STARCH CONTENT IN LEAVES AND ROOT *Khaya senegalensis* SUBMITTED TO SALT STRESS

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ABSTRACT: *Khaya senegalensis*, commonly known as African mahogany, is belonging to the family Meliaceae, the same as the brazilian mahogany. It is currently one of the most used plants in commercial plantations due to its hardness, wood quality and resistance to "drill of the Meliaceae". With the objective of determination of starch in leaves and root of plants of *K. Senegalensis* subjected to saline stress, using sodium chloride salt (NaCl), young mahogany plants were used, cultivated in pots with washed sand, in greenhouse, subjected to different concentrations of NaCl (00, 145, 270, 395 and 520 mM), added to the nutrient solution, which equates to the values of electrical conductivity (EC) 3.4, 15.1, 29.9, 42.6 and 53.6 $dS.m^{-1}$ respectively. The experiment consisted of six treatments and four replications, totaling 24 experimental plots, in a completely randomized design. At 120 days after treatment (DAT), plants were removed from vessels, leaves and roots were dried in oven at 65 ºC, for 72 hours and crushed in a knife mill and, soon after, the materials were used to determine the starch contents. The starch content was significantly different ($p<0.05$) among the treatments, when compared with the control plants, both for leaves and roots. The treatment of CE 42.6 $dS.m^{-1}$ was the one that showed higher starch content in relation to control treatment, for leaves. In roots, the treatment of CE 53.6 $dS.m^{-1}$ showed lower starch content than the control treatment. The increase of starch content in leaves and roots of *Khaya senegalensis* shows that the excess of salts in the soil causes physiological alterations in the plant, thus demonstrating that this species can tolerate saline stress.

KEYWORDS: carbohydrates, african mahogany, salinity

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TEOR DE AMIDO EM FOLHAS E RAIZ DE *Khaya Senegalensis* SUBMETIDAS AO ESTRESSE SALINO

RESUMO: *Khaya senegalensis*, conhecida comumente como mogno africano, é pertencente à família Meliaceae, a mesma do mogno brasileiro. É atualmente uma das plantas mais utilizadas em plantios comerciais devido a sua dureza, qualidade da madeira e resistência a "broca das meliáceas". Com o objetivo de determinação de amido em folhas e raiz de plantas de *K. senegalensis* submetidas ao estresse salino, utilizando o sal cloreto de sódio (NaCl), foram utilizadas plantas jovens de mogno, cultivados em vasos com areia lavada, em casa de vegetação, submetidas a diferentes concentrações de NaCl (00, 145, 270, 395 e 520 mM), adicionadas à solução nutritiva, que equivalem a valores de condutividade elétrica (CE) 3,4, 15,1, 29,9, 42,6 e 53,6 $dS.m^{-1}$ respectivamente. O experimento foi constituído de seis tratamentos e quatro repetições, totalizando 24 parcelas experimentais, em um delineamento inteiramente casualizado. Aos 120 dias após o tratamento (DAT), as plantas foram retiradas dos vasos, as folhas e as raízes foram secas em estufa à 65 ºC, por 72 horas e trituradas em moinho de facas e, logo após, os materiais foram utilizados para determinar os teores de amido. O teor de amido foi significativamente diferente ($p<0,05$) entre os tratamentos, quando comparadas com as plantas do tratamento controle, tanto para folhas quanto nas raízes. O tratamento de CE 42,6 $dS.m^{-1}$, foi o que demonstrou maior teor de amido em relação tratamento controle, para folhas. Em raízes, o tratamento de CE 53,6 $dS.m^{-1}$, demonstrou menor teor de amido que o tratamento controle. O aumento dos teores de amido em folhas e raízes de *Khaya senegalensis* evidencia que o excesso de sais no solo provoca alterações fisiológicas na planta, demonstrado, portanto, que esta espécie pode tolerar o estresse salino.

PALAVRAS-CHAVE: carboidratos, mogno africano, salinidade.

INTRODUCTION

The african mahogany (*Khaya senegalensis*) is a plant belonging to the family Meliaceae, the same family of Brazilian mahogany, cedar and andiroba. The genus *Khaya* A. Juss, is occurring in Africa and Madagascar, and is considered the main source of African mahogany commercialized in the world (Pinheiro et al., 2011).

Currently, it is one of the most used plants in commercial plantations due to its hardness and quality of wood, resistance to pests such as the pointer drill ("drill of the Meliaceae"-

Hypsipyla Grandella Zeller) and its high commercial value and important characteristics, such as vigorous growth, resistance to drought periods, with a dry season of 4 to 7 months (Falesi & Baena, 1999).

The semiarid region of the country presents soils as high concentrations of soluble salts due to its low rainfall index and high evaporation rate, however, soils from other regions present a salinization process, in an anthropogenic way, due to the use of inadequate irrigation practices (Oliveira et al., 2002).

Plants subjected to soils with these conditions may present reduced growth due to the low water absorption of the soil and the accumulation of salts inside the plant. Excess salts, in these soil conditions, may disturb the physiological and biochemical functions of the plants (Amorin et al., 2010). Among these metabolic alterations, we highlight the accumulation of organic solutes, such as soluble carbohydrates (Tester & Davenport, 2003).

Therefore, the objective of this work was to determine the starch content in leaves and root of *Khaya senegalensis* plants subjected to saline stress, using sodium chloride salt (NaCl).

MATERIAL AND METHODS

The experiment was conducted in a greenhouse at the State University of Southwest Bahia (UESB), on the campus of Vitoria da Conquista, with coordinates 14° 53' 17" S and 40° 48' 9" W and altitude of 875 m. According to the Köppen classification, the climate is of the type *Cwb* (subtropical altitude climate, with dry winter and mild and humid summer), with average rainfall of 700 mm annually, and has an average annual temperature of 20ºC.

African mahogany seedlings were cultivated in pots, using washed sand, subjected to nutrient solutions with different concentrations of sodium chloride (NaCl) (00, 145, 270, 395 and 520 mM). These concentrations are equivalent to electrical conductivities (EC) 3.4, 15.1, 29.9, 42.6 and 53.6 $dS.m^{-1}$, respectively.

Constituting an experiment with six treatments and four replications, totaling 24 experimental plots, in a completely randomized design. At 120 days after treatment (DAT), the plants were removed from the vessels, their leaves and roots were collected and dried in the oven at 65 ºC, with forced air circulation for 72 hours and then homogenized and grinded into knife mill. Samples of the crushed materials (root and leaf) were used for the determination of starch, according to the method described by McCready et al. (1950), with adaptations.

The data were subjected to analysis of variance by the F test at 5% probability and the averages compared by the Dunnett test at 5% probability.

RESULTS AND DISCUSSION

Figure 1 shows that the starch content in *Khaya senegalensis* leaf differed significantly between treatments. The treatment EC 42.6 $dS.m^{-1}$, showed higher starch content in relation to the control treatment. There was a decrease in starch in the highest EC of 53.6 $dS.m^{-1}$ in relation to the control plants, when compared to the treatment in EC 42.6 $dS.m^{-1}$.

Similar results were found by Parida et al. (2004), where eucalyptus plants, subjected to treatment with sodium chloride (NaCl), obtained lower starch contents, as the concentration of the same was increased. We can infer that this possibly occurred due to the decrease in the photosynthetic rate, caused by saline stress, or because hydrolysis of this to soluble sugars occurred.

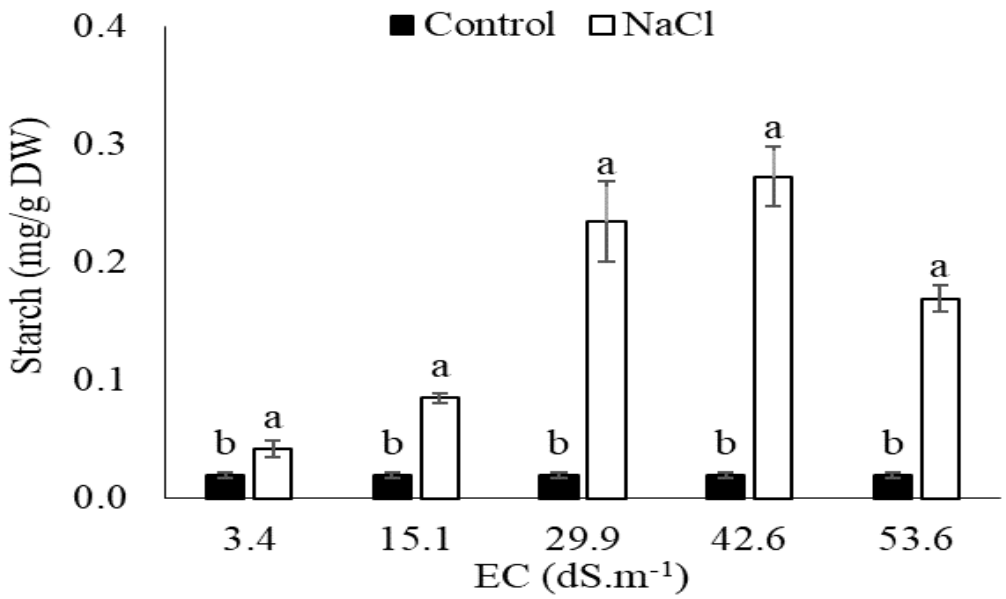

Figure 1. Starch content in leaves of *Khaya senegalensis* subjected to salt stress at 120 DAT. The columns are average of 4 repetitions and the bars represent the standard error of the mean. Lowercase letters indicate comparison between the effects of control plants and the treatments with NaCl by Dunnett test ($p<0.05$).

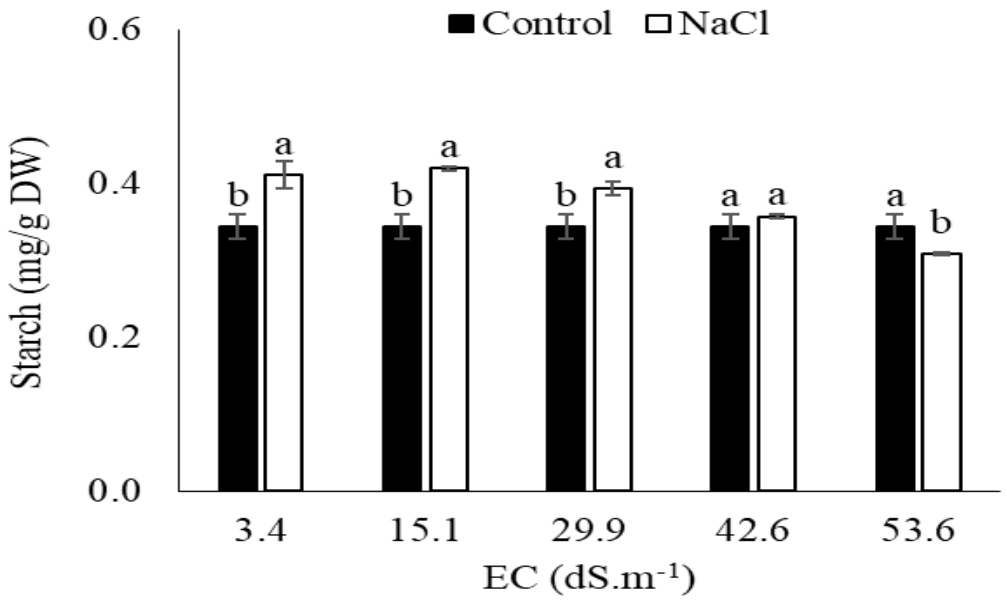

Figure 2. Starch content in roots of Khaya senegalensis subjected to salt stress at 120 DAT. The columns are average of 4 repetitions and the bars represent the standard error of the mean. Lowercase letters indicate comparison between the effects of control plants and the treatments with NaCl by Dunnett test ($p<0.05$).

Figure 2 shows that the starch contents differed significantly in the treatments compared to the control treatment, except for the EC 42.6 $dS.m^{-1}$, that showed the highest starch content in relation to the control treatment (Figure 1). The starch content in the treatment of EC 53.6 $dS.m^{-1}$ was inferior to the control treatment. This behavior is probably the result of a decrease in the photosynthetic rate, as the NaCl levels are elevated, thus inhibiting the synthesis of starch and also the partition of the photoassimilates to other organs of the plant. Possibly, hydrolysis of this starch may also have occurred producing soluble sugars (Geigenberger et al., 1997).

CONCLUSIONS

The increase of starch content in leaves and roots of *Khaya senegalensis* shows that the excess of salts in the soil causes physiological alterations in the plant, thus demonstrating that this species can tolerate saline stress.

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