

Evaluation of Bhendi [*Abelmoschus esculentus* (L.) Moench] Hybrids under Coastal Region of Karaikal

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ABSTRACT: The material for the present study comprised of 11 F₁ hybrids of bhendi assembled from various sources across the country to study their yield potential under coastal ecosystem. As there is no specific high yielding hybrid of bhendi recommended for cultivation in Karaikal region, which is located on the east coast, it is a main challenge to identify a suitable high yielding genotype for coastal region of Karaikal, so as to recommend for similar coastal situations. The hybrids were assessed for *per se* performance on growth and yield at Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, Puducherry, India. The experiment revealed the presence of significant differences for almost all the major growth and yield contributing characters studied. Among the 11 hybrids evaluated, NOH 1648 (Nidhi) recorded the highest plant height at final harvest (166.4 cm) and fruit girth (7.88 cm). The highest fruit weight (32.78 g), number of seeds fruit⁻¹ (74.33), yield plant⁻¹ (1229.73 g), yield plot⁻¹ (83.54 kg) and yield hectare⁻¹ (20.88 tonnes) were recorded in NOH 1758. The hybrid COBh 4 recorded the highest number of fruits plant⁻¹ (50.22) and also produced the first flower at the lowermost node (5.22), with the shortest internodal length of main stem (3.94 cm). The hybrid VNR 999 was found to produce the tallest plant at flowering (41.06 cm). The highest number of primary branches plant⁻¹ both at flowering (4.33) and final harvest (6.00) were observed in Janhvi. Among the 11 hybrids, NOH 1758 has outperformed with an yield of 20.88 tonnes ha⁻¹, followed by Arka Nikitha (17.18 tonnes ha⁻¹) and BHS 680 (16.81 tonnes ha⁻¹). Bhendi being one of the most suitable vegetable crops for year-round cultivation, the identified hybrid(s) could be raised by the farming community of the region for enhanced yield and economic benefits.

Keywords: Bhendi, F₁, hybrids, *per se* performance, okra, yield.

INTRODUCTION

Bhendi [*Abelmoschus esculentus* (L.) Moench] commonly known as “lady’s finger” and bhindi or okra in India is suitable for cultivation as a garden crop even on large commercial farms. It is an annual vegetable crop in tropical and subtropical parts of the world (Sanjay *et al.*, 2021). Okra is a popular vegetable grown in almost all states of the country for its tender green fruits, which are cooked and commonly consumed as boiled vegetable as well as in several recipes of Indian cuisine (Chattopadhyay *et al.*, 2011). Ripe seeds of bhendi can be dried, roasted and ground to be used as a coffee substitute (Gemede *et al.*, 2015). Mature fruits and stem containing crude fiber are used in paper industry. Bhendi has a vast potential as one of the foreign exchange earner and accounts for 30 per cent of the export of fresh vegetables excluding potato, onion and garlic (Prasad *et al.*, 2016). The crop performs very well in hot weather, especially in the regions with warm nights (Ndunguru and Rajabu, 2004). Bhendi

production and productivity is often seriously affected by the use of low yielding local varieties, sub optimal plant density, heavy attack of insect pests, diseases and weeds. One of the major problems in bhendi cultivation is the selection of low yielding varieties due to which productivity in India is less as compared to many other countries. Higher production in bhendi is possible by replacing low yielding varieties with hybrids, which show enhanced returns, compared to other cultivars grown under same climatic conditions and inputs application (Rajesh *et al.*, 2018). As large number of okra hybrids are now available in the market, considering the above issues, there is a need to compare some of the available hybrids to select high yielding, better adaptable hybrids for commercial cultivation in any specific region. Therefore, the present investigation was focused to identify superior and promising okra hybrids in respect to tender fruit yield and other yield contributing characters under coastal region of Karaikal as no similar studies on identification of high yielding

genotypes or specific hybrids for coastal ecosystem has been attempted. The present study assumes significance in this context.

MATERIAL AND METHODS

The field experiment was conducted at Pandit Jawaharlal Nehru College of Agriculture and Research Institute, Karaikal, UT of Puducherry, India during Rabi/summer, 2020. The material consisted of 11 F₁ hybrids of bhendi from different parts of the country viz., COBh 4, Arka Nikitha, BHS 120, BHS 240, BHS 480, BHS 680, Janhvi, VNR 999, NOH 1648, NOH 1684 and NOH 1758. The experiment was laid out in a Randomized Block Design, replicated thrice. A plot size of 22.50 m² was maintained for each treatment in each replication. The experimental field was well prepared and broad beds of 90 cm wide alternated with channels of 60 cm were formed. The seeds were sown on beds in a paired row system with a spacing of 90 × 60 × 30 cm. The cultural practices as recommended (Crop production techniques of horticultural crops, 2004) were uniformly followed. Observations were recorded on five plants from each replication in each hybrid for various growth and yield contributing characters as suggested by Mahajan *et al.*, (2000). The mean data were subjected to statistical analysis as suggested by Panse and Sukhatme (1978).

RESULTS AND DISCUSSION

A. Growth components

Statistically analyzed mean data of the experiment revealed that most of the growth contributing characters under observation had shown significant differences among the hybrids. The *per se* performance of bhendi hybrids for growth characters is given in Table 1. The mean value for days to first flowering was found to be non-significant while significant differences existed among hybrids for plant height at flowering ranging from 31.54 cm to 41.06 cm. The tallest plants at

flowering was observed in VNR 999 (41.06 cm), followed by BHS 680 (40.72cm), NOH 1648 (36.73 cm) and COBh 4 (36.44 cm). However, the tallest plants at final harvest were recorded in NOH 1648 (166.4 cm), followed by Janhvi (157.87 cm) and BHS 680 (150.83 cm). Significant variation for plant height in bhendi has already been reported by Rajesh *et al.*, (2018); Sarada *et al.*, (2018). The hybrid BHS 680 was found to record the first flower at the lowermost node (4.44), followed by NOH 1684 (4.56), BHS 480 and NOH 1648 (4.67) and similar observations have been reported by Rajesh *et al.*, (2018). The internodal length of main stem ranged from 3.00 cm (NOH 1684) to 3.94 cm (COBh 4). The shortest internodal length was recorded in NOH 1684 (3.00 cm), followed by BHS 480 (3.06 cm), while the internodal length observed was the longest in COBh 4 (3.94 cm). The variation in length of inter node of main stem might be due to specific genetic make-up of different hybrids and its interaction with the prevailing environmental condition (Reddy *et al.*, 2013). Among the 11 hybrids, the highest number of primary branches plant⁻¹ at flowering was noticed in Janhvi (4.33), followed by COBh 4 (4.11), BHS 240 and VNR 999 (3.89). The number of primary branches plant⁻¹ observed was the least at flowering in NOH 1648 (3.11), followed by NOH 1684 (3.22) and BHS 120 (3.33). The same trend was also observed during the final harvest with the highest number of primary branches plant⁻¹ at final harvest recorded in Janhvi (6.00), followed by COBh 4 (5.78), BHS 240 and VNR 999 (5.56). The number of primary branches plant⁻¹ at final harvest was the least in NOH 1648 (4.78). This variation in number of primary branches plant⁻¹ might be due to variation in plant height as well as differential photosynthetic ability of each hybrid. The trend observed from the present study is in conformity with the report of Singh and Jain (2012); Ranjani *et al.*, (2019).

Table 1: *Per se* performance of bhendi hybrids for growth characters.

Hybrids	Days to first flowering	Plant height at flowering (cm)	Plant height at final harvest (cm)	Node at which first flower appears	Inter nodal length of main stem (cm)	Number of primary branches plant ⁻¹ at flowering	Number of primary branches plant ⁻¹ at final harvest
COBh 4	37.22	36.44	124.09	5.22	3.94	4.11	5.78
ArkaNikitha	38.11	31.54	123.46	5.00	3.30	3.78	5.45
BHS 120	38.22	33.31	146.16	5.11	3.36	3.33	5.00
BHS 240	37.33	35.29	138.46	5.22	3.64	3.89	5.56
BHS 480	37.78	33.42	143.48	4.67	3.06	3.44	5.11
BHS 680	37.33	40.72	150.83	4.44	3.53	3.78	5.45
Janhvi	38.22	32.28	157.87	5.00	3.88	4.33	6.00
VNR 999	37.78	41.06	120.62	4.89	3.24	3.89	5.56
NOH 1648 (Nidhi)	38.44	36.73	166.40	4.67	3.44	3.11	4.78
NOH 1684 (Kajri)	38.33	35.12	124.22	4.56	3.00	3.22	4.89
NOH 1758	39.00	33.50	143.08	4.78	3.60	3.67	5.33
S.Ed	0.920	0.614	3.810	0.168	0.069	0.100	0.113
CD - 5%	NS	1.290	8.004	0.080	0.146	0.210	0.238

B. Yield components

The results indicated the existence of significant differences among the bhendi hybrids for all the yield traits observed (Table 2). The highest fruit length was observed in BHS 480 (18.84 cm), followed by BHS 680 (18.37 cm) and NOH 1648 (18.09 cm), whereas minimum fruit length of 13.96 cm was recorded in COBh 4. The difference in average fruit length of different hybrids due to their genetic make-up had already been observed and reported by Rajesh *et al.*, (2018); Sarada *et al.*, (2018); Ranjani *et al.*, (2019). The fruit girth recorded was maximum in hybrid NOH 1648 (7.88 cm), followed by NOH 1684 (7.69 cm) and NOH 1758 (7.46 cm). The lowest fruit girth was noted in BHS 240 (6.19 cm). Such variation for fruit girth has been reported by Rajesh *et al.* (2018); Sarada *et al.*, (2018). The highest fresh weight of fruit was observed in hybrid NOH 1758 (32.78 g), followed by BHS 680 (32.46 g) and NOH 1648 (32.44 g), whereas the lowest fruit weight of 21.27 g was found in BHS 120. The variation in the growth attributes of hybrids, which might have led to variation in photosynthesis could ultimately resulted in variation for fruit weight. Rajesh *et al.*, (2018); Saitwal *et al.*, (2011) also reported similar findings from their experiment on bhendi. In the present study, the highest number of seeds fruit⁻¹ (74.33) was recorded in NOH 1758, followed by NOH 1684(73.00) and COBh 4 (70.11), whereas the seed content was the lowest in Janhvi (53.11). These findings are in conformity with the earlier findings of

Rajesh *et al.*, (2018); Ranjani *et al.*, (2019). The fresh weight of seeds fruit⁻¹ ranged from 3.66 g to 5.93 g with the highest fresh weight of seeds fruit⁻¹ registered in NOH 1684, followed by NOH 1758 (5.00 g). Among the bhendi hybrids evaluated, the maximum number of fruits plant⁻¹ was observed in COBh 4 (50.22), followed by NOH 1758 (46.78) and BHS 120 (46.44), whereas the lowest number of fruits plant⁻¹ (36.45) was observed in BHS 480. The results corroborate with the findings of Rajesh *et al.*, (2018). Maximum fruit yield plant⁻¹ was recorded in the hybrid NOH 1758 (1229.73g), followed by Arka Nikitha (1096.32 g) and BHS 680 (1069.02 g), whereas the fruit yield plant⁻¹ recorded was the least in BHS 480 (763.44g). The yield of fruit plant⁻¹ is directly related to number of primary branches, number of fruits and fruit weight and similar results in bhendi has been reported earlier by Rajesh *et al.*, (2019). The fruit yield plot⁻¹ ranged from 53.43 kg to 83.54 kg with the highest fruit yield plot⁻¹ registered in NOH 1758 (83.54 kg), followed by Arka Nikitha, BHS 680 and NOH 1648 (68.7, 67.26 and 65.20 kg, respectively). The fruit yield plot⁻¹ was the lowest in Janhvi (53.43 kg). The fruit yield hectare⁻¹ was the maximum in the hybrid NOH 1758 (20.88 tonnes), followed by Arka Nikitha (17.18 tonnes) and BHS 680 (16.81 tonnes) and the differences in fruit yield could be attributed to the differential genetic make-up and adaptability for the given agro climatic conditions by the hybrids as reported by Sarada *et al.*, (2018); Rajesh *et al.*, (2019).

Table 2: Per se performance of bhendi hybrids for yield characters.

Hybrids	Fruit length (cm)	Fruit girth (cm)	Fruit weight (g)	Number of seeds fruit ⁻¹	Fresh weight of seeds fruit ⁻¹ (g)	Number of fruits plant ⁻¹	Yield plant ⁻¹ (g)	Yield plot ⁻¹ (kg)*	Yield hectare ⁻¹ (tonnes)
COBh 4	13.96	6.44	22.19	70.11	4.07	50.22	849.65	55.72	13.93
ArkaNikitha	16.72	6.71	25.77	61.56	4.87	42.89	1096.32	68.70	17.18
BHS 120	15.04	6.82	21.27	60.67	4.51	46.44	960.02	61.33	15.33
BHS 240	15.62	6.19	23.53	61.67	4.32	46.22	1031.32	65.04	16.26
BHS 480	18.84	7.33	29.68	53.78	4.16	36.45	904.26	59.24	14.81
BHS 680	18.37	7.29	32.46	64.56	4.92	44.11	1069.02	67.26	16.81
Janhvi	14.90	6.46	22.86	53.11	3.66	39.44	763.44	53.43	13.36
VNR 999	17.13	6.66	23.00	57.56	3.94	43.33	919.42	59.62	14.90
NOH 1648 (Nidhi)	18.09	7.88	32.44	62.44	4.89	42.89	1067.24	65.20	16.30
NOH 1684 (Kajri)	17.00	7.69	32.23	73.00	5.93	46.11	1001.98	64.79	16.19
NOH 1758	17.42	7.46	32.78	74.33	5.00	46.78	1229.73	83.54	20.88
S.Ed	0.427	0.138	0.717	1.312	0.098	0.810	18.172	1.629	0.296
CD - 5%	0.897	0.290	1.506	2.756	0.206	1.702	38.172	3.421	0.622

*Plot size - 22.50 m²

CONCLUSION

Among the 11 hybrids evaluated, NOH 1758 was found to outperform with a yield of 20.88 tonnes ha⁻¹, followed by Arka Nikitha (17.18 tonnes ha⁻¹) and BHS 680 (16.81 tonnes ha⁻¹) and these hybrids could be commercially explored as bhendi being one of the most suitable vegetable crops for year-round cultivation in this region. The study area is located in the tail end of river Cauvery along the East Coast, experiencing the biotic stress typical of coastal tract. Hence, the findings

of the present study would help in extrapolating the findings under similar situation.

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Conflict of Interest. None.

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