

## EVALUATION OF JACK BEAN GENOTYPES FOR GROWTH AND YIELD CHARACTERS

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### ABSTRACT

The study has been under taken to evaluate the available genotypes of Jack bean for growth and yield characters at NBPGR (National Bureau of Plant Genetic Resources) Regional Station, Rajendranagar, Hyderabad during Kharif, 2013 in a randomized block design with three replications. The results revealed that highly significant differences were found among the genotypes for all the characters indicating presence of sufficient amount of variability. Among the genotypes, PSR – 12202 was found superior for number of pods per plant, pod weight and marketable pod yield per plant, while IC – 512946 for plant height at last harvest and number of days to first pod harvest whereas, IC – 541380 for number of primary branches per plant at last harvest and number of seeds per pod. Hence these genotypes may be further tested in different locations for their stable performance and thereafter may be selected as parental source for future breeding programmes.

**Key words:** Jack bean, growth, performance, yield, yield characters

### INTRODUCTION

Jack bean (*Canavalia ensiformis* (L.) DC.) belongs to the family leguminaceae is one of the underexploited tropical dry beans. The Genus *Canavalia* consisting of 48 species of which, four species are reported from India, viz., *C. ensiformis*, *C. gladiata*, *C. maritima* and *C. virosa* (Bose *et al.* 2003). Jack bean is a valuable green manure and cover crop, as it is grown on impoverished soils of arid and semi arid regions which are not suitable for growing common legumes such as *Phaseolus* and *Vigna* species. It has, therefore, great potential in most tropical and subtropical parts of the world (Akpapunam and Sefa-Dedeh, 1997). Ever increasing population especially in developing countries like India require alternate available sources of energy and nutrition. Production of traditional leguminous crops in these countries has not adequately met the energy and nutritional requirements. Hence, the search for alternate wild legumes as a cost effective source of energy and nutrition is highly essential. Though efforts have been made for nutritional evaluation of jack bean seed as pulse but information on nutritional status of pod as vegetable is nil. In India, very limited efforts have been made for germplasm collection and evaluation in Jack bean. Hence the present study was undertaken to evaluate the jack bean genotypes for growth and yield characters.

### MATERIALS AND METHODS

The study was conducted at National Bureau of Plant Genetic Resources, Regional Station, Rajendranagar, Hyderabad in randomized block design with three replications during the period from

August 2013 to February 2014. The spacing adopted was 3.0 m between rows and 0.5 m between plants. The climate of Hyderabad is semi arid tropical climate and it lies at latitude of 17.19° N and longitude of 79.23° E, with an altitude of 542.3m above the Mean Sea Level. All the package of practices to raise the crop was followed as recommended for dolichos bean as jack bean is under exploited vegetable crop. The need based plant protection measures were taken to raise the healthy crop. Data recorded on thirteen traits on ten randomly selected plants in each genotype from each replication. The recorded data were subjected to analysis of variance as per the procedure given by Panse and Sukhatme (1967).

### RESULTS AND DISCUSSION

The results of analysis of variance (Table 1) revealed that highly significant differences among the genotypes for all the characters indicating presence of sufficient amount of variability for all the characters studied thus offering greater scope for selecting desirable genotypes. On the basis of mean performance of the genotypes, significant maximum plant height at last harvest ranged from 120.66 to 425.00 cm with a mean of 334.93 cm. Among the genotypes studied, IC-512946 recorded significantly maximum plant height (425.00 cm) which was on par with NSA/08/002 (410.00 cm), IC-32881 (408.30 cm), RJR-529 (400.00 cm) and IC-26174 (396.60 cm) while, minimum (120.66 cm) was recorded in IC-541380. Number of primary branches per plant at last harvest varied from 2.26 to 5.13 with a general mean of 3.36. Among the genotypes studied, IC-541380

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(5.13) and NSKS-346 (5.13) recorded significantly maximum number of primary branches per plant at last harvest followed by IC-32881 (4.93) and IC-26174 (4.73) while, PSR-12202 recorded minimum number of primary branches per plant at last harvest (2.26). These findings are in similar to results of Kulaz and Ciftci (2012) French bean. Days to 50% flowering exhibited a range of 54.66 to 66.00 days with a general mean of 60.33 days. Among the

genotypes, IC-26174 took significantly minimum days to 50 percent flowering (54.66 days) while NSA-34 (66.00 days) was late. Similar results were reported by Pan *et al.* (2004) in French bean. Highly significant differences were observed among the genotypes for length of leaf with a mean value of 12.59 cm and a range from 11.34 cm to 16.23 cm. IC-26174 recorded shorter leaf length (11.34 cm) while RJR-529 recorded longer leaf length (16.23 cm).

Table 1: Analysis of variance for thirteen traits in jack bean

Character	Mean sum of squares		
	Replications (df = 2)	Treatments (df = 14)	Error (df = 28)
Plant height at last harvest	256.86	35417.82**	638.77
Primary branches/plant at last harvest	0.243	3.891**	0.096
Days to 50% flowering	1.400	44.952**	3.281
Leaf length	0.036	5.447**	0.601
Petiole length	0.004	21.675**	0.549
Days to first pod harvest	3.931	42.944**	9.345
Days to last pod harvest	0.689	570.451**	7.094
Pod length	1.143	18.715**	0.351
Pod weight	1.128	39.945**	0.868
Pods per plant	2.512	80.976**	1.658
Seeds per pod	1.094	11.157**	0.474
100 seed weight	56.231	16325.96**	149.72
Marketable pod yield/plant	2281.33	70227.93**	953.75

\* and \*\* significant at  $P = 0.05$  and  $P = 0.01$  level of significance, respectively

These results are in conformity with Bode *et al.* (2013) in French bean. The mean petiole length was 9.21 cm with a range from 5.33 cm to 15.12 cm. Out of 15 genotypes, NS-2009/059 recorded shorter petiole (5.33 cm) while NSB/2010/035 recorded significantly longer petiole (15.12 cm). Days to first pod harvest ranged from 64.51 to 75.77 days with a mean of 69.78 days. Among the genotypes, IC-26174 recorded significantly minimum days to first pod harvest (64.51 days), while NSA-34 recorded maximum days (75.77 days). Days to last pod harvest ranged from 92.0 days to 140.33 days with a general mean of 116.64 days. The genotype, IC-541380 recorded significantly minimum days to last pod harvest (92.0 days), while PSR-12202 recorded maximum days (140.33 days) and it was on par with NSA-69 (138.66). For pod length, significant differences were observed which was ranged from 13.36 cm to 21.76 cm with a mean of 16.44 cm. The maximum pod length (21.76 cm) was recorded in NSB/2010/035 which might be due to excess cell elongation while the minimum was recorded in NSA/08/002 (13.36 cm). For the character pod length, the mean value of 9.41 and range of 8.26 to 12.06 was reported by Pan *et al.* (2004) in French bean and Upadhyay and Mehta (2010) reported the range and mean value of 6.00 to 14.5 and 9.00 respectively in Dolichos bean. The pod weight ranged from 9.87 g to 22.04 g with a general mean of 15.35g. The

significantly superior genotype in terms of pod weight was PSR-12202 (22.04 g) which was on par with NSB/2010/035 (21.23) whereas minimum (9.87 g) was recorded in RJR-529. Prolonged fruiting period was helpful in accumulation of more photosynthates and due to efficient translocation, more pods per plant with good pod weight was observed in the genotype PSR-12202. Highly significant differences were observed for number of pods per plant with a mean of 24.57 and ranged from 17.53 to 34.46. Among the genotypes, PSR-12202 exhibited more number of pods per plant (34.46) while NSA-69 exhibited minimum pods per plant (17.53). The number of seeds per pod was ranged from 7.00 to 12.73 with a mean of 9.38. Out of 15 genotypes studied, the significantly superior genotype in terms of number of seeds per pod was IC-541380 as it recorded maximum number of seeds per pod (12.73) which was on par with RJR-529 (12.23) whereas minimum number of seeds per pod (7.00) was recorded in NSA/08/002. The maximum number of seeds per pod in IC-541380 may be due to more number of primary branches which had well developed vascular tissue connection along with the genetically fixed potential which was exploited for the formation of well filled pods as a result maximum number of seeds per pod. The mean for 100 seed weight was 181.25 g with a range from 116.75 g to 315.25 g. The genotype, NS/2009/053 recorded

significantly maximum weight of 100 seeds (315.25 g) which was on par with PSR 12202 (314.31) and RJR-529 (302.34) whereas minimum weight of 100 seeds (116.75 g) was recorded by the genotype NSA-69. Kulaz and Ciftci (2012) and Upadhyay and Mehta (2010) also reported similar type of findings in French bean and Dolichos bean respectively. Highly significant differences were observed for marketable

pod yield per plant which was ranged from 200.52 to 760.18 g with a general mean of 384.60 g. The genotype, PSR-12202 recorded the maximum marketable pod yield per plant (760.18 g) while minimum pod yield (200.52 g) was recorded in NSA/08/002. These results are in agreement with that of Pan *et al.* (2004) in French bean.

Table 2: Performance of jack bean genotypes for growth, yield and yield attributes

Genotypes	Plant height at last harvest (cm)	Primary branches / plant at last harvest	Days to 50% flowering	Leaf length (cm)	Petiole length (cm)	Days to first pod harvest	Days to last pod harvest	Pod length (cm)	Pod weight (g)	Pods per plant	Seeds per pod	100 seed weight (g)	Marketable pod yield per plant (t ha <sup>-1</sup> )
RJR- 628	373.3	2.53	63.0	11.81	8.66	66.1	104.3	15.65	12.68	20.3	7.93	141.42	1.71
NS-2009/059	345.0	3.00	62.6	11.65	5.33	72.3	97.3	15.96	17.98	24.2	9.36	241.41	2.90
IC-541380	120.6	5.13	56.0	12.00	11.56	69.8	92.0	20.45	15.91	21.1	12.73	132.99	2.24
IC-32881	408.3	4.93	56.6	12.24	12.21	67.7	110.3	16.11	13.22	31.3	9.10	128.55	2.76
IC-26174	396.6	4.73	54.6	11.34	7.49	64.5	128.3	17.98	15.24	25.2	9.30	126.96	2.56
NS/2009/053	371.6	2.80	59.3	11.78	8.60	72.2	109.3	14.43	15.17	26.5	7.20	315.25	2.69
NSB/2010/035	135.0	4.46	57.0	14.80	15.12	68.8	112.3	21.76	21.23	21.6	11.33	132.73	3.06
PSR 12202	366.6	2.26	57.6	12.37	6.19	65.4	140.3	15.98	22.04	34.4	10.20	314.31	5.06
NSA/08/002	410.0	2.80	63.0	11.61	6.76	75.7	122.0	13.36	11.02	18.1	7.00	192.59	1.33
IC-512946	425.0	2.33	55.0	12.81	7.22	67.5	123.0	16.15	19.61	33.2	10.13	138.67	4.34
NSA-69	383.3	2.46	62.0	12.44	8.42	66.9	138.6	13.45	14.91	17.5	7.23	116.75	1.75
RJR- 529	400.0	2.40	63.0	16.23	11.42	70.9	116.6	19.61	9.87	27.4	12.23	302.34	1.81
N/06-158	375.0	2.73	65.3	12.74	8.19	75.3	111.3	14.73	12.84	21.2	7.06	147.38	1.81
NSA-34	383.3	2.67	66.0	11.53	9.09	75.7	128.3	14.48	16.73	23.3	8.53	134.11	2.60
NSKS- 346	130.0	5.13	63.6	13.52	11.92	67.1	115.3	16.55	11.78	22.6	11.46	153.36	1.78
Mean	334.9	3.36	60.3	12.59	9.21	69.7	116.6	16.44	15.35	24.5	9.38	181.25	2.56
C.V.	7.54	9.22	3.00	6.15	8.04	4.38	2.28	3.59	6.06	5.23	7.32	6.75	8.06
S.E. m±	14.59	0.17	1.04	0.44	0.42	1.76	1.53	0.34	0.53	0.74	0.39	7.06	0.11
C.D 5%	42.27	0.51	3.02	1.29	1.23	5.11	4.45	0.99	1.55	2.15	1.15	20.46	0.34
CD 1%	57.02	0.69	4.08	1.74	1.67	6.89	6.00	1.33	2.10	2.90	1.55	27.60	0.46

Out of fifteen genotypes, PSR – 12202 proved superior for pod weight, number of pods and marketable pod yield/plant while, IC – 512946 was found superior for plant height and to harvest the pods. Similarly for other characters like, number of primary branches per plant and number of seeds per pod IC – 541380 was found to be best. Hence these

three superior genotypes may be further tested in different locations for their stable performance and thereafter may be selected as parental source for future breeding programmes and also may be recommended for commercial cultivation to meet the nutritional security.

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