RESPONSES OF CHERRY TOMATO GENOTYPES TO SALINITY DURING THE GERMINATION AND INITIAL GROWTH

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ABSTRACT: Salinity is one of the main abiotic factors that can affect the germination and initial growth of many plants whose magnitude of the stress response varies according to the genotype. The objective of this work was to evaluate among three cultivars of cherry tomato the most sensitive and the most tolerant genotype to saline stress. The experimental design was completely randomized with treatments arranged in a factorial scheme 3 x 4 (three cherry tomato genotypes X four salinity levels) with four replicates of 50 seeds each. Were evaluated the germination velocity index (GVI), the percentage of germination, the shoot and root lengths, and the dry mass of the seedling. As a result, it was observed that all the analyzed parameters were negatively affected by the increase of the saline stress level, with different responses among the studied genotypes. The analysis of the results allowed to conclude that cv. "Carolina" is the most sensitive genotype and cv. "Cereja Laranja" is the more tolerant to salt stress in the germination and initial seedling growth phase.

KEYWORDS: *Solanum lycopersicum,* salt stress, tolerance.

RESPOSTAS DE GENÓTIPOS DE TOMATE CEREJA À SALINIDADE DURANTE A GERMINAÇÃO E CRESCIMENTO INICIAL

RESUMO: A salinidade é um dos principais fatores abióticos que pode afetar a germinação e o crescimento inicial de muitos vegetais, cuja magnitude da resposta ao estresse varia de

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acordo com o genótipo. Este trabalho teve como objetivo avaliar dentre três cultivares de tomate cereja o genótipo mais sensível e o mais tolerante ao estresse salino. O delineamento experimental utilizado foi inteiramente casualizado com os tratamentos arranjados em esquema fatorial 3 x 4 (três genótipos de tomate cereja X quatro níveis de salinidade), com quatro repetições de 50 sementes cada. Avaliaram-se o índice de velocidade de germinação (IVG), a porcentagem de germinação, os comprimentos da parte aérea e raiz e a massa seca da plântula. Como resultado, foram observados que todos os parâmetros analisados foram afetados negativamente pelo amento do nível de estresse salino, com diferentes respostas entre os genótipos estudados. A análise dos resultados permitiu concluir que o cv. Carolina é o genótipo mais sensível e o cv. Cereja Laranja o mais tolerante ao estresse salino na fase de germinação e crescimento inicial de plântulas.
PALAVRAS-CHAVE: *Solanum lycopersicum*, estresse salino, tolerância.

INTRODUCTION

The cherry tomato (*Solanum lycopersicum* L.) is one of the oleraceous cultures whose cultivation and consumption have been intensifying and spreading year after year, reaching prices quite attractive to the producers in large commercial centers (Albuquerque Neto & Peil, 2012). This type of tomato presents a great potential to be exploited in the Brazilian Northeast, but the quality water supply has been pointed out as essential for the culture to express its maximum development and productive potential in the field (Guedes *et al.*, 2015). However, this region presents climatic conditions of low rainfall and high evaporation (Medeiros *et al.*, 2012), which contribute in increasing the concentration of salts in the hydro sources, thus compromising the quality of the water (Diniz *et al.*, 2018).

Plants submitted to saline soils or irrigation with saline water can suffer from stress caused by the high concentration of salts, which according to Sá *et al*. (2017) can induce, mainly, an osmotic effect and/or specific ionic toxicity as much seeds as in formed seedlings. In the literature, the definition of sensitivity or tolerance to salinity is found for only the traditional tomato culture, whose response to stress varies according to the genotype (Boari *et al*., 2016).

Thus, the objective of this work was to determine the most sensitive and tolerant genotype to saline stress during germination and initial seedling growth by the screening of three cultivars of cherry tomato (Carolina, Cereja Laranja e Cereja Vermelha) under salinity.

MATERIAL AND METHODS

The work was conducted in the Laboratory of Seed Analysis of the Federal University of Ceará. For the screening been used seeds of three commercial cultivars of cherry tomato: "Carolina, Cereja Laranja, Cereja Vermelha". In order to induce the saline stress, NaCl solutions were used in concentrations 0, 50, 100 e 150 mM.

The germination test was conducted in accordance with the Rules for Seed Analysis (Brasil, 2009), in gerbox boxes over germitest paper moistened with the solutions of NaCl, in B.O.D at the temperature of 25 ± 2°C under constant light. It was evaluated the germination velocity index (GVI) according to Maguire (1962), and when the radicle protrusion was large than 2 mm, the percentage of germination was determined. Ten normal seedlings were randomly selected per treatment to determine the lengths of shoots and roots, which were measured using a ruler. The dry mass of the seedlings was obtained with the aid of a forced circulation oven, regulated at 65 ° C.

The experimental design was completely randomized with treatments arranged in a factorial scheme 3 x 4 (cherry tomato cultivars X salinity levels) with four replicates of 50 seeds each. The data were submitted to analysis of variance (ANOVA F-test). The mean treatment values were separated by a Scoot-Knoot test ($p \leq .05$), using the SISVAR 5.6 program.

RESULTS AND DISCUSSION

In all analyzed variables there was significant interaction between cultivars and salinity levels ($p \leq 0.05$). All cultivars present reduced germination with increased salinity. The cv. "Carolina" presented germination of 19,5% under 100 mM of NaCl salinity and was not able to germinate under salinity of 150 mM of NaCl, while the cv. "Cereja laranja" had 51,5% germination (Figure 1A). According to Cavatte et al., (2004) the reduction of seed germination is linked to the difficulty of water absorption, due to very negative water potentials, especially at the beginning of the imbibition, which may make the sequence of events related to the germination process unfeasible. For the GVI, the most pronounced reductions occur in the cv. "Carolina", in which the GVI reduces from 48 to 2,87 under 0 (control) to 150 mM of NaCl, respectively. On the other hand, a cv. "Cereja laranja" maintained higher GVI under salinity from 100 mM of NaCl (Figure 1B). Sultana et al.

(2016) evaluating the effect of saline stress of four maize genotypes, reported that only BARI Maize 5 was able to germinate in the concentration of 300 mM NaCl. Thus, only genotypes "Cereja laranja" and "vermelha" were able to germinate under 150 mM of NaCl.

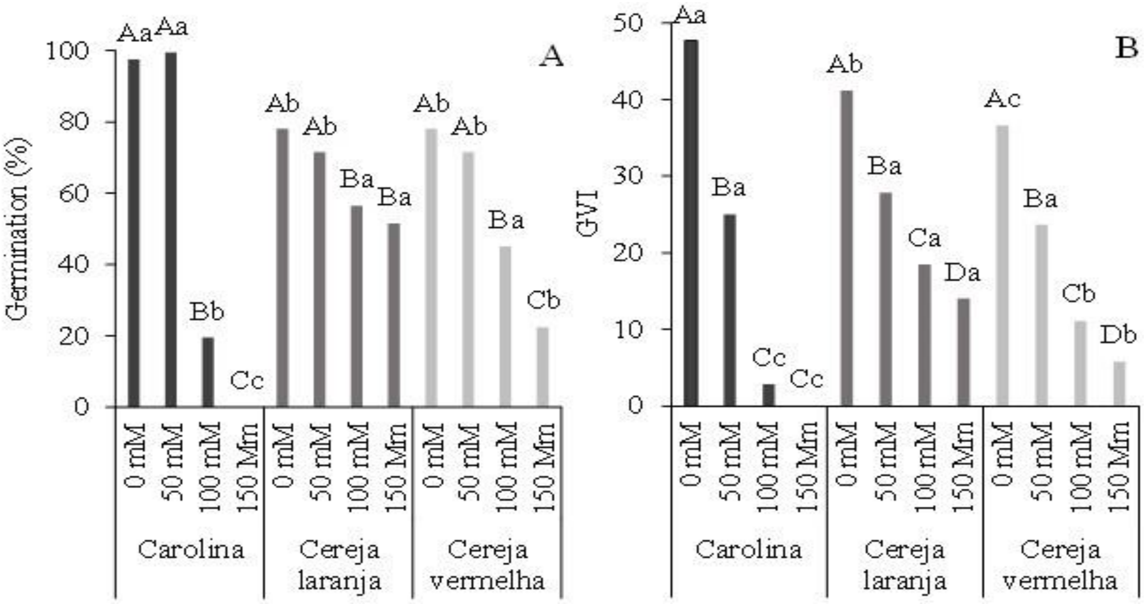

Figure 1. Germination (A) and germination velocity index (B) of three cherry tomato cultivars under salinity. Upper case letters and lower case letters compare salinity levels and cultivars by the Scoot-Knoot test ($p \leq 0.05$), respectively.

According to Dickmann et al. (2005), the length of the seedling allows determining the vigor of the seeds. The seedlings formed by cv. "Carolina" and "Cereja laranja" showed reduction in the length of the aerial part, root and dry mass with the increase of saline stress (Figures 2 and 3). The seedlings of cv. "Cereja laranja" had the highest root and shoot lengths under 100 mM of NaCl, and the root length and dry mass of this genotype were not affected by salinity (Figures 2 and 3). Similar results of the harmful action of salinity were also observed in rice seeds and Chorisia glaziovi (Guedes et al. 2011, Vibhuti et al. 2015).

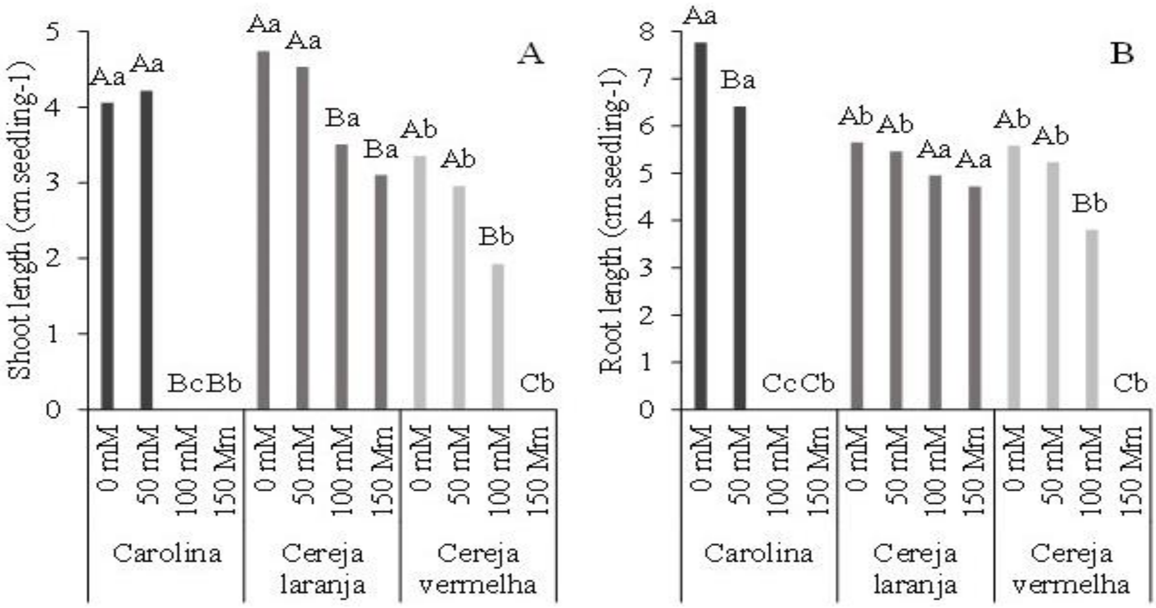

Figura 2. Shoot (A) and root length (B) of three cherry tomato cultivars under salinity. Upper case letters and lower case letters compare salinity levels and cultivars by the Scoot-Knoot test ($p \leq 0.05$), respectively.

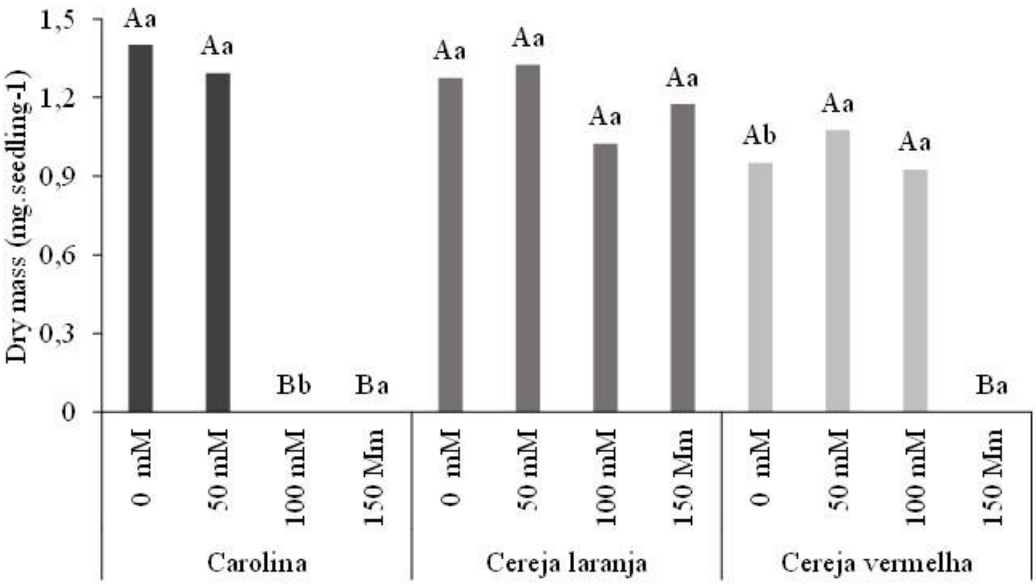

Figure 3. Dry mass of three cherry tomato cultivars under salinity. Upper case letters and lower case letters compare salinity levels and cultivars by the Scoot-Knoot test ($p \leq 0.05$), respectively.

It is worth mentioning that dry mass is a variable commonly associated with seedling growth. According to Araújo et al. (2018), it can be adversely affected by the high concentration of salt, which makes it difficult for water to enter to the seed, making the germination process more difficult in relation to the metabolization of the reserves necessary for root and shoot growth.

CONCLUSION

The cultivars of cherry tomato “Carolina” and “Cereja laranja” are genotypes more sensitive and more tolerant to salt stress, respectively.

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