ELECTRICAL CONDUCTIVITY OF YELLOW ULTISOL CULTIVATED WITH TWO SUGARCANE VARIETIES

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ABSTRACT: The aim of the present study was to evaluate the physical proprieties and electrical conductivity of a yellow Ultisol type soil under the cultivation of different sugarcane varieties. The study was conducted under field conditions, at the Carpina experimental station (EECAC / UFRPE), located in the municipality of Carpina, PE, Brazil. A completely randomized experimental design with two sugarcane varieties (RB86 7515; RB92 579) and four replications were used. The varieties were planted in August 2014, and before the first harvesting, soil samples were collected in each plot for pH analysis, texture, moisture content and electrical conductivity of the saturation extract (ECs), at 0-0.20 m layer. The yellow ultisol soil type was classified as sandy loam with clay content below 15 %. The analysis of variance indicated that there was no statistical difference by studied variables. The average ECs value obtained in this study was 0.2 dS m^{-1}, which is found within the plant requirements. High ECs, clay and moisture content were observed for the variety RB86 7515. The average pH value was 4.5; this result is considered close to sugarcane tolerance limit.

KEYWORDS: *Saccharum* spp., salinity, hydrogenation potential

CONDUTIVIDADE ELÉTRICA DE UM ARGISSOLO SOB CULTIVO DE DUAS VARIEDADES DE CANA-DE-AÇÚCAR

RESUMO: O objetivo da presente pesquisa foi avaliar atributos físicos e condutividade elétrica de um Argissolo Amarelo distrocoeso sob cultivo de diferentes variedades de cana-de-açúcar. O estudo foi conduzido em condição de campo na Estação Experimental de Cana-de-açúcar do Carpina, UFRPE, situada no Município de Carpina, PE. O delineamento experimental utilizado foi inteiramente casualizado com duas variedades de cana-de-açúcar (RB86 7515; RB92 579)

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e 4 repetições. O plantio foi realizado em agosto de 2014 e antes do primeiro corte, amostras de solo foram coletadas em cada parcela na camada 0,00-0,20m para análise de pH, textura, umidade e condutividade elétrica do extrato de saturação (CEes). O Argissolo estudado foi classificado como franco arenoso com teores de argila abaixo de 15%. A análise de variância indicou que não houve diferença estatística para as variáveis estudadas. A CEes média observada foi de 0,2 dS m^{-1}, dentro da exigência da cultura. Maiores CEes, teor de argila e umidade foram observados na variedade RB86 7515. O pH apresentou média de 4,5, considero próximo ao limite de tolerância da cana-de-açúcar.

PALAVRAS-CHAVE: *Saccharum spp.*, salinidade, potencial hidrogeniônico

INTRODUCTION

Brazil is the largest sugar and alcohol producer. However, because of the country's extension, sugarcane is cultivated in a different type of soils, under the influence of several characteristic factors of the different regions, which can influence the production (Rhein et al., 2016). For the 2016/17 harvest season, 665,586.2 thousand tons of sugarcane was produced in an area of 9,110.9 thousand hectares, of which 27.86 billion liters of ethanol and 39,814.8 thousand tons of sugar were obtained, with prospecting increase in the sugar production (CONAB, 2016). Sugarcane production varies according to climatic conditions, soil type, and variety, and the overexploitation of natural resources and human activity has contributed negatively to abiotic stress (drought, salinity, soil-related problems, and nutrient deficiencies) affecting sugarcane productivity Shirivastava et al. (2015). According to Ayers & Westcot (1999), sugarcane can be considered as moderately sensitive to salinity. According to Mortele et al. (2006), high salt concentration in the soil is a stress factor for species that are sensitive to salinity, due to the osmotic potential reduction in the soil, promoting water retention and making it difficult to absorption in plant roots. Soil salinity can be evaluated by different methods such as pH, electrical conductivity of the saturation extract and the exchangeable sodium percentage (PST). Among the soil proprieties, the apparent electrical conductivity (ECs) has been widely used, this due to its correlation with other proprieties in the soil, and crop productivity, because it has relation with soil water content, texture, organic matter content, size and pore distribution, and salinity (Siqueira et al., 2013). In this way, the aim of the present study was to evaluate the physical properties and electrical conductivity of a yellow argisol soil type under the cultivation of different sugarcane varieties.

MATERIAL AND METHODS

The study was conducted under field conditions, at the Carpina experimental sugarcane station, UFRPE, located in the municipality of Carpina, PE, at coordinates 7º 1' South Latitude and 35º 4' West Longitude, 178 masl. Based on the Köppen classification system the climate of the region is an "AS" climate type defined as tropical wet with dry summer. The rainfall recorded during the study was obtained through an EECAC meteorological station. The experimental area is located in a yellow Ultisol area, divided into 8 experimental plots, 26 m wide, 16 m long, and spaced at 2 m. Harrowing was performed with a Baldan disk plough, model bia, mounted to a Massey Ferguson 4292 tractor, with 16 discs, 30 cm in diameter each, meanwhile, furrowing was performed with the John Deere 6405 tractor mounted with a three line furrow implement, manufactured by Baldan, model bia, with 1.10 m spacing and 30-40 cm depth. Now, 23-bed openings per plot, with 1.10 m spacing were used. The varieties RB86 7515 and RB92 579 were used. Sugarcane planting was carried out manually placing 18 buds per linear meter. The seedlings were placed in the furrow with the help of a machete.

Soil samples were collected at the center of each plot, at a 0 - 0.20 m depth to analyzes the following soil properties: soil moisture (w), texture, electrical conductivity of the saturation extract according to (ECes) and pH according to EMBRAPA (1997). The experimental design was a completely randomized with two sugarcane varieties (RB86 7515; RB92 579) and four replicates. When necessary, Tukey's test was used to compare the probability among treatments, at 5 %.

RESULTS AND DISSCUSSION

The Argisol type soil was classified as sandy loam with clay content below 15% (Table 1). The analysis of variance indicated no statistical difference was found among the variables used in the study. The average ECe was observed within the crop requirement, at 0.25 dS m^{-1} (Table 1). The maximum soil salinity of the saturation extract tolerated by sugarcane is 1.7 dS m^{-1} (Maas and Hoffman, 1977). According to Ayers & Westcot (1999), water with electrical conductivity lower than 0.7 dS m^{-1} does not present the risk of soil salinization. Higher ECs was observed for the variety RB86 7515 while higher clay and moisture content were observed for the variety RB92 579. An average pH of 4.3 was presented. (Table 1). The low pH obtained for both treatments was not detrimental to the crop because the value was within the sugarcane

tolerance limit (pH = 4), but close to this limit. Simões Neto et al. (2015) observed pH 4.30 in a yellow Ultisol soil type. Sugarcane is quite tolerant to acidity and alkalinity and cultivation takes place in soils with pH between 4 and 8.5, and the ideal is around 6.5 (Marim, 2017).

In cases for soil acidity verification, initially observed using pH values, th potential soil acidity ($H^{+}{}^{+}$ Al $^{+}$ 3) should also be taken into account for corrective adjustments and recommendations (Santiago and Rosseto, 2009).

The increase in soil pH by liming methods may increase the potassium adsorption capacity, reducing leach loss, but excessive limestone doses could cause imbalances when applying potassium fertilizer (Rosseto et al., 2004). Based on the Terminology Committee of the American Soil Science Society classification system (TCASSC) (Bohn et al., 1985) and Richards (Richards, 1954), the studied soil can be classified as normal (Cees <4 dS m^{-1}; pH <8.5) for salinity and sodicity.

CONCLUSIONS

No statistical differences were found for ECs, pH, texture and soil moisture. EC and soil pH are within the sugarcane tolerance limit. The acidity measured by pH is close to the sugarcane tolerance limit.

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Table 1. Mean values of the properties of a yellow argisol using two sugarcane varieties

	RB86 7515	RB92 579
pH	4.32 A	4.33 A
ECs (dS m^{-1})	0.308 A	0.282 A
Clay (%)	13.00 A	14.50 A
Fine sand (%)	21.45 A	21.00 A
Thick sand (%)	51.30 A	53.00 A
Silt (%)	14.25 A	11.50 A
Moisture content (%)	9.95 A	12.40 A

ECs – Electric conductivity in saturation extract