



Plant Archives

Journal homepage: <http://www.plantarchives.org>DOI Url : <https://doi.org/10.51470/PLANTARCHIVES.2026.v26.no.2.197>

ASSESSMENT OF GROWTH, YIELD AND FRUIT QUALITY TRAITS IN ACID LIME (*Citrus aurantifolia* SWINGLE) GENOTYPES

Shraddha R Wale^{1*}, S.B. Jadhav², B.T. Patil³, S.S. Dighe⁴, and R.B. Kadu⁴¹Department of Horticulture, MPKV, Rahuri, Maharashtra, India.²AICRP on Floriculture, ZARS, Ganeshkhind, Pune, Maharashtra, India.³AICVIP, MPKV, Rahuri, Maharashtra, India.⁴AICRP on Fruits, MPKV, Rahuri, Maharashtra, India.*Corresponding author E-mail: shraddhawale99@gmail.com

(Date of Receiving-18-07-2026; Date of Revision-12-09-2026; Date of Acceptance-22-09-2026)

ABSTRACT

An experiment was conducted during 2024–25 at the AICRP on Fruits, MPKV, Rahuri, to evaluate eighteen acid lime (*Citrus aurantifolia* Swingle) genotypes for growth, yield and fruit quality traits. Significant variability was observed among the genotypes for all the characters studied. NRCC Nimboo-3 recorded the maximum plant height (3.54 m), leaf width (45.15 mm), fruit yield (84.75 kg tree⁻¹ or 23.57 t ha⁻¹), ascorbic acid content (37.73 mg 100 g⁻¹) and juice content (52.32%). TAL-94/13 exhibited the highest tree spread (5.05 m E–W and 4.96 m N–S), canopy volume (69.47 m³), total soluble solids (7.95 °Brix) and TSS ratio (1.37). Selection No. 4 recorded the maximum stem girth (54.72 cm), fruit diameter (45.92 mm) and titratable acidity (7.90 %). Akola lime produced the heaviest fruits (51.26 g), longest fruits (48.72 mm), maximum leaf length (64.08 mm) and largest leaf area (22.28 cm²), while Sai Sharbati recorded the minimum number of seeds per fruit (6.80) and seed weight (0.61 g). Based on the overall performance, NRCC Nimboo-3 emerged as the most promising genotype for commercial cultivation owing to its superior growth, yield and fruit quality, followed by Selection No. 4, Phule Sharbati, Sai Sharbati and TAL-94/13.

Key words: Acid lime, Genotypes, Evaluation, Yield, Quality.

Introduction

Acid lime (*Citrus aurantifolia* Swingle), commonly known as key lime, is an important evergreen, ever-bearing fruit crop of the family Rutaceae. It is a diploid species (2n = 18) and is believed to have originated in Southeast Asia, particularly India and Southeast China (Prasanna *et al.*, 2023a). Owing to its wide adaptability and year-round bearing habit, acid lime is extensively cultivated in tropical and subtropical regions of India, especially Maharashtra, Andhra Pradesh, Gujarat and Tamil Nadu (Rajamanickam, 2023). In India, during 2025–26, citrus cultivation extended over 11,09,000 ha, producing 1,46,74,000 MT of fruits. Out of this, limes and lemons occupied 2,95,000 ha with a total production of 36,46,000 MT (Anon., 2026). The fruits are consumed fresh and processed into juice, squash, pickles and citric acid

products (Yadlod *et al.*, 2018), besides being an excellent source of vitamin C and several bioactive compounds with antioxidant and therapeutic properties (Maheshwari *et al.*, 2023; Rajeshwari and Khyadagi 2023).

Despite its commercial importance, acid lime production is constrained by a narrow genetic base, pest and disease incidence and variable adaptation to different agro-climatic conditions. Therefore, the assessment of genetic variability is essential for the identification of superior genotypes and the development of improved cultivars (Munankarmi *et al.*, 2014). Morphological characterization provides a simple and reliable approach for evaluating diversity. Hence, the present investigation was undertaken to evaluate acid lime genotypes for growth, yield and quality attributes to identify superior genotypes with higher productivity and to generate useful

information for future breeding programmes and commercial cultivation under Maharashtra conditions.

Materials and Methods

The study on “Evaluation of acid lime (*Citrus aurantifolia* Swingle) genotypes for growth, yield and quality parameters” was carried out during 2024–2025 at the All India Coordinated Research Project (AICRP) on Fruit Crops, Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri, Maharashtra, India. A total of 18 acid lime genotypes (Table 1) were evaluated in a Randomized Block Design (RBD) with two replications, maintaining a spacing of 6 × 6 m.

- **Tree characters:** The tree morphology was observed for tree height (m), tree spread (E-W and N-S) (m), trunk girth (cm) and canopy volume (m³).
- **Tree height:** Tree height was measured from the ground level to the tip of the leading shoot by using bamboo.
- **Tree spread:** The spread of tree was measured with the help of measuring tape, in east to west as well as from north to south direction.
- **Trunk girth:** Trunk girth was recorded at 15 cm above the ground level with the help of measuring tape.
- **Canopy volume:** Canopy volume was determined in accordance with Morse and Robertson, (1987). $CV = 0.5236 \times HD$, Where H = tree height, D = tree diameter.
- **Leaf characters:** The leaf characteristics were recorded for leaf length (mm), leaf width (mm) and leaf area (cm²).
- **Leaf length and width:** Leaf length was recorded from petiole base to lamina tip and leaf width was taken at the widest point with the help of Vernier caliper.
- **Leaf area:** The leaf area was measured with the help of leaf area meter.
- **Fruit characters:** Fruit characteristics were studied for fruit weight (g), fruit length (mm), fruit diameter (mm), yield per tree (kg/tree) and yield (t/ha).
- **Fruit weight:** Five fruits from each selected genotype were taken at random at the harvesting time and mean weight was calculated in grams by using analytical balance.
- **Fruit length and fruit diameter:** Fruit length and diameter were measured from mature,

healthy fruits collected from each treatment and replication. A uniform number of representative fruits were randomly selected. Fruit length (cm) was taken from the pedicel to the styler end and diameter (cm) at the widest equatorial portion using a Vernier caliper. Mean values were calculated and statistically analyzed to assess treatment differences.

- **Fruit yield:** Fruit yield was recorded from all plants in each treatment and replication at harvest. Mature fruits were collected and weighed using a digital balance in kg. Yield per hectare was estimated based on plant population per unit area.
- **Seed characters:** Seed description was based on average number of seeds per fruit, seed weight (g).
- **Number of seeds per fruit:** Seeds were extracted from five fruits of each tree of the respective genotype and then counted manually and average number was calculated.
- **Seed weight:** Average seed weight was calculated by weighing seeds from five fruits per tree on digital electric balance and the sum was averaged and expressed in gram.
- **Fruit quality characters:** The fruit quality of the acid lime genotypes was evaluated based on total soluble solids (TSS), titratable acidity, TSS:acidity ratio, juice content, ascorbic acid content and pH.
- **TSS, Titratable acidity, TSS to acid ratio:** Five healthy fruits were selected randomly from each tree at full maturity stage. A hand refractometer was employed to measure the total soluble solids (TSS). Fruit acidity was determined through a standard acid–alkali titration procedure, while ascorbic acid content and juice per cent were analyzed following the method outlined by Ranganna (1986). The pH of the juice was determined using a digital pH meter.

Statistical analysis

Data were analyzed using standard statistical procedures described by Panse and Sukhatme (1985). Treatment effects were tested at 5% significance, with CD values used for mean comparison.

Results and Discussion:

Tree characters

The growth parameters of 18 acid lime genotypes and mean values are depicted in Table 1. The findings

Table 1: Mean performance of acid lime genotypes for tree and leaf characters.

Genotypes	Tree height (m)	Tree spread (m)		Trunk girth (cm)	Canopy volume (m ³)	Leaf length (mm)	Leaf width (mm)	Leaf area (cm ²)
		East-West	North-South					
Phule Sharbati	3.39	4.91	4.95	51.42	65.84	60.32	41.34	19.92
Sai Sharbati	3.46	4.41	4.77	53.30	56.76	58.84	39.40	19.56
TAL-94/13	3.28	4.96	5.05	49.51	69.47	47.79	41.32	19.15
TAL-94/14	3.12	4.50	4.65	47.23	46.40	61.06	40.96	21.93
Akola lime	3.16	4.89	5.00	48.67	54.61	64.08	43.40	22.28
NRCC Nimboo-2	3.22	4.75	4.50	49.70	50.73	55.21	32.92	17.34
NRCC Nimboo-3	3.54	4.45	4.84	52.88	63.68	63.81	45.15	21.59
NRCC Nimboo-4	3.14	4.40	4.63	45.32	43.60	46.91	29.46	15.57
KL-12	3.26	3.93	4.55	47.56	42.80	53.87	28.87	16.44
Selection No. 1	2.70	3.05	3.76	41.45	23.67	47.53	23.53	13.56
Selection No. 2	3.23	4.00	4.56	43.86	38.93	58.86	35.79	19.24
Selection No. 3	3.42	4.94	5.03	51.64	65.40	61.13	42.26	18.59
Selection No. 4	3.52	4.60	4.97	54.72	61.55	62.63	42.79	19.98
Selection No. 5	3.30	4.64	4.68	46.14	56.91	59.70	36.86	19.20
Selection No. 6	3.09	4.87	5.04	40.26	62.79	60.06	35.87	17.56
Selection No. 7	2.49	4.35	4.69	39.32	37.25	44.57	22.98	12.37
Selection No. 8	2.65	3.65	4.05	43.15	24.25	60.81	35.89	20.08
Selection No. 9	2.90	4.66	4.74	41.32	48.50	58.61	32.92	19.92
Mean	3.16	4.44	4.69	47.08	50.73	56.99	36.20	18.57
S.E.(m)±	0.15	0.21	0.22	2.96	3.74	3.26	2.15	1.39
CD at 5%	0.44	0.62	0.67	8.85	11.15	9.71	6.41	4.15

revealed that among the 18 acid lime genotypes, NRCC Nimboo-3 recorded the highest tree height of 3.54 m while the Selection No. 7 registered the lowest tree height of 2.49 m. The observed variation in tree height may be attributed to genetic differences and the inherent vigour of the genotypes. This is in concurrence with the earlier findings of Ranpise (1993), Prasanna *et al.*, (2023a), Rajamanickam (2023) and Nyamagoud *et al.*, (2025) in acid lime. In the present study, the highest tree spread was recorded in genotype TAL-94/13 (4.96 m E-W; 5.05 m N-S), while the lowest tree spread was noted in Selection No. 1 (3.05 m E-W; 3.76 m N-S).

Regarding trunk girth, the highest values was exhibited in Selection No. 4 (54.72 cm) whereas, the lowest was found in Selection No. 7 (39.32 cm). Variation in trunk girth among genotypes is mainly due to differences in cambial activity and it indicates vigorous growth and greater photosynthate accumulation. Highest canopy volume was observed in TAL-94/13 (69.47 m³) and the lowest in Selection No. 1 (23.67 m³). Genotypes with greater height and spread generally produce larger canopies due to vigorous growth. Tree spread and canopy volume are important growth attributes that support branch development and fruit bearing, thereby contributing to yield. Similar observations have been reported by Ranpise (1993), Shinde *et al.*, (2004), Kamatyanatti *et al.*, (2016),

Yadlod *et al.*, (2018) and Rajamanickam *et al.*, (2024) in acid lime.

Leaf characters

The maximum leaf lamina length was observed in genotype Akola lime (64.08 mm) whereas the lowest length was registered in Selection No. 7 (44.57 mm). The genotype NRCC Nimboo-3 recorded the maximum leaf width of 45.15 mm, while the minimum value was observed in Selection No. 7 (22.98 mm) (Table 1). The variation observed in leaf traits among acid lime genotypes may be attributed to their genetic constitution and environmental influences, which is in agreement with the

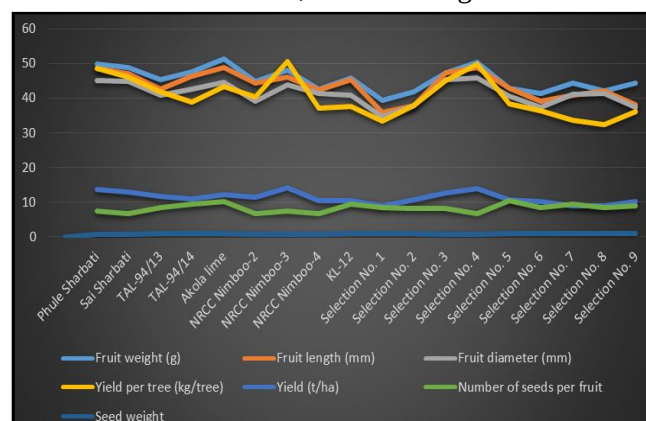
**Fig. 1:** Mean performance of acid lime genotypes for fruit and seed characters.

Table 2: Mean performance of acid lime genotypes for fruit and seed characters.

Genotypes	Fruit weight (g)	Fruit length (mm)	Fruit diameter (mm)	Yield per tree (kg/tree)	Yield (t/ha)	No. of seeds per fruit	Seed weight(g)
Phule Sharbati	49.79	48.51	45.08	48.62	13.52	7.50	0.78
Sai Sharbati	48.76	46.94	45.03	46.26	12.86	6.80	0.61
TAL-94/13	45.25	42.43	41.02	42.04	11.69	8.60	0.82
TAL-94/14	47.63	46.31	42.62	38.92	10.82	9.40	0.86
Akola lime	51.26	48.72	44.64	43.55	12.11	10.20	0.92
NRCC Nimboo-2	44.83	44.24	39.09	40.56	11.28	7.30	0.73
NRCC Nimboo-3	48.03	46.09	43.86	50.66	14.08	7.50	0.70
NRCC Nimboo-4	42.63	42.22	41.55	37.20	10.34	7.20	0.68
KL-12	45.70	45.25	41.01	37.61	10.46	9.50	0.88
Selection No. 1	39.25	35.96	34.58	33.60	9.34	8.40	0.80
Selection No. 2	41.83	37.75	37.92	37.89	10.53	8.30	0.82
Selection No. 3	47.17	47.29	45.49	45.21	12.57	8.30	0.78
Selection No. 4	50.17	48.63	45.92	49.85	13.86	7.30	0.71
Selection No. 5	42.72	42.76	40.60	38.46	10.69	10.50	0.92
Selection No. 6	41.33	39.10	37.48	36.36	10.11	8.60	0.81
Selection No. 7	44.18	40.70	41.18	33.71	9.37	9.40	0.85
Selection No. 8	42.16	41.94	41.50	32.36	9.00	8.50	0.83
Selection No. 9	44.27	38.06	37.52	36.10	10.03	9.00	0.86
Mean	45.38	43.49	41.45	40.50	11.26	7.50	0.80
S.E.(m)±	2.26	2.41	1.88	2.64	0.73	0.36	0.04
CD at 5%	6.76	7.20	5.62	7.88	2.19	1.07	0.13

findings of Mishra *et al.*, (2018), Sonwane (2019), Kumari (2020) and Kumari *et al.*, (2021) in acid lime. Akola lime exhibited the highest leaf area of 22.28 cm² and lowest was registered in Selection No. 7 (12.37 cm²). Larger leaf area enhances light interception and photosynthesis, resulting in greater carbohydrate production for vegetative growth, flowering and fruit development. Similar results were also recorded by Kamatyanatti *et al.*, (2016) and Shambhulingappa *et al.*, (2016), in acid lime

Fruit characters

In case of fruiting traits, significant variation was observed among the different acid lime genotypes (Table 2). The genotype Akola lime recorded the highest values of the traits such as fruit weight (51.26 g) and fruit length (48.72 mm), whereas the lowest values of fruiting traits registered in Selection No. 1 (39.25 g; 35.96 mm) 34.58 mm). Variation in fruit weight and fruit length among genotypes is mainly attributed to genetic differences, nutrient uptake, cell expansion and environmental conditions. The mean fruit diameter was significantly different among the acid lime genotypes (Fig. 1). The results revealed that Selection No. 4 recorded the highest fruit diameter (45.92 mm) whereas the lowest fruit diameter was noticed in Selection No. 1 (34.58 mm). This might be due to enhanced cell division and cell enlargement during fruit development, leading to greater accumulation of water and photosynthates in the fruits.

The variations in yield per tree (Table 2) was found to be significant for the 18 genotypes studied from a range of 57.88 to 84.75 kg/tree and the mean yield of 70.50 kg/tree (Table 2). NRCC Nimboo-3 produced the maximum total yield (84.75 kg/tree) and was statistically at par with Selection No. 4, Phule Sharbati, Sai Sharbati, Selection No. 3 and TAL-94/13, reflecting their superior yield potential. However, the lowest total yield was recorded in Selection No. 8 (57.88 kg/tree). Total yield per hectare (Table 2) varied from 16.08 to 23.57 t/ha with a mean of 19.60 t/ha. NRCC Nimboo-3 (23.57 t/ha) recorded the maximum total yield and was at par with Selection No. 4 (23.42 t/ha), Phule Sharbati (22.67 t/ha), Selection No. 3 (21.73 t/ha) and Sai Sharbati (21.97 t/ha). In contrast, Selection No. 8 (16.08 t/ha) produced the lowest total

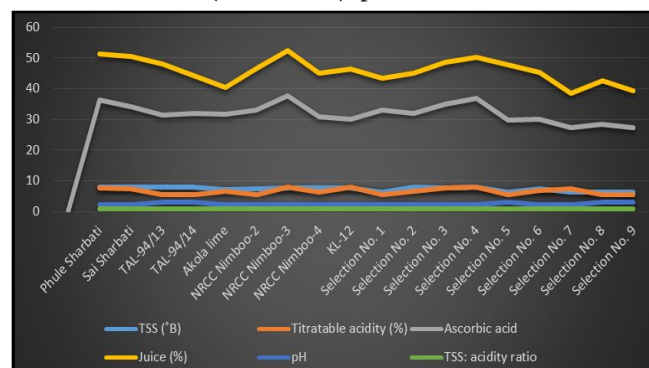
**Fig. 2:** Mean performance of acid lime genotypes for fruit quality characters.

Table 3: Mean performance of acid lime genotypes for fruit quality characters.

Genotypes	TSS (°B)	Titrateable acidity (%)	Ascorbic acid (mg/100g)	Juice (%)	pH	TSS: acidity ratio
Phule Sharbati	7.87	7.73	36.24	51.20	2.40	1.02
Sai Sharbati	7.86	7.34	34.32	50.42	2.54	1.07
TAL-94/13	7.95	5.81	31.46	47.84	2.90	1.37
TAL-94/14	7.89	5.95	31.87	44.26	2.84	1.33
Akola lime	7.20	6.63	31.68	40.29	2.72	1.09
NRCC Nimboo-2	7.52	6.11	33.13	46.56	2.67	1.23
NRCC Nimboo-3	7.72	7.79	37.73	52.32	2.27	0.99
NRCC Nimboo-4	7.66	6.27	30.98	44.89	2.65	1.22
KL-12	7.73	7.88	30.14	46.24	2.49	0.98
Selection No. 1	6.93	6.07	33.06	43.26	2.80	1.14
Selection No. 2	7.82	6.49	32.12	45.06	2.79	1.20
Selection No. 3	7.56	7.64	34.94	48.43	2.32	0.99
Selection No. 4	7.90	7.90	36.92	50.18	2.21	1.00
Selection No. 5	6.82	5.93	29.88	47.76	2.88	1.15
Selection No. 6	7.42	6.76	30.08	45.20	2.70	1.10
Selection No. 7	6.88	7.37	27.39	38.51	2.53	0.93
Selection No. 8	6.99	5.55	28.41	42.62	2.93	1.26
Selection No. 9	6.39	5.37	27.24	39.26	2.96	1.19
Mean	7.45	6.70	32.09	45.79	2.64	1.13
S.E.(m)±	0.21	0.22	1.11	1.31	0.09	-
CD at 5%	0.62	0.67	3.33	3.91	0.26	-

yield. Yield is a complex polygenic trait influenced by both genetic and environmental factors. Variations in yield among acid lime genotypes may be attributed to differences in vegetative growth, fruiting behaviour and genetic potential. Since fruiting traits are closely associated with yield, genotypes exhibiting superior fruiting performance generally produce higher yields. This is in accordance with the earlier finding of Paithankar *et al.*, (2018), Sonwane (2019), Kumari *et al.*, (2022) and Rajamanickam (2023) in acid lime.

Seed characters

The number of seeds per fruit varied significantly and ranged from 6.80 to 10.50 with a mean of 8.46. The highest seeds per fruit registered in the Selection No. 5 (10.50) whereas the lowest seeds were observed in genotype Sai Sharbati (6.80). Seed weight varied from 0.61 to 0.92 g, with an average of 0.79 g. The lowest seed weight was recorded in Sai Sharbati (0.61 g) while, the highest was noted in Akola lime (0.92 g). Fewer seeds per fruit are considered a desirable trait in acid lime, as they increase the edible portion of the fruit. Similar findings were reported by Mishra *et al.*, (2018), Sonwane (2019) and Kumari *et al.*, (2021).

Fruit quality characters

Quality parameters such as TSS, acidity, TSS: acidity ratio, ascorbic acid content, fruit juice percentage and pH of juice were evaluated in all 18 genotypes and the

results presented in Table 3. The genotype TAL-94/13 recorded the highest TSS (7.95°Brix) followed by Selection No. 4 (7.90 °Brix) whereas the lowest TSS was exhibited in Selection No. 9 of 6.39 °Brix. The observed increase in TSS might result from the hydrolysis of starch and other complex carbohydrates into soluble sugars, leading to an increase in total soluble solids. This is in conformity with the findings of earlier workers Prasanna *et al.*, (2023b), Rajamanickam (2023), Rajeshwari and Khyadagi (2023) in acid lime. In the present study, highest acidity (7.90 %) was recorded in Selection No. 4 whereas the lowest in Selection No. 9 (5.37).

The highest TSS: acidity ratio was observed in TAL 94/13 (1.37), whereas Selection No. 7 recorded the lowest ratio (0.93). The TSS:acidity ratio is considered as a reliable index for assessing fruit quality. The current findings align with the results reported by Shrestha *et al.*, (2012) and Nyamagoud *et al.*, (2025) in acid lime. Regarding vitamin C content, NRCC Nimboo-3 had the highest value (37.73 mg/100g) followed by Selection No. 4 (36.92 mg/100g) while, Selection No. 9 had the lowest (27.24 mg/100g). Variation in ascorbic acid content among genotypes may be due to genetic differences and favourable seasonal conditions. Juice content was highest in NRCC Nimboo-3 (52.32 %) followed by Phule Sharbati (51.20 %) and lowest in Selection No. 7 (38.51%). The observed variation in juice content may be associated

with differences in pulp development and juice vesicle formation among genotypes. Selection No. 9 recorded the highest value of pH (2.96), whereas the lowest pH was noted in Selection No. 4 (2.21). This might be due to genotypic variation in acid synthesis and degradation during fruit development. This is in accordance with earlier findings of Shrestha *et al.*, (2012), Deshmukh *et al.*, (2015), Abhilash *et al.*, (2018) in acid lime.

Conclusion

The present investigation demonstrated considerable variability among the eighteen acid lime genotypes for growth, yield and fruit quality traits, indicating ample scope for the selection of superior genotypes. NRCC Nimboo-3 emerged as the most promising genotype owing to its superior plant growth, highest fruit yield, juice content and ascorbic acid content. Selection No. 4 exhibited desirable performance for stem girth, fruit diameter, fruit yield, titratable acidity and ascorbic acid content, while TAL-94/13 excelled in tree spread, canopy volume, total soluble solids and TSS: acidity ratio. Akola lime was superior for fruit size and leaf characteristics, whereas Sai Sharbati recorded the lowest seed number and seed weight. Overall, NRCC Nimboo-3, followed by Selection No. 4, Phule Sharbati, Sai Sharbati and TAL-94/13, showed superior performance and can be recommended for commercial cultivation and utilization in future acid lime improvement programmes.

Acknowledgement

The authors gratefully acknowledge the Department of Horticulture and AICRP on Fruits, MPKV, Rahuri for their support and for providing the necessary resources to carry out this experiment.

References

- Abhilash, K., Kerutagi M.G., Rashmi K., Satish D. and Naik N. (2018). Evaluation of the elite strains of acid lime (*Citrus aurantifolia* Swingle) for the growth and yield parameters. *International Journal of Current Microbiology and Applied Sciences*, **7**(7), 666-677.
- Anonymous (2026). Ministry of agriculture and Farmers Welfare. Govt. of India (2nd Adv. Estimates, 2025-26). <http://www.indiastat.com/data/agriculture/citrus/datayear/2026>
- Deshmukh, G.N., Alekar A.N. and Hirve P.S. (2015). Performance of acid lime varieties for Hasta Bahar under Akola conditions. *Journal of Horticulture*, **2**(2), 131.
- Kamatyanatti, M., Nagre P.K., Ramteke V. and Baghe M.M. (2016). Evaluation of acid lime (*Citrus aurantifolia* Swingle) genotypes during Hasth bahar for growth, yield and quality attributes. *The Ecoscan: an international quarterly journal of environmental sciences*, **9**, 277-283.
- Kumari, S. (2020). Morphological, biochemical and molecular characterization of indigenous lime genotypes of jammu region. Ph.D. thesis, submitted to Sher-e-Kashmir University of Agricultural Sciences and Technology of Jammu.
- Kumari, S., Sharma A., Salgotra R., Sharma M. and Singh P. (2021). Morphological studies of acid lime (*Citrus aurantifolia* Swingle) genotypes of north western regions of India. *Biological Forum-An International Journal*, **13**(4), 1020-1032.
- Kumari, S., Sharma A., Salgotra R., Sharma M., Gupta V., Panotra N. and Singh P. (2022). Variability analysis of seedling grown acid lime genotypes in the foot hills of north western himalayan regions of India. *Agricultural Mechanization in Asia*, **53**(05), 7839-7851.
- Maheswari, K., Prathap B. and Madhavi P. (2023). Flowering pattern and fruiting behaviour in acid lime (*Citrus aurantifolia* Swingle). *The Pharma Innovation Journal*, **12**(4), 2733-2735.
- Mishra, D.S., Singh S., Singh A.K. and Yadav V. (2018). Genetic variability in acid lime accessions from central Gujarat. *Indian Journal of Horticulture*, **75**(4), 703-708.
- Munankarmi, N.N., Shrestha R.L., Rana N., Shrestha J.K.C., Shrestha S. and Koirala R. (2014). Genetic diversity assessment of acid lime (*Citrus aurantifolia* Swingle) landraces of eastern Nepal using RAPD markers. *International Journal of Applied Sciences and Biotechnology*, **2**(3), 315-327.
- Nyamagoud, A., Thoke S., Hipparagi K., Golagi S., Hiremath V., Padashetti B. and Patil S.N. (2025). Evaluation of acid lime (*Citrus aurantifolia* swingle) varieties for growth, yield and quality parameters under northern dry zone of karnataka, india. *Plant Archives*, **25**(2), p2592.
- Paithankar, D.H., Nagre P., Ingle Megha Y.V. and Jadhao G.G. (2018). Evaluation of acid lime clones for growth yield and quality. *International Journal of Current Microbiology and Applied Sciences*, **6**, 2737-2745.
- Panse, V.G. and Sukhatme P.V. (1985). Statistical methods for Agricultural Workers. ICAR, Publication, New Delhi, 115-130.
- Prasanna, V.S.S.V., Madhavi M., Lakshmi L.M., Rajasekharam T., Amaravathi Y. and Krishna K.U. (2023a). Assessment of variability in qualitative and quantitative morphological characters of acid lime (*Citrus aurantifolia* Swingle) germplasm. *The Pharma Innovation Journal*, **12**(5), 2751-2757.
- Prasanna, V.S.S.V., Madhavi M., Lakshmi L.M., Rajasekharam T., Amaravathi Y. and Krishna K.U. (2023b). Assessment of variability in fruit, yield and biochemical characters of acid lime (*Citrus aurantifolia* Swingle) germplasm. *The Pharma Innovation Journal*, **12**(5), 4232-4238.
- Rajamanickam, C. (2023). Assessment of acid lime (*Citrus aurantifolia* Swingle) varieties for yield and quality traits. *Journal of Krishi Vigyan*, **11**(suppl), 1-4.
- Rajamanickam, C., Rangaraj T. and Sankar C. (2024). Evaluation of acid lime (*Citrus aurantifolia* Swingle) genotypes for growth, yield and quality traits. *International Journal*

- of *Plant and Soil Science*, **36(9)**, 516-524.
- Rajeshwari, F.K. and Khyadagi K. (2023). Quality attributes and nutrient composition of acid lime (*Citrus aurantifolia* Swingle) varieties. *The Pharma Innovation Journal*, **12(11)**, 384-388.
- Ranganna, S. (1986). *Handbook of analysis and quality control for fruit and vegetable products*. Tata McGraw-Hill Education.
- Ranpise, S.A. (1993). Assessment of Kagzi lime (*Citrus aurantifolia* Swingle) selections for yield and quality. Ph.D. Thesis, Mahatma Phule Krishi Vidyapeeth, Rahuri, India.
- Shambhulingappa, N., Patil D.R., Kulapati H., Patil S.N., Babu P., Nadaf A.M. and Kumar K.K. (2016). Studies on variability of growth and yield component in seedling strains of acid lime (*Citrus aurantifolia* Swingle). *Advances in Life Sciences*, **5(4)**, 1401-1408.
- Shinde N.N., Jature S.D., Patil M.B. and Shinde V.N. (2004). Seedless lime a promising mutant of acid lime. *Journal of Maharashtra Agriculture University*, **29(2)**, 227-228.
- Shrestha, R.L., Dhakal D.D., Gautum D.M., Paudyal K.P. and Shrestha S. (2012). Study of fruit diversity and selection of elite acid lime (*Citrus aurantifolia* Swingle) genotypes in Nepal. *American Journal of Plant Sciences*, **3(8)**, 1098-1104.
- Sonwane, R.G. (2019). Genetic diversity studies of acid lime genotypes using morphological and molecular markers. M.Sc. Thesis, submitted to Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola.
- Yadlod, S.S., Bhalerao R.V. and Pingle S.N. (2018). Variability studies of strains of kagzi lime (*Citrus aurantifolia* Swingle) in Latur district of Maharashtra, India. *Agricultural Science Digest-A Research Journal*, **38(1)**, 48-51.