AgroScience Today

Popular Article

e-ISSN: 2583-0147

Volume 6 Issue 2
Page: 1106 - 1111

Towards Sustainable Acid Lime Production in Tamil Nadu - Constraints and Strategic Approaches

Thirugnanavel Anbazhagan[1*], Prasanth Tejkumar[2], Kiran Kumar Kommu[3], Darshan M. Kadam[4] and Naresh M. Meshram[5]

[1]Senior Scientist (Fruit Science), ICAR-Central Citrus Research Institute, Nagpur, Maharashtra, India.

[2]Scientist (Biotechnology), ICAR-Central Citrus Research Institute, Nagpur, Maharashtra, India.

[3]Scientist (Nematology), ICAR-Central Citrus Research Institute, Nagpur, Maharashtra, India.

[4]Scientist (Fruit Science), ICAR-Central Citrus Research Institute, Nagpur, Maharashtra, India.

[5]Senior Scientist (Entomology), ICAR-Central Citrus Research Institute, Nagpur, Maharashtra, India.

Corresponding author's e-mail: *lotus.thiru@gmail.com*

Published on: April 30, 2025

ABSTRACT

Acid lime is an important fruit crop in Tamil Nadu, extensively cultivated in several parts. Grown across diverse soils, including heavy clays, it is sensitive to frost, waterlogging, and prolonged wet spells. The area under cultivation has expanded due to rising demand and regional adaptability. Despite this, productivity remains inconsistent due to biotic and abiotic stresses, suboptimal orchard practices, and poor-quality planting materials. Addressing these challenges through improved varieties, integrated nutrient and pest management, and disease-free nursery techniques is crucial for enhancing sustainable acid lime production in the state.

INTRODUCTION

Acid lime (*Citrus aurantifolia* L.), locally known as Elumichai, occupies a prominent place in the horticultural landscape of Tamil Nadu. It is one of the important fruit crops in the state, predominantly cultivated in the districts of Tirunelveli, Dindigul, Virudhunagar, Madurai, Tiruchirappalli, Ramanathapuram, and Theni. Acid lime needs well-drained soil that has a pH range of 6.0 to 7.5 with good water holding capacity, such as light sandy loam or alluvial soils. In some places, it is also grown in heavy clay soils, albeit these soils provide drainage and *Phytophthora* infection problems. The tree is susceptible to frost and cold and extended exposure to wet weather can seriously impair its health and yields. According to the Ministry of Agriculture and Farmers' Welfare (2022), acid lime was cultivated over an area of 13,770 hectares in Tamil Nadu, with an average annual production of 196,180 metric tonnes during the year 2021–22. In recent years, both the area and production of acid lime have increased, driven by rising market demand and the crop's adaptability to the region's agro-climatic conditions. However, productivity has shown considerable fluctuations due to various biotic and abiotic stresses.

CONSTRAINTS IN ACID LIME PRODUCTION

The acid line industry faces several challenges including biotic and abiotic stresses, lack of high yielding varieties, climate change, lack of technical knowledge, poor irrigation and nutrient management, orchard management, etc.

POOR QUALITY PLANTING MATERIALS

It is propagated through seeds. Most of the nurseries lack proper mother blocks, often collects seeds from non-descript, low-performing trees for propagation. These poor-quality planting materials affect quality and productivity and tend to have a shorter orchard life. Therefore, the production of healthy, high-quality planting material is essential for ensuring sustainable acid lime cultivation.

LACK OF HIGH YIELDING VARIETIES

Traditional varieties exhibit variability, susceptible to pest and diseases, often producing fruits that are less attractive to consumers and have a shorter post-harvest life, which negatively impacts market demand and profitability. The decline in productivity of these varieties is often more rapid, necessitating earlier replanting and thus increasing long-term production costs while reducing sustainability. In contrast, several canker-tolerant and high-yielding varieties have been developed and released by State Agricultural Universities and ICAR Institutes. Adoption of these improved varieties by farmers can significantly enhance production and productivity in Tamil Nadu.

POOR NUTRIENT AND WATER MANAGEMENT

In Tamil Nadu, fertilizer application has often been arbitrary and inconsistent, with many farmers not adhering to recommended dosages. It leads to multiple nutrient deficiencies resulting in poor quality fruits. Among the micronutrients, zinc (Zn) deficiency is the most widespread, second only to nitrogen (N) deficiency. Additionally, deficiencies in boron (B) and iron (Fe) are also common. Further, soil moisture stress during critical stages of growth results in low

productivity. Thus, effective irrigation and nutrient management in acid lime orchards is essential to achieve high yields and good-quality fruits

PEST AND DISEASES

Several pest and diseases affect acid lime both in nursery and field throughout the year. These pest and diseases cause several economic losses to farmers. Among the pests, Citrus psylla, aphids, thrips, leaf miners, lemon butterflies, bark-eating caterpillars, mites, and nematodes attacks acid lime throughout the year, and the population are particularly high during April, August, and October. In diseases, citrus canker, greening, twig blight, *Phytophthora*, stem end rot, yellow mosaic virus and citrus nematode, *Tylenchulus semipenetrans* are reported in most of the acid lime growing regions in Tamil Nadu. Of the several diseases, canker, greening and *Phytophthora* causes severe damages to the plants.

STRATEGIC APPROACHES TO ENHANCE ACID LIME PRODUCTION

Several challenges affect the production and productivity of acid lime in Tamil Nadu. To address these issues, a range of strategic approaches are required. The key approaches include production of disease-free planting materials, use of high yielding varieties, pest and disease management, integrated nutrient and irrigation management etc. These strategies could play a vital role in enhancing the quality production, reduces the crop losses, and ensure the long-term sustainability of acid lime cultivation.

PRODUCTION OF DISEASE-FREE PLANTING MATERIALS

Many nurseries in Tamil Nadu raise the seedlings directly in the field, making the eradication of soil-borne pathogens, such as Phytophthora, challenging. An alternative method is the use of a containerized nursery system with sterilized potting mix helps prevent soil-borne pathogens. The mix is spread on a cement floor (up to 1.5 feet) and drenched with water. During summer, covering it with a UV-stabilized polyethylene sheet raises the temperature to 54°C, effectively eliminating most harmful pathogens. Selection of genetically pure, disease-free, and high-yielding mother plants is essential for healthy seedlings. Seeds are sown in trays (60 x 40 x 12 cm) containing solarized media, and 10–15 cm tall seedlings with 8–10 leaves are transplanted into polybags. Proper pest management ensures disease-free planting material for establishing healthy, productive acid lime orchards.

HIGH YIELDING VARIETIES

The farmers in Tamil Nadu mostly cultivating locally available acid lime varieties which are highly prone to canker and produce low quality fruits. Several high yielding varieties were released by State Agricultural Universities and Institutes. Planting of high yielding varieties increases the yield potential of acid lime orchards thereby increases the production of acid lime in Tamil Nadu. Some of the important improved varieties are described in table 1.

Table 1. Improved varieties and their characters

Improved variety	SAU/Institute	Characters
PKM-1	Tamil Nadu Agricultural University	Fruit weight is 52g, juice content of 52.3%, total soluble solid content 8.0% and vitamin C, 43 mg/100 ml is found in fruit. It yields 50

		kg/tree. This variety is tolerant to leaf miner and lemon butterfly.
NRCC Acid Lime-7	ICAR-Central Citrus Research Institute, Nagpur.	Fruit weight is 48 g, number of seeds per fruits are 8.45, acidity 7.05% and total soluble solids is 7.93%. The yield potential is 54 t/ha under high density planting.
NRCC Acid Lime-8	ICAR-Central Citrus Research Institute, Nagpur	The average fruit weight is 50 g. with high juice content (51.53 percent), number of seeds per fruit is 8.31, acidity 7.1% and total soluble solids 7.96%. bears fruits in bunch
Balaji	CRS, Tirupathi, Dr.YSRHU, Andhra Pradesh	The average fruit weight is 47-48 g, juice content 47 %, TSS 7.82 % and acidity 6.8 %. It is tolerant to canker, immune to bark eruptions and moderately resistant to dry root rot (F. *solani*).

INTEGRATED NUTRIENT AND WATER MANAGEMENT

Application of 100 per cent recommended dose of fertilizers (600: 200: 300 g NPK plant^{-1} year^{-1}) + *Azospirillum* (100g plant^{-1}) + phosphobacteria (100g plant^{-1}) + Arbuscular Mycorrhizal Fungi (500g plant^{-1}) + *Trichoderma harzianum* (100g plant^{-1}) is important for optimum production. In addition, application of $ZnSO_4$ (0.5%) + $FeSO_4$ (0.5%) + Borax (0.2%) enhances the yield and quality of fruits. Irrigation during critical growth stages via. new vegetative flush, flowering, fruit development and fruit maturity, are important.

INTEGRATED PEST MANAGEMENT

Integrated pest management (IPM), a comprehensive, ecosystem-based technique includes cultural and biological management. Pesticides are applied only when the insect population surpasses an economically viable level. The control measures of different pests are covered in table 2.

Table 2. Management of citrus insect pests and nematodes

Pests	Cultural control	Biological control	Chemicals for control
Thrips, Aphids, psylla, black fly, white fly, mealy bugs	Removal of dead and dry woods, infected parts, pruning of intermingling branches	Release of *Mallada desjardinsi* @ 30 larvae/plant, neem oil @10 ml/l or neem soap or pongamia soap @ 5 gm/l	Imidacloprid 17.8% SL (0.5 ml/l), Thiamethoxam 25% WG (0.3 g/l)
leaf miner, citrus lemon butterfly	Removal of dead and dry woods, infected parts, pruning of intermingling branches	Neem oil @10ml/l Horticultural mineral oil @20 ml/l	Imidacloprid 17.8% SL (0.5 ml/l), Thiamethoxam 25% WG (0.3 g/l),

Flat mite, green mite, brown mite	Pruning of intermingling branches, proper irrigation, keep the orchard	azadirachitin1%@2ml Neem oil @10ml/l Horticultural mineral oil @20 ml/l	Diafenthiuron 50% WP (2 g/l), Spiromesifen 240 SC (0.3 ml/l), Propergite 57 EC(0.3 ml/l), Fenazaquin 10% EC (1 ml/l)
Citrus nematode	Using nematode-resistant rootstocks, sanitation, and soil solarization	Neem Seed Kernal Extract (NSKE) 5% @ 4 L/ha twice at 30 days interval NSKE 5% + *Purpureocillium lilacinum* (5x109 CFU/ml) mixed with 500 L water and apply through drip irrigation system	Carbofuran 3G @100 g/plant

INTEGRATED DISEASE MANAGEMENT

Effective control of citrus canker requires clean cultivation, proper nutrient management, appropriate irrigation practices, and the removal of dead wood post-harvest. Periodic pruning of infected shoots is essential, along with a pre-monsoon application of 1% Bordeaux mixture. In cases of infection, it is recommended to spray 1% copper oxychloride and 100 ppm streptocycline. Spray of *Pseudomonas fluorescens* at 5 g/L has also been shown to help reduce canker disease incidence.

MANAGEMENT OF *Phytophthora* spp.

Integrated management is essential to control *Phytophthora* effectively. Sterilization of potting material is crucial for disease prevention at nursery stage. Planting of disease-free planting materials in the orchard is crucial. In the field, the disease can be efficiently managed by soil drenching and spraying of metalaxyl and mancozeb, and fosetyl aluminum (2.5g/l). Additional control measures include removing dead wood, applying Bordeaux paste to the trunk up to three feet in height before and after the monsoon season.

MANAGEMENT OF CITRUS GREENING

An integrated management approach is necessary, which includes the removal of infected plants, planting disease-free material, vector control, and the use of antibiotics. Strict monitoring and control of the citrus psyllid, the vector of the disease, are critical for effective management of citrus greening In addition to vector control and antibiotic treatment, improved fertilization practices are crucial for managing the disease and enhancing the overall health of the orchards. Foliar spray of tetracycline 600 ppm (6g in 10 litre of water) twice should be carried out and soil application of $ZnSO_4$ and $FeSO_4$ 100 g each should be applied twice a year.

CONCLUSION

Acid lime cultivation requires scientific orchard management, including proper site selection and high yielding varieties. Planting systems depend on soil, climate, and variety, with high-density planting offering higher yields but requiring intensive care. Canopy management through training and pruning enhances light, airflow, and pest control, improving fruit quality. Efficient nutrient and water management, including timely irrigation and balanced macro- and micronutrient application, supports healthy growth and yield. Integrated pest and disease management (IPDM) reduces chemical use while safeguarding the crop. This chapter highlights the complexity of acid lime orchard management and the need for sustainable, productivity-driven practices.