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Application strategies of saline water and nitrogen doses in mini watermelon cultivation

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Abstract

Salt stress is highlighted as one of the limiting factors for the establishment of agriculture in the semiarid region of Northeastern Brazil. In this context, it is essential to look for new strategies aiming at minimizing the effects of salt stress on the crops. The present work aimed to evaluate the photochemical efficiency, photosynthetic pigments, and growth of the watermelon cv. Sugar Baby under different use strategies with saline waters and nitrogen fertilization. The experiment was conducted in a protected environment at the Center of Technology and Natural Resources of the Federal University of Campina Grande, municipality of Campina Grande, Paraíba. An experimental design in randomized blocks was adopted, arranged in a 6 x 2 factorial scheme, with six management strategies of water salinity and two nitrogen doses (corresponding to 50 and 100% of the recommendation), with five replications. Two salinity levels of the irrigation water were studied, one with low and another with a high level of electrical conductivity of the water (ECw = 0.8 and 3.2 dS m^{-1}). The watermelon cv. Sugar Baby expressed higher sensitivity to salt stress in the flowering phase, with a decrease in the synthesis of chlorophyll *b*, chlorophyll total, and carotenoids. The 50% dose of N provided an increment in the initial fluorescence, stem diameter, and the number of leaves of the watermelon cv. Sugar Baby. The length of the main branch of the watermelon plants decreased with the salt stress applied in the fructification phase; however, the fertilization with 100% of N stimulated a higher growth when the irrigation with saline waters was performed at the vegetative and flowering phases.

Keywords: nitrogen fertilization, *Citrullus lanatus,* salt stress

Introduction

Watermelon (*Citrullus lanatus* L.) is a vegetable crop cultivated in nearly all Brazilian states, with the Northeast region standing out due to the favorable climatic conditions for crop establishment since the dry and hot climate provides fruits of better quality (Silva et al., 2015).

However, in the semiarid region of Northeastern Brazil, water scarcity is a common problem, and the high evapotranspiration rates contribute to decrease the water availability and increase the salt concentration in both superficial and underground water sources, changing the water quality through salinization (Holanda et al., 2016). The plants are limited regarding their development and productivity when using water with salinity above the limit level of the crops, since, with the increase of the electrical conductivity of the water, the potential of water in the soil is reduced and can exert negative effects due to the reduced availability of water and due to specific ions (Lima et al., 2018).

The reduction in the osmotic potential and the high concentrations of cations and anions cause alterations in ionic homeostasis, decrease of plant development, and the imbalance in the physiological functions of the plants (Braz, 2018). Furthermore, the plants under salt stress may decrease their chlorophyll content due to the accumulation of ions and disturbances observed during the opening and closing of stomata (Melo et al., 2017).

One of the strategies to mitigate the harmful effects on plants of irrigation water salinity in the soil is the use of fertilization with mineral nitrogen (N), which can attenuate salt stress (Lima et al., 2014). This occurs since N participates directly in plant metabolism, becoming a constituent of the chlorophyll molecule, as well as nucleic acids, amino acids, and proteins (Bezerra et al., 2018). Furthermore, it acts in important biochemical and

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physiological processes that occur in the plant, such as photosynthesis, respiration, ionic absorption of other nutrients, growth, and cell differentiation (Taiz et al., 2017).

The irrigation with saline waters in the different developmental stages of the crops should be considered as a promising strategy for the expansion of irrigated agriculture in the semiarid region of Northeastern Brazil. The use of saline waters in the developmental stage that the crop expresses higher tolerance allows the use of water sources with high salt concentrations (Barbosa et al., 2012). It is an alternative that allows greater availability of other water sources for agricultural production (Medeiros et al., 2017).

In this context, this study was conducted aiming to evaluate the photochemical efficiency, photosynthetic pigments, and growth of the mini watermelon cv. Sugar Baby under different use strategies of saline waters and nitrogen fertilization.

Material and Methods

The experiment was performed from May to August 2017 in protected conditions (plant nursery), at the Federal University of Campina Grande, in Campina Grande, state of Paraíba, Brazil (7°15'18' S, 35°52'18' W and mean elevation of 550 m). The mean internal temperature of the plant nursery during the experimental period was 28.33 °C.

The experimental design was in randomized blocks, in a 6 x 2 factorial scheme - six salinity management strategies; two nitrogen doses: 50% and 100%, equivalent to 50 and 100 mg of N kg^{-1} of soil according to recommendations of Novais et al. (1991), in the form of urea (45% of N); with five replications, totaling 60 experimental units. The nitrogen doses were divided into three equal applications, via topdressing at 25, 37, and 47 days after sowing (DAS).

The six management strategies of water salinity consisted of two levels of electrical conductivity (ECw): one of low (ECw = 0.8 dS m^{-1}) and another of high salinity (ECw = 3.2 dS m^{-1}), varying according to the phenological phases of the plants: SE = without stress throughout the crop cycle; VE – salt stress only in the vegetative phase; VE/FL – salt stress in the vegetative phase and at flowering; FL = salt stress in the flowering phase; FR = salt stress in the fructification phase; MAT = salt stress in the fruit maturation phase.

The vegetative phase comprised the period from the appearing of the second true leaf until the emission of the first female flower (25-41 DAS); flowering – from the first female flower until the establishment of the first fruit (42-55 DAS); fructification – from fruit establishment until fruit filling (56-66 DAS), and maturation – from fruit filling until harvest (67-85 DAS).

The crop used was the mini watermelon cv. Sugar Baby, highlighted for its precocious cycle, with the harvest being performed from 75 DAS. The plant is rustic, with vigorous leaves, and tolerant to high temperatures, presenting round fruits with a dark green rind, with weight varying from 2 to 4 kg. It presents a pulp with high sugar content, soft, and with intense red coloration.

The plants were cultivated in plastic recipients adapted as drainage lysimeters with 20 L capacity, which received a 3 cm gravel layer and a geotextile fabric to avoid the obstruction of the drainage system by soil material. Covering the surface of the base of the recipient, a transparent 4 mm hose was connected to its base in order to facilitate drainage, being coupled to a plastic bottle to receive the drained water, working as a drainage lysimeter. Afterward, 24 kg of a sandy-loam Entisol was added, originated from cultivated area in the municipality of Lagoa Seca - PB, whose values of physical and chemical attributes were determined according to Donagema et al. (2011): Ca^{2+} = 2.60 $cmol_c$ kg^{-1}; Mg^{2+} = 3.66 $cmol_c$ kg^{-1}; Na^+ = 0.16 $cmol_c$ kg^{-1}; K^+ = 0.22 $cmol_c$ kg^{-1}; H^++Al^{3+} = 1.93 $cmol_c$ kg^{-1}; cation exchange capacity (CEC) = 8.57 $cmol_c$ kg^{-1}; organic matter = 1.36 dag kg^{-1}; P = 6.8 mg kg^{-1}; pH in water (1:2.5) = 5.90; electrical conductivity of the soil saturation extract (ECse) = 0.19 dS m^{-1}; sand = 732.9 g kg^{-1}; silt = 142.1 g kg^{-1}; clay = 125 g kg^{-1}; moisture at 33.42 kPa = 11.98 dag kg^{-1}; moisture at 1519.5 kPa = 4.32 dag kg^{-1}. At the end of the experiment (85 DAS), the levels of the ECse under different treatments were: control = 1.34; vegetative stage = 1.80; vegetative/flowering = 2.18; flowering (FL) = 2.76; fructification = 1.59; and fruit maturation = 5.08 dS m^{-1}.

The fertilization with phosphorus and potassium was performed according to the recommendation by Novais et al. (1991) by applying 300 and 150 mg kg^{-1} of soil of P_2O_5 and K_2O, respectively, in the form of single superphosphate and potassium nitrate. The fertilization with K_2O and P_2O_5 was performed via topdressing, divided into three equal applications at 22, 40, and 45 DAS for K, and at 16, 32, and 43 DAS for P.

Sowing was performed with four seeds per lysimeter at a 3 cm depth, distributed equidistantly. Before sowing, the moisture content of the soil was increased to the corresponding level of field capacity, using low-salinity water (0.8 dS m^{-1}). After sowing, irrigation was performed daily at 5:00 p.m. by applying, in each recipient, the volume corresponding to the water requirement of the plants, determined through the water balance, considering the volume of water applied and drained in the previous irrigation, and the leaching fraction equivalent to 20% to prevent the excessive accumulation of salts in the root zone. At 24 DAS, the application of water with the highest saline level was started, according to the strategies for salinity management.

The water used in the irrigation of the treatment with the lowest saline level (0.8 dS m^{-1}) was obtained by diluting the water from the public supply system of Campina Grande with rainwater (ECw = 0.02 dS m^{-1}). The level corresponding to the ECw of 3.2 dS m^{-1} was prepared by adding salts in the form of chloride to obtain a 7:2:1 equivalent ratio for Na, Ca and Mg, respectively, a ratio that predominates in water sources used for irrigation in small properties of Northeastern Brazil. In the preparation of the water, the relation between the ECw and salt concentration was considered ($mmol_c$ L^{-1} = 10*CEa - dS m^{-1}), as reported by Richards (1954).

The vertical training of the mini watermelon plants was performed by allowing only the main branch and three lateral branches per plant. Pollination was performed artificially, and were after the fecundation of the flowers, allowing only one fruit per plant.

The fluorescence of chlorophyll *a*, photosynthetic pigments, and growth of the mini watermelon were determined in the phenological phase of fructification (65 DAS). An Opti Science® portable modulated chlorophyll fluorometer, model OS5p, was used for the determination of the initial fluorescence (Fo). This protocol was performed after the adaptation of the leaves to the dark, using metallic tweezers contained in the equipment to guarantee that all acceptors were first oxidized, that is, ensuring that the reaction centers were opened.

For the determination of the contents of photosynthetic pigments, the extraction was performed in recipients containing 8 mL of 80% acetone and five leaf discs with an area of 2.8 cm^2. Due to the great oxidation that the mini watermelon leaves suffer, the leaf discs were kept in the dark, under refrigerated conditions, for 48 hours.

The readings of the contents of chlorophyll *a* (Chl *a*), *b* (Chl *b*), total (Chl *T*), and carotenoids (Car) were performed by emission spectrophotometry in the 470 nm, 645 nm, and 663 nm wavelengths, respectively, through the equations proposed by Arnon (1949), in which A is the absorbance in the wavelength used. The values were expressed in mg g^{-1} of fresh matter (MF). It is highlighted that the determination of total chlorophyll was performed by summing the contents of chlorophylls *a* and *b*.

Chlorophyll *a* (Chl *a*) = 12.21 ABS_{663} – 2.81 ABS_{646}..........................(1)

Chlorophyll *b* (Chl *b*) = 20.13 A_{646} – 5.03 ABS_{663}.............................(2)

Total carotenoids (Car) = (1000 ABS_{470} – 1.82 Cl *a* – 85.02 Cl *b*)/198.....(3)

The growth of the mini watermelon plant was determined through the length of the main branch (LMB), stem diameter (SD), and number of leaves (NL). The LMB was obtained by measuring the base of the plant until the apical bud, using a measuring tape; the SD was measured at 2 cm from the soil, using a digital vernier caliper. For the NL quantification, only those leaves with length greater than 3 cm were considered, with the characteristic coloring for this species.

The data obtained were evaluated through analysis of variance by the F-test. In case of significant effect, for the comparison of means, Tukey's test was performed (at a $p \leq 0.05$ level of probability) for the management strategies of water salinity and doses of nitrogen, using the Sisvar software (Ferreira, 2014).

Results and Discussion

There was a significant effect ($p<0.01$) of the strategies of saline water use for the variables of chlorophyll *b* (Chl *b*) and total (Chl *T*), and ($p<0.05$) for the stem diameter - SD (Table 1). The nitrogen doses significantly influenced ($p<0.01$) the initial fluorescence (Fo) and the SD, and at $p<0.05$ the number of leaves (NL). There was a significant effect of the interaction between the strategies of saline water use and nitrogen doses (SSW X ND) on Chl *b* ($p<0.01$), total carotenoids (Car), and length of the main branch – LMB ($p < 0.05$) of the mini watermelon cv. Sugar Baby, at 65 days after sowing.

Regarding the effects of the nitrogen doses on the initial fluorescence (Figure 1), it is verified that the plants under fertilization with 50% of the N recommendation presented a statistically superior Fo compared to those that received 100% of N, that is, there was a decrease of 4.21% in the Fo of the mini watermelon plants fertilized with the highest dose of N in relation to those cultivated with 50% of N. According to Oliosi et al. (2017), the Fo reflects the energy released by the molecules of chlorophyll *a* in the photosystem-II antenna before the migration of electrons to the reaction center P 680 (PSII), being the minimal component of the fluorescence signal. In this manner, it is an expected photochemical loss, that is, regardless of the N supply.

The strategies of use of saline waters significantly influenced the total chlorophyll of the mini watermelon plants (Figure 2), and through the means comparison test it was verified that the plants irrigated with water of low ECw (SE) throughout the crop cycle and subjected to salt stress in the vegetative (VE), vegetative/flowering (VE/FL), flowering (FL), and maturation phases (MAT) obtained the highest contents of Chl *T* (13.62; 12.39; 12.00; 12.58, and 13.58 mg g^{-1} MF), respectively, significantly differing only from the plants irrigated with water of high salinity in the fructification phase (FR). The reduction in the synthesis of chlorophyll by salt stress may possibly be related to the inhibition of the enzymatic activity of chlorophyllase, which degrades the molecules of the photosynthetic pigment and induces the structural destruction of chloroplasts, also leading to the imbalance and loss of activity of pigmentation proteins (Cavalcante et al., 2011).

Table 1. Summary of the analysis of variance for the initial fluorescence (Fo), chlorophyll *a* (Chl *a* – mg g^{-1} FM), chlorophyll *b* (Chl *b* – mg g^{-1} FM), total chlorophyll (Chl *T* – mg g^{-1} FM), total carotenoids (Car – mg g^{-1} FM), length of the main branch (LMB - cm), stem diameter (SD - mm), and number of leaves (NL) of the watermelon cv. Sugar Baby cultivated under different strategies of use of saline water (SSW) and nitrogen doses (ND) at 65 days after sowing.

SV	DF	Mean square							
		Fo	Chl *a*	Chl *b*	Chl T	Car	LMB	SD	NL
SSW	5	124.67^{ns}	7.30^{ns}	11.30**	14.20**	1.10^{ns}	1970.00^{ns}	0.50*	111.10^{ns}
ND	1	756.15**	0.40^{ns}	0.03^{ns}	0.70^{ns}	1.00^{ns}	1024.60^{ns}	2.50**	395.20*
SSW x ND	5	36.59^{ns}	7.40^{ns}	11.80**	2.40^{ns}	2.40*	2609.10*	0.20^{ns}	77.70^{ns}
Blocks	4	963.94**	8.50^{ns}	27.20**	5.60^{ns}	4.90**	4538.30**	0.10^{ns}	242.70*
Residue	44	72.83	4.50^{ns}	2.20	3.60	0.70	1014.20	0.10	80.40
Mean		165.05	7.20	5.10	12.40	1.30	160.70	5.40	46.60
CV (%)		5.17	29.40	28.90	15.30	67.00	19.80	8.00	19.20

SV: source of variation; DF – degree of freedom; CV (%) – coefficient of variation; *significant at a 0.05 level of probability; ** significant at a 0.01 level of probability; ^{ns} not significant.

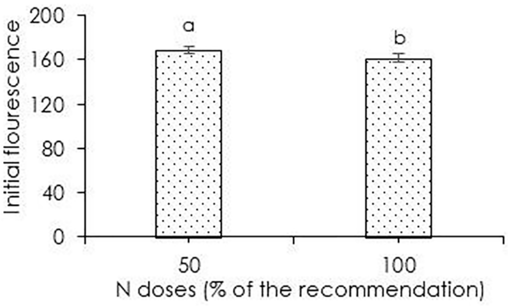

Figure 1. Initial fluorescence - Fo of the mini watermelon cv. Sugar Baby as a function of nitrogen doses, at 65 days after sowing.
Vertical bars represent the standard error of the mean (n=5). Means with different letters represent that the treatments differ from each other by Tukey's test (p<0.05).

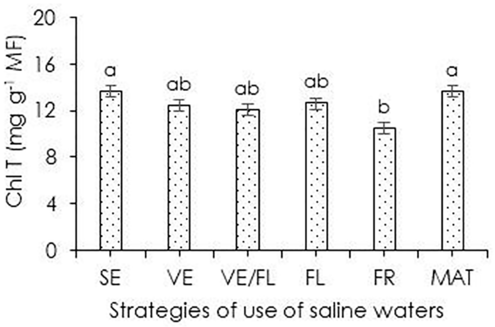

Figure 2. Total chlorophyll - Cl *T* of the mini watermelon cv. Sugar Baby as a function of strategies of use of saline waters, at 65 days after sowing.
Vertical bars represent the standard error of the mean (n=5). Means with different letters represent that the treatments differ from each other by Tukey's test (p<0.05).
SE – without stress throughout the crop cycle; VE – salt stress only in the vegetative phase; VE/FL – salt stress in the vegetative phase and at flowering; FL - salt stress in the flowering phase; FR - salt stress in the fructification phase; MAT - salt stress in the fruit maturation phase.

The contents of chlorophyll *b* (Figure 3A) of the mini watermelon plants cultivated with 50% of the N recommendation and under irrigation with high-salinity water in the VE phase differed significant way only from the plants cultivated under the FL and FR strategies. The absence of a significant effect is verified when comparing the content of Chl *b* of the plants cultivated under the SE, VE, FL, and MAT strategies.

The mini watermelon plants fertilized with 100% of N had the highest contents of Chl *b* when cultivated under the SE, VE, FL, and MAT strategies, being statistically superior to those that received irrigation with water of high salinity in the vegetative/flowering phase and at fructification. The decrease of chlorophyll synthesis may be related to the duration of stress exposure (Soares Filho et al., 2016). Furthermore, salt stress leads to protein denaturation and membrane destabilization, which inhibit photosynthesis (Taiz et al., 2017). Regarding the plants cultivated under the FR strategy, this decrease is justified by the fact that plantsthey were being irrigated with water of higher ECw (3.2 dS m^{-1}), causing salt stress to harden the synthesis of pigments in these plants, or even degrade them since one of the effects of salinity on plants is the alteration of ionic homeostasis due to the excessive accumulation of toxic ions (especially Na^+ and Cl^-), causing the inhibition of the synthesis of photosynthetic pigments (Taiz et al., 2017).

In the unfolding of the nitrogen doses within the strategies of use of saline waters for the *Chl b* of the mini watermelon plants (Figure 3A), significant differences are noted in the plants irrigated with high-salinity water in the VE/FL and FL phases. When the plants were subjected to the VE/FL strategy, the fertilization with 50% of N resulted in the highest content of *Chl b*. When the plants were irrigated with ECw of 3.2 dS m^{-1} in the FL phase, the 100%

dose of N favored a higher synthesis of Chl *b* compared to those under 50% of N. The increase in the availability of nitrogen results in a higher content of this element in the leaves, resulting in a strong positive correlation between the photosynthetic activities and the nitrogen content (Mota et al., 2015).

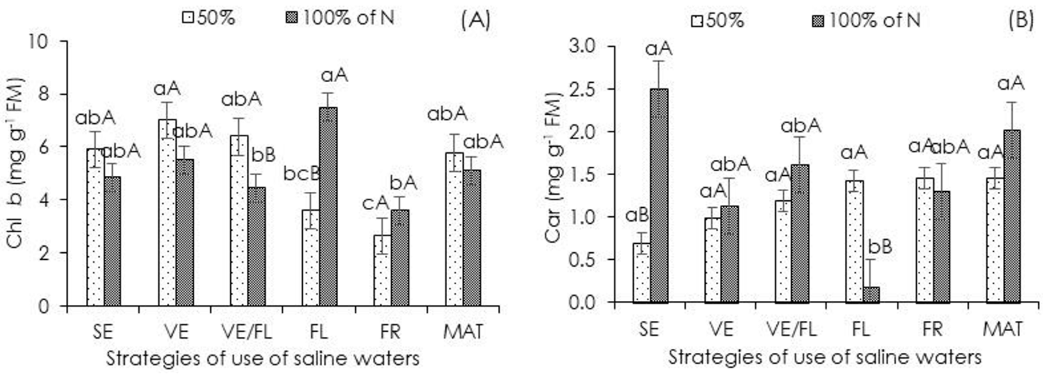

Figure 3. Unfolding of the interaction between the strategies of use of saline waters and nitrogen doses for chlorophyll *b* - *Cl b* (A) and carotenoids – Car (B) of the mini watermelon cv. Sugar Baby, at 65 days after sowing.

Vertical bars represent the standard error of the mean (n=5). In each management strategy, means with the same lowercase letters indicate no significant differences (Tukey; $p < 0.05$); between the doses, and with the same uppercase letters, indicate that, for the same dose, there are no differences (Tukey; $p < 0.05$) among the management strategies, respectively. SE – without stress throughout the crop cycle; VE – salt stress only in the vegetative phase; VE/FL – salt stress in the vegetative phase and at flowering; FL - salt stress in the flowering phase; FR - salt stress in the fructification phase; MAT - salt stress in the fruit maturation phase.

However, when plants were grown under 100% N and irrigation with saline water in the successive VE/FL phases, there was a reduction in the synthesis of this photosynthetic pigment. This situation may be related to the N source used in this research (urea). After the action of the urease enzyme, the amide N is transformed into ammoniacal N. The excessive absorption of ammonium may cause a reduction of the intracellular pH and osmotic imbalance, favoring the increment in the content of reactive oxygen species, inducing oxidative stress, and leading to alterations in the synthesis of pigments by plants (Bittsánszky et al., 2015).

For the contents of carotenoids (Figure 3B), it is observed that the plants under 50% of N did not differ statistically in relation to the strategies of use of saline water. However, the plants fertilized with 100% of the N recommendation and subjected to the SE strategies were statistically superior to those irrigated with saline water in the flowering phase. The increment in the synthesis of carotenoids in the plants cultivated under the SE, VE, VE/FL, FR, and MAT strategies is an alternative for the absorption and transference of radiant energy and chlorophyll protectors, presenting a complex non-enzymatic defense system in response to salt stress, with this behavior constituting a way to dissipate the excess of luminous energy in plants (Rojas et al., 2012). Furthermore, Car can exert a photoprotective action of the photochemical apparatus, reducing photo-oxidative damages caused to the chlorophyll molecules (Taiz et al., 2017).

On the other hand, the reduction in the content of carotenoids in the plants subjected to salt stress at flowering may be associated with the degradation of β-carotene, being integrated components of the thylakoids and highlighted as a protection strategy for the reduction of energy expenditure, as well as necessary nutrients for chlorophyll synthesis (Gomes et al., 2011).

In the unfolding of the N doses within each strategy of use of saline waters (Figure 3B), it is verified that the mini watermelon plants fertilized with 100% of the N recommendation and subjected to SE strategies obtained the highest contents of carotenoids, differing significantly from those cultivated under 50% of N. For the mini watermelon plants subjected to the FL strategy, it was verified that the 50% dose of N provided a greater synthesis of carotenoids in relation to the plants fertilized with 100% of N. Considering that Novais et al. (1991) recommend 100 mg of N kg^{-1} of soil, that is, a value applied regardless of the crop, this dose may be excessive for mini watermelon cultivation. According to Falk & Munné-Bosch (2010), carotenoids can act as antioxidant agents, which protect the lipid membranes from oxidative stress when the plants are subjected to salt stress, thus constituting a protective mechanism, aiming at preventing photoinhibition under stress conditions.

According to Lima et al. (2015), the excess of N in the soil can possibly cause toxicity during the excessive accumulation of this element, as well as lead to a probable nutritional imbalance of nutrients that are essential to plant metabolic processes. Ali et al. (2015), working with watermelon characterization under irrigation with saline waters (ECw varying from 1.5 to 6.0 dS m[-1]), concluded that the increase in salinity reduced the contents of chlorophyll.

The nitrogen doses significantly influenced the stem diameter and the number of leaves of the mini watermelon plant (Figure 4A and B), and according to the comparison test, it is verified that the plants fertilized with 50% of the N recommendation obtained the higher values for SD (5.68 mm) and NL (49.2 leaves), being superior to the growth obtained in the plants fertilized with the 100% dose of the N recommendation.

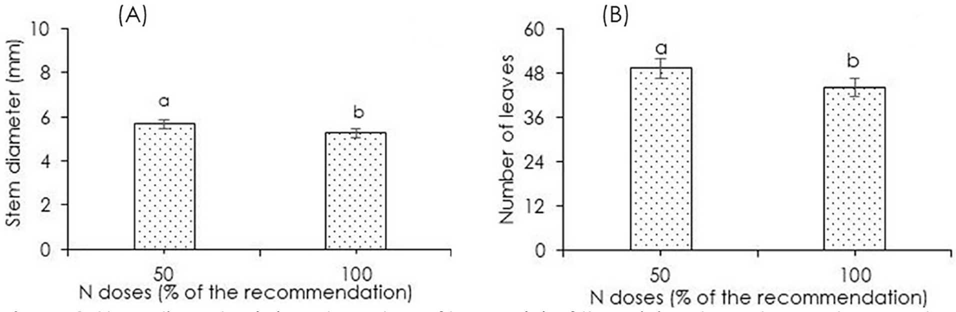

Figure 4. Stem diameter (A) and number of leaves (B) of the mini watermelon cv. Sugar Baby, as a function of nitrogen doses.
Vertical bars represent the standard error of the mean (n=5). Means with different letters represent that the treatments differed from each other by Tukey's test ($p<0.05$).

The reduction in plant growth can be observed by the SD and NL in accordance with Bittsánszky et al. (2015). According to Ramos et al. (2016), the excess of N in the soil can cause toxicity during the assimilation of this element, as well as a probable nutritional imbalance due to the alterations in ionic homeostasis and, consequently, in plant metabolic processes.

According to the test of means for stem diameter (Figure 5), it is verified that the plants irrigated with water of low ECw (SE), and with high ECw in the VE, VE/FL, FL, and FR phases did not differ statistically from each other. However, in the plants subjected to the MAT strategy, the SD was superior in these plants compared to those that received low-salinity water during the entire cycle (SE). Irrigation with saline water, in most cases, results in adverse effects in the soil-water-plant relationships. Thus, the increase in the saline concentration may cause a growth reduction in the stem diameter due to the osmotic and toxic effects of the salts absorbed by the plants, especially Na^+ and Cl^- in the cells, and the reduction of the total water potential (Albuquerque et al., 2016).

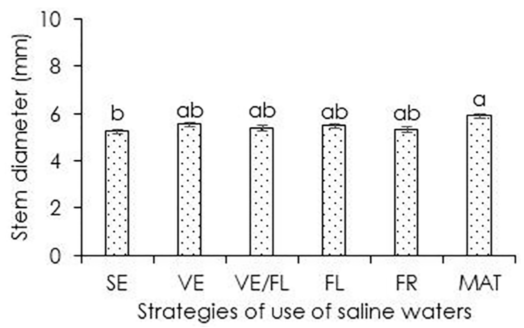

Figure 5. Stem diameter of the mini watermelon cv. Sugar Baby as a function of strategies of use of saline waters.
Vertical bars represent the standard error of the mean (n=5). Means with different letters represent that the treatments differ from each other by Tukey's test ($p<0.05$). SE – without stress throughout the crop cycle; VE – salt stress only in the vegetative phase; VE/FL – salt stress in the vegetative phase and at flowering; FL - salt stress in the flowering phase; FR - salt stress in the fructification phase; MAT - salt stress in the fruit maturation phase.

Regarding the unfolding of the interaction between the strategies of saline water use and nitrogen doses (Figure 6), it is observed that the plants fertilized with a 50% dose of N had inferior length of the main branch (LMB) to those cultivated under 100% of N and irrigated with high-salinity water in the VE/FL phase. In the remaining strategies of use of saline waters, there was no significant difference in the LMB, regardless of the N dose applied.

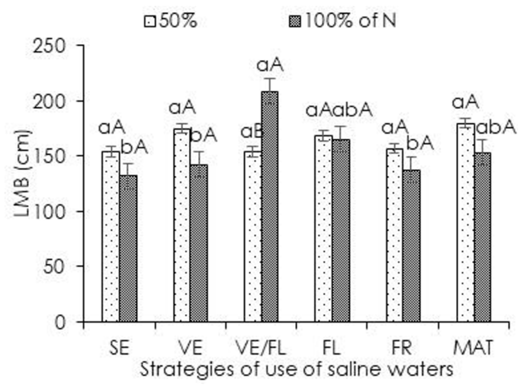

Figure 6. Unfolding of the interaction between the strategies of use of saline waters and nitrogen doses for the length of the main branch – LMB of the mini watermelon cv. Sugar Baby, at 65 days after sowing.
Vertical bars represent the standard error of the mean (n=5). In each management strategy, means with the same lowercase letters indicate no significant differences (Tukey; $p < 0.05$); between the doses, and with the same uppercase letters, indicate that, for the same dose, there are no differences (Tukey; $p < 0.05$) among the management strategies, respectively.

When analyzing the unfolding of the N doses within the strategies (Figure 6), it is observed that the length of the main branch of the plants fertilized with 50% of N was not significantly influenced by the strategies of saline water use. However, the plants fertilized with 100% of N presented a higher main branch growth (LMB) when irrigated with high-salinity water in the VE/FL phases. According to Bredemeier & Mundstock (2000), the amount of nitrogen absorbed by the plants varies throughout the developmental cycle and as a function of the root volume and absorption rate per unit of root weight, with N availability being a limiting factor and production systems, influencing plant growth.

Conclusions

The mini watermelon cv. Sugar Baby expresses higher sensitivity to salt stress in the flowering phase, with a decrease in the synthesis of chlorophyll *b*, chlorophyll total and carotenoids. The 50% dose of N provides an increment in the initial fluorescence, stem diameter, and number of leaves of the mini watermelon cv. Sugar Baby. The length of the main branch of the watermelon plants decreases with the salt stress applied in the fructification phase, however, the fertilization with 100% of N stimulates greater growth when the irrigation with saline waters is performed in the vegetative/flowering phases.

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