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Unveiling growth and flowering dynamics: A comparative study of okra genotypes (*Abelmoschus esculentus* (L.) Moench)

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Abstract

Twenty-one genotypes of okra were evaluated for growth and flowering parameters during *Summer* 2024 in randomized block design with three replications at the Department of Vegetable Science, College of Horticulture, Mudigere, Karnataka, India. The characters studied were, Plant height, number of leaves per plant, internodal length, number of nodes per plant and stem girth at 30, 60 and 90 DAS are growth characteristics. The flowering characteristics includes days to first flowering and days to 50 per cent flowering. The results demonstrated that all the genotypes exhibited significant variation in their performance in terms of growth and flowering traits. Among the genotypes, Halu bhendi, Siddapura local and Arbhavi local were found promising for most of the growth and yield-contributing traits under Hill zone of Karnataka. These genotypes could be used further in a breeding program, due to their superior performance for various traits.

Keywords: Okra genotypes, *Abelmoschus esculentus*, growth dynamics

Introduction

Okra (*Abelmoschus esculentus*, 2n=2x=130) has many other names in different cultures, such as guano-gombo in Spanish, guibeiro in Portuguese, Igbo in Nigeria, and qiukui in Taiwan. It is commonly referred to as lady's finger in England, bhendi in India, and gumbo in the United States. It is known by regional names like Vendaikai and Ramtoriyan in India. In tropical and subtropical locations, bhendi, the most popular vegetable in the Malvaceae family, grows as an important crop throughout the spring-summer and rainy seasons. In warmer winters, it can be grown all year round. With 6.873 million tonnes produced from 521 thousand hectares at a productivity rate of 13.19 tonnes per hectare, India tops the world in okra production. Nigeria comes in second. In India, Gujarat is the top-producing state, contributing 15.89% of the national total, followed by West Bengal, Bihar, and Madhya Pradesh.

A vegetable that is low in calories and fat and high in fibre and vital vitamins like C, A, and B, okra is nutrient-dense and antioxidant-rich. Additionally, it offers substantial levels of iodine, potassium, and calcium, all of which can aid in the treatment of goitre. Its ripe seeds are also rich in edible oil and protein, and they can be crushed, roasted, and dried to make coffee. Okra is therefore an essential nutritional supplement in underdeveloped nations where vitamin deficits are prevalent. In addition to their nutritional value, the dried fruit stems and skins can be used to make mucilage for industrial and therapeutic uses, as well as paper, cardboard, and fibre. Additionally, okra has pharmacological qualities that could aid in the treatment of cancer, diabetes, and obesity. All things considered, okra makes a substantial contribution to economic sustainability, nutrition, health, and food security. (Das *et al.)*

The findings will help out the farmers in finding suitable cultivars for growing and breeders will be able to select desired traits for further genetic development. Hence the present study was undertaken to find out the superior genotypes for growth and flowering parameters having better economic viability.

Materials and Methods

The present investigation comprising twenty-one genotypes of okra and they were evaluated in a randomized block design with three replication during summer season at Department of Vegetable Science, College of Horticulture, Mudigere. Each genotype was planted with spacing of 60

cm × 45 cm. All recommended agronomic practices and plant protection measures were followed during the crop growth period to ensure proper growth and good yield. The observations were recorded on five randomly selected plants per plot in each replication for growth and flowering parameters. Plant height, number of leaves per plant, internodal length, number of nodes per plant and stem girth at 30, 60 and 90 DAS are growth characteristics. The flowering characteristics includes days to first flowering and days to 50 per cent flowering.

Results and Discussion

The result shows that the Plant height diversified between 18.35 cm (Jamkhandi local- 02) and 33.94 cm (Arbhavi local), 38.20 cm (Mandya local) and 76.10 cm (Siddapura local- 02) and 63.43 cm (Mandya local) and 122.12 cm (Siddapura local- 02), with the mean values of 26.39 cm, 57.10 cm, and 89.47 cm at 30, 60 and 90 DAS, respectively. The significant difference in plant height among the genotypes could be due to the genetic setup and inheritance of the character as well as differences in apical dominance, cell division and cell elongation. The plant height is usually a good index of plant vigour which may contribute towards higher productivity. The obtained results are in accordance with earlier findings of Saleem *et al*., Kelemage *et al*., Singh *et al.* (2017) [19] and Karadi *et al.* (2018) [5] in okra.

Number of leaves varied from 8.88 (Mandya local) to 19.88 (Halu bhendi), 14.85 (Mandya local) to 24.39 (Siddapura local- 02) and 18.06 (Mandya local) to 27.37 (Siddapura local- 02), with an average mean of 13.91, 18.28 and 21.62 at 30, 60 and 90 DAS, respectively. The variation in the number of leaves per plant between the genotypes might be due to the expression of temporal and spatial enzymes of genes and it could also be due to the variation in the genetic makeup of okra. These results are in accordance with the findings of Morey *et al*.,

Internodal length varied from 3.18 (Sirsi local- 01) to 5.64 cm (Arbhavi local), 4.61 (Jamkhandi local -02) to 6.85 cm (Arbhavi local) and 5.65 (Jamkhandi local -02) to 9.44 cm (Arbhavi local) with an average mean of 4.56, 5.94 and 7.24 cm at 30, 60 and 90 DAS, respectively.

Number of nodes per plant differed from 4.75 (Mandya local) to 7.72 (Sirsi local- 01), 6.10 cm (Mandya local) to 12.05 (Halu bhendi), and 7.76 (Mandya local) to 14.46 (Halu bhendi). At 30, 60, and 90 DAS, the mean values were 5.81, 9.12 and 10.33, respectively. The increase in number of nodes per plant leads to increase in number of leaves and fruits per plant and leaf area per plant implies higher active photosynthetic area leading to higher production of biomass and yield. These results are in accordance with the findings of Morey *et al*., Farooqkhan *et al.* (2023) [3], Shwetha *et al.* (2022) [20]. Rambabu *et al.* and Kalemoge *et al.* in okra.

Stem girth varied from 6.90 (Mandya local) to 10.93 mm (Halu bhendi), 7.93 (Mandya local) to 14.10 mm (Halu bhendi) and 11.49 (Mandya local) to 20.12 mm (Halu bhendi) with an average mean of 8.84, 10.60 and 15.75 mm at 30, 60 and 90 DAS, respectively. In stem girth the significant difference among genotypes might be due to the influence of their genetic makeup regulating the endogenous hormone balance which controls the cell division, cell enlargement and cell differentiation resulting in differential branching which ultimately affects the stem girth. Stem girth is also an important index of vigorous growth of the plants which leads to get higher productivity. The results of present findings are in line with the observations of Kumar *et al*. and Meena *et al*. in okra.

Statistically significant variation was observed for flowering parameters among the okra genotypes. Days to flowering is an important characters of okra as earlier flowering resulted early picking of marketable green fruits which generally fetching higher prices in the market. The genotypes Siddapura local 02 recorded the minimum number of days for first flower appearance (36.33) and days to 50 per cent flowering (39.67), which indicates the earliness of the genotypes. while the genotype Jamkhandi local-01 recorded the maximum number of days for first flower appearance and days to 50 per cent flower. These findigs are in close conformity with the results reported by Osekita *et al*. and Morey *et al*. in okra.

Table 1: Mean performance of okra genotypes for plant height, number of leaves and the number of nodes per plant.

Genotypes	Plant height (cm)			Number of leaves per plant			Number of nodes per plant		
	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS
Sira local - 01	26.59	50.07	86.39	12.46	17.29	20.26	5.62	8.58	9.61
Sira local - 02	31.42	43.56	100.91	19.38	20.08	24.54	6.54	7.30	9.86
Haveri local - 01	30.55	65.59	98.32	14.01	17.84	20.57	5.89	9.97	10.86
Haveri local - 02	22.36	45.02	76.27	11.04	16.68	19.51	5.31	7.60	8.25
Arbhavi local	33.94	70.90	112.34	18.06	19.42	25.77	6.01	10.19	12.87
Sorbha local	29.18	58.14	97.14	13.66	18.23	21.29	5.86	9.82	10.27
Harihara local	26.01	62.69	75.70	12.79	17.79	20.22	5.67	10.16	9.89
Sirsi local - 01	24.49	68.83	98.48	19.18	21.23	26.31	7.72	11.31	13.63
Sirsi local - 02	22.08	54.52	74.58	10.89	16.25	19.33	5.24	8.10	8.34
Sonda local	22.99	45.10	82.52	11.71	17.15	20.31	5.43	8.22	8.96
Hassan local	30.68	72.46	105.95	14.56	20.55	23.85	5.94	10.35	11.17
Halu bhendi	24.79	70.88	99.25	19.88	21.56	25.53	5.81	12.05	14.46
Mandya local	21.46	38.20	63.43	8.88	14.85	18.06	4.75	6.10	7.76
Jamkhandi local - 01	21.40	39.89	67.66	9.74	15.71	18.15	4.95	7.21	7.91
Jamkhandi local -02	18.35	43.03	72.53	9.91	15.74	18.52	5.12	8.77	8.16
Siddapura local - 01	25.41	52.02	83.36	11.55	17.40	20.15	5.55	8.82	9.48
Siddapura local - 02	32.71	76.10	122.12	19.27	24.39	27.37	7.28	11.18	13.87
Hiriyur local	28.16	57.25	88.41	14.11	17.93	20.50	5.75	9.15	10.14

Ranebennur local - 01	26.77	69.39	90.34	13.33	17.66	21.10	5.67	8.50	9.97
Ranebennur local - 02	23.63	45.77	80.17	11.88	17.14	20.13	5.42	7.76	9.13
Arka Anamika	31.31	69.61	102.89	15.74	18.90	22.47	6.47	10.39	12.36
Mean	26.39	57.10	89.47	13.91	18.28	21.62	5.81	9.12	10.33
S. Em±	0.400	0.47	0.40	0.30	0.24	0.31	0.05	0.20	0.18
CD at 5%	1.14	1.35	1.14	0.84	0.68	0.89	0.14	0.58	0.50

Table 2: Mean performance of okra genotypes for inter nodal length, stem girth and flowering parameters.

Genotypes	Inter nodal length (cm)			Stem girth (mm)			Days to first flowering	Days to 50 % flowering
	30 DAS	60 DAS	90 DAS	30 DAS	60 DAS	90 DAS		
Sira local - 01	4.73	5.73	6.54	8.28	10.10	15.83	40.67	43.67
Sira local - 02	4.82	5.84	7.21	7.81	9.58	15.31	41.67	44.67
Haveri local - 01	5.20	6.09	7.37	8.61	8.66	13.87	40.33	44.33
Haveri local - 02	4.23	5.81	6.44	8.23	10.34	15.26	40.00	44.67
Arbhavi local	5.64	6.85	9.44	9.58	11.38	16.31	38.67	44.33
Sorbha local	4.99	5.83	6.59	9.29	10.70	16.16	40.00	42.33
Harihara local	4.61	5.83	6.72	8.90	10.19	15.61	39.00	41.67
Sirsi local - 01	3.18	6.11	7.22	10.10	12.82	18.76	37.00	41.00
Sirsi local - 02	4.27	6.60	6.94	8.38	9.89	14.63	38.33	42.67
Sonda local	4.24	5.39	6.12	8.54	9.76	14.38	38.67	42.33
Hassan local	5.11	6.32	8.24	9.52	11.66	17.07	38.33	41.00
Halu bhendi	4.26	5.81	6.74	10.93	14.10	20.12	37.33	41.67
Mandya local	4.65	5.52	6.14	6.90	7.93	11.49	40.33	44.00
Jamkhandi local - 01	4.34	5.43	7.12	7.89	8.47	13.44	43.00	46.00
Jamkhandi local -02	3.61	4.61	5.65	8.21	11.12	14.79	41.33	43.67
Siddapura local - 01	4.58	5.80	6.96	8.61	9.37	15.54	39.00	42.33
Siddapura local - 02	4.42	6.71	9.21	9.78	12.48	17.80	36.33	39.67
Hiriyur local	4.93	6.15	7.88	9.41	11.88	16.43	38.67	42.67
Ranebennur local - 01	4.75	5.86	7.72	8.89	10.29	16.16	37.33	42.33
Ranebennur local - 02	4.38	5.76	6.70	8.74	9.71	15.16	41.33	44.00
Arka Anamika	4.86	6.69	9.09	9.15	12.20	16.58	40.00	45.33
Mean	4.56	5.94	7.24	8.84	10.60	15.75	39.40	43.06
S. Em±	0.08	0.09	0.06	0.09	0.10	0.16	0.725	0.65
CD at 5%	0.22	0.26	0.18	0.26	0.30	0.45	2.071	1.85

Conclusion

The present investigation on okra genotypes concluded that, wide range of variation was observed among the genotypes for all the characters studied. Halu bhendi, Siddapura local 2 and Arbhavi local were considered as superior okra genotypes for growth and flowering and they can be used in future breeding and crop improvement program.

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