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West Indian cherry production under irrigation with saline water and potassium-phosphorus fertilization[1]

Produção da aceroleira sob irrigação com águas salinas e adubação com potássio-fósforo

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HIGHLIGHTS:
The salinity of the water reduces the number and diameter of the fruits and, the total weight of West Indian cherry fruits.
Potassium-phosphorus fertilization attenuates the deleterious effects of salt stress on West Indian cherry production.
The effect of water salinity on West Indian cherry fruit varies with salt stress intensity and exposure time to salinity.

ABSTRACT: Water resources in the Brazilian Northeast region commonly have high concentrations of salts, which limits crop production. Thus, the combined supply of nutrients such as K and P can reduce the absorption of Na^+ and Cl^- ions in plants, enabling the use of saline waters. In this context, the objective of this study was to evaluate the production of West Indian cherry cv. BRS 366 Jaburu under irrigation with saline water and potassium-phosphorus fertilization in two production cycles in the second year of cultivation. The treatments were distributed in randomized blocks, in a 5 x 4 factorial scheme with three replicates, corresponding to five values of electrical conductivity of irrigation water (0.6; 1.4; 2.2, 3.0 and 3.8 dS m^{-1}) and four potassium/phosphorus combinations (100/100, 85/85, 60/60 and 45/45% of the recommendation for the crop). In the first production cycle, plants irrigated with waters of 1.4 and 1.9 dS m^{-1} obtained the highest average and total weights of fruits, respectively, while in the second cycle irrigation with waters from 0.6 dS m^{-1} reduced production. Fertilization with 45/45% of the K_2O/P_2O_5 recommendation results in a higher number and weight of West Indian cherry fruits in the first production cycle, regardless of the salinity level.

Key words: *Malpighia emarginata* Sesse & Moc. ex DC., salt stress, mineral nutrition

RESUMO: Os recursos hídricos no Nordeste brasileiro comumente apresentam elevadas concentrações de sais, o que limita a produção das culturas. Assim, o fornecimento de nutrientes, como o K e P de forma combinada pode reduzir a absorção dos íons Na^+ e Cl^- nas plantas, tornando viável o uso de águas salinas. Nesse contexto, objetivou-se, avaliar a produção de aceroleira cv. BRS 366 Jaburu sob irrigação com águas salinas e adubação com potássio-fósforo em dois ciclos produtivos no segundo ano de cultivo. Os tratamentos foram distribuídos em blocos casualizados, em esquema fatorial 5 x 4 com três repetições, relativos a cinco valores de condutividade elétrica da água de irrigação (0,6; 1,4; 2,2; 3,0 e 3,8 dS m^{-1}), e quatro combinações de potássio/fósforo (100/100, 85/85, 60/60 e 45/45% da recomendação para a cultura). No primeiro ciclo produtivo, as plantas irrigadas com águas de 1,4 e 1,9 dS m^{-1}, obtiveram o maior peso médio e total de frutos, respectivamente, enquanto que no segundo a irrigação com águas a partir de 0,6 dS m^{-1} reduziu a produção. A adubação com 45/45% da recomendação de K_2O/P_2O_5 resulta em maior número e peso de frutos de acerola no primeiro ciclo produtivo, independentemente do nível salino.

Palavras-chave: *Malpighia emarginata* Sesse & Moc. ex DC., estresse salino, nutrição mineral

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Introduction

The cultivation of West Indian cherry (*Malpighia emarginata* Sesse & Moc. ex DC.) stands out in the Brazilian fruit growing scene, due to the high levels of vitamin C, anthocyanins and carotenoids in its fruits (Dias et al., 2018). Brazil is the largest producer, consumer and exporter of this fruit in the world, especially its Northeast region, the main producer, with production of 22,964 Mg per year and yield of 60 Mg ha^{-1} (Souza et al., 2017), representing about 70% of the national production, as its climate and soil conditions are favorable for the cultivation of this fruit crop (Furlaneto & Nasser, 2015).

Due to low rainfall and high evapotranspiration rates, irrigation is an essential practice to ensure agricultural production in the semi-arid region; however, waters with high concentrations of dissolved salts are commonly found in this region (Dalchiavon et al., 2016).

The use of these saline waters leads to excessive accumulation of salts in the soil, which reduces the availability of water to plants, due to the osmotic effect, nutritional imbalance and toxicity of specific ions in the plant, compromising crop production (Cordão Terceiro Neto et al., 2013). Thus, conducting studies that enable the use of saline water in regions where water resources are limited is essential.

The supply of nutrients, such as K and P, to a salinity-sensitive crop can increase its tolerance to salinity due to the reduction in the absorption of Na^+ and Cl^- ions by plants because of competitive inhibition (Andrade Júnior et al., 2011). K contributes to enzymatic activation, respiration and photosynthesis, improves water balance and competes with Na^+ (Heidari & Jamshid, 2010), while P acts in energy storage, root development, water use efficiency and nutrient absorption and use (Diniz et al., 2018).

In this context, the objective of this study was to evaluate the production of West Indian cherry cv. BRS 366 Jaburu cultivated under salt stress and combined potassium-phosphorus fertilization.

Material and Methods

The study was carried out under conditions of greenhouse belonging to the Center for Technology and Natural Resources of the Federal University of Campina Grande (CTRN/UFCG), located in the municipality of Campina Grande, PB, Brazil, at the geographic coordinates 7° 15' 18" S latitude, 35° 52' 28" W longitude and altitude of 550 m.

West Indian cherry plants were grown during the second year of cultivation in continuity of a previous experiment that tested the influence of five values of electrical conductivity of irrigation water - ECw (0.6; 1.4; 2.2, 3.0 and 3.8 dS m^{-1}) and four proportions of phosphorus and nitrogen (100/100; 140/100; 100/140 and 140/140% of recommendation of P_2O_5/N) distributed in randomized blocks with three replicates. Plastic pots with height and diameter of 90 x 60 cm, adapted as drainage lysimeters, were filled with a 1-kg layer of crushed stone number zero, followed by 250 kg of an Entisol with sandy clay loam texture, whose chemical and physico-hydric characteristics before applying the treatments were obtained according to Donagema et al. (2011): Ca^{2+} = 3.49 cmol$_c$ kg^{-1}; Mg^{2+} = 2.99 cmol$_c$ kg^{-1}; P = 18.20 mg kg^{-1}; Na^+ = 0.17 cmol$_c$ kg^{-1}; K^+ = 0.21 cmol$_c$ kg^{-1}; $H^+ + Al^{3+}$ = 5.81 cmol$_c$ kg^{-1}; organic matter = 1.83 dag kg^{-1}; pH in water (1:2.5) = 5.63; electrical conductivity of saturation extract = 0.61 dS m^{-1}; exchangeable sodium percentage = 2.48%; sand = 573 g kg^{-1}; silt = 101 g kg^{-1}; clay = 326 g kg^{-1}; moisture at 33.42 kPa = 12.68 dag kg^{-1}; moisture at 1519.5 kPa = 4.98 dag kg^{-1}.

The application of 100% of phosphate fertilization (45.0 g of P_2O_5 per plant per year) and nitrogen (23.85 g of N per plant per year) was based on recommendations of Musser (1995). The end of the first year of cultivation occurred in September 2017. In October 2017, all plots were leached to reduce the excess of soluble salts. After leaching, irrigation was performed using low-salinity water (EC = 0.4 dS m^{-1}) until January 2018 and, from then on, the second year of cultivation began.

The management of West Indian cherry during the second year occurred from January to December 2018, divided into two production cycles with duration of 6 months each. The data of maximum and minimum mean temperature and relative air humidity during the experimental period are shown in Figure 1.

The treatments were distributed in randomized blocks, with three replicates, using the factorial arrangement 5 x 4, being five electrical conductivities of irrigation water - ECw (0.6; 1.4; 2.2; 3.0 and 3.8 dS m^{-1}) and four combinations of potassium-phosphorus fertilization (100/100, 85/85, 60/60 and 45/45% of the recommendation for the crop in its second year of cultivation). The doses of 100% of K_2O and P_2O_5 corresponded to 200 and 120 g per plant per year, respectively (Cavalcanti, 2008). To meet the N recommendation, 200 g per plant were applied, as recommended by Cavalcanti (2008) for the cultivation of West Indian cherry in the second year of production.

Fertilization with N, P and K was performed using monoammonium phosphate - MAP (11% N and 60% P_2O_5) as source of phosphorus, urea (45% N) as source of nitrogen, taking into account the percentage of N contained in MAP, and potassium chloride (60% K_2O) as source of potassium. Phosphate fertilization was split into 12 equal applications, being supplied in the first week of each month, while potassium and nitrogen fertilizers were applied in the second, third and fourth weeks of each month, that is, three

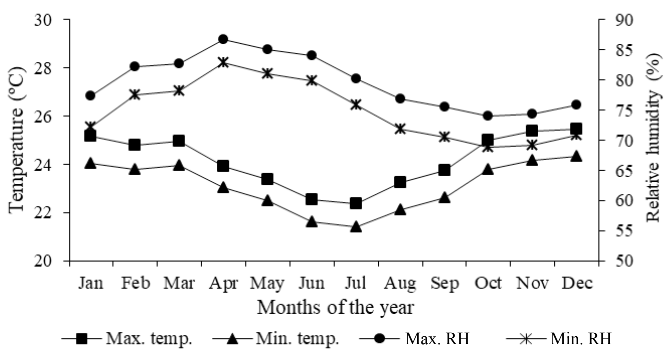


Figure 1. Mean temperature (maximum - Max. temp. and minimum - Min. temp.) and relative air humidity - RH (maximum - Max. RH and minimum - Min. RH) during the experimental period

times a month, in a total of 36 equal applications for both N and K. Fortnightly, fertilization with micronutrients was performed in the proportion of 0.5 g L^{-1} using as source the foliar fertilizer 'Quimifol Nutri', which contains 25% potassium, 2.5% magnesium, 6.0% sulfur, 2.0% boron, 0.5% copper, 0.3% molybdenum and 5.0% zinc.

The values of electrical conductivity of irrigation water were obtained by dissolving the salts NaCl, $CaCl_2.2H_2O$ and $MgCl_2.6H_2O$ in the equivalent proportion of 7:2:1 in public-supply water (ECw = 0.4 dS m^{-1}) of Campina Grande, PB. Irrigation was carried out at intervals of two days, applying the volume corresponding to that obtained by the water balance, according to Eq. 1:

$$VI = \frac{(Va - Vd)}{(1 - LF)} \quad (1)$$

where:

VI - volume of water to be used in the irrigation event, mL;

Va and Vd - volume applied and drained in the previous irrigation event, mL; and,

LF - leaching fraction (0.10).

For the evaluation of West Indian cherry production, all fruits were harvested when they showed an orangish red color (characteristic when ripe). Then, total weight of fruits (TWFr) was determined on a scale with precision of 0.01 g; number of fruits per plant (NFr) was determined by counting the fruits harvested per plant; average weight of fruits (AWFr) was determined by the relationship between TWFr and NFr; and equatorial diameter (transverse region) and polar diameter (from apex to base) of fruits were measured in a sample of 20 fruits per plant, using a digital caliper.

The data obtained were subjected to analysis of variance and polynomial regression analysis for the electrical conductivity of irrigation water and to Tukey test for potassium-phosphorus combinations, using the statistical program SISVAR 4.2 (Ferreira et al., 2014).

Results and Discussion

Water salinity significantly influenced the total weight of fruits per plant (TWFr), average weight of fruits (AWFr) and the equatorial (EDFr) and polar (PDFr) diameters of fruits of West Indian cherry in both production cycles, while the number of fruits (NFr) was significantly affected only in the first production cycle (Table 1). Potassium-phosphorus combinations caused a significant difference in AWFr only in the second production cycle, while TWFr, NFr and PDFr were influenced in both production cycles. The interaction between the factors (SL x FC) significantly influenced only the NFr of West Indian cherry plants in the first production cycle.

The total weight of fruits (TWFr) of West Indian cherry was described by a quadratic and a linear model, in the first and second production cycles, respectively. According to the regression equation (Figure 2A), in the first production cycle there was increase in TWFr up to the estimated ECw of 1.9 dS m^{-1} (3,828.44 g per plant), followed by reduction

Table 1. Summary of the F test for total weight of fruits per plant (TWFr), number of fruits per plant (NFr), average weight of fruits (AWFr), and equatorial (EDFr) and polar diameter (PDFr) of fruits of West Indian cherry cv. BRS 366 Jaburu irrigated with saline water and fertilized with potassium-phosphorus combinations in the first and second production cycles of the second year of cultivation

Source of variation	Significance of F test				
	TWFr	NFr	AWFr	EDFr	PDFr
	First production cycle				
Water salinity levels (SL)	**	ns	**	**	*
Linear regression	ns	ns	**	**	**
Quadratic regression	*	ns	*	ns	ns
Fertilization combinations (FC)	*	*	ns	ns	*
Interaction (SL × FC)	ns	**	ns	ns	ns
Blocks	ns	ns	ns	ns	ns
CV (%)	22.08	20.37	15.52	9.32	9.32
	Second production cycle				
Water salinity levels (SL)	**	*	*	**	**
Linear regression	**	**	*	**	**
Quadratic regression	ns	ns	ns	ns	*
Fertilization combinations (FC)	*	*	ns	*	*
Interaction (SL × FC)	ns	ns	ns	ns	ns
Blocks	ns	ns	ns	ns	ns
CV (%)	24.55	34.50	44.63	7.39	7.82

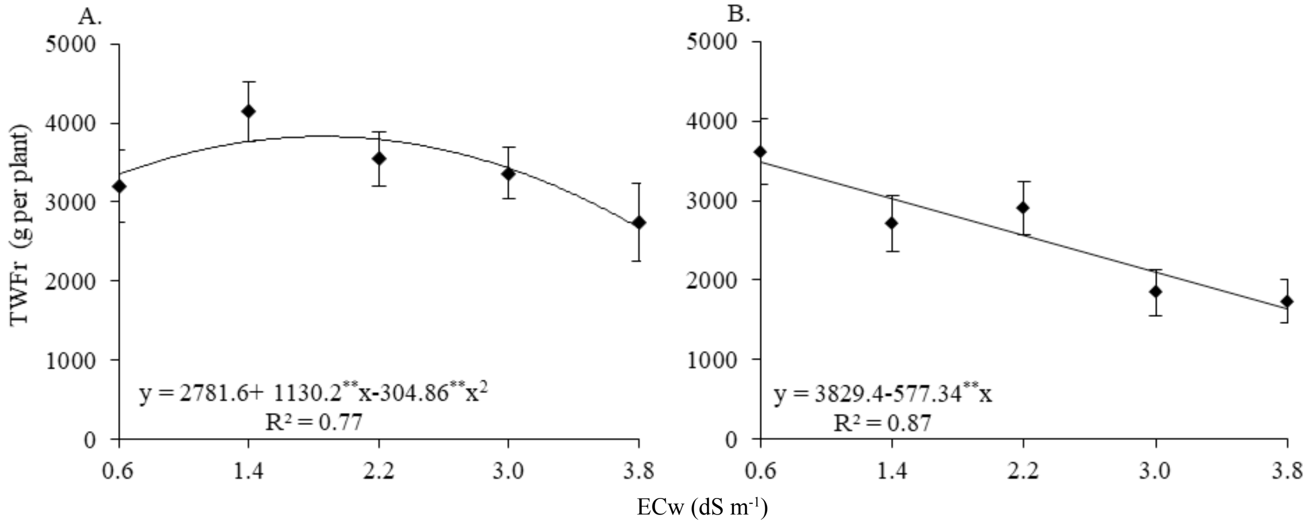
CV - Coefficient of variation; ns, * and **: Not significant, significant at $p \leq 0.05$ and significant at $p \leq 0.01$, respectively

from this value of water salinity. When the TWFr of plants irrigated with ECw of 3.8 dS m^{-1} was compared to the value of those cultivated with 0.6 dS m^{-1}, there was reduction of 675.79 g per plant. In the second production cycle (Figure 2B), it can be observed that TWFr decreased linearly by 15.07% per unit increase in irrigation water salinity, that is, plants irrigated with the highest salinity level (3.8 dS m^{-1}) showed a reduction of 1,847.48 g per plant (53.04%) compared to those under the lowest ECw (0.6 dS m^{-1}).

When comparing the reductions in total weight of fruits in the first and second production cycles (20.17 and 53.04%, respectively) between the lowest and highest values of ECw, a greater reduction was observed in the second cycle, which is related to the higher intensity of stress, due to the longer exposure of plants to salt stress. Under saline conditions, plants close their stomata, reducing the fixation of CO_2 and, consequently, the photosynthetic rate (Schossler et al., 2012), which reduces the synthesis of photoassimilates as well as their translocation for fruit formation.

For the total weight of West Indian cherry fruits (Figure 3A) it can be seen that, in the first productive cycle, the highest values (3214.77; 3667.52 and 3,750.68 g per plant) were observed in the plants under 85/85, 60/60 and 45/45% recommendation of K_2O/P_2O_5; when compared to 100/100% combination which presented lowest TWFr, the K_2O/P_2O_5 combination 45/45% showed, significant differences. In the second productive cycle, plants grown under the combination of 45/45% K_2O/P_2O_5 had statistically lower TWFr than those that received 60/60% fertilizer combination of potassium-phosphorus (Figure 3B). However, when plants fertilized with 100/100; 85/85 and 60/60% K_2O/P_2O_5 were compared there were no significant differences between them.

In the long run, the external concentration of the Na^+ ion occupies the K^+ and Mg^{+2} absorption sites, and the Cl^- ion



** - Significant at $p \leq 0.01$ by F test; Vertical bars represent the standard error of the mean (n = 3)

Figure 2. Total weight of fruits - TWFr of West Indian cherry cv. BRS 366 Jaburu, as a function of the electrical conductivity of irrigation water - ECw in the first (A) and second (B) production cycles in the second year of cultivation

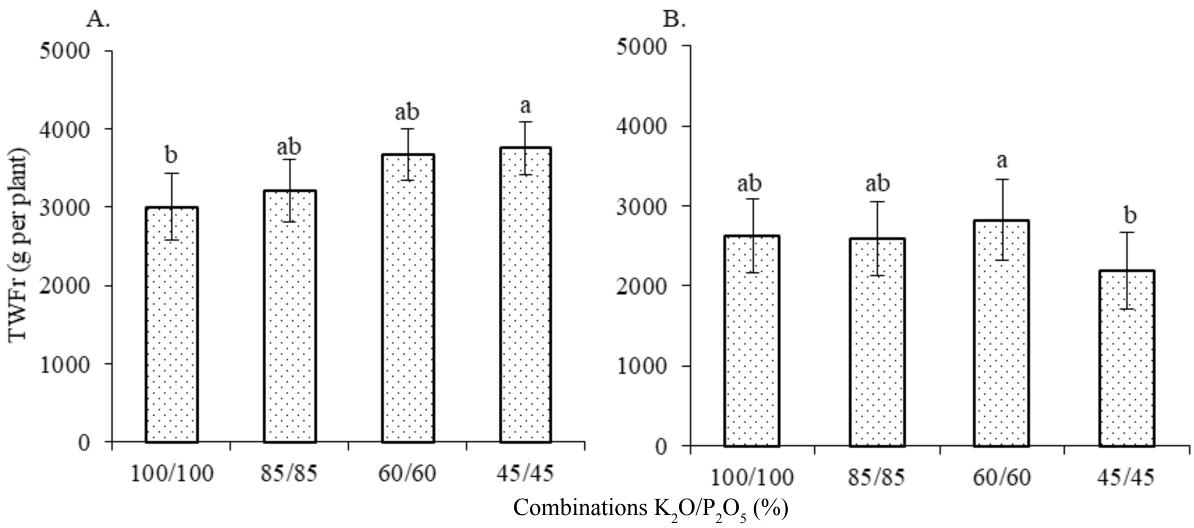
acts on the N and P absorption sites (Lucena et al., 2012). Thus, the increase in the supply of K^+ and P increases their concentrations in the soil solution with a consequent increase in its absorption, to the detriment of toxic ions (Cl^- and Na^+), due to competitive mechanisms.

In the second production cycle (Figure 3B), regardless of the potassium-phosphorus combination, the TWFr was lower than that obtained in the first cycle, confirming the premise that crop tolerance varies not only with stress intensity and plant variety but also with the time of exposure of crops to the stressful factor (Willadino & Camara, 2010; Bezerra et al., 2019).

The higher production in plants supplied with the lowest combination of K_2O/P_2O_5, in the first production cycle, is an indication that the dose of K_2O/P_2O_5 recommended by Cavalcanti (2008) provokes excessive concentrations. Another factor that may have contributed was also the fertilizers used, because potassium chloride and MAP, sources of potassium and phosphorous, respectively, are salts that can potentiate the negative effects of salinity, since they have high salt indices (116 and 30 for KCl and MAP, respectively) (Trani & Trani, 2011).

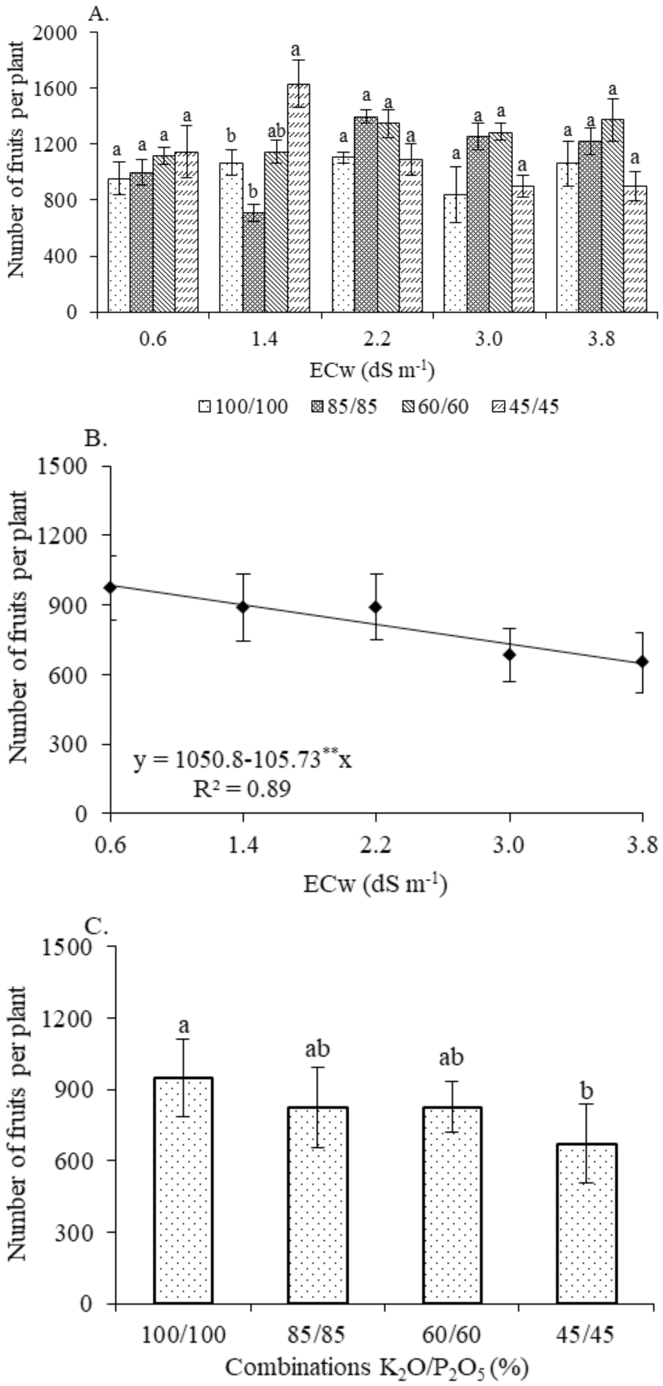
In the analyses of K_2O/P_2O_5 fertilization combinations at each salinity level for the number of fruits per plant (NFr) in the first production cycle (Figure 4A), only plants irrigated with water of 1.4 dS m^{-1} were influenced by the combinations of K_2O/P_2O_5, and the highest NFr was obtained under 45/45% of K_2O/P_2O_5 recommendation. When comparing the number of fruits per plant subjected to the combinations of 100/100, 85/85 and 60/60% of K_2O/P_2O_5, there was no significant effect.

The deleterious effects of potassium chloride, a fertilizer with high salt index (Trani & Trani, 2011; Prazeres et al., 2015), and monoammonium phosphate (Abrêu et al., 2011) may have resulted in the intensification of the osmotic effect. Lima et al. (2018) found a negative effect of K doses greater than 79.2 mg K_2O kg^{-1} of soil on the weight of fruits of West Indian cherry irrigated with waters of 0.8 and 3.8 dS m^{-1}. These authors highlight that, under conditions of salt stress,



Means followed by different letters indicate significant difference between treatments by Tukey test ($p \leq 0.05$); Vertical bars represent the standard error of the mean (n = 3)

Figure 3. Total weight of fruits - TWFr of West Indian cherry cv. BRS 366 Jaburu as a function of fertilization with potassium-phosphorus combinations - K_2O/P_2O_5 in the first (A) and second (B) production cycle in the second year of cultivation



Means followed by different letters indicate significant difference between treatments by Tukey test ($p \leq 0.05$); ** - Significant at $p \leq 0.01$; Vertical bars represent the standard error of the mean (n = 3)

Figure 4. Number of fruits per plant of West Indian cherry cv. BRS 366 Jaburu as a function of fertilization with the combinations of potassium-phosphorus (K_2O/P_2O_5) and electrical conductivity of irrigation water - ECw in the first production cycle (A), and the effect of electrical conductivity of irrigation water - ECw (B) and K_2O/P_2O_5 combinations (C) in the second production cycle in the second year of cultivation

the increase in K doses does not always result in beneficial effects on plants and, in some cases, salinity caused by high concentrations of K^+ can be as harmful as that resulting from high concentrations of sodium.

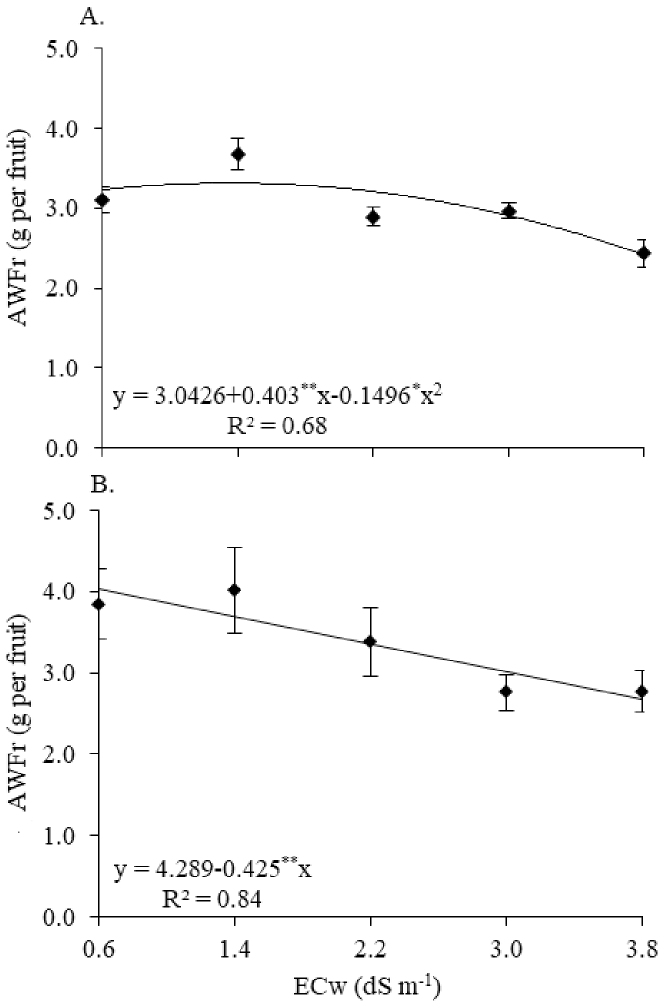
According to the regression equation (Figure 4B), the NFr in the second production cycle decreased linearly by 10.06% per unit increase in ECw, which is equivalent to a decrease of 34.26% in the number of fruits of plants irrigated with 3.8 dS m^{-1} water compared to those under ECw of 0.6 dS m^{-1}. In line with the results obtained in this study, Bezerra et al. (2019) found a reduction of 28.13% in the number of guava fruits with the increase in ECw from 0.3 to 3.5 dS m^{-1} in the second production cycle. According to these authors, this is due to the intensification of osmotic effects and excessive accumulation of potentially toxic ions (Na^+ and/or Cl^-) in plant tissues throughout the cultivation cycle.

Regarding the potassium/phosphorus combinations (Figure 4C), the highest NFr in the second production cycle was obtained in plants fertilized with 100/100, 85/85 and 60/60% of K_2O/P_2O_5. However, there was no significant difference when the combinations of 85/85, 60/60 and 45/45% of K_2O/P_2O_5 were compared. The highest NFr was obtained under the highest supply of K_2O/P_2O_5 because K performs physiological functions in metabolism, such as control of osmotic regulation and maintenance of ionic homeostasis (Lima et al., 2018), while P promotes greater root formation, flowering and fruiting, acting directly in production (Malavolta, 2006). When subjecting West Indian cherry plants to salt stress (ECw of 0.8 and 3.8 dS m^{-1}) and fertilization with doses of K, Lima et al. (2018) found a positive response in NFr under fertilization with 100% of the K_2O recommendation, regardless of ECw.

The average weight of fruit was negatively affected by water salinity and, as shown in Figure 5A, in the first production cycle the maximum estimated value for AWFr (3.14 g) was obtained when plants were irrigated with ECw of 1.4 dS m^{-1}, decreasing from this level of water salinity, until reaching the minimum value of 2.41 g, at highest ECw (3.8 dS m^{-1}), corresponding to a loss of 21.41% in AWFr compared to that under 1.4 dS m^{-1}.

In the second crop cycle, the AWFr decreased linearly as ECw increased, with a reduction of 9.91% per unit increase in ECw. According to the regression equation (Figure 5B), as the ECw increased from 0.6 to 3.8 m^{-1}, there was a decrease of 1.36 g, that is, 33.71% of reduction in the AWFr of West Indian cherry plants. Corroborating the results obtained in this study, Lima et al. (2018) found a reduction of about 14.94% in the average weight of fruit of West Indian cherry as ECw increased from 0.8 to 3.8 dS m^{-1}. The authors associated these results with lower absorption of water and nutrients by plants, resulting from increased levels of soil salinity, which can cause cell damage due to oxidative stress in the plant, leading to a reduction in agricultural production.

The equatorial diameter of the fruits was negatively influenced by the increase in irrigation water salinity in both production cycles (Figures 6A and B). There were reductions in the equatorial diameter of 3.57 and 6.54%, respectively, per unit increase in water salinity. When comparing the EDFr of plants subjected to irrigation with ECw of 3.8 dS m^{-1} to the values of those under 0.6 dS m^{-1}, there were reductions of 11.69 and 21.78% or 2.74 and 4.74 mm in EDFr in the first and second production cycles, respectively. Fruit size decreases because of changes in the production of photoassimilates in plants imposed by salt stress. Reduction in fruit diameter in plants under salt stress conditions was also observed by Souto et al. (2015) in noni (*Morinda citrifolia* L.).

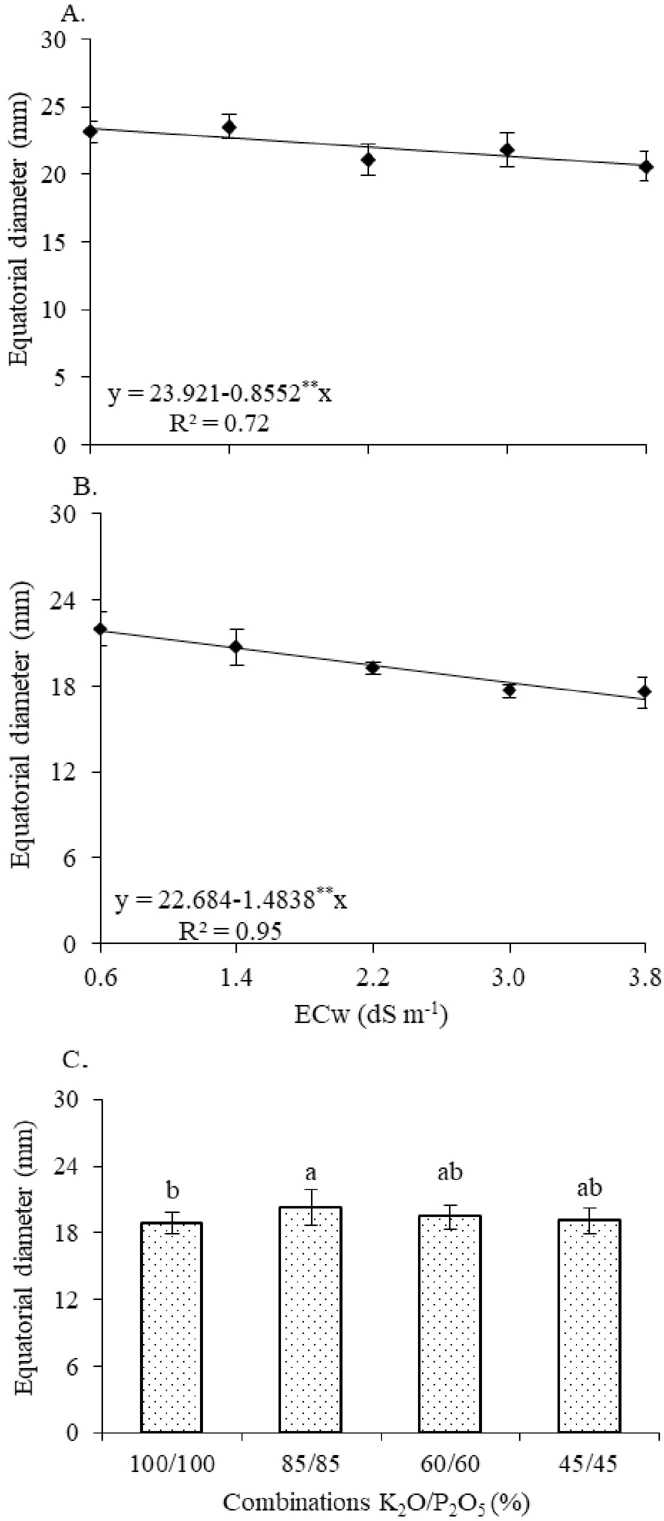


** and * - Significant at $p \leq 0.01$ and $p \leq 0.05$; Vertical bars represent the standard error of the mean (n = 3)

Figure 5. Average weight of fruit - AWFr of West Indian cherry cv. BRS 366 Jaburu, as a function of the electrical conductivity of irrigation water - ECw in the first (A) and second (B) production cycles in the second year of cultivation

As for the combinations of potassium/phosphorus, it can be noted (Figure 6C) that the highest EDFr (20.31 mm) was obtained under 85/85% of the K_2O/P_2O_5 recommendation, differing statistically only from plants fertilized with the 100/100% combination. The increase in EDFr of West Indian cherry in response to the combined fertilization of K_2O/P_2O_5 is a consequence of the functions performed by K in the translocation of photoassimilates from leaves to fruits, resulting in higher fruit weight and, consequently, production (Carneiro et al., 2017), while P stimulates synthesis and consequently a greater supply of organic solutes, greater energy availability, enabling the plant to increase selectivity in the absorption of beneficial ions, improving the exclusion of toxic ions, favoring ionic homeostasis (Gupta & Huang, 2014).

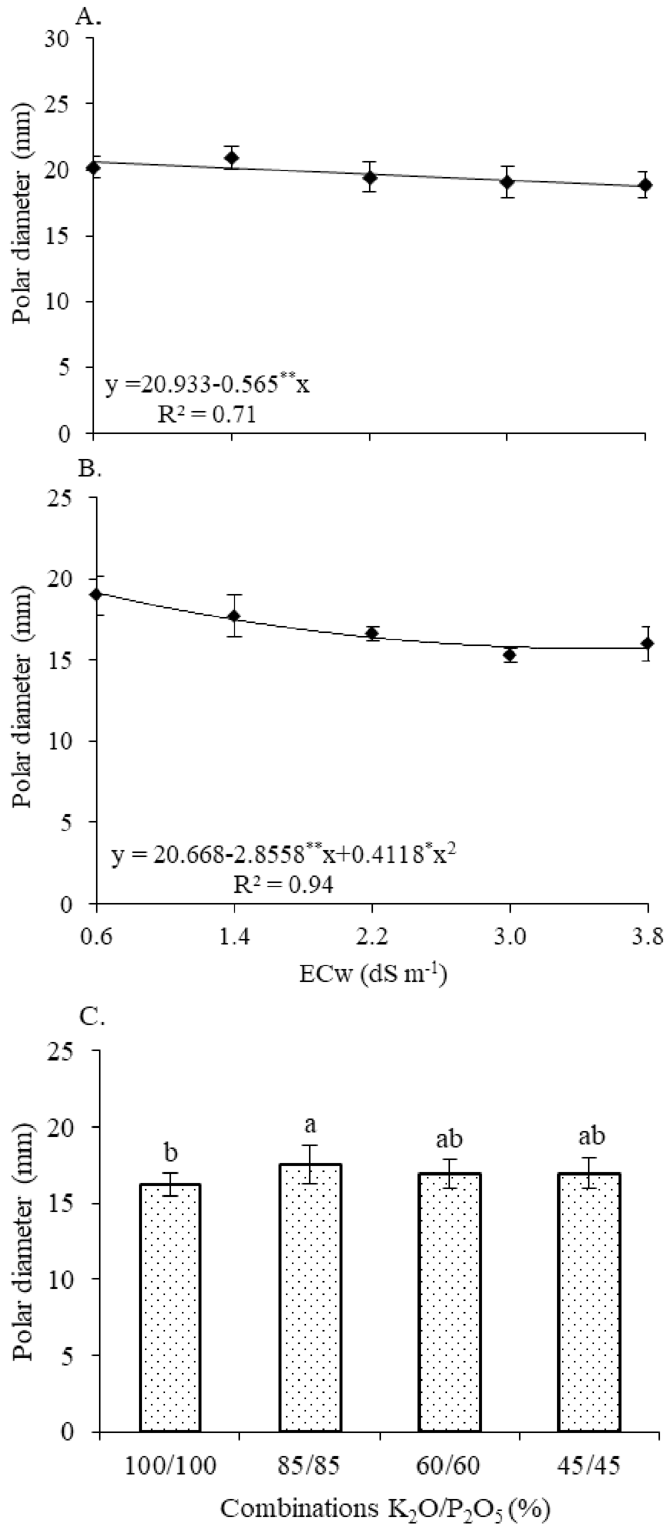
The polar diameter of the fruits - PDFr of West Indian cherry decreased in a linear and quadratic manner with water salinity increment the first and second productive cycles, respectively, being verified through the regression equations (Figures 7A and B) reductions of 8.77 and 17.48%, that is, 1.81 and 3.34 mm in the PDFr of plants cultivated with ECw of 3.8 dS m^{-1} compared to those irrigated with waters of 0.6 dS m^{-1}, respectively. The reduction observed



Means followed by different letters indicate significant difference between treatments by Tukey test ($p < 0.05$); ** - Significant at $p \leq 0.01$; Vertical bars represent the standard error of the mean (n = 3)

Figure 6. Equatorial diameter of fruits - EDFr of West Indian cherry cv. BRS 366 Jaburu as a function of the electrical conductivity of irrigation water - ECw in the first (A) and second (B) production cycles and as a function of the combinations of K_2O/P_2O_5 fertilization (C) in the second production cycle in the second year of cultivation

in the PDFr of West Indian cherry (Figure 7) can be attributed, among other causes already mentioned on TWFr, AWFr and EDFr, to protein denaturation and membrane destabilization, which reduce plant growth and prevent



Means followed by different letters indicate significant difference between treatments by Tukey test ($p < 0.05$); ** - Significant at $p \le 0.01$; Vertical bars represent the standard error of the mean (n = 3)

Figure 7. Polar diameter of fruits - PDFr of West Indian cherry cv. BRS 366 Jaburu, depending on the electrical conductivity of irrigation water - ECw in the first (A), in the second production cycle (B) and the combinations of fertilization with K_2O/P_2O_5 (C) in the second production cycle in the second year of cultivation

photosynthesis (Taiz et al., 2017), as well as to higher energy expenditure of plants under such conditions to maintain their metabolic activities, causing the formation of fruits with lower weight (Silva et al., 2019).

As observed for EDFr, the values of polar diameter of West Indian cherry fruits in the second cycle of production, according to the means comparison test (Figure 7C), were also higher in the application of the combination of 85/85% K_2O/P_2O_5 (17.54 mm), but did not differ statistically from those of plants cultivated under fertilization with 60/60% (16.92 mm) and 45/45% (16.96 mm) of K_2O/P_2O_5, hence denoting that the lowest combination of K_2O/P_2O_5 (45/45%) is the best option for the nutrition of West Indian cherry under saline conditions, since it represents savings with acquisition of inputs for crop management. When comparing the PDFr values of plants fertilized with 85/85% and 100/100% of K_2O/P_2O_5, there was a decrease of 7.59%, that is, 1.33 mm in the polar diameter of West Indian cherry. The increase in K content in the soil solution causes reduction in Ca and Mg contents in plants, due to the existence of competitive inhibition between these ions (Silva & Trevizam, 2015). This reduction in the absorption of Ca and Mg is harmful to crop production, as calcium influences the structure and resistance of the cell wall, while magnesium plays a specific role in the activation of enzymes involved in respiration, photosynthesis and synthesis of DNA and RNA, besides being part of the structure of the chlorophyll molecule (Taiz et al., 2017).

On the other hand, high concentrations of phosphorus may reduce photosynthesis due to the excessive export of triose-P from mitochondria to cytosol, which hampers the regeneration of RuBP and, therefore, the fixation of CO_2 in the photosynthetic process. In addition, it causes deleterious effects on the utilization of cationic micronutrients, especially Zn and others such as Cu, Fe and Mn, to a lesser extent (Abrêu et al., 2011), which are essential for the adequate development and production of plants.

Conclusions

1. In the first production cycle of the second year of West Indian cherry cultivation, plants irrigated with waters of electrical conductivity of 1.4 and 1.9 dS m^{-1} obtained higher average and total weights of fruits, respectively, while in the second production cycle irrigation with waters above 0.6 dS m^{-1} reduced production.

2. Fertilization with 45/45% of K_2O/P_2O_5 recommendation results in a higher number and weight of West Indian cherry fruits in the first production cycle, regardless of the salinity level.

3. The supply of 100/100 and 85/85% of K_2O/P_2O_5 recommendation increases the number of fruits and the equatorial and polar diameters, respectively.

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