

Assessment of different okra varieties ~~of okra~~ for yield, quality, and economical feasibility cultivated under-in the Hadoti region of South-East Rajasthan, India

ABSTRACT

The study focuses on the cultivation of okra, a prominent Indian vegetable with significance in both export and family consumption. Emphasizing the potential for increased okra production through the selection of high-yielding varieties, the research specifically targets the Hadoti region, aiming to identify varieties suitable for its agro-climatic conditions. The lack of such screening in the region prompted the study. The trial was conducted during the summer ~~seasons~~ of 2022 and 2023 at the Instructional Farm of Career Point University, Kota, Rajasthan, and the research evaluated 12 okra varieties using a randomized block design with three replications. The analysis of variance revealed significant differences among all varieties for various traits, including yield, quality, and **economical feasibility**. The study underscores the presence of a substantial varietal effect, offering insights into optimizing okra cultivation in the South-~~E~~east climatic conditions of Rajasthan's Hadoti region. The results showed the presence of a significant varietal effect. However, the present study demonstrated the superiority of Punjab Selection variety over other varieties in terms of maximum mean fruit length (13.07 cm), fruit diameter (3.77 cm) and fruit weight (15.56 g), minimum mean titratable acidity (0.22%), maximum TSS (3.18 °B), ascorbic acid (19.64 mg/100g) and mucilage content (0.91%), maximum mean fruit yield per plant (0.53 kg), fruit yield per plot (11.68 kg) and fruit yield per hectare (124.30 q). However, the net return of Rs. 248575 Rs./ha and 249325 Rs./ha along with benefit-cost ratio 5.02 and 5.05 in 2022 and 2023 respectively was also obtained from okra variety Punjab Selection.

KEYWORDS: *Assessment, Mucilage, TSS, Weight*

INTRODUCTION

Okra [*Abelmoschus esculentus* (L.) Moench] holds a significant position

among vegetables, known by various names globally such as lady's finger in England, Gumbo in the U.S.A., and Bhindi in India. In India, it stands as a crucial vegetable crop, cultivated for its tender green fruits during the summer and rainy seasons. Propagated through seeds, okra is valued for its delectable green fruits used in diverse culinary applications, including curries and soups. Notably remunerative, it surpasses leafy vegetables in economic returns. While not commonly consumed as a leafy vegetable in India, okra's roots and stems are utilized in the preparation of gur or jaggery. Ripe okra seeds find use as a coffee substitute in Turkey. Despite its economic importance, okra cultivation faces challenges, particularly from various insect pests and diseases such as jassid, fruit and shoot borer, powdery mildew, and yellow vein mosaic. The imperative to meet the growing world population's food requirements underscores the need for enhanced crop yield and resilience.

Okra is widely cultivated in plains of India mostly in Uttar Pradesh, Bihar, Orissa, West Bengal, Andhra Pradesh, Karnataka, and Assam. In India, okra shares a 5.28 million hectare area and 61.46 million tonnes of production with a productivity of 12.2 million tonnes per hectare (Anonymous, 2022). Rajasthan has a 1.3 million hectare area under okra cultivation with production of 8.34 million tonnes and productivity of 5.15 MT per ha (Anonymous, 2022)

The study's primary focus is to identify superior-performing okra varieties in the Hadoti region of Rajasthan, specifically tailored for the South-East climatic conditions. This research aims to pinpoint varieties that not only adapt well to the local environment but also demonstrate resistance to biotic and abiotic stresses, ensuring optimal yield and quality. The understanding that a variety excelling in one locality may not be suitable for another emphasizes the need for region-specific assessments to enhance okra cultivation and contribute to sustainable food production.

Materials and Methods

Location

Kota district is located at 25.18° N to 75.83° E Latitude in South Eastern Rajasthan. It covers an area of 221.36 km². Agro-climatically, the district falls in Zone V, known as Humid South Eastern Plain. The average rainfall in the region is 660.6. mm. The maximum temperature range in the summer is 40 to 48°C and a minimum of 1.0- 2.6°C during winter.:

Experimental Details

The present studies were carried out at the Department of Horticulture, School of Agricultural Sciences, Career Point University, Kota (Rajasthan) during the years 2022 and 2023. Twelve varieties of okra viz. Parbhani Kranti, Parbhani Bhindi, Arka Anamika, Shahiba, Shan, No. 55, Harita, Jhilmil, No. 64, Sonal, Shakti, and Punjab Selection were evaluated in randomized block design, replicated thrice. Raised bed planting system at 60 x 30 cm spacing was adapted to grow the crop. The FYM 20 tonnes and RDF 150:100:100 NPK applied per hectare respectively, as basal dose.

Comment [T1]: Mention the size of the beds.

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Comment [T3]: Spell out

Measurement of the yield parameters

Fruit yield per plant (kg) was calculated from ~~pickings~~ fresh marketable fruits ~~were done~~ from the five observational plants separately throughout the harvesting period at an interval of ~~3~~ three days. It was totaled and then the average yield per plant was worked out for each genotype. The fruits yield per plot (kg) harvested from all the plants in each plot including ~~5~~ the observational plants ~~were was~~ weighted at each harvest. The yield of fruit per hectare was obtained from yield per plot by multiplying with the factor.

$$\text{Fruit yield per ha (q)} = \frac{\text{Fruit yield per plot (kg)}}{\text{Gross plot area (m}^2\text{)}} \times \frac{10000 \text{ m}^2}{100}$$

Measurement of the quality parameters

The colour of the fruit was observed by visual observation and categorized into dark green light green and yellow green. The fruit length was measured from randomly selected five fruits from every genotype with the help of a scale and then the average was recorded. The widths of the randomly selected fruits were recorded with different positions such as at base, at middle, and ~~at~~ top with the help of a Vernier caliper and the average was worked out. The average fruit weight was calculated as the weight of fruit in grams from five fruits from observational plants that were selected randomly from each treatment and weighed. The total soluble solids content of the fruit was determined by using a digital hand refractometer. The acidity was determined by the method of A.O.A.C. (1990). The Ascorbic acid content of juice was determined ~~by~~ according to A.O.A.C. (1990). The mucilage was extracted by the method given

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advocated by Ahiakpa, *et al.* (2014).

Measurement of the economic feasibility

The cost of cultivation will be taken into account by calculating total expenses incurred for inputs such as seeds, fertilizers, and chemicals, to reach a particular level of output. Gross return is calculated as the total amount of revenue that can be obtained by the yield of okra during the total life-time of the plants. The gross returns are calculated by considering the prices of green fruit prevailing at the time of harvest. The net returns are calculated by deducting the cost of cultivation from the gross returns. The sale rate of okra was Rs. 25/kg.

Net returns (Rs.) = Gross income/ha (Rs.) – Total cost of cultivation/ha (Rs.)

The benefit-cost ratio will be calculated as follows;

$$\text{B:C ratio} = \frac{\text{Gross returns (Rs. ha-1)}}{\text{Cost of cultivation (Rs. ha-1)}}$$

RESULTS

Yield parameters of okra

The fruit yield was found significantly different during the both years 2022 and 2023. Significant differences were observed amongst the different varieties of okra with respect to concerning fruit yield per plant which ranged from 0.36 to 0.53 kg. The highest fruit yield per plant was recorded in “Punjab Selection” (0.53 kg) which was significantly higher over the rest of the varieties but at par to “Sonal” (0.49 kg), whereas, whereas the minimum fruit yield per plant (0.36 kg) was found in “Parbhani Bhindi.” The fruit yield per plot was found significantly different during the both years 2022 and 2023. Significant differences were observed amongst the different varieties of okra with respect to concerning fruit yield per plot which ranged from 9.48 to 11.68 kg. The maximum fruit yield per plot was recorded in “Punjab Selection” (11.68 kg) which was significantly highest over the rest of the varieties but at par to with “Sonal” (9.48 kg), whereas the minimum fruit yield per plot was found in “Parbhani Bhindi” (11.08 kg). The maximum mean fruit yield per hectare was recorded in “Punjab Selection” (124.30 q) which was significantly highest over the rest of the varieties but at par to with “Sonal” (121.52 q), whereas the minimum fruit yield per hectare was found in “Parbhani Bhindi” (103.74 q).

Comment [T5]: What type of statistical analysis was used to assess the significance of variation? Provide details in the methods.

Quality parameters of okra

The fruit length was found significantly different during the both years 2022 and 2023. Significant differences were observed amongst the different varieties of okra with respect to fruit length which ranged from 11.06 to 13.07 cm. The maximum fruit length was recorded in “Punjab Selection” (13.07 cm) which was significantly highest over the rest of the varieties but at par with “Sonal” (12.72 cm), whereas the minimum fruit length was found in “Parbhani bhindi” (11.06 cm). The maximum fruit diameter was recorded in “Punjab Selection” (3.77 cm) which was significantly highest over the rest of the varieties but at par with “Sonal” (2.97 cm), whereas the minimum fruit diameter was found in “Parbhani bhindi” (2.69 mm). The fruit weight was found significantly different during the both years 2022 and 2023. Significant differences were observed amongst the different varieties of okra with respect to fruit weight which ranged from 12.96 to 15.20 g. The maximum mean fruit weight was recorded in “Punjab Selection” (15.56 g) which was significantly highest over the rest of the varieties but at par with “Sonal” (15.20 g), whereas the minimum fruit weight (12.96 g) was found in “Parbhani Bhindi” (Table 1). The fruits of all the okra varieties were observed for qualitative trait study of fruit colour and fruits of all the varieties were found to be dark green in colour except “Shan, No.55 and Harita” which were light green in colour (Table 1).

The TSS in okra was found significantly different during the both years for 2022 and 2023. Significant differences were observed amongst the different varieties of okra with respect to TSS in which ranged from 1.60 to 3.18 °B. The maximum mean TSS in okra was recorded in “Punjab Selection” (3.18 °B) which was significantly highest over the rest of the varieties but at par with “Arka Anamika” (2.86 °B), whereas the minimum TSS in okra was found in “No. 64” (1.60 °B). The minimum mean acidity percentage in okra was recorded in “Punjab Selection” (0.22 %) which was significantly lowest over the rest of the varieties but at par with “Arka Anamika” (0.23 %), whereas the maximum acidity percentage in okra was found in “No. 64” (0.44 %). The highest ascorbic acid was recorded in “Punjab Selection” (19.64 mg/100g) which was significantly highest over the rest of the varieties but at par with “Arka Anamika” (18.37 mg/100g), whereas the minimum ascorbic acid was found in “No. 64” (14.82 mg/100g). The mucilage content was found significantly different during the both years 2022 and 2023. Significant differences were observed amongst the different varieties of okra with respect to mucilage content which ranged from 0.71 to 0.91 per-cent. The highest mean mucilage content was recorded in “Punjab Selection”

(0.91%) which was significantly highest over the rest of the varieties but at par ~~to~~-with “Arka Anamika” (0.85%), whereas the minimum mucilage content was found in “No. 64” (0.71 %).

Economic feasibility of okra

Higher ~~money~~-sale value and less cultivation cost ~~of cultivation~~ are desirable characteristics for getting higher returns. Hence, the economics of the genotypes was worked out. It is revealed from the data obtained that a significantly higher~~st~~ marketable fruit yield of 124.15 in 2022 and 124.45q/ha in 2023 was found ~~under for the~~ variety “Punjab Selection”. The net return of Rs 248575 Rs/ha and 249325 Rs/ha along with benefit-cost ratio 5.02 and 5.03 in 2022 and 2023 respectively was obtained under okra variety “Punjab Selection” followed by “Sonal” gave fruit yield 121.37 and 121.67 q /ha and net return of Rs 2,41,625/ha and 2,42,375 with benefit-cost ratio of 4.91 and 4.9203 in 2022 and 2023 respectively. While, the lowest marketable fruit yield 103.59 and 103.89 q/ha, and net return of Rs 1,97,175/ha and 1,97,925/ha along with benefit-cost ratios 4.19 and 4.20 03 in 2022 and 2023 respectively, ~~was~~-were recorded in genotype “Parbhani Bhindi” (Table 3 & 4).

Comment [T6]: Avoid repeating values that are already in the tables.

DISCUSSION

Significant differences were observed among the different varieties of okra with respect tofor the physical parameters *viz.* fruit length, fruit diameter, fruit weight, and colour of okra fruit, and yield parameters *viz.* fruit yield per plant, fruit yield per plot, and fruit yield per hectare. Chemical parameters *viz.* TSS, acidity, ascorbic acid, and mucilage percentage.

Comment [H7]: This sentence is incomplete.

The maximum fruit length at the marketable stage was found in “Punjab Selection” (13.07 cm) while the minimum fruit length was found in “Parbhani bhindi”(11.06 cm). The significant differences ~~for in~~ fruit length in the varieties may be due to their genetic makeup leading to differential synthesis, translocation, and accumulation of photosynthates in the sink (fruit). Similar results have been reported by Singh *et al.* (2013), Yonas *et al.*(2014), Chandramouli *et al.* (2016), Kumar *et al.* (2017), and Rajesh *et al.* (2018).

Comment [T8]: For the same varieties used in the study?

The thickest fruits (3.77 cm diameter) were recorded in ‘Arka Anamika’, while the thinnest (2.69 cm) in ‘Parbhani Kranti’. The fruit size (length and diameter) of okra at the marketable maturity stage is an important varietal characteristic that is primarily governed by its genotypic constitution and secondarily by the availability of water and nutrients coupled with the influence of the growing climate. The differences obtained in fruit diameter amongst

Comment [T9]: Cite suitable reference.

the varieties and hybrids of okra could be attributed to their genetic makeup and the prevailing environmental factors. Similar results have been reported by Akotkar *et al.* (2010) and Chandra *et al.* (2014).

The maximum mean fruit weight at the marketable maturity stage was recorded in 'Punjab Selection' (15.56 g), while the minimum mean fruit weight in 'Parbhani Bhindi' (12.96 g). The observed variation in fruit weight amongst the varieties and hybrids of okra might be due to their genetic makeup governing the fruit size and sink-source relationship in the diversion of photosynthates to the fruit. The results find support from Deepanshu and Shamad (2017) and Kumar *et al.* (2017).

The fruits of all the okra varieties were observed for qualitative trait study of fruit colour and fruits of all the varieties and hybrids were found to be dark green in colour except "Shan, No.55 and Harita" which were light green in colour.

Comment [T10]: Here discuss how the fruit colour is important and the factors that can influence fruit colour in okra.

The highest mean fruit yield per plant was recorded in "Punjab Selection" (0.53 kg) whereas the minimum fruit yield per plant was found in "Parbhani Bhindi" (0.36 kg). The yield per plant had a high positive genotypic and phenotypic correlation with the high number of branches per plant with more number of nodes on the plant, providing the site for fruit production. The observed variation in yield per plant amongst the varieties of okra might be due to their genetic makeup governing the number and size of fruits due to varying and sink-source relationships. The findings lend support from Akotkar *et al.* (2010) and Bagwale *et al.* (2016) for fruit yield per hectare; Mishra *et al.* (2015), Darshan *et al.* (2016), and Kumari *et al.* (2019) for fruit yield per plant and fruit yield per plot.

The maximum mean fruit yield per plot (11.68 kg) and estimated fruit yield per hectare (124.30 q) were recorded in 'Punjab Selection' whereas the lowest fruit yield per plot (11.08 kg) and per hectare (103.74 q) were recorded in 'Parbhani Bhindi'. It is evident from the results that fruit yield per plant had directly influenced the fruit yield per unit area which had a high positive correlation with fruit yield per plant for genotypic as well as phenotypic correlation. Similar results have been reported by Chandra *et al.* (2014), Deepanshu and Shamad (2017), and Chandramouli *et al.* (2016).

The minimum mean acidity percentage in okra was recorded in "Punjab Selection" (0.22 %) which was significantly lowest over the rest of the varieties while the maximum acidity percentage in okra was found in "No. 64" (0.44 %). Similarly maximum mean TSS in

okra was recorded in “Punjab Selection” (3.18 °B) which was significantly highest over rest of the varieties whereas the minimum mean TSS in okra was found in “No. 64” (1.60 °B). It is evident ~~that from~~ the results directly influenced the chemical quality of okra might be due to ~~for~~ genotypic correlation. The finding of Bendale *et al.* (2003), Yonas *et al.* (2014), and Priyanka *et al.* (2018) were similar to the present findings.

The ascorbic acid was found significantly different during the both years 2022 and 2023. The highest ascorbic acid was recorded in “Punjab Selection” (19.64 mg/100g) which was significantly highest over the rest of the varieties whereas the minimum ascorbic acid was found in “No. 64” (14.82 mg/100g). On the other hand highest mucilage content was recorded in “Punjab Selection” (0.91 %) whereas the minimum mucilage content was found in “No. 64” (0.71 %). It is evident from the results directly influenced the chemical quality of okra might be due to for genotypic correlation. Similar results have been reported by Chandra *et al.* (2014), Deepanshu and Shamad (2017), and Chandramouli *et al.* (2016).

Comment [H11]: Rewrite for clarity.

It is revealed from the data obtained that a significantly highest marketable fruit yield of 124.15 in 2022 and 124.45 q/ha in 2023. The net return of Rs 248575 Rs/ha and 249325 Rs/ha along with benefit-cost ratio 5.02 and 5.05 in 2022 and 2023 respectively was obtained under the okra variety “Punjab Selection” followed by “Sonal” gave fruit yield 121.37 and 121.67 q /ha and net return of Rs 2,41,625/ha and 2,42,375 with benefit-cost ratio of 4.91 and 4.9203 in 2022 and 2023 respectively. While, the lowest marketable fruit yield 103.59 and 103.89 q/ha and net return of Rs 1,97,175/ha and 1,97,925/ha along with benefit-cost ratios 4.19 and 4.20 in 2022 and 2023 respectively, ~~was-were~~ recorded in genotype “Parbhani Bhindi”. It is evident from the results that the maximum benefit-cost ratio had directly influenced ~~due to~~ the fruit yield per unit area which had high positive correlation with economic feasibility for genotypic as well as phenotypic correlation. Similar results have been reported by Chandra *et al.* (2014), Deepanshu and Shamad (2017), and Chandramouli *et al.* (2016).

CONCLUSION

Based on the overall effect the variety Punjab Selection was highest in terms of physical, chemical, and yield characteristics hence, variety Punjab Selection may be considered worth for better harvest of the crop under Hadoti region of South-East Rajasthan.

REFERENCES

Ahiakpa JK, Amoatey HM and Amenorpe G (2014). Mucilage content of 21 accessions of okra. *Sci. Agri.*, **2** (2): 96-101.

Akotkar PK, De DK and Pal AK (2010). Genetic variability and diversity in okra [*Abelmoschus esculentus* (L.) Moench]. *Electronic Journal of Plant Breeding*, 1(4): 393-398.

Anonymous, (2022). *Horticulture Statistics at a Glance*. Ministry of Agriculture and Farmers Welfare (Department of Agriculture, Cooperation and Farmers Welfare) Krishi Bhawan, New Delhi.

AOAC (1990). Official Methods of Analysis. *Association of Official Analytical Chemists*, AOAC, Benjamin Franklin Station, Washington D.C.

Bagwale SB, Jawale LN, Deosarkar DB and Jadhav RA (2016). Genetic variability studies for yield, yield contributing and quality traits in okra [*Abelmoschus esculentus* (L.) Moench]. *Indian Journal of Agricultural Research*, **50** (6): 614-618.

Bendale VW, Kadam SR, Bhawe SG, Mehta JL and Pethe UB (2003). Genetic variability and correlation studies in okra [*Abelmoschus esculentus* (L.) Moench]. *Oriental Journal of Horticulture*, **31**(2): 1-4.

Chandra S, Bhardwaj M, Kumar R, Kumar D, Kumar S, Gautam N, Dogra Band Sharma S. (2014). Estimation of parameters of variability for different quantitative traits in okra [*Abelmoschus esculentus* (L.) Moench]. *International Journal of Farm Sciences*, **4**(3): 33-41.

Chandramouli B, Shrihari D, Rao AVDD and Rao MP (2016). Studies on genetic variability, heritability and genetic advance in okra [*Abelmoschus esculentus* (L.) Moench] genotypes. *Plant Archives*, **16**(2): 679-682.

Darsha S, Nikitha J and Arya K (2016). Genetic variability studies for yield and yield parameters in okra [*Abelmoschus esculentus* (L.) Moench]. *Advances in Life Sciences*, **5**(17): 6539-6541.

Deepanshand Shamad A (2017). Genetic variability, heritability and correlation coefficient in okra [*Abelmoschus esculentus* (L.) Moench] in Allahabad agro

climatic conditions. *Plant Archives*, **17**(2):1597-1602.

Kumar A, Kumar R, Kumar A, Tyagi S, Solankey SS, Roy C and Verma RB
(2017). Studies on the performance and morphological characterization of okra [*Abelmoschus esculentus* L. Moench] genotypes for yield and yellow vein mosaic viruses. *International Journal of Current Microbiology and Applied Sciences*, **6**(7): 1102-1106.

Kumari A, Singh VK, Kumari Mand Kumar A (2019). Genetic variability, correlation and path coefficient analysis for yield and quality traits in okra [*Abelmoschus esculentus* (L.) Moench]. *International Journal of Current Microbiology and Applied Sciences*, **8**(6): 918-926.

Mishra A, Mishra HN, Senapati N and Tripathy P
(2015). Genetic variability and correlation studies in okra [*Abelmoschus esculentus* (L.) Moench]. *Electronic Journal of Plant Breeding*, **6**(3): 866-869.

Priyanka DV, Reddy MT, Begum H, Sunil N and Jayaprada M (2018). Studies on genetic variability, heritability and genetic advance in genotypes of okra [*Abelmoschus esculentus* (L.) Moench]. *International Journal of Current Microbiology and Applied Sciences*, **7**(5): 401-411.

Rajesh J, Prasad VM and Ranganna G. (2018). Evaluation of okra [*Abelmoschus esculentus* (L.) Moench.] hybrids for yield and economics under Allahabad agro climatic condition. *International Journal of Chemical Studies*, **7**(1): 323-325.

Singh B, Yadav RC, Pal AK, Rao RGS and Rai M (2003). Fruit and seed quality development in okra. *Veg. Sci.* **30**(1): 60-63.

Yonas M, Garede W and Debela A (2014). Variability and association of quantitative characters among okra [*Abelmoschus esculentus* (L.) Moench] collection in South Western Ethiopia. *Journal of Biological Science*, **14**(5): 336-342.

Table 4.1 Performance of different varieties of okra with respect to physical parameters

Treatment	Varieties	Fruit length (cm)			Fruit diameter (cm)			Fruit weight (cm)		
		2022	2023	Pooled	2022	2023	Pooled	2022	2023	Pooled
T ₁	Parbhani Kranti	11.98	12.41	12.20	3.05	3.26	3.16	13.50	13.80	13.65
T ₂	Parbhani Bhindi	10.84	11.27	11.06	2.58	2.79	2.69	12.81	13.11	12.96
T ₃	Arka Anamika	12.42	12.85	12.64	3.42	3.63	3.53	14.95	15.25	15.10
T ₄	Shahiba	12.06	12.49	12.28	3.17	3.38	3.28	14.92	15.22	15.07
T ₅	Shan	11.14	11.57	11.36	2.63	2.84	2.74	13.35	13.65	13.50
T ₆	No. 55	11.53	11.96	11.75	2.71	2.92	2.82	13.75	14.05	13.90
T ₇	Harita	11.43	11.86	11.65	2.81	3.02	2.92	13.49	13.79	13.64
T ₈	Jhilmil	11.56	11.99	11.78	2.90	3.11	3.01	13.67	13.97	13.82
T ₉	No. 64	12.13	12.56	12.35	2.53	2.74	2.64	13.86	14.16	14.01
T ₁₀	Sonal	12.50	12.93	12.72	3.54	3.75	3.65	15.05	15.35	15.20
T ₁₁	Shakti	12.46	12.89	12.68	2.86	3.07	2.97	13.93	14.23	14.08
T ₁₂	Punjab Selection	12.85	13.28	13.07	3.66	3.87	3.77	15.41	15.71	15.56
	SEm±	0.33	0.34	0.35	0.24	0.17	0.16	0.47	0.51	0.35

	C.D.(p=0.05)	0.98	1.01	1.05	0.72	0.49	0.48	1.35	1.52	1.05
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Table 4.2 Performance of different varieties of okra with respect to yield parameters

Treatment	Varieties	Yield per plant (kg)			Yield per plot (kg)			Yield per hectare (q)		
		2022	2023	Pooled	2022	2023	Pooled	2022	2023	Pooled
T ₁	Parbhani Kranti	0.41	0.43	0.42	9.37	9.69	9.53	104.15	104.45	104.30
T ₂	Parbhani Bhindi	0.42	0.44	0.36	9.32	9.64	9.48	103.59	103.89	103.74
T ₃	Arka Anamika	0.50	0.52	0.48	9.97	10.29	10.13	110.81	111.11	110.96
T ₄	Shahiba	0.46	0.48	0.47	9.72	10.04	9.88	108.04	108.34	108.19
T ₅	Shan	0.36	0.38	0.37	9.51	9.83	9.67	105.70	106.00	105.85
T ₆	No. 55	0.38	0.40	0.39	9.40	9.72	9.56	104.48	104.78	104.63
T ₇	Harita	0.41	0.43	0.42	9.99	10.31	10.15	111.04	111.34	111.19
T ₈	Jhilmil	0.40	0.42	0.41	9.92	10.24	10.08	110.26	110.56	110.41
T ₉	No. 64	0.38	0.40	0.39	10.12	10.44	10.29	112.48	112.78	112.63
T ₁₀	Sonal	0.48	0.50	0.49	10.92	11.24	11.08	121.37	121.67	121.52
T ₁₁	Shakti	0.34	0.43	0.41	10.23	10.55	10.39	113.70	114.00	113.85
T ₁₂	Punjab Selection	0.52	0.54	0.53	11.17	11.49	11.67	124.15	124.45	124.30
	SEm±	0.04	0.02	0.03	0.33	0.35	0.51	2.01	1.66	2.44
	C.D.(p=0.05)	0.11	0.06	0.09	0.98	1.05	1.50	5.90	4.89	6.59

Table 4.3 Performance of different varieties of okra with respect to colour and chemical parameters

Treatment	Varieties	Fruit colour			Acidity (%)			TSS (B ⁰)		
		2022	2023	Pooled	2022	2023	Pooled	2022	2023	Pooled
T ₁	Parbhani Kranti	Dark green	Dark green	Dark green	0.35	0.36	0.36	2.52	2.67	2.60
T ₂	Parbhani Bhindi	Dark green	Dark green	Dark green	0.36	0.37	0.37	2.67	2.82	2.75
T ₃	Arka Anamika	Dark green	Dark green	Dark green	0.22	0.23	0.23	2.78	2.93	2.86
T ₄	Shahiba	Dark green	Dark green	Dark green	0.28	0.29	0.29	1.92	2.07	2.00
T ₅	Shan	Light green	Light green	Light green	0.23	0.24	0.24	1.70	1.85	1.78
T ₆	No. 55	Light green	Light green	Light green	0.37	0.38	0.38	1.57	1.72	1.65
T ₇	Harita	Light green	Light green	Light green	0.25	0.26	0.26	1.82	1.97	1.90
T ₈	Jhilmil	Dark green	Dark green	Dark green	0.33	0.34	0.34	2.32	2.47	2.40
T ₉	No. 64	Dark green	Dark green	Dark green	0.43	0.44	0.44	1.52	1.67	1.60
T ₁₀	Sonal	Dark green	Dark green	Dark green	0.34	0.35	0.35	2.43	2.58	2.51
T ₁₁	Shakti	Dark green	Dark green	Dark green	0.32	0.33	0.33	1.97	2.12	2.05
T ₁₂	Punjab Selection	Dark green	Dark green	Dark green	0.21	0.22	0.22	3.10	3.25	3.18

	SEm±	-	-	-	0.04	0.03	0.01	0.22	0.16	0.24
	C.D.(p=0.05)	-	-	-	0.11	0.10	0.04	0.65	0.48	0.72

Table 4.4 Performance of different varieties of okra with respect to chemical parameters

Treatment	Varieties	Ascorbic Acid (mg/100g)			Mucilage (%)		
		2022	2023	Pooled	2022	2023	Pooled
T ₁	Parbhani Kranti	17.47	17.77	17.62	0.77	0.88	0.83
T ₂	Parbhani Bhindi	17.82	18.12	17.97	0.78	0.89	0.84
T ₃	Arka Anamika	18.22	18.52	18.37	0.79	0.90	0.85
T ₄	Shahiba	15.62	15.92	15.77	0.70	0.81	0.76
T ₅	Shan	15.07	15.37	15.22	0.65	0.76	0.71
T ₆	No. 55	16.82	17.12	16.97	0.64	0.75	0.70
T ₇	Harita	15.37	15.67	15.52	0.75	0.86	0.81
T ₈	Jhilmil	14.37	14.67	14.52	0.63	0.74	0.69
T ₉	No. 64	14.67	14.97	14.82	0.67	0.78	0.73
T ₁₀	Sonal	17.12	17.42	17.27	0.76	0.87	0.82
T ₁₁	Shakti	15.92	16.22	16.07	0.74	0.85	0.80
T ₁₂	Punjab Selection	19.42	19.72	19.57	0.85	0.96	0.91
	SEm±	0.50	0.80	0.44	0.02	0.04	0.02
	C.D.(p=0.05)	1.46	2.33	1.31	0.06	0.12	0.08

Table 4.5 Economics of different varieties for okra (2022).

Treatments symbol	Treatments	Fruit yield (q/ha)	Cost of Cultivation (Rs/ha)	Gross Returns (Rs/ha)	Net Returns (Rs/ha)	B:C ratio
T ₁	Parbhani Kranti	104.15	61800	260375	198575	4.21
T ₂	Parbhani Bhindi	103.59	61800	258975	197175	4.19
T ₃	Arka Anamika	110.81	61800	277025	215225	4.48
T ₄	Shahiba	108.04	61800	270100	208300	4.37
T ₅	Shan	105.70	61800	264250	202450	4.28
T ₆	No. 55	104.48	61800	261200	199400	4.23
T ₇	Harita	111.04	61800	277600	215800	4.49
T ₈	Jhilmil	110.26	61800	275650	213850	4.46
T ₉	No. 64	112.48	61800	281200	219400	4.55
T ₁₀	Sonal	121.37	61800	303425	241625	4.91
T ₁₁	Shakti	113.70	61800	284250	222450	4.60
T ₁₂	Punjab Selection	124.15	61800	310375	248575	5.02

Table 4.6 Economics of different varieties for okra (2023).

Treatments symbol	Treatments	Fruit yield (q/ha)	Cost of Cultivation (Rs/ha)	Gross Returns (Rs/ha)	Net Returns (Rs/ha)	B:C ratio
T₁	Parbhani Kranti	104.45	61800	261125	199325	4.23
T₂	Parbhani Bhindi	103.89	61800	259725	197925	4.20
T₃	Arka Anamika	111.11	61800	277775	215975	4.49
T₄	Shahiba	108.34	61800	270850	209050	4.38
T₅	Shan	106.00	61800	265000	203200	4.29
T₆	No. 55	104.78	61800	261950	200150	4.24
T₇	Harita	111.34	61800	278350	216550	4.50
T₈	Jhilmil	110.56	61800	276400	214600	4.47
T₉	No. 64	112.78	61800	281950	220150	4.56
T₁₀	Sonal	121.67	61800	304175	242375	4.92
T₁₁	Shakti	114.00	61800	285000	223200	4.61
T₁₂	Punjab Selection	124.45	61800	311125	249325	5.05

Comment [H12]: Combine with the previous table.