rani Channamma
College of Horticulture, Arabhavi,
Karnataka, India

VD Gasti

Asst. Prof., Dept. of Vegetable
Science, College of Horticulture,
Bagalkot, Karnataka, India

Chethan Kumar S

Ph.d Scholar Dept. Of vegetable
science, Kittur Rani Channamma
College of Horticulture, Arabhavi,
Karnataka, India

Chandrakant Kamble

Asst. Prof. Dept. of Vegetable
Science, HRES, Hidakal Dam,
Belagavi, Karnataka, India

Correspondence**Basavaraj**

Ph.d Scholar Dept. of vegetable
science, Kittur Rani Channamma
college of Horticulture, Arabhavi,
Karnataka, India

Chethan Kumar S

Ph.d Scholar Dept. Of vegetable
science, Kittur Rani Channamma
college of Horticulture, Arabhavi,
Karnataka, India

Per se performance of dolichos bean (*Lablab purpureus* L.) genotypes for pod yield and quality traits

Mahesh RO, Shashikanth Evoor, Basavaraj, VD Gasti, Chethan Kumar S and Chandrakant Kamble

Abstract

Research work was undertaken in dolichos bean (*Lablab purpureus* L.) genotypes to identify suitable germplasm for cultivation with high pod yield and quality traits. The study reveals that highly significant difference were observed for all the sixteen traits. Mean performance showed that Arka Jay (912.0 g) registered the highest pod yield per plant and lowest by Glory (228.5 g). From the nutrient point of view, the genotype Sarpan Seeds recorded highest protein content (3.84g) whereas Bhopal local for pod fiberness and Glory for highest total sugar content (1.25%). Hence, these genotypes could be better utilized for further breeding programme for the improvement of pod yield and other quality parameters.

Keywords: Sem, phenotype, critical value, *Per se* performance

1. Introduction

Dolichos bean (*Lablab purpureus* L.) is an important under exploited vegetable crop grown throughout the India and called with various vernacular names like Indian bean, Hyacinth bean, Egyptian bean, Sem bean *etc.* It belongs to the family Leguminosae and having a chromosome number of $2n=22$. Vavilov (1939) [17] had considered India as the primary centre of origin of dolichos bean and its wild forms are found in many parts of the country. It is a perennial herbaceous twining climber but cultivated as an annual. Leaves are alternate, long petiole, pinnately trifoliolate. Flowers are bisexual with raceme inflorescence arise on long peduncle. It is a self pollinated crop due to cleistogamous nature of flower. This crop has multipurpose uses, the green pods are used as vegetable while, ripe and dried seeds are consumed as a split pulse. The green pods are eaten after cooking and has very good nutritive value. Fresh pods are highly nutritive and contain carbohydrates (6.7 g), protein (3.8 g), fat (0.7 g), minerals (0.9 g), magnesium (34 mg), calcium (210 mg), phosphorus (68 mg), sodium (55.4 mg), iron (1.7 mg), potassium (74.0 mg), sulphur (40.0 mg), vitamin A (312 I.U.), riboflavin (0.06 mg), vitamin C (9.0 mg), nicotinic acid (0.7 mg) and fiber (1.8 g) per 100 g of edible portion (Bose *et al.*, 2000) [1]. The area and production of this crop is limited mainly because of the unavailability of high yielding genotypes. To have good economic returns and to improve nutritional condition of the country, research is needed and should be started to identify the best high pod yielding cultivars. Therefore the investigation was undertaken to find out the potential pod yielding cultivars for north Karnataka.

2. Material and Methods

The experiment was conducted at the Department of Vegetable Science, KRCC, Arabhavi, University of Horticultural Sciences, Bagalkot and carried out during the period of Aug 2016 to Dec 2016, 25 genotypes viz., Arka Swagath, Vijaya Royal, Katkari local, glory, Indore local, Laxmi, Nimbhod local, Todi local, COGB 14, Samrat, Chithodgad local, Arka jay, Bhupal local, Clara, Mary, Sarpan seeds, Ratlam local-2, Sanwad local-2, Dharmapuri local, Arka Amogh were evaluated in Randomized block design with 2 replications.

The sowing was done on ridge with spacing of 45cm X 15 cm. All the recommended intercultural operations were done during the lifespan of the experiment. Observations for different traits viz., plant height @ 45DAS, plant height @ 90DAS, canopy spread N-S @ 90 DAS, canopy spread E-W @ 90DAS, stem girth @ 90DAS, No. of inflorescence per plant, panicle length, No. of days to 1st flowering, No. of days to first harvesting, No. of pods/plant, pod length, pod breadth, 10 pod weight, pod yield/pt, pod yield/plot, pod yield/ha, protein content, pod fiberness, total sugar content(%) were recorded on randomly selected 5 plants in each replication were recorded from 3 randomly selected competitive plants for each genotype.

The data were analyzed by the methods outlined by Panse and Sukhatme (1967) ^[11] using the mean values at random plots in each replication from all genotypes to find out significance of genotype effect. Total protein content of pod from each genotype was estimated using the protocol given by Lowry *et al.* (1951) ^[8]. Procedure for crude fiber content analysis (Prosky *et al.* 1988) ^[15]. The total sugar was measured by estimation of reducing and non-reducing sugar using the dinitrosalicylic acid (John, 1985) ^[7].

3. Result and Discussion

The success of crop improvement lies in the selection of suitable parents. While evaluating the genotypes, high mean value is considered as the acceptable procedure for a long time among the breeders, in this context, the 25 dolichosbean genotypes assembled from different geographical locations were evaluated for sixteen characters and were given scores based on their significance over general mean for all the characters. The analysis of variance (Table 3) revealed the significant difference among the genotypes for all the traits. Mean performance of all 25 dolichosbean genotypes were given in Table 1 and 2. The topranked genotypes in terms of pod yield per hectare in descending order is Arka Jay (18.26 t) and COGB 14 (16.59 t). The lowest pod yield recorded in Katkari Local (5.92 t).

Plant height is considered as one of the important character for growth and vigour of the plants. In the present investigation, the genotypes exhibited significant differences for plant height. Among the 25 genotypes, the genotyp Arka Swagath (126.80 cm) was taller (Table 1). Number of pods per plant is another yield increasing trait in dolichosbean. Here, the genotype Arka Jay (33.60) recorded more number of pods followed by Ratlam Local-2 (32.00), Bhupal Local (31.80) and Arka amogh (31.10). The yield being polygenic trait, is a result of component characters like number of pods per plant, canopy spread, pod length, pod breadth and ten pod weight. The higher yield in the top ranked genotypes is attributed to higher number of pods per plant (Arka Jay, Ratlam Local-2 and Bhupal Local). The range for number of pods per plant was from 28.10 (Vijaya Rayal) to 33.60 (Arka Jay). The length of the pod among genotypes ranged from 7.94 cm (Katkari Local) to 12.09 cm (Vijaya Royal) with a grand mean of 10.05 cm. Pod breadth ranged from 1.32 cm (Arka Swagath) to 2.59 cm (Mary) with an average of 1.64 cm. The weight of ten pods in dolichos bean genotypes ranged from 8.50g (Vijaya Rayol) to 27.50g (Arka Jay) with an average mean of 22.10g.

The Plant height at 90 DAS ranged from 56.50 cm (Katkari Local) to 126.80 cm (Arka Swagath) with mean of 72.93 cm (Jitendra *et al.* (2016) ^[6]. At 90 DAS, plant spread (E-W) ranged from 18.10 cm (Ratlam Local-2) to 42.40 cm (Ratlam Local-1) with average mean of 26.41. Plant spread (N-S) at 90 DAS ranged from 25.20 cm (Samrat) to 61.30 cm (ARDL

183) with average of 34.15 cm (Girish *et al.* (2013) ^[4] Stem girth of the plant ranged from 7.10 cm (Mary) to 9.35 cm (Arka Jay) with an average mean of 8.04cm (Hanchinamani (2004) ^[5]. The mean performance of number of inflorescence per plant was 3.93. Maximum number of inflorescence per plant was recorded in Arka Jay (6.50) whereas minimum number of inflorescence per plant was observed in case of Indore Local (1.90) (Verma *et al.* (2014) ^[18]. Highest panicle length (26.90 cm) was recorded in Arka Jay and lowest was recorded in Arka Swagath (15.65 cm) with an average panicle length of 22.78 cm. The dolichos bean genotype Arka Amogh took least number of days (35.50) to first flowering while, Nimbhod Local took maximum number of days (43.50) to first flowering. On average dolichos bean genotype took 38.77 days for appearance of first flower (Pawar and Prajapati (2013) ^[14]. Among the dolichos bean genotypes Arka Jay took minimum days to first pod harvest (42.50 days) and Arka Swagath took maximum days to first harvest (62.50 days). On an average genotype took 50.35 days for harvest (Ganesh *et al.* (2006) ^[3]. Maximum number of pods were recorded in the genotype Arka Jay (33.60) and minimum number of pods were recorded in Vijaya Rayal (28.10) with a mean of 30.14 (Mohan *et al.* (2014) ^[10]. The length of the pod among genotypes ranged from 7.94 cm (Katkari Local) to 12.09 cm (Vijaya Royal) with a grand mean of 10.05 cm (Patil *et al.* (2015) ^[13]. The weight of ten pods in dolichos bean genotypes ranged from 8.50g (Vijaya Rayol) to 27.50g (Arka Jay) with an average mean of 22.10g (Ganesh *et al.* (2006) ^[3]. The pod yield per plant in dolichos bean genotypes ranged from 228.50 g (Glory) to 912.00 g (Arka Jay) with a mean of 457.60 g (Chaudhari *et al.* (2013) ^[2]. Protein content of pods in dolichos bean genotypes ranged from 1.74g (Glory) to 3.84 g (Sarpan Seeds) with a grand mean of 2.68 g (Parmar *et al.* (2013) ^[12]. Pod fiberness in dolichos bean genotypes ranged from 1.19 g (Indore Local) to (Bhopal Local) with a ground mean of 2.08g (Magalingam *et al.* (2013) ^[9]. Total sugar content among dolichos bean genotypes ranged from 0.14 percent (Madhuri) to 1.25 percent (Glory) with an average mean value of 0.67 percent (Rakesh *et al.* (2015) ^[16].

Pod yield per plant was significantly and positively correlated with number of inflorescence per plant, panicle length, ten pod weight, pod length and pod breadth. These traits were also recorded high direct effect on pod yield per plant. Hence, these traits have to be considered while selecting for pod yield per plant.

Over all summary of the experiment revealed that top six genotypes (Arka Jay, COGB 14, Arka Amogh, ARDL 183, Chithodgad Local, Mary) were identified as best genotypes based on their per se values for pod yield per hectare, Protein content, Pod fiberness, Total sugar content have been identified (Table 4) and these can be further exploiting them for commercial cultivation.

Table 1: Mean performance of dolichosbean genotypes for growth, earliness parameters

S/N	Genotype	PH	CS (N-S)	CS (E-W)	SG	NIPP	PL	NDFD	NDFH
1	Arka Swagath	126.8	37.00	30.50	7.30	2.00	15.65	42.00	62.50
2	Vijaya Royal	75.70	30.70	25.10	7.75	5.60	21.80	39.50	46.50
3	Katkari Local	56.50	31.30	24.30	7.80	2.30	21.40	36.75	47.50
4	Glory	62.40	30.80	24.10	7.45	3.80	20.40	38.50	51.50
5	Indore Local	65.20	29.30	22.10	8.35	1.90	22.20	36.00	55.50
6	Laxmi	69.70	31.10	26.90	8.70	3.80	23.20	36.50	49.50
7	Nimbhod Local	67.30	33.20	26.30	8.25	3.00	23.10	43.50	53.50
8	Todi Local	68.30	34.00	22.60	7.80	3.30	23.80	39.00	51.00
9	COGB 14	66.40	29.20	20.20	7.35	4.40	25.50	35.50	46.00
10	Samrat	65.70	25.20	25.60	8.05	3.60	22.90	43.50	51.50
11	Chithodgad Local	63.90	28.60	24.00	8.95	4.05	25.25	37.00	45.50
12	Arka Jay	68.50	32.00	19.90	9.35	6.50	26.90	37.00	42.50
13	Bhupal Local	74.20	33.00	23.44	8.20	3.60	21.90	36.00	53.50
14	Clara	73.80	34.90	22.00	7.70	3.60	22.90	40.00	57.00
15	Mary	74.50	31.00	27.20	7.10	6.00	24.35	36.00	48.00
16	Sarpan seeds	69.30	30.90	29.80	8.30	4.40	22.20	40.50	52.00
17	Ratlam Local-2	75.80	36.10	18.10	8.40	3.00	21.90	41.50	47.00
18	Sanwad Local-1	72.00	27.30	21.90	8.80	2.80	24.50	39.00	45.25
19	Mahiwal	75.60	29.54	18.50	7.55	2.30	21.20	37.50	48.50
20	ARDL 183	78.60	61.30	22.90	7.75	4.45	25.40	36.50	49.50
21	Madhuri	77.10	36.60	39.90	8.30	4.40	22.20	42.50	50.50
22	Ratlam Local-1	73.40	40.80	42.40	8.50	5.60	22.00	37.00	50.00
23	Sanwad Local-2	77.20	44.50	37.00	7.85	5.30	22.90	41.50	50.50
24	Dharmपुरi Local	69.30	43.80	36.50	7.35	4.30	22.00	41.00	51.50
25	Arka amogh	76.20	31.80	29.00	8.25	4.35	24.05	35.50	52.50
	Mean	72.93	34.15	26.40	8.04	3.93	22.78	38.77	50.35
	S.Em±	1.10	1.44	0.74	0.39	0.37	0.75	1.75	1.36
	CD (0.05)	3.21	4.20	2.16	1.16	1.08	2.19	5.10	3.99

Table 2: Mean performance of dolichosbean genotypes for yield and quality parameters

S/N	Genotype	NPPP	Po. L	Po. B	TPW	PYPP	Protein	PF	TSC
1	Arka Swagath	30.50	10.81	1.32	24.50	562.50	2.57	1.25	0.16
2	Vijaya Royal	28.10	12.09	1.66	8.50	400.00	1.98	1.26	0.92
3	Katkari Local	30.40	7.94	1.33	20.50	251.00	2.28	2.17	0.17
4	Glory	29.50	9.26	1.52	20.50	228.50	1.74	2.71	1.25
5	Indore Local	29.60	9.65	1.39	23.50	314.00	2.71	1.19	0.20
6	Laxmi	28.50	11.18	2.16	21.75	401.00	3.61	1.59	1.14
7	Nimbhod Local	30.60	9.78	1.46	21.25	345.00	1.76	1.62	1.11
8	Todi Local	30.50	8.74	1.35	21.00	353.50	3.16	2.32	1.12
9	COGB 14	28.70	10.47	2.07	26.00	812.50	2.96	2.67	0.17
10	Samrat	31.10	11.84	2.17	24.00	364.50	1.94	2.38	1.05
11	Chithodgad Local	30.90	11.84	1.35	24.50	700.00	2.26	1.78	0.66
12	Arka Jay	33.60	9.52	1.73	27.50	912.00	2.38	2.04	0.18
13	Bhupal Local	31.80	9.97	1.78	18.75	354.00	3.17	2.87	0.17
14	Clara	29.30	10.14	1.53	19.75	360.00	2.73	2.05	1.13
15	Mary	28.40	10.40	2.59	24.50	675.00	3.30	1.54	0.18
16	Sarpan seeds	30.60	11.75	1.45	23.50	385.00	3.84	2.66	0.16
17	Ratlam Local-2	32.00	8.65	1.60	23.50	371.00	2.98	1.74	0.85
18	Sanwad Local-1	29.00	8.31	1.43	22.75	295.50	2.72	2.22	1.07
19	Mahiwal	29.60	9.45	1.56	25.00	266.50	1.99	2.23	1.13
20	ARDL 183	29.20	10.54	1.45	23.90	712.50	3.30	2.27	1.00
21	Madhuri	30.10	9.94	1.77	21.50	362.00	3.19	2.02	0.14
22	Ratlam Local-1	31.10	9.61	1.62	22.00	237.00	3.04	2.70	0.64
23	Sanwad Local-2	30.20	9.29	1.53	18.25	637.50	2.35	2.83	1.13
24	Dharmपुरi Local	29.10	8.22	1.46	21.25	414.50	1.83	2.24	0.16
25	Arka amogh	31.10	12.05	1.78	24.50	725.00	3.19	1.71	1.00
	Mean	30.14	10.05	1.64	22.10	457.60	2.68	2.08	0.67
	S.Em±	0.39	0.17	0.08	0.90	114.45	0.07	0.12	0.11
	CD (0.05)	1.16	0.52	0.25	2.63	334.08	0.22	0.36	0.34

PH - Plant Height (cm) at 90 DAS

SG- Stem girth (cm) at 90DAS

PL- Panicle length (cm)

NDFH- Number of days to first harvesting

Po.L - Pod length (cm)

PYPP- Pod yield per plant (g)

PF- Pod fiberness (g per 100g)

CS- Canopy spread N-S and EW (cm) at 90DAS

NIPP- Number of inflorescence per plant

NDFD- Number of days to first flowering

NPP- Number of pods per plant

Po. B- Pod breadth (cm) TPW- Ten pod weight

PC- Protein content (g per 100g)

TSC- Total sugar content (%)

Table 3: Analysis of variance (mean sum of squares) for growth, earliness, yield and quality parameters in dolichos bean

Sl. No.	Source of variation/ Characters	Replications	Treatments (Genotypes)	Error
	Degrees of freedom	1	24	24
1.	Plant height at 90 DAS	12.70	311.33**	2.42
2.	Canopy spread N-S at 90 DAS	4.07	108.38**	4.14
3.	Canopy spread E-W at 90 DAS	0.90	84.33**	1.10
4.	Stem girth	0.08	0.63**	0.31
5.	Number of inflorescence per plant	5.98	3.04**	0.27
6.	Panicle length	3.37	9.28**	1.12
7.	Number of days to first flowering	0.60	13.66**	6.12
8.	Number of days to first harvesting	3.64	35.39**	3.74
9.	Number of pods per plant	0.58	3.26**	0.31
10.	Pod length	0.006	3.05**	0.06
11.	Pod breadth	0.13	0.19**	0.01
12.	Ten pod weight	4.92	26.14**	1.63
13.	Pod yield per plant	9800	77356**	26201
14.	Protein content	0.41	0.73**	0.01
15.	Pod fiberness	0.50	0.51**	0.03
16.	Total sugar content	0.08	0.39**	0.02

** Significant at 1 % * Significant at 5 % N-S: North-South E-W: East-West DAS: Days After Sowing

Table 4: Top six dolichos bean genotypes with best per se performance

Sl. No.	Genotypes	PYPH (t)	Protein content (g/100g)	Pod fiberness (g/100g)	Total sugar content (%)
1	Arka Jay	18.26	2.38	2.04	0.18
2	COGB 14	16.59	2.96	2.67	0.17
3	Arka Amogh	15.56	3.19	1.71	1.00
4	ARDL 183	13.95	3.30	2.27	1.00
5	Chithodgad Local	13.32	2.26	1.78	0.66
6	Mary	12.83	3.30	1.54	0.18

4. Conclusion

The results of the present study show that high-yielding and good quality dolichosbean germplasm are available in the India. Selected promising germplasm collections are being tested in replicated elite variety trails to determine their adaptability.

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