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Evaluation of Acid Lime (*Citrus aurantifolia* Swingle) Genotypes for Growth, Yield and Quality Traits

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

A study on evaluation of acid lime genotypes for growth, yield and quality traits was carried out at Citrus Research Station, Vannikonenthal, Manur Taluk and Tirunelveli district, Tamil Nadu during the year 2021–2023. Twenty five acid lime genotypes were selected for the experiment. Observation on quantitative traits such as tree height (m), tree spread (m), canopy spread (m^2), tree girth (cm), leaf lamina length (mm), number of fruits/tree, mean fruit weight (g), fruit length (cm), fruit girth (cm), fruit volume (cc), number of seeds per fruit, yield/tree (kg) and qualitative traits such as total soluble solids (°Brix), acidity (%), juice content (ml), fruit juice percentage (%) and

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ascorbic acid content (mg/100g) were recorded. The present study results revealed that genotype SCA 19 recorded the highest values for the traits such as tree height (3.49 m), tree spread (3.58 m^2 E-W; 3.74 m^2 N-S), canopy spread (6.57 m^3), leaf lamina length (58.40 mm) and tree girth (13.66 cm). However, genotype SCA 06 registered the lowest tree spread character. In the case of yield traits, genotype SCA 19 registered the highest values in number of fruits per tree (1080), mean fruit weight (58.75 g), yield per tree (57.89 kg per tree), number of seeds (9.10), fruit length (8.50 cm), fruit girth (4.90 cm) and fruit volume (54.81 cc). Regarding quality traits, SCA 19 observed the highest values *viz.,* TSS (6.71˚Brix), acidity (6.78 %), ascorbic acid content (26.50 mg/100 g), fruit juice percentage (52.1 %) and juice content (46.0 ml). Hence, acid lime genotype SCA 19 recommended for further evaluation in different parts of Tamil Nadu.

Keywords: Acid lime; citrus aurantifolia; evaluation; genotypes; growth; quality; yield.

1. INTRODUCTION

Citrus is one of the most important fruit crops of the world and grown in more than 100 countries. India ranks first in production of acid lime in the word (2.54 million metric tonnes) and cultivated in an area of 0.282 million ha with productivity of 10.17 MT per ha. Acid lime (*Citrus aurantifolia* Swingle) is one of the most important fruits in India considered to be indigenous to India, and is extensively cultivated in many states under tropical and subtropical climatic conditions. India is the largest producer of acid lime in the world [1]. Acid lime also known as Kagzi lime (Nimboo), Mexican lime has gained more popularity, as it can be used to make pickles and seasonal cuisine in India and other zones of the world. In India, it is extensively cultivated in Maharashtra, Andhra Pradesh, Telangana, Karnataka, Tamil Nadu, Gujarat and Bihar. In Tamil Nadu, it is commercially cultivated at Tirunelveli, Tenkasi, Tuticorin, Perambalur, Madurai, Theni, Dindigul, Virudhunagar, Coimbatore and Vellore districts. In Tirunelveli district, acid lime fruits can be harvested throughout the year. In Tamil Nadu, acid lime can be cultivated 10,000 ha area. Demand of acid lime fruit is always higher round the year, particularly during the summer months when the price goes up and fetches higher prices. The fruits having bigger size with more juice content with less number of seeds are always in market demand. The variation among different acid lime cultivars with regard to growth, bearing habits, yield, colour and quality were reported by earlier works in different parts of the country [2,3,4,5]. Studies on performance of varieties of acid lime have been scanty in Tamil Nadu as well as many of the farmers are cultivating local types and not much research work is taken up in recent times. With this background, the present experiment on evaluation of acid lime genotypes for growth, yield and quality traits was conducted during 2021 – 2023.

2. MATERIALS AND METHODS

The present investigation was carried out at Citrus Research Station, Vannikonenthal, Manur Taluk, Tirunelveli district, Tamil Nadu during 2021 – 2023. The objective of the present experiment is to study the evaluation acid lime genotypes, extent of variability and to identify the high yielding and better performing genotypes. A total of 25 acid lime genotypes were used for the study. The place of collections of acid lime genotypes were presented in Table 1. The experiment was laid out in a randomized block design and replicated twice. The recommended cultivation practices were followed as per the crop production guide of Tamil Nadu Agricultural University, Coimbatore [6]. Observation on quantitative traits *viz.,* tree height (m), tree spread (m), canopy spread (m^2), tree girth (cm), leaf lamina length (mm), number of fruits/tree, mean fruit weight (g), fruit length (cm), fruit girth (cm), fruit volume (cc) and yield /tree (kg) were recorded. In addition, qualitative traits data such as total soluble solids (°Brix), acidity (%), juice content (ml), fruit juice percentage (%) and ascorbic acid content (mg/100g) were observed. Evaluation of total soluble solids (TSS) was estimated by the digital refractometer with results expressed in °Brix. Juice content, fruit juice percentage, acidity and ascorbic acid content were estimated using procedures described by Ranganna [7]. The data was subjected to statistical analysis as per the method was suggested by Panse and Sukhatme [8].

Table 1. Acid lime accessions collected from parts of Tamil Nadu were used in the study

Sl. No.	Accessions number	Place of collection
1.	SCA 1	Puliyankudi, Tenkasi
2.	SCA 2	Vannikonenthal, Manur, Tirunelveli
3.	SCA 3	Puthukulam, Kayathar, Tirunelveli
4.	SCA 4	Melaneelitha Nallur, Tirunelveli
5.	SCA 5	Vannikonenthal, Manur, Tirunelveli
6.	SCA 6	Koodalur, Vasudevanallur, Tenkasi
7.	SCA 7	Subramaniapuram, Puliyankudi, Tenkasi
8.	SCA 8	Muthaliarpatti, Ambasamuthiram, Tirunelveli
9.	SCA 9	Thiruviruthanpulli, Cheranmahadevi, Tirunelveli
10.	SCA 10	Thiruviruthanpulli, Cheranmahadevi, Tirunelveli
11.	SCA 11	Pattangadu, Cheranmahadevi, Tirunelveli
12.	SCA 12	Pattangadu, Cheranmahadevi, Tirunelveli
13.	SCA 13	Vadakkuveeravanallur, Cheranmahadevi, Tirunelveli
14.	SCA 14	Villichery, Kovilpatti, Thoothukudi
15.	SCA 15	Donalur, Valliyur, Tirunelveli
16.	SCA 16	Valasai, Villiseri, Thoothukudi
17.	SCA 17	Puliyankudi, Tenkasi
18.	SCA 18	Puliyankudi, Tenkasi
19.	SCA 19	Senthamaram, Puliyankudi, Tenkasi
20.	SCA 20	Karisalkulam, Sankarankovil, Tenkasi
21.	SCA 21	Karisalkulam, Sankarankovil, Tenkasi
22.	SCA 22	Punnaiyapuram, Kadayanallur, Tenkasi
23.	SCA 23	Punnaiyapuram, Kadayanallur, Tenkasi
24.	SCA 24	Punnaiyapuram, Kadayanallur, Tenkasi
25.	SCA 25	Chinthamani, Puliyankudi, Tenkasi

3. RESULTS AND DISCUSSION

3.1 Growth Traits

The growth parameters of 25 acid lime genotypes and mean values are depicted in Table 2. The significant variance was observed among the genotypes. The findings revealed that among the acid lime genotypes, SCA 19 recorded the highest tree height of 3.49 m followed by SCA 20 (3.28 m) while SCA 02 registered the lowest tree height of 2.45 m. The maximum height of the tree might be due to the vigorous growth and genetic influence. This is in concurrence with the earlier findings of Srinivas et al*.* [9] and Mahantesh et al*.,* [10] in acid lime. In the present study, the highest tree spread was recorded in genotype SCA 19 (3.58 m^2 E-W; 3.74 m^2 N-S) followed by SCA 25 (3.42 m^2 E-W; 3.60 m^2 N-S). The lowest tree spread was noticed in SCA 06 (2.61 m^2 E-W; 3.04 m^2 N-S). Regarding tree girth, the highest values was exhibited in genotype SCA 19 followed by SCA 20 (13.66 cm). The lowest tree girth was found in genotype SCA 01 (11.25 cm). The same trend was noticed in leaf lamina length also. The maximum leaf lamina length was observed in genotype SCA 19 (58.40 mm) whereas the lowest length was registered in genotype SCA 01 (44.20 mm). The maximum canopy volume exhibited in genotype SCA 19 (6.57 m^3) followed by genotype SCA 20 (6.49 m^3) whereas the lowest canopy volume was registered in genotype SCA 08 (4.17 m^3). The differences in the morphological traits in different genotypes of acid lime fruits are probably due to their genetic makeup as well as due to the influence of climatic factors. This is in accordance with the findings of Khurshid et al*.* [11]. Tree spread and tree volume is an important character which contributes significantly on yield of tree as it supports primary branches as well as secondary branches essential for fruit bearing. The present study report is in accordance with the findings of earlier workers Desai et al*.* [12] in Kagzi lime and Prasanna et al*.* [13] in acid lime.

3.2 Fruiting Traits

In the case of fruiting traits, significant variation was observed among the different acid lime genotypes (Table 3). Genotype SCA 19 recorded the highest values of the traits such as fruit length (8.50 cm), fruit width (4.90 cm) and fruit volume (54.81 cc) followed by SCA 23 (8.41 cm; 4.62 cm; 50.20 cc) whereas the lowest values of

fruiting traits registered in genotype SCA 01 (5.49 cm; 4.10 cm; 42.58 cc). The mean fruit weight was significantly different among the acid lime genotypes (Fig. 1). The results revealed that SCA 19 recorded the highest fruit weigh (58.62 g) followed by SCA 20 (53.36 g) whereas the lowest fruit weight was noticed in SCA 13 (45.30 g). This might be due to round the year flowering, fruiting, productive branchlets and canopy volume which lead to enhanced number of fruits per tree. The environmental conditions also influenced the variations among genotypes was observed on some of the fruiting traits. Fruiting characters directly correlated with the yield and have good market acceptability. This is in accordance with the earlier finding of Rajamanickam [5].

3.3 Yield Traits

The data clearly indicated that the treatments differed significantly with respect to the fruit yield (Fig. 2). Genotype SCA 19 recorded the highest yield of 57.89 kg per tree followed by SCA 25 (51.38). However, the lowest yield per tree was found in SCA 13 (30.51 g per tree). Wide variation was observed among the different genotypes with respect to growth and yield traits and this may be attributed to their genotypic differences. Saraswathy et al*.* [14] reported that great variation in fruit size was noticed in sapota. This is in conformity with the findings of earlier workers Kumar et al*.* [4] in acid lime; Rajamanickam [15] in tamarind. Regarding number of fruits per tree, significant differences were noticed among the acid lime genotypes (Fig. 3). In the present study, number of fruits per tree showed wide variance among the genotypes studied and ranged from 652 to 1080. The highest values was registered in genotype SCA 19 (1080 fruits/tree) and the lowest was noticed in SCA 1 (652 fruits/tree). More vegetative development leads to a faster rate of photosynthesis which produced more number of fruits per tree. This is in accordance with the findings of Prasanna et al*.* [13]

Table 2. Mean values of different growth characters of twenty five acid lime genotypes

S. No.	Genotypes	Tree height (m)	Tree spread (m^2)		Canopy volume (m^3)	Tree girth (cm)	leaf lamina length (mm)
			E-W	N-S			
1.	SCA 01	2.80	3.12	3.41	4.97	11.25	44.20
2.	SCA 02	2.85	3.09	3.46	4.36	11.32	55.30
3.	SAC 03	2.78	2.95	3.21	4.24	12.83	51.40
4.	SCA 04	2.95	2.85	3.14	4.40	13.21	52.20
5.	SCA 05	2.78	2.64	3.12	4.38	11.55	53.10
6.	SAC 06	3.10	2.61	3.04	4.27	11.50	56.30
7.	SCA 07	3.14	2.78	3.25	4.51	12.29	54.80
8.	SCA 08	2.89	2.70	3.21	4.17	11.26	55.10
9.	SAC 09	2.70	3.10	3.65	5.09	12.58	56.20
10.	SCA 10	2.85	3.24	3.52	5.33	13.18	53.60
11.	SCA 11	3.02	2.98	3.32	4.92	13.21	54.20
12.	SAC 12	2.80	3.14	3.45	5.01	12.86	57.80
13.	SCA 13	2.91	3.19	3.52	5.39	11.87	54.20
14.	SCA 14	2.49	2.91	3.55	4.33	12.45	55.30
15.	SAC 15	2.85	2.87	3.24	4.37	12.80	51.40
16.	SCA 16	2.96	3.16	3.47	5.35	12.49	48.90
17.	SCA 17	2.48	2.86	3.28	3.84	13.47	47.50
18.	SAC 18	2.85	3.40	3.39	5.53	12.92	49.30
19.	SCA 19	3.49	3.58	3.74	6.57	14.50	58.40
20.	SCA 20	3.28	3.29	3.54	6.49	13.66	51.41
21.	SAC 21	3.20	3.39	3.45	6.17	13.50	55.20
22.	SCA 22	3.12	3.25	3.49	5.99	13.40	54.20
23.	SCA 23	2.84	3.20	3.40	5.09	12.95	51.10
24.	SAC 24	2.95	2.90	3.20	4.52	12.55	53.30
25.	SCA 25	3.24	3.42	3.60	6.44	12.40	55.50
	SEd	0.0134	0.0148	0.0103	0.0462	0.0481	0.1888
	CD (P=0.05 %)	0.0380	0.0421	0.0293	0.1315	0.1367	0.5367

and Rajamanickam [16]. The number of seeds per fruit varied significantly and ranged from 4.64 to 9.10. The highest seeds per fruit registered in the genotype SCA19 (9.10) whereas the lowest seeds was observed in genotype SCA 11 (4.64). Rajamanickam [5] stated that the highest number of seeds per fruit was recorded in PKM1 variety under Sankarankovil conditions of Tamil Nadu.

3.4 Quality Traits

Quality parameters such as TSS, juice content, fruit juice percentage, acidity and ascorbic acid content were evaluated in all 25 genotypes and the results presented in Table 4. The genotype SCA 19 recorded the highest TSS (6.71˚Brix) followed by genotype SCA 25 (6.56 ˚Brix) whereas the lowest TSS was exhibited in genotype SCA 21 of 6.10 ˚Brix. The increase in TSS might be due to conversion of starch and their insoluble carbohydrate into soluble form of sugar which is responsible for increasing the TSS content [17]. This is in conformity with the findings of earlier worker Prasanna et al. [13] in acid lime. The fruit juice percentage (52.1 %) and juice content (46.0 ml) recorded the highest in genotype SCA 19 whereas the lowest juice percentage (36.54 %) and juice content (42.31ml) were noticed in SCA 05. This might be due to phenotypic characters of the genotype. In the present study, acidity (6.780 %) and ascorbic acid (26.50 mg/100 g) recorded the highest in genotype SCA 19 and the lowest acidity (6.15 %) and ascorbic acid content (23.41 mg/100 g) were observed in genotype SCA 14. The variation in ascorbic acid content may be attributed as a varietal character and due to favourability of seasonal conditions. This is in accordance with earlier findings of Srinivas et al. [9] in Kagzi lime; Mandal and Thokchom, [18] in mango.

Table 3. Mean values of fruiting and yield traits of twenty five acid lime genotypes

S. No.	Genotypes	Fruit length (cm)	Fruit width (cm)	Mean fruit weight (g)	Fruit volume (cc)	Number of fruits per tree	Number of seeds per fruit	Yield per tree (kg/tree)
1.	SCA 01	6.49	4.10	45.32	42.58	652	5.21	31.88
2.	SCA 02	6.82	4.70	47.02	44.38	742	6.45	33.28
3.	SAC 03	6.65	5.0	49.20	47.21	725	5.52	33.76
4.	SCA 04	6.70	4.30	51.30	48.90	698	5.23	33.37
5.	SCA 05	6.51	4.35	48.50	46.10	685	4.14	31.22
6.	SAC 06	6.84	4.51	51.42	48.52	669	8.07	32.50
7.	SCA 07	7.25	4.20	46.50	43.65	715	6.42	31.74
8.	SCA 08	7.50	4.25	50.42	43.20	840	7.30	36.08
9.	SAC 09	7.62	4.39	46.82	43.85	730	5.43	32.78
10.	SCA 10	7.10	3.89	45.89	48.89	690	5.24	30.64
11.	SCA 11	7.58	4.36	49.50	47.10	830	4.64	40.85
12.	SAC 12	7.80	4.32	51.10	48.30	765	6.51	38.91
13.	SCA 13	7.60	4.15	45.30	37.85	684	6.33	30.51
14.	SCA 14	8.20	4.12	45.60	43.54	720	4.80	31.83
15.	SAC 15	8.70	4.27	51.04	48.58	960	7.42	47.78
16.	SCA 16	7.30	4.21	51.33	49.80	1020	7.32	50.24
17.	SCA 17	6.90	4.00	50.88	47.69	1005	6.84	49.13
18.	SAC 18	7.60	3.90	52.39	50.13	940	6.91	47.46
19.	SCA 19	8.50	4.90	58.62	54.81	1080	9.10	57.89
20.	SCA 20	8.20	4.45	53.36	50.90	980	5.82	50.94
21.	SAC 21	8.14	4.30	50.80	48.10	945	6.41	46.06
22.	SCA 22	7.50	4.10	51.65	48.68	1030	7.64	51.10
23.	SCA 23	8.41	4.62	52.13	50.20	1010	7.43	50.65
24.	SAC 24	8.35	4.60	47.50	44.49	985	8.54	44.65
25.	SCA 25	8.20	4.40	52.33	49.80	1020	7.35	51.38
	SEd	0.0388	0.0123	0.1801	0.2023	8.4688	0.0423	0.5092
	CD (P=0.05%)	0.1104	0.0343	0.5121	0.5753	24.0807	0.0934	1.4479

Table 4. Mean values of quality parameters of twenty five acid lime genotypes

S. No.	Genotypes	Total Soluble Solids (ºBrix)	Juice content (ml/fruit)	Fruit juice percentage (%)	Acidity (%)	Ascorbic acid content (mg/100g)
1.	SCA 01	6.25	37.20	42.80	6.21	26.34
2.	SCA 02	6.37	44.60	42.60	6.60	24.50
3.	SAC 03	6.50	40.10	48.56	6.63	25.40
4.	SCA 04	6.47	39.20	43.67	6.40	26.10
5.	SCA 05	6.31	36.54	42.31	6.50	24.32
6.	SAC 06	6.50	37.50	46.02	6.521	25.54
7.	SCA 07	6.28	41.30	46.58	6.245	24.40
8.	SCA 08	6.42	42.50	44.47	6.43	26.20
9.	SAC 09	6.45	40.90	44.78	6.25	25.84
10.	SCA 10	6.39	38.80	45.66	6.32	24.50
11.	SCA 11	6.51	38.30	44.79	6.46	24.62
12.	SAC 12	6.30	39.50	45.54	6.38	25.30
13.	SCA 13	6.25	41.30	45.62	6.38	26.14
14.	SCA 14	6.41	40.10	43.80	6.15	23.41
15.	SAC 15	6.35	45.00	45.80	6.670	24.70
16.	SCA 16	6.54	40.40	42.58	6.552	25.40
17.	SCA 17	6.52	41.20	44.23	6.448	26.21
18.	SAC 18	6.20	45.00	45.41	6.748	26.00
19.	SCA 19	6.71	46.00	52.10	6.780	26.50
20.	SCA 20	6.31	39.80	51.65	6.424	25.20
21.	SAC 21	6.10	45.0	44.22	6.472	24.30
22.	SCA 22	6.35	39.0	48.10	6.48	25.40
23.	SCA 23	6.45	45.10	50.20	6.34	26.25
24.	SAC 24	6.38	44.10	47.05	6.64	25.60
25.	SCA 25	6.56	41.20	48.30	6.65	26.42
	SEd	0.0076	0.1606	0.1554	0.0096	0.0485
	CD (P=0.05 %)	0.0217	0.4566	0.4419	0.0272	0.1378

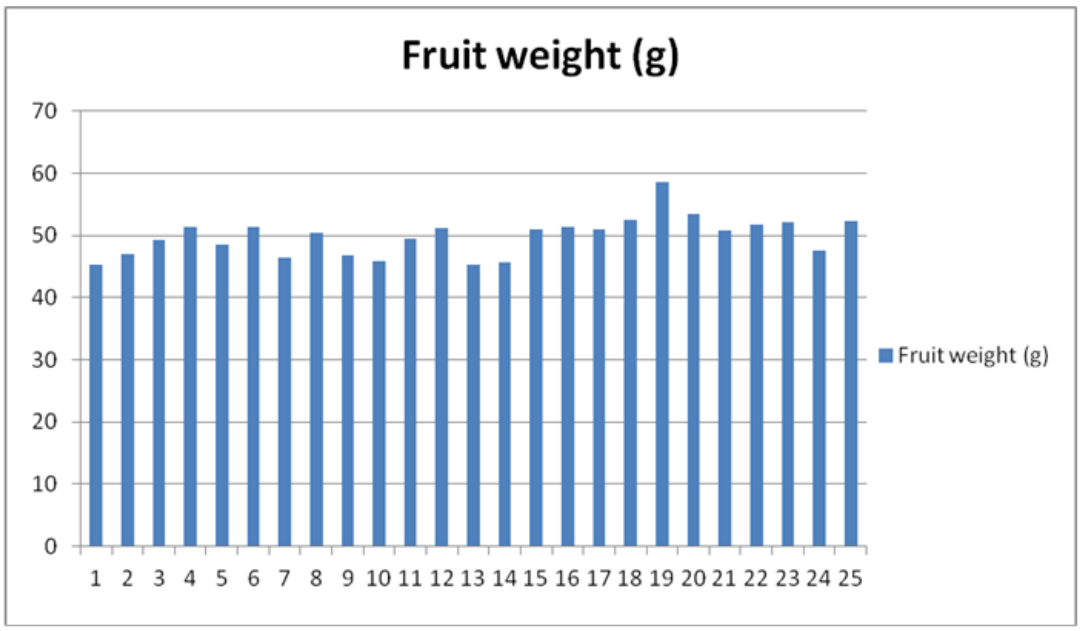

Fig. 1. Fruit weight (g) of twenty five acid lime genotypes

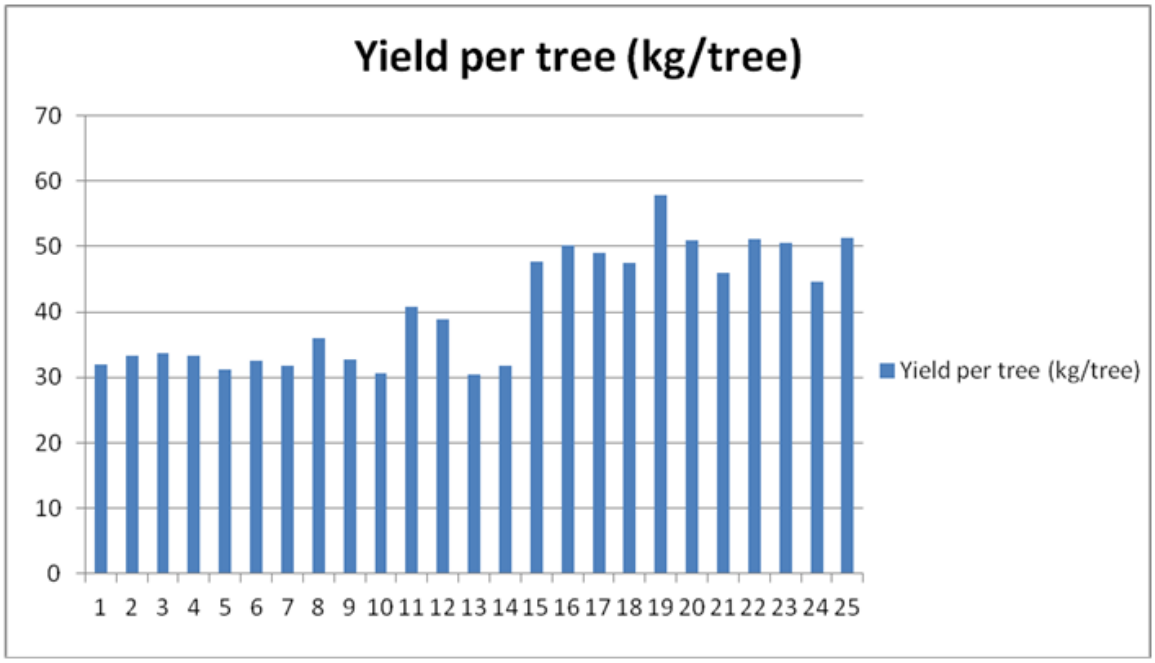

Fig. 2. Yield per tree (kg/tree) of twenty five acid lime genotypes

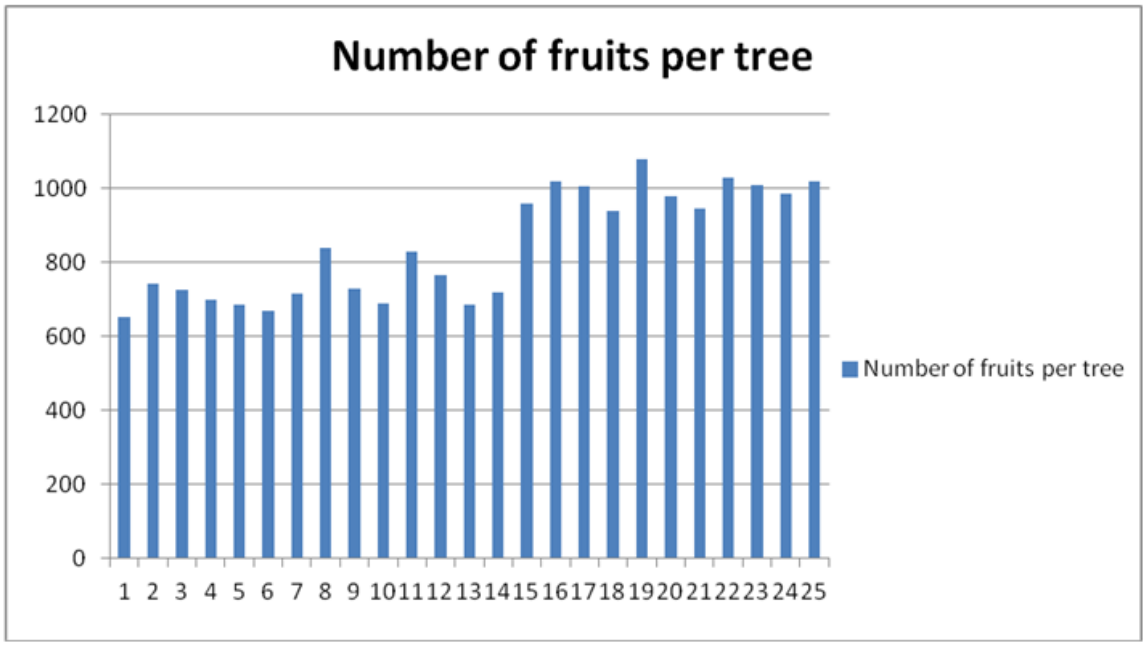

Fig. 3. Number of fruits per tree of twenty five acid lime genotypes

4. CONCLUSION

The present study it was concluded that genotype SCA 19 recorded the highest values for the growth traits such as tree height (3.49 m), tree spread ((3.58 m^2 E-W; 3.74 m^2 N-S), canopy spread (6.57 m^3), leaf lamina length (58.40 mm) and tree girth (13.66 cm), yield traits like number of fruits per tree (1080), mean fruit weight (58.75 g), yield per tree (57.89 kg per tree), number of seeds (9.10), fruit length (8.50 cm), fruit girth (4.90 cm), fruit volume (54.81 cc) and quality traits such as TSS (6.71˚Brix), acidity (6.78 %), ascorbic acid content (26.50 mg/100 g), fruit juice percentage (52.1 %) and juice content (46.0 ml). Hence, acid lime genotype SCA 19 is

recommended for further evaluation in different parts of Tamil Nadu as as well as to standardize the postharvest qualities.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author (s) hereby declared that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text to image generators have been used during writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. IIFPT. Detailed project report, Lime Squash manufacturing unit. Indian Institute of Food Processing, Technology, Ministry of Food Processing Industries, Govt. of India. 2021;6.
2. Singh AK, Lal M. Performance of citrus fruits in the North Genetic Plains. Punjab Hort. J. 1982;13(4): 29-34.
3. Ingle HV, Athawale RB, Tayde GS, Pakhare GB. Studies on sexuality and fruit set in various cultivar of acid lime tree. Agric. Sci. Digest. 2000;20(4):273-274.
4. Kumar M, Parthiban S, Saraladevi D, Aruna P. Evaluation of acid lime (*Citrus aurantifolia* Swingle) cultivars for yield attributes. The Asian J. Hort. 2011;6(2): 442-444.
5. Rajamanickam C. Assessment of acid lime (*Citrus aurantifolia* Swingle) varieties for yield and quality traits. J Krishi Vigyan. 2023;11(Supple):1- 4.
6. Anonymous. Crop Production Guide – 2020. Tamil Nadu Agricultural University, Coimbatore; 2020.
7. Ranganna S. Handbook of analysis and quality control for fruit and vegetable products. 2nd Ed. Tata Mc Graw Hill Publication Co. Ltd., New Delhi. 2000;1112.
8. Panse VG, Sukhatme PV. Statistical methods for Agricultural workers, ICAR, New Delhi. 1967;381.
9. Srinivas N, Athani SI, Sabarad AI, Patil PB, Kotikal YK, Swamy GSK, Patil BR. Studies on variability of fruit physical characters quality and yield in seedling strains kagzi lime (*Citrus aurantifolia* Swingle). The Asian Journal of Horticulture. 2006;2(3):148-150.
10. Mahantesh K, Prakash KN, Vikas R, Murlimanohar B. Evaluation of acid lime (*Citrus aurantifolia* Swingle) genotypes during Hasth bahar for growth, yield and quality attributes. An International Quarterly Journal of Environmental Science. 2016;9:277-83.
11. Khurshid S, Ahmad I, Anjum MA. Genetic diversity in different morphological characteristics of litchi (*Litchi chinensis* Sonn.). International Journal of Agriculture and Biology.2004;6(6):1062–1065.
12. Desai UT, Musmade AM, Ranpise SA, Kale PN, Chaudhari SM, Kulkarni SR. Studies on variability in kagzi lime. J. Maharashtra Agric. Univ. 1994;19(1):97-99.
13. Prasanna VSSV, Madhavi M, Mukundalakshmi L, Rajasekharam T, Amaravathi Y, Umakrishna K. Assessment of variability in fruit, yield and biochemical characters of acid lime (*Citrus aurantifolia* Swingle) germplasm. The Pharma Innovation Journal. 2023;12(5):4232 - 4238.
14. Saraswathy S, Parameswari C, Parthiban S, Selvarajan M, Ponnuswami V. Evaluation of sapota genotypes for growth, yield and quality attributes. Electronic Journal of Plant Breeding. 2010;1(4):441 - 446.
15. Rajamanickam C. Evaluation of tamarind (*Tamarindus indica* L.) genotypes for growth, yield and quality. Int. J. Chemical Studies. 2019;7(4):1906 - 1909.
16. Rajamanickam C. Survey and identification of suitable acid lime genotypes for improvement of yield and year round production. Research abstract presented in National Seminar on Horticulture for sustainable development, nutritional & livelihood security, organized by Faculty of Horticulture, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Bihar, West Bengal from 26 -27 May. 2022;68.
17. Hulme AC. The Biochemistry of fruit and their product. Academic Press, New York; 1970.

18. Mandal G, Thokchom R. Evaluation of different mango (*Mangifera indica*) varieties for high density orchard in lateritic zone of eastern India. Indian Journal of Agricultural Sciences, 2018;88(12):1836–1838.

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