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SCREENING OF YARDLONG BEAN (*VIGNA UNGUICULATA* SUB SP. *SESQUIPEDALIS*) GENOTYPES UNDER COASTAL REGION OF KARAIKAL, INDIA

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ABSTRACT

Twenty-nine Yardlong bean genotypes including commercial varieties were investigated to identify the better performing genotypes for the region of Karaikal. The experiment was laid in Randomized Block Design with two replications, at on college farm, Department of Horticulture, Pandit Jawaharlal Nehru college of Agriculture and Research Institute, Karaikal. Among the entries evaluated Sumant was found to be the best for yield plant^{-1} (4.35 kg) as well as superior for the characters *viz*., days to first flowering (36.75 days), individual pod length (53.48 cm), individual pod weight (37.00 g), 100 seed weight (22.30 g), crude fiber (18.25 per cent) and shelf life (7.00 days) followed by Lola and Mannuthi local.

Key words : Yardlong bean, genotypes.

Introduction

Vegetables are a great source of many nutrients and are also relatively inexpensive. According to ICMR, per capita vegetable requirement is 300 g per day. But the availability of vegetables for consumption on per capita basis in our country is only 186 g. Therefore, there is a need to increase the production of vegetables, by growing high yielding varieties and expanding the area of cultivation with nutrient rich exploited and underexploited vegetables based on their adaptability.

Yardlong beans are mainly a warm-season crop and capable of surviving under extreme humidity and heat and they are very sensitive to cold temperatures. Although cowpea is originated in Africa, this vegetable form has been introduced here only in recent times. In India, yardlong bean is a less known under-utilized vegetable grown in the peninsular region particularly Kerala, Tamil Nadu, coastal Andhra Pradesh and Odisha. It is also cultivated to some extent in West Bengal, Assam and the North Eastern Hill region.

It is a highly self-pollinating, vigorous climbing annual, growing up to a height of three to four meters. It produces very long, slender and succulent pods that may be white, light green, dark green, brownish red or purple. Although, it is a highly nutritive legume vegetable, commercial cultivation of yardlong bean for vegetable purpose was very low under coastal ecosystem. The production and productivity of yardlong bean is mainly constrained by low yield, sensitive to adverse climatic conditions and susceptibility to pests and diseases (Sarutayophat *et al*., 2007). Though, there has been lots of diversity reported in yardlong bean throughout the country, its commercial exploitation is very scanty for coastal ecosystem of Karaikal due to lack of ideal varieties.

Materials and Methods

The present experiment was carried out under randomized block design (RBD) at College farm, Department of Horticulture, Pandit Jawaharlal Nehru college of Agriculture and Research Institute, Karaikal, during 2021– 2022. The material for the study comprised of 29 yardlong bean genotypes, collected from different sources. Growth and yield parameters were collected

Table 1 : Details of yardlong bean genotypes and varieties used in the study.

S. no.	Genopyes	Source
1	VS – 17	KAU, COA, Vellayani, Kerala.
2	VS – 27	Aripra – Mallappuram: KAU, COA, Vellayani, Kerala
3	VS – 28	KAU, COA, Vellayani, Kerala.
4	VS – 35	Periya – Kasargode: KAU, COA, Vellayani, Kerala.
5	VS – 37	Kanjhangad – Kasargode: KAU, COA, Vellayani, Kerala.
6	VS – 38	KAU, COA, Vellayani, Kerala.
7	VS – 40	KAU, COA, Vellayani, Kerala.
8	VS – 43	Ettumanoor- Kottayam: KAU, COA, Vellayani, Kerala.
9	VS – 44	Kanakkary – Kottayam: KAU, COA, Vellayani, Kerala.
10	VS – 53	KAU, COA, Vellayani, Kerala.
11	VS – 54	KAU, COA, Vellayani, Kerala.
12	VS – 55	Palakkad - KAU, COA, Vellayani, Kerala.
13	VS – 56	Palakkad - KAU, COA, Vellayani, Kerala.
14	VS – 57	Palakkad - KAU, COA, Vellayani, Kerala.
15	Kanjikuzi payar local	Mannuthi – Thrissur, Kerala.
16	Kilichundan payar local	Mannuthi – Thrissur, Kerala.
17	Palakkad local	Palakkad - Kerala.
18	Mannuthi local	Mannuthi – Thrissur, Kerala.
19	Kollam local	Kollam - Kerala.
20	Arka Mangala	IIHR – Bangalore.
21	Lola	*KAU* – Thrissur, Kerala.
22	Vyjayanthi	*KAU* – Thrissur, Kerala.
23	Deepika	*KAU* – Thrissur, Kerala.
24	Sumanth	Tanindo Seed Private Limited, Bangalore.
25	Rocket	Tanindo Seed Private Limited, Bangalore.
26	YLB – 7	Dharani agro technologies – Udumalpet, Tamilnadu.
27	YLB – Red	Dharani agro technologies – Udumalpet, Tamilnadu.
28	YLB -Green long	Dharani agro technologies – Udumalpet, Tamilnadu.
29	NS 621	Namdhari Seeds Pvt.Ltd, Karnataka.

throughout the experimental period from five randomly selected plants from each plot genotypes per replication.

Observations *viz.*; vine length (cm), number of primary branches plant^{-1}, petiole length (cm), leaflet length (cm), leaflet width (cm), days to first flowering, days to 50 per flowering, peduncle length (cm), pod set (per cent), pod length (cm), pod girth (cm), pod weight (g), days to first harvest, days to last harvest, 100 seed weight (g), pods plant^{-1}, number of seeds pod^{-1}, total soluble solids (^{0}brix), pod vitamin C content (per cent), protein content (per cent), crude fiber (per cent), shelf life and yield plant^{-1} (Kg) were observed during the experiment. The analysis of variance technique was applied for drawing conclusions from the data. The recorded value of F was compared with tabulated value of F 5% and 1% level of probability for the appropriate degree of freedom. If calculated value exceeded the table value, the effect was considered to be significant.

Results and Discussion

The potentiality of the genotype for the successful selection process may be assessed based on the *per se* performance of the genotype. According to the ANOVA presented in Table 2, there was a highly significant different observed for all the traits under study which clearly indicated wider scope for selection of superior genotypes from gene pool (Sultana *et al.*, 2021).

Among the vegetative characters, the differential percent of genotypes had recorded greater value for vine length (59.0 per cent), number of primary branches plant^{-1} (48.0 per cent) over their respective grand mean values, which strongly support that contributing trait for vigorous growth, which favoured them to survive better under salinity condition. These phenomena could be attributed by the leaf traits such as the leaf area for grater photosynthetic ability to achieve higher yield through extending crop duration. In the present study too, the leaflet length (59.0 per cent), leaflet width (41.0 per cent) was greater in significant percent of genotypes as compared to the trait grand mean value. Kusmiyati *et al.* (2021) also evaluated F_3 progenies of yardlong bean and found that the leaf and growth traits are the most important selection indices of yardlong bean breeding. Hence, notably the genotypes Vyajayanthi (T_{22}), VS-38 (T_6) and

Table 2 : Analysis of variance for different characters in Yardlong bean.

S. no.	Characters	Replication sum of square	Treatment sum of square	Error sum of square
1.	Vine length (m)	1.762	135.71**	6.389
2.	Number of primary branches plant^{-1}	1.989	337.552**	13.961
3.	Petiole length (cm)	0.000	187.152**	28.136
4.	Leaflet length (cm)	0.008	131.370**	23.922
5.	Leaflet width (cm)	0.025	62.195**	10.599
6.	Days to first flowering (days)	11.326	974.583**	52.369
7.	Days to 50% flowering (days)	2.545	1958.254**	59.453
8.	Peduncle length (cm)	0.889	2249.593**	98.879
9.	Pod set (per cent)	13.643	12731.661**	358.285
10.	Individual pod length (cm)	2.202	8930.921**	222.361
11.	Individual pod girth (cm)	0.1002	51.972**	39.590
12.	Individual pod weight (g)	9.758	4288.618**	79.254
13.	Days to first harvest (days)	20.832	10450.064**	570.379
14.	Days to last harvest (days)	30.937	63282.750**	2546.297
15.	Number of number of pods plant $^{-1}$	4.010	75940.760**	80.170
16.	Number of seed pod^{-1}	10.159	106.720**	150.901
17.	100 seed weight (g)	11.664	664.669**	254.783
18.	TSS (^{0} brix)	0.269	27.091**	6.792
19.	Pod vitamin C content (per cent)	0.304	984.527**	46.290
20.	Crude fibre (per cent)	0.550	848.706**	25.731
21.	Crude protein content (per cent)	0.663	291.238**	34.394
22.	Shelf life (days)	0.130	145.306**	6.901
23.	Yield plant^{-1} (Kg)	0.150	66.537**	2.701

*, ** significant at 0.05 % and 0.01 % level of significance, respectively.

Mannuthi local (T_{18}) for vine length and VS-35 (T_4) and Kollam local (T_{19}) could be isolated for number of branches plant^{-1} from the present study.

Considering the floral traits, days to first flowering, days to 50 per cent flowering and days to first harvesting are an important trait in selection for earliness in crop improvement programme. In the present study, yardlong bean genotypes (48.0, 45.0 and 69.0 per cent, respectively) showed lower mean value over their respective grand mean value, which strongly revealed that early genotypes for yield could be isolated from the genepool. Further it is suggested that rapid transition from vegetative to reproductive stages is a stress escaping mechanism (Song *et al*., 2013). Notably, the genotype Sumant (T_{24}) for early flowering, VS-53 (T_{10}) and Vyjayanthi (T_{22}) for greater pod setting which could result with greater pod yield in yardlong bean.

The fruiting traits too showed a wider difference among the genotypes where 52.0 per cent genotypes of the gene pool had greater mean value over their grand mean value for peduncle length and pod set percent. However, genotypes having greater mean value over grand mean was less than 40 per cent for individual pod length (38.0 per cent), individual pod girth (31 per cent) and individual pod weight (38.0 per cent). This phenomenon revealed that despite of greater pod setting the marketable pod with ideal size is influenced by the genotypes and their growing environments. This trend was clearly reflected on their number of pods plant^{-1} too as 31.0 per cent of genepool had greater mean value over grand mean.

Similarly, 41 per cent genepool registered higher mean value for yield plant^{-1} and expected yield ha^{-1} over their respective grand mean value clearly indicated that a high yielding genotype can be isolated for successful cultivation of yardlong bean under the existing climate of Karaikal. In the present study, VS-37 (T_5), YLB-Green long (T_{28}), VS-57 (T_{14}), VS-38 (T_6) and Sumant (T_{24}) for lengthier pods, YLB-Green long (T_{28}) followed by VS-54 (T_{11}) and VS-53 (T_{10}) for bolder pods, VS-57 (T_{14}), Sumant (T_{24}) and YLB- Green long (T_{28}) heavier pods could be isolated for commercial exploitation. In

Table 3 : Mean performance of yardlong bean genotypes for growth parameters.

Genotypes	Vine length (cm)	Number of primary branches plant^{-1}	Petiole length (cm)	Leaflet length (cm)	Leaflet width (cm)
VS-17	7.30	8.75	14.15	15.62	9.28
VS-27	7.58	8.23	13.13	13.87	7.54
VS-28	8.76	5.00	9.68	14.56	6.37
VS-35	5.80	13.75	11.75	13.81	7.15
VS-37	5.42	5.68	9.20	11.86	5.72
VS-38	8.84	7.78	11.49	14.09	8.79
VS-40	5.02	4.50	10.88	9.95	6.05
VS-43	4.15	9.64	10.21	12.29	6.35
VS-44	6.25	2.60	11.58	12.52	6.88
VS-53	8.09	6.87	11.21	13.64	7.88
VS-54	7.10	8.82	12.10	12.58	8.61
VS-55	6.69	5.43	8.83	11.20	7.79
VS-56	4.40	5.63	10.68	10.83	6.09
VS-57	7.52	7.13	8.83	10.98	8.41
Kanjikuzhi payar local	4.46	6.23	9.77	10.95	6.38
Kilichundan payar local	7.48	8.23	10.20	12.50	7.28
Palakkad local	5.36	8.60	14.82	14.58	9.03
Mannuthi local	8.76	4.63	9.42	12.45	7.11
Kollam local	6.95	10.78	12.46	13.54	8.75
Arka Mangala	7.71	7.16	6.85	10.51	6.57
Lola	7.18	5.00	9.83	13.63	7.96
Vyjayanthi	9.05	4.85	12.99	12.61	7.28
Deepika	8.09	3.20	9.65	13.19	8.59
Sumant	6.67	3.75	11.38	12.83	7.15
Rocket	6.64	6.45	8.53	9.85	5.63
YLB-7	4.71	9.08	8.02	10.73	7.10
YLB-Red	4.20	7.27	10.80	13.18	6.31
YLB-Green long	5.58	5.04	9.66	10.50	7.20
NS-621	4.11	4.21	9.07	10.91	8.56
Standard error	0.47	0.70	1.00	0.92	0.16
CD (P = 0.05)	0.97	1.44	2.05	1.89	1.26
CD (P = 0.01)	1.32	1.95	2.77	2.55	1.70
CV (per cent)	7.29	10.54	9.46	7.29	8.34

addition to ideal pod size, the early harvest is also a most important selection indices in yardlong bean breeding programme. The present study brought YLB-Red (T_{27}) and YLB-7 (T_{26}) for early harvest and VS-57 (T_{14}), Lola (T_{21}) and VS-38 (T_6) for late harvest as they are characterized with long duration. This result is supported with finding of Shubha *et al*. (2022).

Besides immature pods, tender leaves and green seeds of yardlong bean are also used as vegetable in certain parts of the country. Accordingly, 45.0 and 52.0 per cent genepool had higher mean value for number of seeds pod^{-1} and 100 seed weight as compared to grand mean of respective traits. The seed related traits are an indicator of shattering and non-shattering phenomena of a genotype as non-shattering genotypes had slightly bolder seeds than non-shattering types due to developing sclerenchyma loads an energy cost for plants that could be allocated for seed production (Murgia *et al*., 2017). Accordingly, there is scope for selection of both shattering and non-shattering genotypes in the present genepool. Notably, the genotypes; Lola (T_{21}) and YLB-7 (T_{26}) for shattering, Kaniikuzhi Payar local (T_{15}) and VS-44 (T_9) for non-shattering could be isolated from the genepool.

Quality parameters are considered as important in

Table 4 : Mean performance of yardlong bean genotypes for yield and quality parameters.

Genotypes	Days to first flowering	Days to 50 per cent flowering	Peduncle length (cm)	Days to first harvest	Days to last harvest	Pod set	Pod length (cm)	Pod girth (cm)	Pod weight (g)	100 seed weight (g)	Pods plant^{-1}	Number of seeds pod^{-1}	Yield plant^{-1} (Kg)
VS-17	48.68	51.50	23.45	62.07	179.91	50.75	36.92	2.42	10.94	19.15	113.86	15.13	1.03
VS-27	47.20	50.36	27.05	72.82	200.53	75.71	36.10	2.29	11.89	19.80	102.59	13.64	1.07
VS-28	44.25	43.27	18.23	55.70	176.68	67.45	33.33	2.28	11.36	19.20	151.14	16.03	1.56
VS-35	44.18	52.96	13.98	53.10	191.66	62.65	32.47	2.71	13.81	18.75	113.23	16.08	1.32
VS-37	42.66	44.20	15.17	58.90	176.31	56.55	89.25	2.32	9.59	17.65	90.35	15.17	0.77
VS-38	44.88	59.72	35.69	72.51	219.78	81.89	55.72	3.85	16.80	20.65	101.75	14.88	1.55
VS-40	40.13	50.74	11.30	60.02	160.02	48.25	31.02	3.08	11.04	17.90	132.48	16.51	1.34
VS-43	48.00	50.91	18.05	58.10	135.66	79.49	36.43	2.54	16.32	16.40	121.75	15.51	1.86
VS-44	42.93	45.57	12.80	55.00	176.13	55.14	33.51	2.11	7.49	13.65	89.49	14.72	0.54
VS-53	48.20	55.42	28.21	88.37	292.94	95.05	43.85	4.17	16.58	19.97	199.22	17.75	3.14**
VS-54	48.45	51.00	19.86	60.90	172.91	50.90	47.65	5.85	17.56	18.21	106.81	16.16	1.67
VS-55	51.93	52.89	18.25	91.06	110.62	37.64	26.08	2.05	9.84	21.45	104.58	15.32	0.90
VS-56	43.70	46.00	22.80	57.50	176.04	51.12	28.86	3.32	9.11	14.10	92.84	16.19	0.68
VS-57	41.48	38.81	25.59	48.66	132.12	52.73	55.98	3.02	37.94	20.25	86.78	21.88	3.13**
Kanjikuzhi payar local	36.15	45.78	14.11	55.10	149.01	45.63	34.75	2.50	8.38	12.90	161.34	14.27	1.19
Kilichundan payar local	46.33	53.81	20.30	92.20	176.50	72.60	38.63	2.35	13.53	16.75	234.17	16.27	3.12**
Palakkad local	48.15	42.78	32.17	56.20	176.14	69.21	33.94	2.68	9.09	17.20	84.23	16.32	0.64
Mannuthi local	44.83	45.39	31.61	57.60	176.20	54.21	40.60	2.47	20.75	21.50	172.15	15.43	3.41**
Kollam local	43.90	47.70	25.30	65.57	150.12	52.99	30.90	2.21	7.31	18.10	101.55	16.03	0.60
Arka Mangala	40.80	43.56	18.31	54.90	163.31	68.42	50.62	2.77	29.16	22.65	84.82	15.98	2.31
Lola	47.38	55.22	29.93	86.70	235.35	80.42	42.90	3.48	30.08	30.13	138.39	15.99	3.92**
Vyjayanthi	52.93	58.90	21.08	69.42	196.60	87.83	43.75	2.19	17.25	17.97	181.78	15.30	3.01**
Deepika	40.78	48.96	21.55	57.75	176.48	49.52	45.25	2.69	17.54	19.45	91.94	14.73	1.49
Sumant	36.75	51.20	22.38	71.54	173.65	41.27	53.48	2.66	37.00	22.30	121.01	15.11	4.35**
Rocket	37.80	42.86	26.35	53.70	176.16	65.45	40.92	2.69	15.27	17.80	114.53	14.39	1.62
YLB-7	41.05	48.19	17.13	41.00	162.50	72.48	45.68	3.10	23.73	24.40	113.78	16.73	2.51
YLB-Red	47.70	42.92	22.66	39.50	170.88	86.86	44.54	2.03	17.38	19.37	143.00	17.60	2.36
YLB-Green long	41.45	33.95	23.08	57.31	149.85	55.00	62.45	5.86	31.19	14.12	108.87	15.78	3.27**
NS-621	43.28	41.63	32.46	48.80	149.45	72.17	48.91	2.83	26.14	19.85	111.28	19.50	2.71*
Standard error	1.36	1.45	1.87	4.51	9.53	3.57	2.81	1.18	1.68	3.01	1.69	2.32	0.13
CD (P = 0.05)	2.80	2.98	3.84	9.24	19.53	7.32	5.77	2.43	3.44	6.17	3.46	4.75	0.63
CD (P = 0.01)	3.77	4.02	5.19	12.47	26.34	9.88	7.78	3.28	4.64	8.33	4.67	6.41	0.85
CV (per cent)	3.08	3.02	8.39	7.26	5.44	5.64	6.56	40.84	9.67	15.85	1.37	14.56	15.77

Table 1 continued...

Table 1 continued...

Genotypes	Total Soluble Solids(^{0}brix)	Pod vitamin C content(per cent)	Protein content (per cent)	Crude fibre content(per cent)	Shelf life
VS-17	2.00	14.55	10.26	10.75	6.25
VS-27	2.50	13.80	9.80	10.13	3.25
VS-28	3.00	6.58	13.15	15.00	3.75
VS-35	3.00	7.29	12.56	8.25	4.25
VS-37	2.50	8.34	11.78	4.53	2.75
VS-38	3.01	11.06	9.87	12.25	6.50
VS-40	3.00	10.73	11.21	16.25	2.25
VS-43	4.00	9.76	13.86	13.50	3.25
VS-44	2.00	8.91	9.23	14.50	3.38
VS-53	4.54	21.57	6.90	15.95	6.75
VS-54	2.00	8.86	8.46	13.50	2.25
VS-55	3.15	13.72	8.77	14.00	3.25
VS-56	3.50	21.20	10.40	10.25	3.75
VS-57	4.00	8.12	8.22	11.00	3.25
Kanjikuzhi payar local	3.50	12.24	6.22	13.00	4.75
Kilichundan payar local	2.68	12.82	15.72	16.13	5.25
Palakkad local	3.00	8.72	11.23	12.13	4.25
Mannuthi local	3.00	10.58	10.45	20.50	2.25
Kollam local	3.50	7.27	14.54	23.63	5.50
Arka Mangala	3.00	6.56	11.26	12.13	2.50
Lola	3.00	15.90	11.91	14.00	4.00
Vyjayanthi	2.00	19.49	13.78	18.75	7.25
Deepika	2.00	8.68	9.82	12.25	2.25
Sumant	2.50	14.02	10.28	18.25	7.00
Rocket	3.00	7.68	12.66	16.13	3.00
YLB-7	3.00	11.78	10.47	14.00	6.25
YLB-Red	3.75	10.15	9.84	11.88	5.25
YLB-Green long	1.99	6.79	13.12	13.00	5.25
NS-621	4.00	14.17	14.10	7.38	6.25
Standard error	0.49	1.28	1.10	0.95	0.49
CD (P = 0.05)	1.00	2.63	2.27	1.96	1.01
CD (P = 0.01)	1.36	3.55	3.06	2.64	1.37
CV (per cent)	16.58	11.25	10.04	7.07	11.43

evaluation of varieties of yardlong bean. The characters like total soluble solids, vitamin C, crude fiber and protein are important traits that contribute for selection of elite genotypes. The genepool had superior genotypes having higher total soluble solids, vitamin C, protein, crude fiber which accounting 69 per cent, 38 per cent, 45 per cent and 45 per cent, respectively over the grand mean of total genepool. This finding clearly revealed that superior genotypes for total soluble solids (VS-53 and VS-57), vitamin C (VS-53 and VS-56), protein (Kilichundan payar local and VS-621), crude fiber (Kollam local and Mannuthi local) can be isolated. This is an encouraging finding that salinity decreased total carbohydrate, fatty acids and protein in several vegetable crops (Patel *et al*., 2020) however the superior genotypes identified in the genepool could support nutritional security.

Conclusion

It can be easily observed that all genotypes are not equally superior for a particular character. Based on the mean performance, it is concluded that the Sumant (T_{24}) found superior for yield as well as for days to first flowering, individual pod length, individual pod weight, 100 seed weight, crude fibre , shelf life followed by Lola (T_{21}) peduncle length, pod set, individual pod girth,

individual pod weight, days to last harvest, 100 seed weight, vitamin C and yield plant^{-1}, Mannuthi local (T_{18}) for vine length, peduncle length, 100 seed weight, number of pods plant^{-1}, crude fibre, yield plant^{-1}. Hence, these genotypes could be better utilized for further br eeding programme for the improvement of yield and quality under coastal ecosystem.

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