Revista Mexicana de Ciencias Agrícolas
DOI: https://doi.org/10.29312/remexca.v16i4.3157
Descripción de cultivar

Lise: a thornless Mexican lime variety with high-quality fruits

Marciano Manuel Robles-González[1,§]
Silvia Herendira Carrillo-Medrano[1]
Miguel Ángel Manzanilla-Ramírez[1]
Víctor Manuel Medina-Urrutia[2]
1 Campo Experimental Tecomán-INIFAP. Carretera Colima-Manzanillo km 35, Tecomán, Colima, México. CP. 28100.

2 CUCBA-Universidad de Guadalajara. Carretera Guadalajara-Nogales km 15.5, Zapopan, Jalisco, México. CP. 44150.

Autor para correspondencia: mmrobles55@hotmil.com.

Abstract

In order to increase the genetic base of the Mexican lime [*Citrus aurantifolia* (Christem) Swingle], in 1984, the Tecomán Experimental Field of the National Institute of Forestry, Agricultural and Livestock Research in Colima, Mexico, began a program of collection and evaluation of natural variants of this crop. The Lise variety is the result of two cycles of clonal selection through agronomic and fruit quality evaluations. It is characterized by the branches of its trees not developing thorns or rarely doing so. In addition, it presents morphological changes in leaves and flowers. At harvest, the fruit is dark green and is practically free of physical damage, which improves its aesthetic quality and consequently, up to 70% of the fruit is selected for fresh marketing. The size of the fruit and its chemical characteristics are like the Colimex variety, with the advantage that Lise shows better postharvest behavior. It is a good option for quality producers. It has registration number LIM-003-230708 in the National Catalog of Plant Varieties of the National Seed Inspection and Certification Service. The Tecomán Experimental Field of the National Institute of Forestry, Agricultural, and Livestock Research has a lot that produces certified buds for marketing. This publication aims to present information on the origin, agronomic characteristics, and physical and chemical quality characteristics of the Lise variety.

Keywords:

Citrus aurantifolia, agronomic characteristics, natural variant, postharvest.

DOI: https://doi.org/10.29312/remexca.v16i4.3157

The cultivation of Mexican limes has great economic and social importance in Mexico. According to data from the Agrifood and Fisheries Information Service (SIAP, 2021), 95 697.3 hectares were cultivated during 2020, from which 1.2 million tonnes of fruit were produced, with a value of $9 552.20 million pesos in Michoacán, Colima, Oaxaca, and Guerrero with 60 696.4, 18 550.3, 6 448.1 and 6 948.4 ha, respectively, are the most important producing states, where 96.8% of the cultivated area and 97.7% of the fruit production are concentrated.

The commercial variety of Mexican lime with thorns Colimex, although it generates good yields and excellent chemical quality, has some drawbacks, among which the loss of physical quality of the fruit stands out, which is caused by scratches and pitting of thorns, which means that only 50% of the fruit is suitable for packaging and fresh marketing (Robles-González and Manzanilla-Ramírez, 2012; Manzanilla-Ramírez *et al*., 2015). In addition, it has a short shelf life (Saucedo-Veloz and Medina-Urrutia, 2008).

Genetic improvement is one of the viable options to solve this problem. The selection of plants with advantageous characteristics was the first method of genetic improvement used by man since agriculture began. This publication aims to provide information on the origin, agronomic characteristics, and physical and chemical quality characteristics of the Lise variety.

Origin and obtaining of variety

Lise is the result of a second cycle of clonal selection on a thornless genotype that was found in the 1970s as a natural variant in a commercial Mexican lime grove in the locality of Madrid, Colima (Becerra-Rodríguez 1979). This individual was cloned by bud grafting and taken to the facilities of the Tecomán Experimental Field of the National Institute of Forestry, Agricultural, and Livestock Research (CET-INIFAP), for their acronyms in Spanish. From then on, agronomic evaluations were made and their morphological characteristics were described.

It was determined that Lise grafted on Macrophylla (*C. macrophylla* Wester) and established in deep soils is as productive as Colimex (Medina *et al*., 2009). In 1991, agronomic evaluation work began at the semi-commercial level. After 10 years of evaluation, a new clonal line was selected from a tree that stood out for its yield (Robles-González *et al*., 2010), which was then registered under the name of Lise, with the number LIM-003-230708 in the National Catalog of Plant Varieties of the National Seed Inspection and Certification Service and with a valid breeder's title (SNICS, 2021).

Varietal description

Lise trees are vigorous with shrubby development (Figure 1A). They are characterized by their branches lacking thorns or eventually having some (Figure 1B). Grafted onto Macrophylla, planted at distances of 8 x 4 m, and with pruning management, the trees can reach average heights of 4 m and a crown diameter of 5 m (Robles-González *et al*., 2008; Robles-González and Manzanilla-Ramírez, 2012). Their foliage is dense with small lanceolate, obtuse-tipped leaves that are green in color, slightly darker than in the Colimex variety.

Revista Mexicana de Ciencias Agrícolas

DOI: https://doi.org/10.29312/remexca.v16i4.3157

Figure 1. A) Lise tree six years after planting; B) terminal branch showing absence of thorns and presence of obtuse-tipped leaves and C) a cluster of flower buds with pistil and anthers exposed before anthesis.

Lise trees have a sparsely branched erect growth pattern. The vegetative shoots are generally long, which makes the trees have a compact and narrow crown in the first years of their development.

Nevertheless, in the third or fourth year, their main branches, generally long, lean and cause the crown to open, so it is important to apply a good pruning and trimming treatment in the first years to properly form their crown, which can be very similar to that of the Colimex variety. With periodic irrigation, the trees flower practically all year round, with three to five massive flowering flushes, depending on the region and agronomic management.

Lise fruit is harvested practically all year round, but the highest volumes are obtained from May to September (Robles-González *et al*., 2014). The inflorescences are produced in clusters with two to seven small, white flowers, which differ from Colimex because they develop short petals (Robles-González and Medina-Urrutia, 1984), which expose the pistil and stamens before the flower opens (Figure 1C).

The fruit reaches a size similar to that of Colimex, with an elliptical to hemispherical shape, and thin and leathery skin (Table 1). When the fruit ripens, it goes from yellowish green to yellow. The essential oil is of a quality similar to that of Colimex. Its pulp is light green, with 45 to 48% juice, acidity of 7.2%, and with 3 to 5 seeds.

DOI: https://doi.org/10.29312/remexca.v16i4.3157

Table 1. Some fruit characteristics and yield of the Lise variety.

Characteristic	Value
Fruit weight (g)	33 to 35
Seeds per fruit (num.)	3 to 4
Peel thickness (mm)	1 to 1.2
Juice content (%)	44 to 48
Selected fruit (%)	70
Yield (t ha^{-1})	40

At harvest maturity, the fruit peel is still green, which is desirable in packaging, and because it is practically free of physical damage caused by the thorns, up to 70% of the fruit is selected for fresh consumption (Robles-González *et al*., 2010). It has better postharvest behavior compared to the Colimex variety, both under shelf and refrigeration conditions (Muños-Lazcano *et al*., 2011; Hernández-Pérez *et al*., 2014).

Due to its high yield, high-quality fruit, and good postharvest performance, it can increase export volumes, benefiting the entire Mexican lime product system. It is a good option, especially for producers of high-quality fruit. Vegetative propagation is carried out by bud grafting, which ensures genetic stability.

Agronomic behavior

Lise is sensitive to the same pests and diseases as the Colimex variety. Grafted onto Macrophylla or Volkameriana (*C. volkameriana*) rootstock, it adapts to a wide range of soils, including those with a high $CaCO_3$ content (40 000 ppm). It has a better productive behavior in deep soils (Medina-Urrutia *et al*., 2009). Due to its erect growth, it requires special pruning management to form its crown and maintain high fruit yields. In their third year after planting, the trees reach annualized yields of 50 kg of fruit.

From the fourth year onwards, their average yield exceeds 100 kg. Planted at 8 x 4 m, with good management of irrigation, nutrition, and pruning, it reaches productions of up to 40 t ha^{-1}. Like Colimex, it is highly tolerant of *Candidatus* Liberibacter asiaticus, the causative agent of HLB, which allows it to continue producing excellent quality fruit despite showing symptoms of the disease on the leaves. However, this bacterium can reduce fruit yields in both varieties by up to 50%.

Field of application

Lise has the same range of adaptation as the commercial variety Colimex, which is successfully grown in Colima, Michoacán, Oaxaca and Guerrero. This variety is mainly a good option for Mexican lime producers organized in the groups called 'quality suppliers' in the states of Colima and Michoacán. Due to its high physical quality, its fruit can be well accepted in both local and export markets.

Availability of propagative material

At INIFAP Tecomán Experimental Station, there is a lot that produces certified buds of the variety, which can be purchased by plant nurseries.

Conclusions

The Lise variety is a clonal selection that is mainly characterized by its branches not developing thorns or rarely having them. With good agronomic management, it can produce up to 40 t ha^{-1} of fruit per year. Due to its high quality and longer shelf life, compared to Colimex, its fruit can be well accepted in the local and export markets.

DOI: https://doi.org/10.29312/remexca.v16i4.3157

Acknowledgements

The authors are grateful to INIFAP, the National Council of Humanities, Sciences, and Technologies (CONAHCYT), for its acronym in Spanish, and the Fundación Produce Colima AC for the funding granted during the development of the research.

Bibliography

1 Becerra-Rodríguez, S. 1979. Un clon sin espinas de limón mexicano (*Citrus aurantifolia* Swingle). Agricultura Técnica en México. 65-71 pp.

2 Hernández-Pérez, M. E.; Saucedo-Veloz, C.; Ramírez-Guzmán, M. E.; Robles-González, M. M. y Chávez-Franco, S. H. 2014. Tratamientos de encerado y 1-MCP para extender el tiempo de frigo conservación en tres variedades de limón mexicano. Revista Iberoamericana de Tecnología Postcosecha. 15(2):153-159.

3 Manzanilla-Ramírez, M. A.; Robles-González. M. M.; Velázquez-Monreal, J. J.; Orozco-Santos, M. y Padrón-Chávez, E. 2015. 'LISE' Limón mexicano sin espinas de alto rendimiento. Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación (SAGARPA)- Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias (INIFAP)-Campo Experimental Tecomán. Tecomán, Colima. México. Folleto para productores núm. 519 p.

4 Medina-Urrutia, V. M.; Robles-González, M. M. y >Velázquez-Monreal., J. J. 2009. Comportamiento de dos cultivares de limón mexicano [*Citrus aurantifolia* (Christm) Swingle] en portainjertos desarrollados en suelos con dos profundidades. Revista Chapingo. 15(1):49-55.

5 Muñoz-Lazcano, A. A.; Saucedo-Veloz, C.; García-Osorio, C. y Robles- Gonzales, M. M. 2011. Evaluación de la Calidad y tiempo de almacenamiento del fruto en tres variedades de limón mexicano. Revista Iberoamericana de Tecnología Postcosecha. 12(2):156-163.

6 Robles-González, M. M.; Medina-Urrutia, V. M.; Velásquez-Monreal, J. J. and Simpson, J. 2008. Field performance and molecular profiles of Mexican lime selections. Euphytica. 161:401-411. 10.1007/s10681-007-9592-2.

7 Robles-González, M. M.; Carrillo-Medrano, S. H.; Manzanilla-Ramírez, M. Á.; Velázquez-Monreal, J. J. y Medina-Urrutia, V. M. 2010. Mejoramiento genético de limón mexicano: avances y perspectivas. *In*: VI simposio internacional citrícola y 1er simposio internacional sobre mejoramiento genético de cítricos. Ed. COEPLIM-INIFAP. Tecomán, Colima. México. 93-110 pp.

8 Robles-González, M. M.; Medina-Urrutia V. M. y Manzanilla-Ramírez M. Á. 2014. Ed. el limón mexicano (*Citrus aurantifolia*). Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación (SAGARPA)- Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias (INIFAP)-Campo Experimental Tecomán. Tecomán, Colima, México. Libro Técnico núm. 1. 140-160 pp.

9 Robles-González, M. M. y Manzanilla-Ramírez, M. Á. 2012. 'LISE': Limón mexicano sin espinas y de alto rendimiento. Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación (SAGARPA)- Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias (INIFAP)-Campo Experimental Tecomán. Desplegable para productores núm. 9.

10 Robles-González, M. M. y Medina-Urrutia, V. M. 1984. Observaciones sobre el desarrollo floral de dos tipos de limón mexicano (*Citrus aurantifolia* (Christm) Swingle, y del limón persa (*Citrus latifolia* Tanaka), Tecomán, Colima. Agric. Tec. Mex. 10(1):31-45.

11 Saucedo-Veloz, C. y Medina-Urrutia, V. M. 2008. Problemas del manejo postcosecha y comercialización de limas ácidas en México. *In*: tópicos em qualidade e pos-coelheita

DOI: https://doi.org/10.29312/remexca.v16i4.3157

de frutas (Org). do Nascimiento, L. M.; de Negri, J. D. and Dirceu, de M. Jr. Instituto Agronómico e Fundag. Cap. 7:93-109.

12 SIAP. 2021. Servicio de Información Agroalimentaria y Pesquera. Anuario estadístico de la producción agrícola. Servicio de Información Agroalimentaria y Pesquera. Secretaría de Agricultura y Desarrollo Rural (SADER). https://nube.siap.gob.mx/cierre agrícola/.

13 SNICS. 2021. Servicio Nacional de Inspección y Certificación de Semillas Catálogo Nacional de Variedades Vegetales. Secretaría de Agricultura y Desarrollo Rural. https://www.gob.mx/snics/documentos/catalogo-nacional-de-variedades-vegetales-cnvv-2021-292278.

Revista Mexicana de Ciencias Agrícolas

DOI: https://doi.org/10.29312/remexca.v16i4.3157

Lise: a thornless Mexican lime variety with high-quality fruits

Journal Information
Journal ID (publisher-id): remexca
Title: Revista mexicana de ciencias agrícolas
Abbreviated Title: Rev. Mex. Cienc. Agríc
ISSN (print): 2007-0934
Publisher: Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias

Article/Issue Information
Date received: 01 May 2025
Date accepted: 01 June 2025
Publication date: 15 July 2025
Publication date: May-Jun 2025
Volume: 16
Issue: 4
Electronic Location Identifier: e3157
DOI: 10.29312/remexca.v16i4.3157

Categories

Subject: Descripción de cultivar

Keywords:

Keywords:

Citrus aurantifolia
agronomic characteristics
natural variant
postharvest

Counts

Figures: 1
Tables: 1
Equations: 0
References: 13
Pages: 0