**Studies on the genetic variability of okra (*Abelmoschus esculentus* L. Moench) genotypes for higher growth, yield and quality traits**

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**ABSTRACT**

The experiment was conducted to estimate genetic variability of genotypes showed significant differences for the characters under study. The phenotypic coefficient of variation (PCV) was higher than the genotypic coefficient of variation (GCV) for all the characters. The high value (>20%) of PCV and GCV were observed for the most of the traits *i.e.*, first flowering node, plant canopy width, crude fiber, ascorbic acid content, number of branches per plant and fruit yield per plant indicating the existence of wider genetic variability for these traits in the germplasm. High heritability was observed for most of the traits viz., day to first flowering node, days to first flowering, days to 50% flowering, day to first fruits picking, plant height, number of branches per plant, plant canopy width, number of fruits per plant, average fruit weight, moisture percentage, crude fiber content, ascorbic acid content and fruit yield/ per plant indicates predominance additive gene action. The moderate heritability was founded in fruit length and fruit diameter. The high magnitude (>20%) of genetic advance was found in traits like plant canopy width, fruit yield per plant and plant height indicating that these traits were less influenced by the environment and presence of additive gene action. Moderate genetic advance was observed for moisture percentage and low genetic advance was observed for day to first flowering node, days to first flowering, day to 50% flowering, days to first fruit picking fruit length, fruit diameter, number branches per plant, number of fruits per plant, average fruit weight, crude fiber and ascorbic acid content . analysis of variance, high heritability coupled high genetic advance as per cent of mean indicates selection could be effective for improvement in these traits. Based on these findings the genotypes *viz*., BCO-1, EC 112241, Sarita, CO-local and EC 112231, were found as the promising genotypes for most of the yield contributing traits in okra.

***Keywords***: Okra genotype, genetic variability, heritability, genetic advance, yield, quality.

**Introduction**

Okra generally known as Lady’s finger (*Abelmoschus esculentus* L. Moench) 2n = 2x = 130) fast growing annual herb of which the young seed pods are used as common vegetable (Awasthi *et al*., 2022). Okra is also known as "Queen of Vegetables" and its leaves, buds, flowers, pods, stems and seeds can be utilized in various forms. Nutritionally okra is a power house and its cultivation thrives with mulching practices (Urmila *et al*., 2024). Okra is also valued for being a rich source of iodine, which helps in managing goiter, a condition related to thyroid health (Vasava *et al*., 2023). It is a warm-season annual herbaceous vegetable crop that is commercially propagated over a period of 90–100 days using seeds that are frequently cross-pollinated (Tripathi *et al*., 2011). It is a good source of carbohydrates, protein, dietary fiber, calcium, magnesium, potassium, vitamins A, C, fat, iron, thiamine, nicotinamide and riboflavin (Gemede *et al.*, 2015).

The okra plant has been widely cultivated in tropical and sub-tropical regions of the world, including India, Turkey, Iran, West Africa, Yugoslavia, Bangladesh, Afghanistan, Pakistan (Salameh *et al.,* 2014). India is the largest producer of okra globally, with a contribution of more than 72% production. In India, the okra crop occupies an area of 523 thousand hectares with an annual production and productivity of 6416 thousand tonnes net green pods along with productivity of 12.2 mt/ha, respectively (NHB-2021-22). In India okra is commercially grown in Gujarat (15%), West Bengal (13.93%), Bihar (12.38%), Madhya Pradesh (11.75%), Orissa (10.33%), Chhattisgarh (5.57%) and Uttar Pradesh (5.23%). All India over the highest okra producing state is Gujarat 1019.42 thousand metric tonnes however, in Bihar okra is growing in an area of 59.19 thousand hectares with a production of 794.10 thousand metric tonnes and productivity of 13.42 metric tonnes per hectare. However, the okra productivity of Bihar (13.42 mt/ha) is higher than the national average (12.2 mt/ha) (Kumara *et al*., 2025). To meet the demand of the ever-growing population in the country, productivity must be optimized. It can be done through proper crop improvement strategies which heavily rely on the magnitude of genetic variability present in the base population. Genetic variability provides the foundation for selecting desirable traits, such as increased yield, disease resistance, drought tolerance, improved nutritional quality and identification of genotypes according to suitability of region.

**Materials and Methods**

The present study was carried out during *Kharif* season of 2023-24 at research farm of Nalanda College of Horticulture (NCOH), Noorsarai. This Nalanda district is located in Agro-climatic Zone – III (B) of Bihar and situated in the Indo-Gangetic plains of North Eastern India. It has a humid subtropical climate and is situated between 25.2748° N latitude and 85.4569° E longitude and 67 meters above mean sea level receives approximately 1165 mm of rainfall per year. The soil is sandy loam that is well-drained with pH of 6.5-7.2.

The source of 30 genotype of okra used in the study is shown in table 1. All the genotype were sown at a spacing of 60 cm (row to row) x 45 cm (plant to plant) in a randomize block desing (RBD) with three replications in a plot size (12m2), 4 m lengh × 3 m width. The standard agronomical practices and plant protection measure were followed to maintain healthy crop growth. Observations were recorded for the morphological character by selecting five plants in each replication. The analysis of variance was carried out by Panse and Sukhatme (1985). Genotypic co-efficient of variation and phenotypic co-efficient of variation were calculated as per the formula suggested by Burton and De Vane (1952). Heritability in broad sense (h²b) was calculated using the formula suggested by Hanson *et al*., (1956) and genetic advance were calculated by using formula given by Johnson *et al*., (1955).

**Table: 1. A list of the genotypes of okra along with source used in the experiment**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **S. No.** | **Genotypes** | **Source** | **S. No.** | **Genotypes** | **Source** |
| 1 | EC 112269 | ICAR-NBPGR (New Delhi) | 16 | Sarita | BCKB, Kalyani (West Bengal) |
| 2 | EC 112274 | ICAR-NBPGR (New Delhi) | 17 | IC 14600 | ICAR-NBPGR (NewDelhi) |
| 3 | EC 112264 | ICAR-NBPGR (New Delhi) | 18 | IC 18544 | ICAR-NBPGR (NewDelhi) |
| 4 | EC 133408 | ICAR-NBPGR (New Delhi) | 19 | IC 18960 | ICAR-NBPGR (NewDelhi) |
| 5 | EC 102605 | ICAR-NBPGR (New Delhi) | 20 | IC 22232 | ICAR-NBPGR (NewDelhi) |
| 6 | EC 112112 | ICAR-NBPGR (New Delhi) | 21 | IC 22285 | ICAR-NBPGR (NewDelhi) |
| 7 | EC 112231 | ICAR-NBPGR (New Delhi) | 22 | IC 27874 | ICAR-NBPGR (NewDelhi) |
| 8 | EC 112241 | ICAR-NBPGR (New Delhi) | 23 | IC 32855 | ICAR-NBPGR (NewDelhi) |
| 9 | EC 133412 | ICARNBPGR (New Delhi) | 24 | IC 27898 | ICAR-NBPGR (NewDelhi) |
| 10 | Japani Jhar | BCKB, (West Bengal) | 25 | IC 29117 | ICAR-NBPGR (NewDelhi) |
| 11 | CO Local | TNAU (Coimbatore) | 26 | IC 29136 | ICAR-NBPGR (NewDelhi) |
| 12 | Kaveri | BCKB, (West Bengal) | 27 | IC 29168 | ICAR-NBPGR (NewDelhi) |
| 13 | BRO-2 | BAU (Sabour) | 28 | Kashi Lalima\* | ICAR-IIVR (Varanasi) |
| 14 | BCO-1 | ICAR-IIVR (Varanasi) | 29 | Pusa Sawani\* | ICAR-IARI (New Delhi) |
| 15 | Sudha | BCKB, (West Bengal) | 30 | Kashi Kranti\* | ICAR-IIVR (Varanasi) |

**Results and Discussion**

The analysis of variance were highly significant for all the traits studied indicating presence of sufficient amount of genetic variability among all the genotype (Table 2). It showed high variability among all the genotypes. The node number to 1st flowering was observed earlier in BCO-1 (4.07). The day to first and 50% flowering was observed in IC 18544 (38 days and 45.33 days). Days to 1st fruit picking was observed earliest in IC 18544 and IC 22285. The above results was in agreement of Solankey *et al*. (2014) and Aminu *et al.* (2017).

The plant height and plant canopy width was highest in EC 133408 followed by Kashi Kranti. The genotype Sarita (5.40) had highest number of primary branches per plant followed by IC 29136 (5.37). Alam and Hossain (2008) and Mahesh (2013) reported the similar results for plant height and number of branches in okra; and Singh *et al*., (2017) for plant height. The desirable fruit diameter has significant value for IC-22285 (1.27 cm) followed by IC-27874 and EC-112112. The fruit length was highest in EC 112112 (14.43 cm) followed by BRO-2 (13.47 cm) with mean value of (11.55 cm). The genotype BCO-1 (24.67g) had highest number of fruits per plant which is at par with Kashi Kranti (23.00g ), Sudha (22.67g ) and BRO-2 (22.00g ). EC-133408 (18.63 g) had highest average fruit weight which is at par with EC 112231 (16.00g). The fruit yield was highest observed in BCO-1 (398.63 g) which is at par with Kashi Lalima (360.07 g). The result was in consonance of Singh *et al*. (2017) and for fruit diameterSolankey & Singh (2009), Mahesh (2013); and Singh *et al*. (2023) for fruit length and number of fruits of okra.

The genotype BCO-1 (398.63g) produced significantly higher pod yield per plant as compared to check variety (Pusa Sawani) and other genotypes. The genotype also showed higher number of fruits per plant. The results suggested that high-yielding genotypes may be considered as varietal improvement of okra for desired characters. The above results was in agreement of Priyanka *et al*., (2018); Ashraf *et al.,* (2020); Singh *et al*., (2023) and Kumar *et al*.,(2024) for number of fruits yield per plant in okra.

The highest ascorbic content (mg/100g FW) was observed significantly higher in Kashi Lalima (19.67 mg/100gFW) and Kashi Kranti (18.37 mg/100gFW). The above results have similarity with the findings of Solankey and Singh (2009); Kumari *et al*. (2020); Srivarsha *et al.* (2022). The genotype Japani Jhar (88.33 %) has highest moisture content while, the highest crude fiber content was found in EC 133412 (4.13%).

High PCV (30.93%) and GCV (30.37%) for days to first flowering showed significant genetic variability, which was further confirmed by high heritability (96.44%) and genetic advance (61.44%). This showed strong genetic influence on these traits in okra, where early flowering genotypes are preferred for earliness and extended harvesting periods. Days to 50% flowering and first fruit picking exhibited moderate heritability (86.02% and 67.75%, respectively), suggesting that selection for early maturity can be effective. The genetic advance for these traits was relatively lower (16.45% and 13.87%), indicating the influence of non-additive gene action, where earliness is governed by both genetic and environmental factors. Fruit length and diameter exhibited moderate heritability (58.69% and 48.21%, respectively). Genetic advance as a percentage of the mean (16.82% and 12.96%) suggests moderate genetic control over these traits. In okra, pod length and diameter also show moderate heritability, making selection moderately effective for these traits. Plant height showed high PCV (19.22%) than GCV (18.89%), and have strong heritability (96.50%). Similarly, the number of branches per plant and plant canopy width showed high heritability (90.16% and 93.51%, respectively) with significant genetic advance (44.38% and 45.91%, respectively), indicating strong genetic control. Plant height and canopy width are critical for yield determination in okra and can be improved through breeding programs. The result was in consonance with the findings of Prakash *et al*. (2022) and Yadav *et al*. (2024) for plant height and fruit length. The number of fruits per plant and average fruit weight exhibited moderate heritability (69.21% and 69.50%, respectively), indicating a combination of genetic and environmental influence. The genetic advance for number of fruit per plant and average fruit weight was also moderate (21.95% and 20.46%), and improvement through selection would be moderately effective. The number of pods per plant and pod weight also showed effective selection criteria for yield estimation. Fruit yield per plant was observed higher PCV (20.39%) than GCV (18.20%). Heritability was substantial (79.69%) and genetic advance (33.47%) indicated that selection would be effective for enhancing yield. High heritability and genetic advance for pod yield per plant, reliable selection criterion in breeding programs. The result was in consonance of Vani *et al*. (2021), Ranga *et al*. (2021), Bagadiya *et al*. (2023) and Syfullah *et al*. (2024) for number of branches per plant and fruit yield per plant.

Moisture content had extremely high heritability (96.87%) with moderate genetic advance (12.79%), indicating that it is primarily governed by genetic factors. Crude fiber and ascorbic acid content exhibited high heritability (99.34% and 99.44%, respectively) with high genetic advance (83.66% and 42.01%, respectively). This suggests that selection can be highly effective for fiber content and vitamin C content in okra *i.e.* crucial for nutritional quality improvement.

**Conclusion**

Traits such as first flowering node, plant height, crude fiber content and ascorbic acid content exhibited high heritability and genetic advance, suggesting their strong genetic control and potential for direct selection in okra breeding. Moderate heritability and genetic advance were observed for traits like fruit length, fruit diameter, and yield-related attributes, indicating that improvement through selection would be effective but influenced by environmental factors. High-yielding genotypes such as BCO-1 and Kashi Lalima, making them potential for commercial cultivation and can be used for development of high yielding okra hybrids.

**Table: 2. Mean performance of 30 okra genotype for 15 characters.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S. No | Genotypes | First flowering node | Days to first flowering | Days to 50 % flowering | Days to first fruit picking | Fruit length (cm) | Fruit diameter (cm) | Plant height (cm) | No of branches/ plant | Plant canopy width (cm) | No of fruits / plant | Average fruit weight (g) | Moisture (%) | Crude fiber (%) | Ascorbic acid content (mg/100g | Fruit yield per plant (g) |
| 1. | EC 112269 | 8.53 | 47.67 | 55.67 | 54.00 | 9.40\*\* | 1.20\*\* | 99.00 | 3.30 | 72.00 | 18.00 | 13.73 | 76.47 | 1.23\*\* | 12.40 | 245.33 |
| 2. | EC 112274 | 8.30 | 44.00 | 52.00 | 52.00 | 10.93 | 1.20\*\* | 112.66 | 2.43\*\* | 61.00 | 17.87 | 15.93 | 78.27 | **1.13\*\*** | 11.77 | 284.28 |
| 3. | EC 112264 | 9.23 | 45.00 | 53.00 | 51.67 | 10.53 | 1.50 | 122.00 | 2.73\*\* | 72.00 | 16.33\*\* | 13.27 | 74.67\*\* | 1.37 | 13.47 | 215.93\*\* |
| 4. | EC 133408 | 10.03 | **55.33** | **61.00** | **61.00** | **8.77\*\*** | **1.67** | **137.00** | 3.33 | **102.33** | **14.53\*\*** | **18.63** | 76.63 | 2.13 | 10.70 | 270.71 |
| 5. | EC 102605 | 9.13 | 39.00\*\* | 46.67\*\* | 46.33\*\* | 12.03 | **1.10\*\*** | 75.00\*\* | 3.23 | 42.67\*\* | 17.00\*\* | 12.93\*\* | 82.24 | **1.13\*\*** | 12.43 | 219.73\*\* |
| 6. | EC 112112 | 6.03 | 51.67 | 58.00 | 59.00 | 14.43 | 1.23\*\* | 99.33 | 4.00 | 76.00 | 16.00\*\* | 13.17 | 85.27 | 2.17 | 11.63 | 210.33\*\* |
| 7. | EC 112231 | 4.17\*\* | 40.00\*\* | 47.00\*\* | 48.67\*\* | 10.33\*\* | 1.33 | 80.67 | **2.43\*\*** | 71.67 | 16.00\*\* | 18.00 | **74.65** | 1.17\*\* | 10.23\*\* | 287.40 |
| 8. | EC 112241 | 6.03 | 42.00 | 47.33\*\* | 47.00\*\* | 12.77 | 1.17\*\* | 80.00 | 4.23 | 61.00 | 20.33 | 16.07 | 84.61 | 2.43 | 10.60 | 326.40 |
| 9. | EC 133412 | 5.37 | 42.33 | 50.33 | 50.33 | 12.30 | 1.27\*\* | 74.33\*\* | 3.23 | 78.00 | 18.33 | 14.53 | 86.32 | **4.13** | 11.40 | 265.20 |
| 10. | Japani Jhar | 5.23 | 45.33 | 51.67 | 52.00 | 10.43\*\* | 1.53 | 82.67 | 4.10 | 95.00 | 15.00\*\* | 13.63 | **88.33** | 2.63 | 15.47 | 204.03\*\* |
| 11. | Co - Local | 4.20\*\* | 48.00 | 55.67 | 54.33 | 12.33 | 1.20\*\* | 76.00\*\* | 5.00 | 53.00\*\* | 19.00 | 15.23 | 75.11\*\* | 1.67 | 17.93 | 289.07 |
| 12. | Kaveri | 5.7 | 39.33\*\* | 46.67\*\* | 46.00\*\* | 13.06 | 1.17\*\* | **71.33\*\*** | 3.37 | 47.67\*\* | 18.00 | 12.10\*\* | 87.80 | 1.17\*\* | 16.77 | 217.57\*\* |
| 13. | BRO -2 | 4.17\*\* | 47.00 | 54.667 | 52.00 | **13.47** | 1.20\*\* | 123.00 | 4.37 | 61.43 | 22.00 | 13.07 | 86.63 | **1.13\*\*** | 14.20 | 287.00 |
| 14 | BCO-1 | 4.07\*\* | 40.33\*\* | 47.00\*\* | 47.00\*\* | 11.17 | 1.23\*\* | 90.00 | 5.23 | 61.67 | **24.67** | 16.17 | 75.74 | 1.43 | 12.13 | **398.63** |
| 15. | Sudha | 6.17 | 52.33 | 58.33 | 58.33 | 12.10 | 1.20\*\* | 97.00 | 4.03 | 64.67 | 22.67 | 12.10\*\* | 80.40 | 2.13 | 10.33\*\* | 273.30 |
| 16. | Sarita | 4.23\*\* | 49.00 | 56.00 | 57.33 | 13.30 | 1.33 | 61.67\*\* | **5.40** | 47.67\*\* | 20.00 | 14.57 | 82.20 | 1.37 | 10.37\*\* | 290.80 |
| 17. | IC 14600 | 4.33\*\* | 50.33 | 57.33 | 57.00 | 9.53\*\* | 1.20\*\* | 104.33 | 3.23 | 71.67 | 18.00 | **11.10\*\*** | 77.51 | 2.17 | 15.07 | 200.00\*\* |
| 18. | IC 18544 | 5.07 | **38.00\*\*** | **45.33\*\*** | 44.67\*\* | 9.27\*\* | 1.17\*\* | 101.33 | 3.10 | 59.00 | 16.00\*\* | 13.13 | 88.06 | 1.67 | 11.50 | 209.53\*\* |
| 19. | IC 18960 | 9.27 | 43.67 | 49.67 | 49.67 | 9.97\*\* | 1.33 | 84.33 | 4.30 | **47.00\*\*** | 18.00 | 12.00\*\* | 74.66\*\* | 2.13 | 10.63 | 216.07\*\* |
| 20. | IC 22232 | 6.03 | 49.33 | 56.00 | 55.00 | 11.33 | 1.37 | 82.00 | 3.50 | 39.67\*\* | 16.00\*\* | 15.60 | 75.70\*\* | 1.20\*\* | 15.63 | 248.00 |
| 21. | IC 22285 | 5.10 | 38.33\*\* | 46.00\*\* | **44.67\*\*** | 12.57 | 1.27\*\* | 97.33 | 3.13 | 66.00 | 19.00 | 15.00 | 81.32 | 2.53 | 12.33 | 284.27 |
| 22. | IC 27874 | 5.43 | 41.67 | 49.33 | 49.33\*\* | 12.47 | 1.23\*\* | 115.00 | 5.06 | 63.00 | 19.00 | 13.07 | 74.76\*\* | 3.27 | 11.40 | 247.87 |
| 23. | IC 32855 | 5.87 | 38.33 | 45.67\*\* | 45.67\*\* | 10.63 | 1.10\*\* | 109.00 | 4.16 | 53.00\*\* | 20.33 | 13.80 | 77.95 | 2.53 | 13.33 | 280.20 |
| 24. | IC 27898 | 5.00 | 49.33\*\* | 55.67 | 55.00 | 12.50 | 1.50 | 96.00 | 5.30 | 70.00 | 15.00\*\* | 12.17\*\* | 88.17 | 1.17\*\* | **10.27** | **182.07** |
| 25. | IC 29117 | 5.00 | 40.33\*\* | 46.00\*\* | 46.33\*\* | 11.10 | 1.13\*\* | 121.00 | 4.20 | 51.67\*\* | 18.00 | 14.03 | 76.98 | 1.33 | 10.43\*\* | 252.27 |
| 26. | IC 29136 | 4.53\*\* | 40.67\*\* | 46.67\*\* | 47.33\*\* | 11.53 | 1.40 | 119.00 | 5.37 | 64.00 | 20.67 | 13.60 | 85.08 | **1.13\*\*** | 11.47 | 280.67 |
| 27 | IC 29168 | 5.00 | 44.67 | 52.33 | 50.67 | 12.43 | 1.27\*\* | 99.00 | 3.30 | 61.67 | 16.67\*\* | 15.93 | 84.86 | 1.23\*\* | 14.37 | 265.63 |
| 28. | Kashi Lalima(C) | 4.50\*\* | 41.67 | 49.00 | 50.33 | 11.70 | 1.40 | 119.66 | 3.47 | 68.00 | 21.00 | 17.13 | 74.75\*\* | 1.17 | **19.67** | 360.07 |
| 29. | Pusa Sawani (C) | 4.53\*\* | 43.33 | 49.67 | 50.33 | 12.03 | 1.20\*\* | 97.00 | 3.13 | 75.33 | 20.00 | 14.20 | 77.50 | 2.33 | 11.30 | 284.93 |
| 30. | Kashi Kranti (C) | 5.00 | 43.33 | 51.67 | 49.33\*\* | 12.20 | 1.40 | 113.00 | 2.97 | 99.00 | 23.00 | 15.30 | 87.99 | 2.13 | 18.37 | 351.17 |
| General Mean | | **5.82** | **44.38** | **51.38** | **51.08** | **11.55** | **1.28** | **97.98** | **3.82** | **65.23** | **18.55** | **14.31** | **80.69** | **1.81** | **12.92** | **264.95** |
| Range Max. | | 10.03 | 55.33 | 61.00 | 61.00 | 13.47 | 1.67 | 137.00 | 5.40 | 102.33 | 24.67 | 18.63 | 88.33 | 4.13 | 19.67 | 398.63 |
| Range Min. | | 4.07 | 38.00 | 45.33 | 44.67 | 8.77 | 1.10 | 71.33 | 2.43 | 47.00 | 14.53 | 11.10 | 74.65 | 1.13 | 10.27 | 182.07 |
| CD. (%) | | 0.56 | 3.66 | 2.92 | 4.72 | 1.69 | 0.20 | 5.77 | 0.47 | 6.49 | 2.60 | 1.85 | 1.50 | 0.10 | 0.32 | 39.89 |
| SE(m±) | | 0.196 | 1.29 | 1.03 | 1.66 | 0.60 | 0.07 | 2.03 | 0.17 | 2.29 | 0.92 | 0.65 | 0.53 | 0.04 | 0.11 | 14.07 |
| CV. (%) | | 5.84 | 5.03 | 3.47 | 5.64 | 8.94 | 9.51 | 3.59 | 7.50 | 6.07 | 8.54 | 7.89 | 1.14 | 3.33 | 1.53 | 9.19 |

\*\* indicates 5% level of significance

**Table 4. Estimate of genetic variability for 15 characters in 30 okra genotypes.**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S.**  **No** | **Characters** | **Range** | | **Grand Mean** | **P. C.V. (%)** | **G. C.V. (%)** | **Heritability Broad Sense (%) h²b** | **G.A.** | **G.A. as % of Mean** |
| **Maximum** | **Minimum** |
| 1. | First flowering node | 10.03 | 4.07 | 5.82 | 30.93 | 30.37 | 96.44 | 3.58 | 61.44 |
| 2. | Days to first flowering | 55.33 | 38.00 | 44.38 | 11.36 | 10.18 | 80.42 | 8.35 | 18.81 |
| 3. | Days to 50% flowering | 61.00 | 45.33 | 51.38 | 9.28 | 8.61 | 86.02 | 8.45 | 16.45 |
| 4. | Days to first fruit picking | 61.00 | 44.67 | 51.08 | 9.93 | 8.18 | 67.75 | 7.08 | 13.87 |
| 5. | Fruit length (cm) | 13.47 | 8.77 | 11.55 | 13.91 | 10.66 | 58.69 | 1.94 | 16.82 |
| 6. | Fruit diameter (cm) | 1.67 | 1.10 | 1.28 | 13.22 | 9.18 | 48.21 | 0.17 | 12.96 |
| 7. | Plant height (cm) | 137.00 | 71.33 | 97.98 | 19.22 | 18.89 | 96.50 | 37.4 | 38.20 |
| 8. | No. of Branches/ plant | 5.40 | 2.43 | 3.82 | 23.90 | 22.69 | 90.16 | 1.70 | 44.38 |
| 9. | Plant canopy width (cm) | 102.33 | 47.00 | 65.23 | 23.84 | 23.05 | 93.51 | 29.95 | 45.91 |
| 10. | Number of fruits/ plant | 24.67 | 14.53 | 18.55 | 15.40 | 12.81 | 69.21 | 4.07 | 21.95 |
| 11. | Average fruit weight (g) | 18.63 | 11.10 | 14.31 | 14.29 | 11.91 | 69.50 | 2.93 | 20.46 |
| 12. | Moisture (%) | 88.33 | 74.65 | 88.33 | 6.41 | 6.31 | 96.87 | 10.32 | 12.79 |
| 13. | Crude fiber (%) | 4.13 | 1.13 | 1.81 | 40.91 | 40.77 | 99.34 | 1.52 | 83.66 |
| 14. | Ascorbic acid content (mg/100g FW | 19.67 | 10.27 | 12.92 | 20.50 | 20.45 | 99.44 | 5.43 | 42.01 |
| 15. | Fruit yield/ plant (g) | 398.63 | 182.07 | 264.95 | 20.39 | 18.20 | 79.69 | 88.67 | 33.47 |

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