***Original Research Article***

**Assessment of Yield and Quality Traits in Okra (*Abelmoschus esculentus* L. Moench) Genotypes Under the Hill Zone of Karnataka.**

**ABSTRACT**

An experiment was carried out during *Summer* 2024 at Department of Vegetable Science, College of Horticulture, Mudigere, Karnataka, India using twenty-one promising genotypes of okra with three replications in randomized block design. Observations on important quantitative and quality characters were recorded. Analyzed data revealed that all characters showed significant effect. The genotype Halu bhendi gave significantly highest fruit yield per plant of 387.03 g/plant followed by Sirsi local- 01 and Siddapura local-02 with the yield of 363.06 g/plant and 333.74 g/plant, respectively. Average fruit weight of 22.45 g was recorded significantly highest in the genotype Halu bhendi followed by Sirsi local – 01 (21.42 g) and Siddapura local- 02 (18.69 g). Maximum Number of fruits per plant was observed in Siddapura local – 02 (17.86) followed by Halu bhendi (17.24) and Siddapura local- 02 (16.95). On the basis of these observations, it may be concluded that the genotypes Halu bhendi, Sirsi local- 01 and Siddapura local- 02 were found most suitable okra genotypes for cultivation in the Hill zone of Karnataka.

**INTRODUCTION**

Okra, also known as Lady’s finger, Gumbo, or Bhendi (*Abelmoschus esculentus* (L.) Moench), is a chief tropical and subtropical vegetable, that is grown extensively throughout the world. It belongs to the Malvaceae family and is one of the most often produced warm-season vegetables. Okra is native to Sudan and Ethiopia and is said to have originated in tropical regions of Africa. From there, it moved to Asia, America and other nations. It is a self-pollinating allopolyploid crop and has the chromosomal number 2n=2x=130. Despite India's 300 g daily requirement (125 g for leaf vegetables, 100 g for root and tuber vegetables, and 75 g for miscellaneous veggies), the country's vegetable availability is close to 175 g per day per inhabitant, according to the ICMR research.

Okra is widely grown and valued in India for its nutritional and medicinal properties. It is rich in vitamins and minerals such as vitamin C, vitamin A, riboflavin, calcium, iron, iodine, and phosphorus (Das *et al.,* 2019). Dehydrated okra is commonly processed for preservation and export. The unripe green pods are often used in a variety of dishes, including soups, stews, and can be fried or boiled (Temam *et al*., 2021). Additionally, dried okra seeds are roasted, ground, and used as a coffee substitute, while also being a good source of oil.

The crop performs very well in hot weather, especially in the regions with warm nights (Ndunguru and Rajabu, 2004). It is heat and drought-tolerant vegetable species in the world and will tolerate soils with heavy clay and intermittent moisture (Gundane et al., 1995) but chilling temperature and frost and foggy weather can damage the crops; however, kharif season is the main growing season. In recent years, public sector and a number of private seed companies in India have been able to develop a good number of commercial cultivars, which are not suitable to all the regions of the country. They are varying in various characters from one region to another. Now today a large numbers of okra varieties/genotypes are available in the market which creates confusion among the farmers to select suitable one, all these are not adapted and suited to all the regions. No specific recommendations of variety all over the country in different agro-climatic zone. Farmers are facing problems in selecting genotypes for a particular area for commercial cultivation. Considering the above mentioned facts, there is a need to compare some of the available genotypes to select high yielding, better adaptable genotypes for commercial cultivation. There is also lacking of suitable genotypes of okra for hill zone of Karnataka. Therefore, the present investigation was undertaken to identify superior and promising okra genotypes in respect to fruit yield and other quantitative characters under hill zone of Karnataka.

**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 characters studied were days to first harvest, fruit length (cm), fruit girth (mm), average fruit weight (g), number of fruits per plant, fruit yield per plant (g), fruit yield per plot (kg) and fruit yield per hectare (t). Chlorophyll a, chlorophyll b, total chlorophyll, shelf life, number of ridges on fruit surface and crude fibre are among the forms of quality indicators.

The overall variability of the twenty-one genotypes for each quantitative characteristic was partitioned into sources of genotype, replication, and error using the ANOVA technique (Panse and Sukhatme, 1967).

**Results and Discussion:**

Statistically analyzed mean data of the experiment revealed that all characters under observation gave significant effect. Fruit and yield characters depicted in table 1 whereas, fruit quality parameters depicted in table 2.

**Fruit and yield parameters.**

Fruit characteristics of any vegetable crops are important parameters to select a variety/genotype for its wider acceptability among the farming community as fruit shape, size, etc. are very much appealing to the consumers in the market. Okra is also a popular vegetable crop and its green tender fruits with long straight firm fruits like by the consumers. So, fruit length and fruit girth are considerable traits during the genotypic evaluation process.

The days to first harvest was minimum in Siddapura local – 02 (43.33 days) and maximum in Jamkhandi local – 01 (51.33 days). Fruit length varied from 11.16 (Sonda local) to 20.89 cm (Sirsi local-01) with a mean value of 15.11 cm. Fruit girth ranged from 15.17 mm (Haveri local -01) to 22.36 mm (Arbhavi local), with an average mean value of 17.73 mm. The differences in genetic make-up of the okra genotypes and their response to the prevailing environmental conditions cause variation in fruit length and fruit girth.

Average fruit weight and number of fruit per plant are an important yield attributing characters in okra. The data recorded on average fruit weight revealed that significant variations among the genotypes. Average fruit weight ranged from 10.80 (Haveri local-02) to 22.45 g (Halu bhendi) with an average mean value of 14.80 g.

As far as number of fruits per plant is concern, the mean values of the data revealed significant variation among the genotypes. Number of fruits per plant ranged from 8.52 (Jamkhandi local – 01) to 17.86 (Siddapura local – 02) with an average mean value of 13.32. Rest of the genotype was observed in intermediate range of number of fruits per plant. Variation in number of fruits per plant might be due to the greater plant height, more number of leaves and internodes per plant. Similar results on okra were also obtained by Baghel *et al.* (2022), Awasthi *et al.* (2022) and Yadav *et al.* (2020).

Fruit yield per plant ranged from 97.65 g (Jamkhandi local – 01) to 387.03 g (Halu bhendi), with an average mean of 204.01 g. The fruit yield per plot ranged from 1.17 kg (Jamkhandi local – 01) to 4.48 kg (Halu bhendi) with a mean value of 2.41 kg. The average fruit yield per hectare was 7.56 tonnes, and it ranged from 3.62 (Jamkhandi local – 01) to 14.33 tonnes (Halu bhendi). Variations among the genotypes for yield per plant might be due to the number of fruits per plant, average fruit weight, fruit length and girth of the fruits and less incidence of yellow vein mosaic virus. These results are in accordance with the result of Mahapatra *et al*. (2007) and Farooqkhan *et al.* (2023)

**Quality parameters**

Chlorophyll- a content varied from 1.00 mg (Sirsi local- 01) to 1.87 mg (Arbhavi local) with mean value of 1.47 mg, chlorophyll- b varies from 0.56 mg (Mandya local) to 0.88 mg (Arbhavi local) with overall mean value of 0.70 mg and total chlorophyll content ranged from 1.57 mg (Sirsi local- 01) to 2.75 mg (Arbhavi local) with overall mean value of 2.17 mg. These results are conformity with the results of Mehta *et al.* (2006) and Koundinya and Dhankhar (2013),

A wide range of shelf-life was recorded from 3.67 days (Sonda local) to 6.67 days (Sirsi local-01) among the different okra genotypes and the mean of overall population was 4.95 days. The number of ridges on the fruit surface ranged from 5.00 to 9.00 with a mean value of 6.62. The variation in number of ridges among various genotypes may be due to the genetic make-up of the genotype which influences the per formance of a crop. The crude fibre content varied from 8.87 % (Ranebennur local – 01) to 14.31 % (Jamkhandi local – 01) with an overall mean of 10.87 %.

These results are in agreement with the findings of Morey *et al.* (2012), Karadi *et al.* (2018) and Yadav *et al.* (2020) and Srivarsha *et al.* (2022).

The superior performance of these genotypes for fruit yield was due to their higher ranking for number of fruits per plant, weight of fruits per plant, fruit length and less infection of yellow vein mosaic virus, which caused greater assimilation of photosynthates. The inherent yield potential of these genotypes was also responsible for higher production of fruits. The genotypes received better adaptability to the environment and get the congenial conditions for the better growth and development of the plant as well as for flowering and fruiting. These findings were also in accordance with the (Tiwari, 2001; Singh and Jain, 2006) that have reported better adaptation of the genotypes with environment and also get the variation among the genotypes for different characters.

## **Table 1. Mean performance of okra genotypes for fruit and yield parameters**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Genotypes** | **DFH** | **FL (cm)** | **FG (mm)** | **AFW (g)** | **NFPP** | **FYP (g)** | **FYPP (kg)** | **FYH (t)** |
| Sira local – 01 | 49.00 | 14.27 | 15.94 | 13.84 | 12.12 | 167.74 | 2.11 | 6.21 |
| Sira local – 02 | 50.67 | 12.08 | 16.07 | 12.37 | 12.18 | 150.67 | 1.67 | 5.58 |
| Haveri local – 01 | 49.33 | 15.11 | 15.17 | 14.44 | 13.53 | 195.29 | 2.34 | 7.23 |
| Haveri local – 02 | 50.33 | 11.72 | 17.16 | 10.80 | 11.71 | 126.47 | 1.40 | 4.68 |
| Arbhavi local | 48.33 | 16.68 | 22.36 | 17.16 | 17.31 | 297.15 | 3.48 | 11.01 |
| Sorbha local | 49.67 | 15.75 | 18.85 | 14.63 | 14.57 | 213.11 | 2.44 | 7.89 |
| Harihara local | 47.67 | 14.32 | 19.26 | 15.53 | 13.26 | 205.93 | 2.47 | 7.65 |
| Sirsi local - 01 | 47.33 | 20.89 | 21.28 | 21.42 | 16.95 | 363.06 | 4.28 | 13.45 |
| Sirsi local – 02 | 47.67 | 16.20 | 15.88 | 13.62 | 11.28 | 153.66 | 1.84 | 5.69 |
| Sonda local | 46.67 | 11.16 | 17.03 | 11.47 | 10.23 | 117.44 | 1.41 | 4.37 |
| Hassan local | 45.33 | 16.27 | 16.03 | 16.88 | 14.52 | 244.97 | 2.84 | 9.07 |
| Halu bhendi | 46.67 | 20.21 | 21.22 | 22.45 | 17.24 | 387.03 | 4.48 | 14.33 |
| Mandya local | 48.33 | 14.85 | 17.64 | 12.35 | 11.28 | 139.32 | 1.67 | 5.16 |
| Jamkhandi local – 01 | 51.33 | 11.38 | 18.24 | 11.47 | 8.52 | 97.65 | 1.17 | 3.62 |
| Jamkhandi local -02 | 49.67 | 13.23 | 18.22 | 13.80 | 10.55 | 145.57 | 1.75 | 5.43 |
| Siddapura local – 01 | 46.67 | 14.72 | 17.30 | 12.87 | 11.28 | 145.14 | 1.74 | 5.38 |
| Siddapura local – 02 | 43.33 | 18.14 | 16.38 | 18.69 | 17.86 | 333.74 | 4.00 | 12.36 |
| Hiriyur local | 48.67 | 15.85 | 18.52 | 15.20 | 14.29 | 217.21 | 2.61 | 8.04 |
| Ranebennur local – 01 | 46.67 | 15.22 | 17.83 | 13.34 | 12.75 | 170.12 | 2.04 | 6.30 |
| Ranebennur local – 02 | 49.67 | 13.63 | 15.83 | 11.71 | 12.19 | 142.83 | 1.68 | 5.31 |
| Arka Anamika | 49.33 | 15.62 | 16.17 | 16.66 | 16.22 | 270.17 | 3.22 | 10.01 |
| **Mean** | 48.21 | 15.11 | 17.73 | 14.80 | 13.32 | 204.01 | 2.41 | 7.56 |
| **S. Em±** | 0.85 | 0.044 | 0.08 | 0.09 | 0.08 | 1.56 | 0.07 | 0.09 |
| **CD at 5%** | 2.42 | 0.125 | 0.22 | 0.24 | 0.23 | 4.47 | 0.20 | 0.26 |

**DFH= Days to first harvest FL= Fruit length (cm) FG=Fruit girth (mm) AVF=Average fruits weight (g) NFPP= Number of fruits per plant FYP= Fruit yield per plant (g) FYPP= Fruit yield per plot (kg) FYH= Fruit yield per ha (t)**

## **Table 2. Mean performance of okra genotypes for quality parameters**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Genotypes** | **Shelf life (days)** | **Number of ridges on fruit surface** | **Crude fibre (%)** | **Chlorophyll a (mg/g)** | **Chlorophyll b (mg/g)** | **Total**  **Chlorophyll (mg/g)** |
| Sira local – 01 | 4.67 | 5.00 | 11.57 | 1.55 | 0.74 | 2.30 |
| Sira local – 02 | 5.00 | 5.00 | 11.16 | 1.57 | 0.76 | 2.33 |
| Haveri local – 01 | 5.33 | 5.00 | 9.32 | 1.30 | 0.63 | 1.92 |
| Haveri local – 02 | 4.33 | 8.00 | 12.67 | 1.25 | 0.62 | 1.87 |
| Arbhavi local | 4.67 | 9.00 | 12.26 | 1.87 | 0.88 | 2.75 |
| Sorbha local | 4.00 | 7.00 | 9.55 | 1.48 | 0.65 | 2.13 |
| Harihara local | 4.33 | 8.00 | 10.45 | 1.78 | 0.80 | 2.58 |
| Sirsi local - 01 | 6.67 | 8.00 | 12.17 | 1.00 | 0.57 | 1.57 |
| Sirsi local – 02 | 5.33 | 5.00 | 10.50 | 1.29 | 0.64 | 1.94 |
| Sonda local | 3.67 | 8.00 | 9.65 | 1.85 | 0.79 | 2.64 |
| Hassan local | 5.67 | 5.00 | 9.05 | 1.54 | 0.65 | 2.20 |
| Halu bhendi | 6.00 | 8.00 | 12.27 | 1.08 | 0.63 | 1.71 |
| Mandya local | 5.33 | 5.00 | 10.07 | 1.02 | 0.56 | 1.58 |
| Jamkhandi local – 01 | 4.00 | 8.00 | 14.31 | 1.81 | 0.81 | 2.62 |
| Jamkhandi local -02 | 4.33 | 9.00 | 12.67 | 1.82 | 0.80 | 2.62 |
| Siddapura local – 01 | 5.33 | 9.00 | 9.44 | 1.46 | 0.67 | 2.13 |
| Siddapura local – 02 | 6.33 | 5.00 | 10.63 | 1.28 | 0.62 | 1.90 |
| Hiriyur local | 5.33 | 7.00 | 11.46 | 1.76 | 0.85 | 2.61 |
| Ranebennur local – 01 | 4.67 | 5.00 | 8.87 | 1.43 | 0.71 | 2.14 |
| Ranebennur local – 02 | 4.33 | 5.00 | 10.39 | 1.37 | 0.66 | 2.03 |
| Arka Anamika | 4.67 | 5.00 | 9.81 | 1.37 | 0.69 | 2.06 |
| **Mean** | 4.95 | 6.62 | 10.87 | 1.47 | 0.70 | 2.17 |
| **S. Em±** | 0.30 | - | 0.13 | 0.05 | 0.038 | 0.08 |
| **CD at 5%** | 0.87 | - | 0.36 | 0.14 | 0.11 | 0.23 |

**Conclusion:**

In the present study based on overall performance of genotypes revealed that Halu bhendi, Sirsi local- 01 and Siddapura local- 02 performed better for some important traits. Hence, the genotypes identified in this study, could be passed on to breeders for utilization in the okra improvement programs.

**REFERENCE:**

AWASTHI, S., SINGH, D. P., LAL, B., SINGH, P., UPADHYAY, A., SINGH, P. K., KUSWAHA, C., PANDEY, S., MAURYA, P. K. AND KUMAR, A., 2022, Assessment of genetic variability, heritability and genetic advance of okra genotypes [*Abelmoschus esculentus* (L.) Monech]. *Agron. Mech. Asia,* **53**(4): 7501-7512.

BAGHEL, S., KUMAWAT, A., PANDEY, A., DEVESH, P. AND GUPTA, N. K., 2022, Estimation of Genetic Parameters in okra [*Abelmoschus esculentus* (L.) Moench] under Malwa region of Madhya Pradesh. *B. F. I. J.,***14**(4): 1024-1027.

DAS, S., NANDI, G. AND GHOSH, L. K., 2019, Okra and its various applications in drug delivery, food technology, health care and pharmacological aspects-A review. *J Pharmaceutical Sci. Res.,* **11**(6): 2139-2147.

FAROOQKHAN, P., RAJAN, R. E. B., KUMAR, C. P. S. AND RUBAN, J. S., 2023, Performance and genetic evaluation of okra (*Abelmoschus esculentus* (L.) Moench) genotypes for agro-morphological traits. *Environ. Ecol.,* **41**(3): 2049-2054.

GUNDANE, S. U., BHATIA, G. L. AND PARTAP, P.S,. 1995, Correlation studies of yield components in okra. *Haryana J. Horti. Sci.,* **24**: 151-156.

KARADI, S. M., HANCHINAMANI, C. N., BASAVARAJA, N., KULKARNI, M. S., TATAGARA, M. H. AND SATISH, D., 2018, Nature and magnitude of genetic variability studies in okra (*Abelmoschus esculentus* (L.) Moench). *Int. J. Chem. Stud.,* **6**(6): 638-641.

KOUNDINYA, A. V. V. AND DHANKHAR, S. K., 2013, Correlation and path analysis of seed yield components in okra (*Abelmoschus esculentus* (L.) Moench). *Ann. Hort.,* **6**(1): 145-148.

MAHAPATRA, M. R., ACHARYYA, P. AND SENGUPTA, S. 2007, Variability and association analysis in okra. *Ind. Agri.,* **51:** 17-26.

MEHTA, D. R., DHADUK, L. K. AND PATEL, K. D., 2006, Genetic variability, correlation and path analysis studies in okra. *Agri. Sci. Digest.,* **26**(1): 15-18.

MOREY, A. L., NAGRE, P. K., DOD, V. N. AND KALE, V. S., 2012, Genetic variability in okra. *Asian J. Hort.,* **7**(1): 01-04.

NDUNGURU, J. AND RAJABU, A. C., 2004, Effect of okra mosaic virus disease on the above-ground morphological yield components of okra in Tanzania. *Scientia Horticulturae*, **99**: 225-235.

PANSE, V. G. AND SUKHATME, P. V., 1967, Statistical methods of agricultural workers. 2nd Endorsement. ICAR Publication, New Delhi, India, 381.

SRIVARSHA, J., DALVI, V. V., BHAVE, S. G., DESAI, S. S., JOSHI, M. S., MANE, A. V. AND SAWARDEKAR, S. V., 2022, Genetic variability studies in the indigenous and exotic accessions of okra (*Abelmoschus* sps*.*) under Konkan conditions. *Pharma Innov. J.,* **11**(4): 1876-1880.

TEMAM, N., MOHAMMED, W., AKLILU, S., 2021, Variability assessment of okra (*Abelmoschus esculentus* (L.) Moench) genotypes based on their qualitative traits. *Int. J. Agron.,* **2**:1-6.

TIWARI, B., 2001, Performance of okra (*Abelmoschus esculentus* L. Moench) hybrid in Tarai conditions of U. P. during rainy season. (M.Sc.Ag. Thesis). G.B.P.U.A.T., Pantnagar. PP. 77.

YADAV, S., VIJAY, B. S., GULAB, C. Y. AND ANIKET, K. V., 2020, Studies on extent of variability, heritability and genetic advance in okra [*Abelmoschus esculentus* (L.) Moench]. *Int. J. Curr. Microbiol. App. Sci.* **9**(10): 54-59.