

QUALITY OF FRUITS FROM TAHITI LIMEIRA GRAFTED IRRIGATED WITH WATERS OF DIFFERENT SALINITIES

ABSTRACT

Objective: the objective of this work was to evaluate the quality of Tahiti lime fruits grafted on rootstocks irrigated with waters of different salinities.

Experimental design: the experiment was conducted in a randomized block design, corresponding to ten citrus genotypes and two levels of irrigation water salinity.

Place and duration of the study: the experiment was conducted at the Agro-Food Science and Technology Center of the Federal University of Campina Grande, Pombal Campus, Paraíba, from February 2016 to February 2017.

METHODS: The experiment was conducted in a randomized block design in a 10 x 2 factorial scheme, with three replicates of 10 citrus genotypes, composed of 9 genotypes from two progenies, and 4 genotypes from the TSKFL x [Poncirus trifoliata Beneke (TRBK)] added to the witness [Cravo Santa Cruz lemon tree (LCRSTC) and two irrigation water salinity levels (0.3 dS m⁻¹ and 3.0 dS m⁻¹).

Results: the best physical and chemical characteristics of the fruits were obtained in the genotype TSKC x (LCR x TR) - 032 mainly in the number of fruits (21.0); volume of juice (466.50 mL); titratable acidity (6.07%) and ascorbic acid (41.03 mg / 100 mL). The genotype TSFL x TRBK - 017 presented the lowest averages for juice volume (295.26 mL); juice weight (304.18 g); pH (2.01); electrical conductivity (3.78 dS m⁻¹) and titratable acidity (5.64%).

Conclusion: citrus rootstocks did not differ in the chemical and physical characteristics of fruits with increased salinity.

Keywords: Citrus spp; propagation; tolerance.

1. INTRODUCTION

The production of citrus plants in Brazil is a major highlight, being the largest exporter of concentrated and frozen juice in the world. In the year 2016, national production of (oranges, lemons and mandarins) were 15 million tons higher, 76% of it is concentrated in the Southeast region of Brazil and 11.6% in the Northeast region of Brazil [1]. In addition to the food value, citriculture represents a generation of employment and income, especially in the Northeast region, however, productivity in this region is low, which is attributed to the water deficit, with the need to introduce irrigation to obtain an increase in production [2].

Citrus productivity is directly linked to hydric availability which ranges from 600 to 1200 mm / year [3]. Precipitation values above that found in the Northeast region. However, the use of rootstocks has ensured the success of the citriculture in the region, due to its adaptability to different soil and climatic conditions, clove lemon is the most commonly used rootstock in the citriculture [4]. According to Brito et al. [5] salinity up to 2.0 dS m⁻¹ can be used, however, causing small restrictions on the growth of citrus genotypes recommended as rootstocks, notably in 'Volkameriano' lemon tree, Sunki Tropical tangerine, Cravo Santa Cruz lime and the trifoliated hybrid (HTR) -069

. The adequate water supply through irrigation can provide the following benefits: greater number of flowers and fruits, ensuring higher productivity, better fruit quality, larger size and weight, accentuated staining; greater amount of oil in the shell [6]. In saline conditions, the growth, development and production of citrus plants may be reduced, which can be attributed to osmotic effects, the reduction in gas exchange or ionic order, such as the occurrence of nutritional and biochemical disorders [7 8].

The effect of salinity on agricultural production is enormous and can lead to large losses in agriculture. Because most of the cultivated plants are glycophytic (they are not able to grow in

environments with high salt concentrations) and suffer severe effects from salt, which make it difficult for the plant to absorb water due to the high concentrations of ions in the substrate solution, which reduce the osmotic potential of this solution, thus reducing the availability of water and nutrients to the plant [9]. In view of the fact that the main quality attributes required for the Tahiti acid lime in order to obtain a profitable marketing, both domestically and externally, are: shape, size, brightness, taste, nutritional value, food safety, green coloring and turgescence. [10].

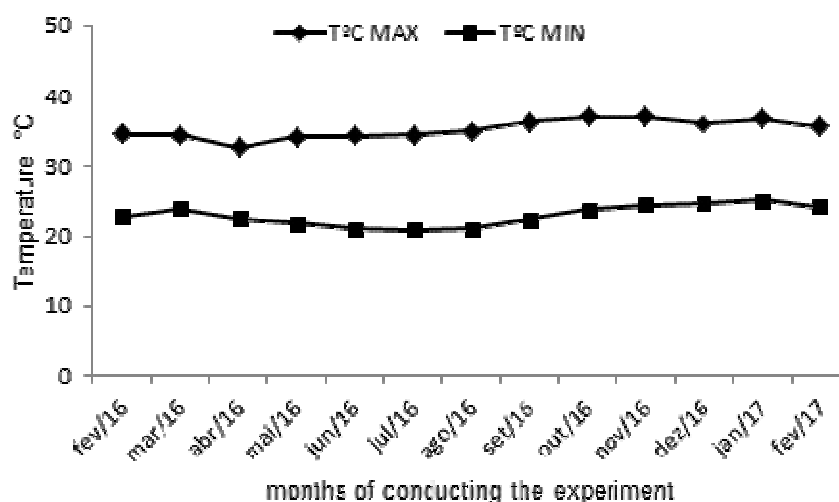
Thus, given the relevance of citriculture represent to the economy and to the diet of the Brazilians and the sensibility that these species present the salinity, the objective was to evaluate the fruit quality of the Tahiti lime tree grafted on rootstocks irrigated with waters of different salinities.

2. MATERIAL AND METHODS

The work was developed at the Experimental Area of the Campina Grande Federal University (Campus Pombal, PB, Brazil) located at 6°46'13 " south latitude and 37°48'06 " west longitude , at an altitude of 184 m. The predominant climate in the region according to the classification of Köppen is BSh, ie hot semiarid, with annual rainfall of 750 mm and rainfall concentrated in the months of December to April [11].

2.1 Environmental variables

During the experimental period, temperature and precipitation were monitored. It was observed that the maximum temperature was 36.9 ° C and the minimum temperature was 20.9 ° C on average (Fig. 1). The temperature is one of the factors that alter the growth and development of the citrus plants, according to information contained in Mattos Júnior et al. [12]. In order to have maximum growth in the vegetative phase, it is interesting to have a temperature between 23 and 31°C, also observing that temperatures below 12°C and above 32°C cause a reduction in growth rates; however, this information is relative to sweet orange, which can be modified according to the canopy / rootstock combination.



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58 **Fig. 1. Variation of temperature data °C, during the conduction of the experiment, obtained**
59 **from the INMET website.**

60 As for rainfall, it was observed that the average 64.9 mm found for the study period (Fig. 2), was
61 insufficient to guarantee the high productivity of the citrus crop, which demand, according to the Lima
62 literature [12], precipitation between 600 and 1200 mm. For the cultivation of Tahiti acid lime in the
63 semi-arid Braz et al. [2], indicated with insufficient, being necessary to replenish water with 100% of
64 evapotranspiration of the crop (ETc), which for the situation of these authors ranged between 4.7 and
65 5.2 mm, that is, between 1700 and 1900 mm year-.

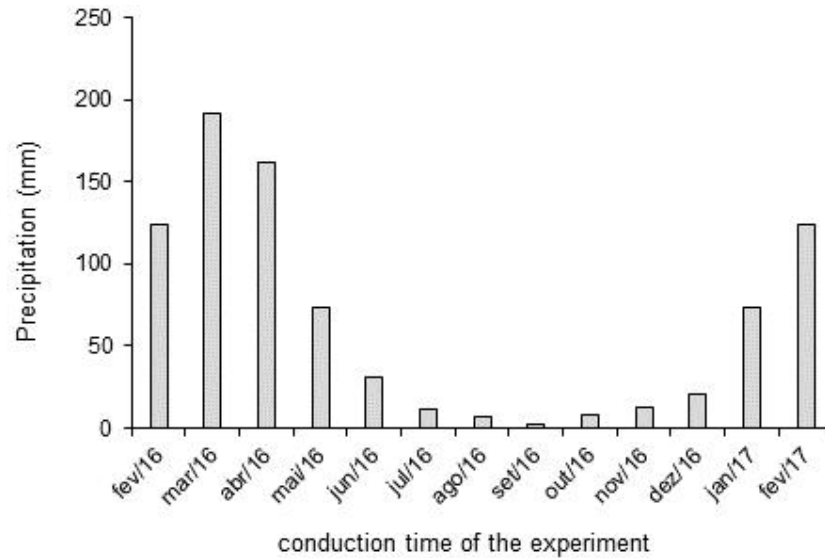


Fig 2. Variation of precipitation data (mm), during the conduction of the experiment, obtained from the AESA website.

The experimental design was a randomized complete block design, with a factorial scheme of type 10 x 2, with three replications composed of two factors. The respective salinity levels were applied in 10 citrus canopy / citrus rootstock combinations, related to the Tahiti acid lime tree as crown, which were grafted on 10 rootstocks, 9 from two citrus progenies (5 and 4 genotypes respectively) and a control genotype, all from the Embrapa Mandioca and Fruticultura Citrus Genotype Breeding Program (PGM-Citrus).

The first progeny related to the crossing: five genotypes were related to the cross between the Sunki mandarin [three of Common Selection (TSKC), and two of the Florida (TSKFL) x [Clove Lemon (Citrus limonea L. Osbeck) x Poncirus trifoliata (TR)], and 4 genotypes for the cross between TSKFL x [Poncirus trifoliata Beneke (TRBK) added to the witness [Cravo Santa Cruz lemon tree (LCRSTC) and two irrigation water salinity levels (0.3 dS m⁻¹ and 3.0 dS m⁻¹). The application of water of higher conductivity was started at 15 days after transplanting (DAT) of the seedlings to the lysimeters and lasted until the first crop cycle, one year after the transplant.

2.2 Installation and conduction of the experimente

The seedlings of each citrus genotype grafted with the Tahiti acid lime tree were obtained from the seedling nursery of Embrapa Mandioca and fruit growing in Cruz das Almas-BA, following the recommendations for production of certified seedlings and using source materials After acclimatization to the region, they were transplanted into bags with a capacity of 5 L, where pruning was performed on the main stem at 50 cm, leading to three lateral shoots forming a canopy, the transplant occurred fifth day of February of two thousand and sixteen.

A layer of 15 L of gravel and sand was used to fill the lysimeters, being 8 and 7 L respectively, which formed a 0.04 m high layer, in order to facilitate underground drainage (Fig. 3B). Following this layer the filling simulated a field planting pit, with dimensions of 40 cm in diameter and 40 cm in depth, for this purpose, the mixture between 40 L of Fluovian soil following the characterization of soil diagnostic horizons, with collections (Fig. 3A), with 20 L of tanned bovine manure and phosphate fertilization with superimposed (Table 1), which were placed in the center of the lysimeter with the aid of a cylinder of the specified dimensions, the outside of the cylinder was filled with 60 L of soil (Fig. 3D) so that the lysimeters were filled with a volume of 135 L.



Fig. 3. Soil collection area to fill lysimeters (A), gravel and coarse sand layer (B), drain outlet (C), lysimeter filling with cylinder in the center (D) and cover with crushed corn husk (E).

Each lysimeter was made from a water tank of 150 L capacity, painted white, in order to increase the reflectance and reduce the heat conservation in the lysimeter's interior soil, then a 18 mm meter was placed at the base of the lysimeter (Fig. 3C), in order to favor the drainage and estimation of the water consumption by the plants. The seedlings of the respective genotypes were transplanted 30 days after filling the lysimeters and were followed by a bed of dry matter from corn and sugarcane ground, in the 1 kg portion per lysimeter (Fig. 3E). In order to raise the relative humidity of the air and reduce the albedo, the emerald grass was planted in the soil between the lysimeters. The chemical characterization of soil and manure used in the test is shown in Table 1.

Table 1. Chemical characteristics of the soil and manure used to fill the lysimeter of citrus plants.

	pH CaCl ₂	C.E dS m ⁻¹	P mg/dm ³	N %	K Cmol _c /dm ³	Na	Ca	Mg g Kg ⁻¹	SB	(t)	MO
Soil	7,26	0,03	7	0,16	0,52	0,36	4,55	2,35	7,79	7,42	3
Manure	6,47	1,09	98	2,44	3,82	1,54	4,52	2,63	12,51	10,97	40

2.3 Preparation of irrigation water

As only two levels of conductivity of the irrigation water, only 3.0 dS m⁻¹, it was necessary to be prepared, which was produced with the addition of NaCl, in addition, the water of lower conductivity 0.3 dS m⁻¹ comes from the local water supply system. For the preparation of the water with higher conductivity, the relation between CEa and the concentration of salts ($10 \times \text{meq} = 1 \text{ dS m}^{-1}$ of CEa), extracted from Rhoades et al. [13], valid for CEa from 0.1 to 5.0 dS m⁻¹, in which the level to be prepared is, based on the water supply on site. The salt was weighed according to the treatment, added to the water until reaching the desired EC level, and the values were verified with a portable conductivity meter that has electrical conductivity adjusted to a temperature of 25 °C.

After preparation, the waters were stored in properly protected 500 L containers in order to avoid evaporation, rainwater infiltration and contamination with materials that could compromise quality. Irrigations were carried out with a localized irrigation system (Fig. 4A), by means of dripping tapes with high pressure and 1.9L h⁻¹ flow per dripper, with five drippers per lysimeter. The ribbons were distributed in the lysimeters in the form of a circle, with the aid of an iron bar 4.2 forming a closed system (Fig. 4A). Irrigation management was performed by the water balance method, in order to restore the average daily consumption of the plants and an additional fraction, dividing the volume value to be applied (mL) by 0.9 to obtain a fraction of leaching corresponding to 10%, in order to promote the leaching of excess salts from the irrigation water (Expression 1). $VI = (Va - Vd) \cdot 1 - F \cdot \text{Exp.1}$ Where: VI = volume to be irrigated in the next irrigation event (mL); Va = volume applied in the previous irrigation event (mL); Vd = drained volume (mL), and FL = coefficient used to obtain a leaching fraction of approximately 10%, moisture was also monitored by tensiometer and by Reflectometry in the TDR time domain.



Fig. 4. Irrigation system (A) and view of the experiment (B).

To perform the collection of the drained water, each lysimeter was drilled in the base, to connect a hose, which allows the flow of the drained fluid to an 18L container, allowing to measure the drained volume. Up to 15 days after transplant, the plants received water with low electrical conductivity (CEa), from the local supply system, CEa (0.3 dS m⁻¹), from this period water was applied with the different levels of electrical conductivity lasting until the end of the harvest. The nutritional management followed recommendations by soil and manure analysis, along with that proposed by Mattos Júnior et al. [12], recommended for cultivation, adopting all other precautions to control weeds, prevention and control of pests and diseases, normally recommended in the production of citrus seedlings [12].

2.4 Characteristics analyzed

The effect of the different treatments was analyzed from the following evaluations: number of fruits per kg (NF); number of locules per fruit (NL); volume of juice per kg (VOL mL); weight of juice per kg (PSg); pH; electrical conductivity (EC dS m⁻¹); soluble solids (SS%); titratable acidity (AT%) and ascorbic acid (AA mg / 100 m).

The harvest period referring to the first crop cycle began in December 2016, extending until February 2017. The fruits for each plot were harvested when they presented physiological maturation, the harvest occurred in the proportion of 1 kg of fruit by genotype of each treatment, and these were identified locally. Harvested, fruits were counted and washed (Fig. 5A). Afterwards, the fruits were cut in half and the number of locules counted (Fig. 5B), then with the aid of a juicer the juice was collected (Fig. 5C) and the volume was measured with a beaker (Fig. 5D), after the samples were stored in identified plastic containers and covered with foil, followed by plastic film to eliminate losses and eventual contamination, and then refrigerated (Fig. 5E).

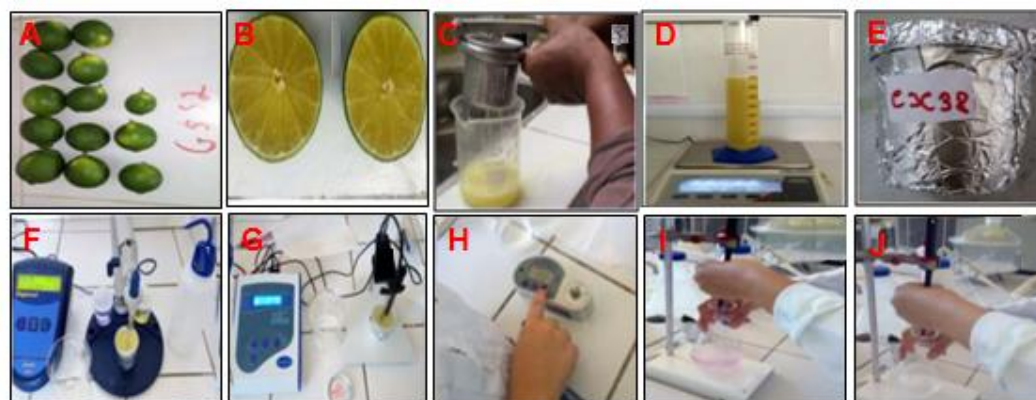


Fig. 5. Fruit counts (A), number of loci per fruit (B), juice extraction (C), juice volume and weight (D), juice conditioning (E), hydrogenation potential, pH, electrical conductivity (G), soluble solids (H), titratable acidity (I), ascorbic acid (J).

The analyzes were carried out in the Laboratory of Chemistry, Biochemistry and Food Analysis of the Federal University of Campina Grande, Pombal Campus. For pH analysis (Figure 5F), a digital potentiometer with glass membrane electrode and resolution of 0.01 was used. The electrical conductivity was determined directly in the sample, using a bench conductivity meter (Figure 5G). Soluble solids determination was expressed in °Brix with the use of a portable refractometer with a resolution of 0.2 (Fig. 5H). The titratable acidity (Fig. 5I) was performed following the Adolfo Lutz Institute's standards expressed as a percentage of citric acid [14]. The ascorbic acid contents (Fig. 5J) were determined by the method of the Adolfo Lutz Institute [14].

2.4 Statistical analysis

The datas obtained were submitted to a variance of analysis, when a significant effect was detected for the F test, the Scott and Knott test was applied at the 5% probability level using the software Sisva® 5.6 [15].

3. RESULTS AND DISCUSSION

By studying the analyzed variables, we can observe significant effects only for the genotype (G), when the variable pH was verified, and the salinity factor (S), when analyzing the (ds m⁻¹), soluble solids (SS%), titratable acidity (AT%) and ascorbic acid (AA mg / 100 mL). What can be observed is that the physical characteristics of the fruits did not suffer as much with the increase of the salinity, these plants come from a young orchard, and the fruits analyzed come from the first year of production and are not fit to commercialize, as they present sizes smaller than those required by the commercial standard. According to Luchetti et al. [6] averages of length and diameter range from 5.5 to 7.0 cm and 4.7 to 6.3 mm, respectively.

Table 2. Number of fruits (NF), number of loci (NL), juice volume (VOL), juice weight (PS), pH, electrical conductivity, soluble solids (SS), titratable acidity and ascorbic acid (A, A mg / 100 mL) in Tahiti acid lime fruits grafted on rootstocks irrigated with waters of different salinities..

Sources of Variation	(G)	(S)	G X S	Bloco	Erro	Média	CV %
Nº of Fruits	25,65 ^{ns}	52,18 ^{ns}	58,18 ^{ns}	22,79	23,57	17,64	27,51
Nº of Locules	0,41 ^{ns}	2,99 ^{**}	0,54 ^{ns}	0,14	0,23	10,78	4,49
Vol. Of Juice	13476,58 ^{ns}	3474,72 ^{ns}	19839,11 ^{ns}	369,54	13790,39	372,14	31,56
Weight of Juice	7601,08 ^{ns}	22080,0 ^{ns}	7031,45 ^{ns}	9504,24	5942,60	375,10	20,55
pH	0,30 ^{**}	0,18 ^{ns}	0,08 ^{ns}	1,06	0,09	2,36	12,96
CE	0,44 ^{ns}	2,02 ^{**}	0,13 ^{ns}	3,33	0,21	4,31	10,74
SS	0,40 ^{ns}	23,44 ^{**}	0,820 ^{ns}	41,53	0,52	8,40	8,62
AT %	0,16 ^{ns}	7,45 ^{**}	0,15 ^{ns}	0,312	0,12	5,89	5,94
AA (mg/100) mL	224,81 ^{ns}	578,52 ^{**}	17,71 ^{ns}	20,24	16,63	38,08	10,71
GL	9	1	9	2	38	-	-

*, ** = significant at the 0.05 and 0.01 probability level; NS = not significant; GL = degree of freedom; CV = coefficient of variation.

Although the effect of the factors studied on the number of fruits was not observed (Table 2), it is mentioned that the plants when irrigated with saline water 3.0 dS m⁻¹ presented NF 10.1% higher than the plants that received water of 0.3 dS m⁻¹. In relation to the genotypes, which also showed no significant difference (Table 2), the average number of fruits was 17.6, the TSKFL x TRBK - 028 genotype showed a lower number of fruits (14.1) when compared to the genotype TSKC x (LCR x TR) - 032.

In relation to the variable number of locules, a significant effect was observed only for the salinity factor (Table 2), where the plants irrigated with water of lower salinity 0.3 dS m⁻¹ had on average 11.0 locules per fruit, already those with CEa of 3.0 dS m⁻¹ had 10.6 inoculants, that is, superiority of only 3.6%. Thus, there is a certain tolerance of genotypes to the salts in relation to this characteristic, since, the salinity tolerance is variable between species, between genotypes and even in a species, between stages of development of the plant, emphasizing that in each stage, salinity tolerance is controlled by more than one gene and highly influenced by environmental factors [16 17 18 19].

For the juice volume characteristic (Vol. ML), no significant effect was observed for any of the studied factors, the means found for the genotypes irrigated with waters of lower CEa were 379.75 mL, not statistically differentiating from the genotypes that received maior waters CEa 364, 54 mL, an increase of only 4.01%, resembled the overall mean which was 372.15 mL. Genotype TSKC x (LCR x TR) -032 was again higher as a mean of 466.50 mL and genotype TSKFL x TRBK-017 with the lowest mean 295.26 mL.

Although no significant effect was found in the factors studied with regard to juice weight (PS) (Table 2), it is mentioned that genotypes irrigated with local water supply 0.3 dS m⁻¹ obtained a higher weight of juice 394, 28 g, while the genotypes that were irrigated with water added NaCl 3.0 dS m⁻¹ presented a mean of 355.92 g, ie a reduction of 9.73%. Regarding the genotype factor, which also did not show significance, presenting a mean of 375, 10 g, being the genotype TSKFL x TRBK - 030 with the highest average 415.03 g, and the TSKFL x TRBK - 017 genotype that had already been identified with the lowest juice volume, was also presented with the lowest mean for juice weight variable 304.18 g.

It is important to point out that it is of great value to the research that no significant effect has been found. This demonstrates the potential of the genotypes under study, since they were studied in the rootstock stage, during the grafting phase, that is, the canopy / rootstock and field combination in the production phase. With regard to the pH variable, a significant effect is observed only for the genotype factor (Table 2), presenting a general mean of 3.36, showing that genotype TSKFL x (LCR x TR) - 018 was highlighted with the highest mean 2.72 and the genotype TSKC x (LCR x TR) -07 with the lowest mean of 2.01 (Table 3), as were studied two progenies and within the same progeny, since in citrus, there is a genetic variation even in individuals from the same parents, and segregation may occur [16 17]. This corroborates with the results found by Silva et al. [20] when studying the perception of stress in citrus genotypes under irrigation with salinized waters in the rootstock phase through gas exchange evaluations.

For the salinity factor, the genotypes irrigated with CEa water equal to 0.3 dS m⁻¹ presented a lower average than the genotypes irrigated with water of higher CE 3.0 dS m⁻¹, being these of 2.35 and 2.36 respectively, and did not differ statistically. This means that the increase in salinity did not influence fruit pH, so changes in juice pH after fruit ripening are almost imperceptible in sensory analysis tests. Citrus fruits commonly present pH between 2.0 for limes, lemons and other acid fruits and approximately 5.0 for ripe mandarins and oranges [21].

Table 3. Test of means related to pH; in fruits of the acid Tahiti lime tree grafted on different rootstocks irrigated with waters of different salinities.

Genótipos	pH
TSKC X (LCR XTR) - 017	2,02B
TSKC X (LCR XTR) - 032	2,43A
TSKC X (LCR XTR) - 059	2,16B
TSKC X (LCR XTR) - 012	2,45A
TSKC X (LCR XTR) - 018	2,73A
TSKFL X TRBK - 011	2,36A
TSKFL X TRBK - 017	2,51A
TSKFL X TRBK - 028	2,31A
TSKFL X TRBK - 030	2,09B
LCRSTC	2,59A

Different upper case letters indicate significant difference between hybrids by the Skott-Knott test at the 5% probability level.

It was verified that the effect caused by the treatments was significant only for the salinity factor (Table 2), where these genotypes presented a average of 4.31 dS m⁻¹, being the genotypes were irrigated with waters of lower CEa 0.3 dS m⁻¹ presented a lower average 4.13 dS m⁻¹ and genotypes that were irrigated with water of higher CEa 3.0 dS m⁻¹ presented an average of 4.49 dS m⁻¹, that is, the genotypes irrigated with water of higher salinity presented a superiority of 8.02% (Table 4), which may be attributed to a greater displacement of salts in the filling of the fruits. However, for genotypes, the LCRSTC control presented an average of 4.72 dS m⁻¹ followed by the TSKFL x TRBK-028 4.70 dS m⁻¹ genotype, whereas the TSKFL x TRBK-017 genotype presented lower average for this variable is 3.78 dS m⁻¹.

Table 4. Test of average referring to significant variables (NL); (EC dS m⁻¹); (SS%); (AT%) and (AA mg / 100 mL) in Tahiti acid lime fruits grafted on different rootstocks irrigated with waters of different salinities.

Significant variables	Irrigation water levels	
	0,3 dS m ⁻¹	3,0 dS m ⁻¹
Nº de locules	16,91A	18,58A
Conductivity (dS m ⁻¹)	4,13B	4,49A
Soluble Solids (SS%)	7,78B	9,03A
Titratable Acidity (AT%)	5,54B	6,25A
Ascorbic acid (mg/100 mL)	34,98B	41,19A

Distinct capital letters on the same line indicate a significant difference between hybrids by the Skott-Knott test at the 5% probability level.

Regarding the soluble solids content (SS%), it was only significant when studying the isolated factors, which had a significant effect on salinity (Table 2), it was reported that the plants when irrigated with conductivity water 3.0 dS m⁻¹ presented 13.86% superiority when compared to plants irrigated with water of 0.3 dS m⁻¹ (Table 4). Some arguments to relate the content of soluble solids to the amount of water applied through irrigation consist of conditions of lower availability of water in the soil, the concentration of sugars in the fruits tends to increase, considering the lower water absorption by the plant and, consequently, a lower dilution of these solids when submitted to water deficit [22 23]. The genotype TSKFL x TRBK - 030 with the highest average of 8.75% and the genotype TSKC x (LCR x TR) - 017 with the lowest genotype average of 7.95%, although they did not differ statistically.

According to (Table 4), the titratable acidity variable (AT%) was only influenced by the salinity factor, where the plants that received higher salinity waters stood out in relation to those that received lower salinity water in 11.22% (Table 4). The genotype TSKC x (LCR x TR) - 032 presented the highest average 6.07% and genotype TSKFL x TRBK - 017 showed the lowest average 5, 64%, so that the values found in this work are considered acceptable being close to the values present in the literature for citrus fruits, similar to those reported by Silva et al. [24] and Alves Júnior et al. [25], whose treatments involving different irrigation slides did not cause significant difference for titratable acidity.

Based on (Table 2), the ascorbic acid levels were not influenced by the salinity factor when studied alone, with an overall average of 38.08 mg / 100 mL, and the plants that underwent irrigation with a higher ECa of 3.0 dS m⁻¹ had an increase of 15.08% (Table 4), in the amount of ascorbic acid when compared to the plants that were irrigated with water of local supply 0.3 dS m⁻¹. TSKC X (LCR x TR) - 032 was higher with 41.03 mg / 100 mL and TSKFL x TRBK-028 genotype showed the lowest mean 33.82 mg / 100 mL, however, the values found resemble the ascorbic acid levels found in the tangerine-pocã, clove lemon and galician lemon described by the Brazilian Food Composition Table, which was 41.8; 32.8 and 34.5 mg of ascorbic acid 100 mL⁻¹ of juice respectively [26].

Considering the importance of the chemical qualities, especially the ascorbic acid content for citrus fruits, it is important to highlight that, although a significant effect was found for these characteristics, the values found did not decrease with the increase of the salinity in the irrigation water of the genotypes (Table 4), this may be linked to the fact that plants subjected to saline stress tend to increase the internal concentration of solutes, so that its potential is high, thus avoiding the loss of water to the soil. This ability to resist is mainly related to the intensity of compartmentalization of the saline ions within the vacuoles and the maintenance of a favorable K + / Na + balance in the cytosol [27].

Despite the lack of a significant effect among genotypes, the best physical and chemical characteristics of fruits were obtained by genotype TSKC x (LCR x TR) - 032 mainly in fruit number (21,0), juice volume (466,50 mL), titratable acidity (6.07%) and ascorbic acid (41.03 mg / 100 mL), the lowest were found in TSKFL x TRBK - 017 genotype for juice volume (295, 26 mL), juice weight (304.18 g), electrical conductivity (3.78 dS m⁻¹) and titratable acidity (5.64%), although these values were lower, they are within the limits allowed for citrus fruits.

However, it was evident that the salinity of the water had an effect on the variables, so that this influence did not alter its post-harvest quality, which can be related to the fact that most of the genotypes were considered salinity tolerant during the port phases graft and after grafting [28].

4. CONCLUSIONS

The different citrus rootstocks did not differ in the characteristics of fruit weight, number of locules, volume and weight of juice. The irrigation with CEa water of 3.0 dS m⁻¹ allowed the highest number of locules, electrical conductivity, soluble solids, titratable acidity and ascorbic acid. There was no significant interaction (Genotype x water salinity) on the studied variables.

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