

RESEARCH ARTICLE

Performance study of cluster bean germplasms under Lucknow condition

■ Sanjay Kumar, Sutanu Maji and S.K. Rawat

SUMMARY

Forty diverse genotypes of cluster bean [*Cyamopsis tetragonoloba* (L.) Taub.] were assessed in a field experiment entitled performance study of cluster bean germplasms under Lucknow condition in Randomized Block Design with three replications. The experiment was conducted at the Horticulture Research Farm of the Department of Horticulture, Babasaheb Bhimrao Ambedkar University, Lucknow- 226025 (U.P.) during Rabi season of 2016. The performance studies of 40 diverse genotypes of cluster bean and considerable variation was recorded for all the characters. The observations were recorded on 19 characters viz., plant height (cm), plant width (cm), leaf length, leaf width (cm), number of cluster, length of pod (cm), width of pods (cm), breadth of pods (cm), number of pods, number of leaves, width of leaves, seed per pod, weight of plant without leaves (g), weight of green leaves (g), weight of dry leaves (g), leaf length/ petiole ratio (cm), stem width, crude protein (%), ash (%) and dry matter (%).

Key Words : Growth, Yield, Quality, Cluster bean

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Cluster bean, also known as guar or guar bean is botanically called as *Cyamopsis tetragonoloba* (L.) Taub belongs to family Leguminosae is an annual legume vegetable crop. It is a self pollinated crop with diploid chromosome number $2n= 14$. Cluster bean

is a versatile and multipurpose vegetable under exploited leguminous vegetable crop. This bean is arid legume crop that is cultivated mostly in the arid and semi arid areas as it is drought resistant. Cluster bean as a legume vegetables successfully cultivated in north-west and southern part of India where rainfall is low. Like the other legumes, guar is an excellent soil-building crop with respect to available nitrogen. The major cluster bean producing regions of this crop in India are Rajasthan, Gujarat, Haryana, Punjab, Uttar Pradesh, Madhya Pradesh, Tamil Nadu, Maharashtra, Karnataka and Andhra Pradesh. Rajasthan can be termed as the largest guar producing state in the world as it dominates the

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Indian production scenario contributing to around 4.20 million tons of this crop *i.e.* over 70% of the total production in India.

The green tender pods are consumed as vegetable, and grown as a green manuring crop. Seeds contain gum mucilaginous substance called guar gum or galactomannan which is used in textiles, paper industry and cosmetic industry. In Uttar Pradesh and Bihar, it is commonly grown for fodder and seeds to feed the cattle. Green pods are rich in vitamin A and iron. Although cluster bean is a minor crop but due to its better and finer guar gum qualities, it is considered as an important cash crop for industrial gum production and for several pharmaceutical and nutraceutical products. Considering the importance of cluster bean as a vegetable, there is prime need for its improvement. Despite of huge demand for the crop, only limited breeding work has been done and very little attention has been given for its genetic improvement to enhance the productivity level. The knowledge of genetic variability in the available germplasm is a prerequisite for effective selection of superior genotypes. Therefore, there is need for identification and development of cluster bean genotypes suited for vegetable purpose under in Lucknow conditions. The knowledge of variation in magnitude of any further study of crop improvement is important so that present study has been designed to the genetic variability among the collected germplasm of cluster bean.

MATERIAL AND METHODS

The experiment was conducted at the Horticulture Research Farm of the Department of Horticulture, Babasaheb Bhimrao Ambedkar University, Lucknow during *Rabi* season of 2016. A field experiment was carried out entitled performance study of cluster bean germplasm under Lucknow conditions in Randomized Block Design with forty varieties and three replications. The experiment comprised of different germplasm and collected from various part of country *i.e.* Pusa Sadabahar, Sharad Bahar, Pusa Navbahar, Jyoti-51, Ankur Rani, Haritima, Desi, Pusa Mausmi, Selection-1, Selection-51, IC-10825, IC-10827, IC-10833, IC-10865, IC-10866, IC-103020, IC-103021, IC-103054, IC-103333, IC-103783, IC-116524, IC-116525, IC-116528, IC-116601, IC 116721, IC-116728, IC-116751, IC-311402, IC-311414, IC-311422, IC-311428, IC-311431, IC-311432, IC-311444, IC-311449, IC-324020, IC-325767, IC-

325806, IC-325821 and IC 325832. The experiment comprised of different germplasm of selection based on genetic variability in cluster bean. The plant to plant and row to row spacing were maintained at 45cm to 30cm during the trial period. The observations were recorded on 19 characters *viz.*, plant width (cm), leaf length, leaf width (cm), number of cluster, length of pod (cm), width of pods (cm), breath of pods (cm), number of pods, number of leaves, width of leaves, seed per pod, weight of plant without leaves (g), weight of green leaves (g), weight of dry leaves (g), leaf length/ petiole ratio (cm), stem width, crude protein (%), ash (%) and dry matter (%). With an evaluation of twenty two diverse vegetable guar accessions, Dwivedi (2009) reported high variability for primary branches plant-1, days to 50% flowering, pods cluster-1 and pod length.

RESULTS AND DISCUSSION

The analysis of variance showed significant differences among the genotypes for all 19 characters studied expect for leaf length (cm), leaf width (cm), number of pods (cm), number of leaves (cm), width of leaves (cm), seed per pod, weight of plant without leaves (g), weight of dry leaves (g), crude protein (%), ash % and dry matter (%). Mean performance of genotypes in respect to 19 characters have been presented in Table 1. Maximum value of different traits were observed in Pusa Sadabahar *viz.*, plant height (82.79cm), leaf length (19.89 cm), and leaf width (19.39 cm), number of cluster (18.56), length of pod (13.41cm), width of pods (1.68 cm), breath of pods (1.76cm), number of pods (63.22), number of leaves (43.44), width of leaves (17.39cm), seed per pod (09.77), weight of plant without leaves (126.66g), weight of green leaves (70.28), weight of dry leaves (10.91g), leaf length/ petiole ratio (10.05cm), stem width (20.37cm), followed by Pusa Mausmi plant height (75.58 cm), plant width (19.33 cm), leaf length (17.81cm) and leaf width (18.20cm), number of cluster (17.11), length of pod (12.67cm), width of pods (1.25 cm), breath of pods (1.60 cm), number of pods (58.78), number of leaves (40.67), width of leaves (16.20cm), seed per pod (08.89), weight of plant without leaves (124.44g), weight of green leaves (65.19), weight of dry leaves (09.92g) and leaf length per petiole ratio (09.41cm). Anandi and Oommen (2007) evaluated 29 genotypes of cluster bean and observed high variability for all the characters under study except number of seeds per pod and days to 50% flowering. Rai *et al.* (2012) evaluated thirty one

Table 1: Performance study of cluster bean germplasm under Lucknow condition

Varieties	Plant height (cm)	Plant width (cm)	Leaf length (cm)	Leaf width (cm)	Number of cluster	Length of pod (cm)	Width of pods (cm)	Breath of pods (cm)	Number of pods	Number of leaves	Width of leaves (cm)	Seed per pod	Weight of plant without leaves (g)	Weight of green leaves (g)	Weight of dry leaves (g)	Leaf length/petiole ratio (cm)	Stem width (cm)	Cruce protein (%)	Ash (%)	Dry matter (%)
Pusa Sadabahar	82.79	20.79	19.89	19.39	18.56	13.41	1.68	1.76	63.22	43.44	17.39	09.77	126.66	70.28	16.91	10.05	20.37	18.20	18.20	26.30
Sharad Bahar	51.76	15.20	13.08	13.14	14.56	11.38	0.65	1.16	45.67	22.89	13.14	05.89	100.00	60.12	06.92	07.48	4.02	18.50	10.20	26.71
Pusa Navbahar	72.70	11.93	17.60	17.03	16.44	12.62	1.15	1.42	58.44	38.00	15.05	07.11	113.33	62.85	08.95	08.71	6.13	18.82	10.02	25.30
Jyoti-51	36.20	13.74	15.55	12.28	10.78	09.10	0.71	1.04	51.22	19.11	12.28	05.33	098.89	60.51	05.52	06.83	3.82	17.02	09.80	22.03
Ankur Ran	52.00	15.17	9.95	14.43	10.67	10.54	0.98	1.11	41.56	18.22	13.43	04.11	095.55	58.09	06.94	07.69	2.27	16.50	08.50	24.11
Haritima	37.70	25.31	12.98	10.77	07.33	09.81	0.56	1.04	53.78	20.11	10.77	05.00	089.99	52.04	05.52	05.45	1.09	17.20	10.12	25.30
Desi	51.54	14.38	12.88	15.74	07.11	09.88	0.58	1.00	54.44	19.00	12.74	04.66	097.78	54.62	05.34	07.57	3.82	16.00	08.60	22.03
Pusa Vausmi	75.58	19.33	17.81	18.20	17.11	12.67	1.25	1.60	53.78	40.67	16.20	08.89	124.44	65.19	09.92	09.41	8.55	18.30	09.67	21.66
Selection-1	40.88	13.09	12.14	15.92	13.89	11.37	0.98	1.16	44.44	17.78	13.92	04.22	093.33	46.73	05.78	07.46	3.02	17.05	07.20	22.33
Selection-51	37.75	13.10	16.23	14.74	12.56	11.43	0.85	1.10	55.89	18.22	11.74	03.11	095.55	56.97	06.47	06.25	2.55	15.03	09.30	23.55
IC-10825	50.48	14.84	10.43	15.43	09.78	10.21	0.95	1.04	45.00	22.89	12.43	04.55	093.33	51.76	06.40	07.02	3.83	16.20	08.60	24.66
IC-10827	53.08	13.29	13.03	12.62	09.33	10.57	0.75	1.08	35.44	21.56	12.62	05.00	097.78	50.72	06.76	07.50	3.93	18.05	07.60	20.55
IC-10833	57.39	12.12	12.08	15.37	12.11	11.51	0.80	1.01	45.44	18.00	11.37	04.89	095.56	54.90	06.67	07.42	2.73	16.01	10.00	21.44
IC-10865	70.99	16.50	17.00	16.27	15.33	12.12	1.00	1.26	57.00	36.78	14.27	06.90	101.11	60.68	07.63	8.21	4.57	17.06	09.54	22.55
IC-10866	61.33	15.96	11.16	11.16	12.22	11.20	0.96	0.84	55.78	18.67	11.16	05.55	090.00	65.05	06.92	07.59	3.15	15.03	08.98	23.66
IC-103020	65.61	13.12	13.68	15.31	11.89	11.21	0.93	0.80	52.44	20.00	13.31	04.00	070.00	54.91	06.29	06.87	1.98	17.90	07.85	24.55
IC-103021	61.91	14.92	13.64	14.01	11.11	11.01	0.46	1.03	51.44	19.56	12.01	05.78	080.00	59.53	05.07	05.23	06.45	16.90	09.56	24.50
IC-103054	59.42	14.62	11.12	13.80	14.33	10.73	0.57	1.05	54.56	19.56	11.80	05.22	090.00	50.47	04.03	07.42	0.04	18.02	08.45	23.05
IC-103333	61.38	12.70	10.05	15.02	09.78	09.66	0.53	1.02	53.33	20.56	12.02	05.00	075.56	59.71	06.83	07.38	2.07	15.30	07.03	24.35
IC-103783	68.23	15.65	9.50	11.18	11.78	11.69	0.63	1.01	55.67	19.22	11.18	04.00	066.67	56.51	05.73	07.38	1.20	15.98	09.50	25.01
IC-116524	67.98	14.41	8.91	13.88	09.89	10.28	0.85	1.03	45.78	20.11	13.88	05.44	073.33	55.38	05.26	06.15	2.40	14.95	06.30	20.10
IC-116525	65.37	13.53	10.88	10.97	14.56	11.71	0.66	1.10	50.33	21.11	10.97	05.90	096.67	51.50	04.42	05.84	3.04	15.00	08.24	21.00
IC-116528	64.86	12.76	12.29	13.82	13.44	11.30	0.95	1.05	52.11	20.11	13.82	04.11	098.33	53.55	06.17	04.39	0.00	16.00	06.34	22.03
IC-116601	68.54	15.00	12.72	13.91	14.33	10.54	0.76	1.01	53.33	19.00	13.91	04.00	093.33	59.63	05.31	07.25	2.38	14.00	07.66	24.06
IC-116721	64.15	14.19	12.28	14.79	11.89	11.86	0.80	1.00	51.78	20.89	13.79	05.00	052.22	57.25	06.87	06.37	1.27	16.00	07.33	25.00
IC-116728	62.78	16.10	14.42	16.03	14.11	11.10	0.75	1.06	51.33	18.78	12.03	05.00	084.44	56.61	05.08	06.82	1.97	17.82	09.20	20.13
IC-116751	68.71	15.38	13.76	11.50	06.22	09.58	0.80	1.04	50.22	19.33	11.50	04.22	056.67	54.34	06.72	06.63	3.22	15.60	08.60	24.06
IC-311402	49.99	12.58	15.32	06.79	08.67	10.60	0.58	1.01	52.33	20.22	06.79	02.67	092.22	58.52	06.02	05.99	2.75	15.56	06.31	22.31
IC-311414	40.42	16.38	12.64	14.88	05.11	11.29	0.65	1.00	51.22	23.00	13.88	05.22	097.78	56.83	05.57	06.19	2.30	17.65	07.65	19.02
IC-311422	44.03	13.32	13.95	13.00	15.00	10.69	0.97	1.10	50.22	23.22	13.00	05.11	097.78	48.04	06.86	06.47	3.25	15.98	08.75	25.03
IC-311428	44.21	15.11	12.99	13.26	12.44	10.00	0.95	1.14	52.56	21.67	08.63	02.67	094.44	56.13	06.03	06.72	0.82	16.00	09.65	21.33
IC-311431	49.34	13.40	15.66	08.74	11.56	09.92	0.90	1.11	42.44	22.78	12.47	05.00	084.44	55.43	04.35	07.39	2.31	14.00	08.25	22.34
IC-311432	45.52	15.72	12.59	14.64	04.00	11.46	0.88	1.02	55.00	20.44	11.47	04.33	077.78	49.90	05.72	07.95	1.21	16.00	07.23	24.00
IC-311444	41.98	14.94	15.03	17.91	12.11	11.78	0.94	1.23	55.00	20.78	13.44	05.55	092.22	52.49	05.00	06.03	1.61	17.75	06.34	22.30
IC-311449	42.86	13.02	16.38	17.92	11.22	11.37	0.88	1.23	53.89	21.44	12.16	04.00	088.89	59.89	05.74	05.27	2.61	15.52	08.52	21.03
IC-324020	47.62	12.87	15.25	15.63	14.11	10.13	0.98	1.20	51.33	22.33	11.28	05.11	078.89	54.41	06.07	06.07	0.24	15.20	07.02	24.12
IC-325767	41.37	15.48	13.00	15.82	11.00	11.61	0.54	0.98	54.44	21.00	11.90	04.56	077.78	55.67	05.23	07.99	3.64	17.11	09.12	20.33
IC-325806	48.09	14.67	16.49	12.89	10.00	10.34	0.68	1.18	54.44	21.00	13.57	05.22	092.22	45.75	06.37	05.41	07.73	15.8	08.24	21.00
IC-325821	42.71	13.08	16.65	09.62	11.11	11.23	0.96	1.02	55.78	14.78	10.67	05.11	082.22	53.65	05.85	05.26	2.48	15.20	09.23	22.03
IC-325832	49.01	15.96	14.48	15.43	11.33	11.86	0.75	1.06	52.56	21.33	13.37	05.33	092.22	53.44	06.56	06.18	1.17	15.00	08.32	22.00
S.E.±	6.637	0.35	2.539	2.824	0.503	0.744	0.095	0.054	6.233	4.049	2.824	1.003	18.517	2.961	26.653	0.881	0.635	0.36	0.845	6.20
C.D. (P=0.05)	18.715	0.986	NS	NS	1.419	2.098	0.267	0.152	NS	NS	NS	2.829	NS	8.349	NS	2.483	1.793	0.78	16.90	14.45

NS=Non-significant

genotypes of cluster bean and observed maximum range of variability for number of branches/ plant, plant height, clusters/ plant, pod length and pod yield/ plant.

Maximum crude protein (18.82%) was observed in Pusa Navbahar followed by (18.50%) Sharad Bahar. Maximum ash (10.20%) was recorded in Pusa Sadabahar followed by Ankur Rani (10.12%). The maximum dry matter (26.71%) was recorded in Sharad Bahar followed by Pusa Sadabahar (26.30%). Girish *et al.* (2012) reported in cluster bean, green pod yield/ plant showed positive and significant correlation with dry pod yield per plant, green pod yield/ plot.

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