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RESPOSTAS DE CULTIVARES DE ALGODOEIRO À ADUBAÇÃO POTÁSSICA

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RESUMO: As respostas do algodoeiro a adubação potássica podem variar de acordo com a cultivar utilizada. Com isso, objetivou-se com este estudo avaliar as respostas de duas cultivares de algodoeiro à adubação potássica. A pesquisa foi conduzida em área experimental na Faculdade de Tecnologia, Centec Cariri, situada no município de Juazeiro do Norte, CE. O delineamento estatístico utilizado foi o inteiramente casualizado, em esquema fatorial de 5 x 2, sendo o primeiro fator composto por cinco doses de potássio (0, 25, 50, 75 e 100 kg ha^{-1} de K_2O equivalentes a 0, 50, 100, 150 e 200% da recomendação de K para a cultura do algodão) e o segundo fator, por duas cultivares (BRS 433FLB2RF e BRS RUBI). Aos 56 dias após a semeadura, as plantas foram coletadas, sendo medido a altura das plantas, diâmetro do caule e o número de folhas. A dose de 39,6 kg ha^{-1} de K_2O maximizou a altura das plantas. As plantas da cultivar BRS 433FLB2RF apresentaram valores superiores de diâmetro do caule e de número de folhas em comparação às da cultivar BRS RUBI.

Palavras-Chave: *Gossypium hirsutum* L, cloreto de potássio, crescimento

RESPONSES OF COTTON CULTIVARS TO POTASSIUM FERTILIZATION

ABSTRACT: Cotton plant responses to potassium fertilization may vary depending on the cultivar used. Therefore, the objective of this study was to evaluate the responses of two cotton cultivars to potassium fertilization. The research was conducted in an experimental area at the Faculty of Technology, Centec Cariri, which is located in the city of Juazeiro do Norte, CE. The statistical design used was completely randomized in a 5 × 2 factorial scheme, with the first factor consisting of five potassium doses (0, 25, 50, 75 and 100 kg ha $^{-1}$ of $K_{2,}$ equivalent to 0, 50, 100, 150 and 200% of the K recommendation for cotton crops) and the second factor consisting of two cultivars (BRS 433FLB2RF and BRS RUBI). At 56 days after sowing, the plants were harvested, and their height, stem diameter and number of leaves were measured. The dose of 39.6 kg ha $^{-1}$ K2O maximized the plant height. Compared with those of the BRS RUBI cultivar, the stem diameter and number of leaves of the BRS 433FLB2RF cultivar were greater.

Keywords: *Gossypium hirsutum* L, potassium chloride, growth

1 INTRODUCTION

Cotton (*Gossypium hirsutum* L.) is an important fiber-producing crop grown worldwide (Dorman *et al*., 2022). In Brazil, its production is concentrated almost entirely (sequentially in volume) in the Central-West, Northeast and Southeast Regions (IBGE, 2024). Since the 2015/16 harvest, the State of Ceará has achieved an evolution in cotton production that represents, in addition to the aspects of volume growth, a characteristic of the resumption of cotton cultivation in the State (EMBRAPA, 2017).

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For cotton crops to achieve adequate establishment in the field, the main management technique required is fertilization with macro- and micronutrients (Aguilar *et al*., 2021). Among the most important nutrients for crops, potassium (K) stands out. Nutrients are the second most abundant element absorbed by cotton plants (Lima *et al*., 2019). It plays an essential role in growth, development, production, and fiber quality (Raper, 2017). The response of cotton to potassium fertilization may vary according to the cultivar used. Therefore, the objective of this study was to evaluate the responses of two cotton cultivars to potassium fertilization.

2 MATERIALS AND METHODS

The experiment was conducted in an open-air environment from October to December 2023 at the Centec Cariri Technology College - FATEC Cariri, belonging to the Technological Education Center Institute - CENTEC, located in the municipality of Juazeiro do Norte - CE, under the geographic coordinates 07°12'47"S, 39°18'55"W. The municipality, which is located at an altitude of 377 m, has a Tropical Semiarid to Tropical Mild Semiarid climate, with an average temperature of 24 to 26 °C and a rainy season from January to May. The average rainfall is 925 mm (Lima; Ribeiro, 2012).

The study was carried out in a completely randomized design with a 5 × 2 factorial scheme and four replications. The first factor of the scheme consisted of five potassium rates (0, 25, 50, 75 and 100 kg ha $^{-1}$ of K_2O equivalent to 0, 50, 100, 150 and 200% of the K recommendation for the cotton crop), and the second factor consisted of two cultivars (BRS 433FLB2RF and BRS RUBI), with four replications. Thus, 40 experimental units were formed consisting of plastic pots with a capacity of 8 L containing one plant. The reference rate (100% of the K recommendation for the crop) corresponded to 50 kg ha $^{-1}$ of K_2O, according to the Fertilization and Liming Recommendation Manual of the State of Ceará (Fernandes, 1993).

The soil used in the research was collected in the experimental area of Fatec Cariri at a depth of 0--20 cm and sieved. After this procedure, the pots were filled. A 2 cm layer of gravel was placed at the lower end of each pot. The soil had the following chemical and physical characteristics: electrical conductivity = 0.16 dS m $^{-1}$; pH = 7.2; P = 4 mg dm $^{-3}$; K = 0.20 cmolc dm $^{-3}$; Ca = 2.48 cmolc dm $^{-3}$; Mg = 0.49 cmolc dm $^{-3}$; Na = 0.02 cmolc dm $^{-3}$; Al = 0.0 cmolc dm $^{-3}$; MO = 3.9 g kg $^{-1}$; C = 2.3 g kg $^{-1}$; total sand = 850.60 g kg $^{-1}$; coarse sand = 499.20 g kg $^{-1}$; fine sand = 351.40 g kg $^{-1}$; silt = 8.65 g kg $^{-1}$; clay = 140.7 g kg $^{-1;}$ and textural class = loamy sand.

Sowing was carried out by placing four seeds per pot. Thinning was carried out 15 days after sowing (DAS), leaving one plant per pot. Potassium fertilization (0, 25, 50, 75 and 100 kg ha $^{-1}$ of K_2O equivalent to 0, 50, 100, 150 and 200% of the K recommendation for cotton crops) and nitrogen fertilization were divided, with 25% applied at thinning and the remainder applied in two equal installments at 15 and 25 days after thinning. At sowing, 7.7 g of simple superphosphate was applied per pot. The sources of potassium and nitrogen used were potassium chloride (60% K_2O and 48% Cl) and urea (45% N).

Irrigation was carried out daily manually, slowly until water drainage was observed in the pot, thus reaching field capacity in all pots.

The plants were collected at 56 DAS. The plant height (AP), stem diameter (DC) and number of leaves (NF) were measured. Plant height was measured via a graduated ruler expressed in centimeters, and stem diameter was measured via a digital caliper. Only photosynthetically active leaves were considered to determine the number of leaves.

The results obtained were subjected to analysis of variance, and, depending on the significance level in the F test for the potassium doses, polynomial regression analysis was performed, adopting the level of 1 or 5%, presenting the best-fit polynomial models. For the effects of the cultivars, the Tukey mean comparison test was adopted at 5% probability. Statistical analyses were performed with the aid of the SISVAR® statistical software, version

5.3 (Ferreira, 2019), and the graphs were generated through Excel.

3 RESULTS AND DISCUSSION

Plant height was influenced in isolation by the potassium dose ($p < 0.05$). The stem diameter and number of leaves differed statistically between the cultivars used in the study ($p < 0.01$), as shown in Table 1.

Table 1. Summary of analysis of variance for plant height (AP), stem diameter (DC) and number of leaves (NF) of cotton cultivars grown under different potassium doses.

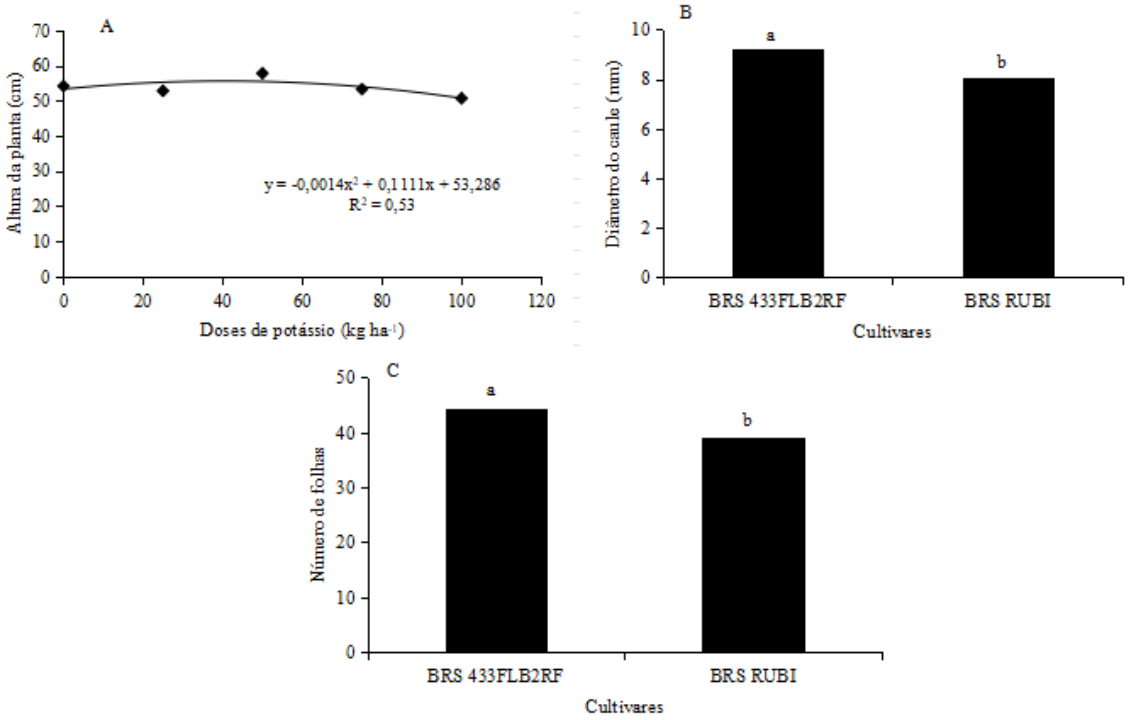
Source of Variation	mean square			
	GL	AP	A.D	NF
K doses	4	54.28 *	0.33 ns	7.52 ns
Cultivars	1	3.60 ns	14.40 **	270.40 **
K Doses x Cultivars	4	16.66 ns	0.83 ns	2.90 ns
Coefficient of Variation (%)		8.15	11.56	13.71

GL = degree of freedom; **,* = significant at 1% and 5%, respectively; ns = not significant
Source: Discussed by the authors

The increase in potassium fertilization increased the plant height to an estimated dose of 39.6 kg ha $^{-1}$ of K_2O, resulting in a maximum value of 55.49 cm (Figure 1A). In addition, the dose that promoted the greatest plant height was lower than the 100% recommended for the crop, which can be attributed to the concentration of potassium available in the soil. Similarly, Lima *et al*. conducted an experiment under field conditions *in the semiarid region of Pernambuco*. (2019) reported that the maximum plant height was obtained at a dose of 32 kg ha $^{-1}$ of K_2O. Meanwhile, Hussain, Ali, and Gardezi (2021), in an experiment carried out under field conditions with three cotton cultivars in the semiarid region of Pakistan, reported that the maximum plant height value, in all cultivars evaluated, was obtained at a dose of 120 kg ha $^{-1}$ of K_2O.

The supply of potassium modulates several physiological processes in plants, the main process being the regulation of the cellular osmotic balance, which allows for cellular turgor and consequently cellular expansion, leading to plant growth (Guo *et al*., 2017).

Figure 1. Heights of cotton plants grown under different potassium doses (A), stem diameters (B) and numbers of leaves (C) of two cotton cultivars (BRS 433FLB2RF and BRS RUBI).



Source: Ela borado by the authors

As shown in Figure 1, the stem diameter (Figure 1B) and number of leaves (Figure 1C) were greater in the BRS 433FLB2RF cultivar than in the BRS Rubi cultivar. These differences can be attributed to the genetic constitution of the studied cultivars.

4 CONCLUSIONS

The dose of 39.6 kg ha $^{-1}$ K2O maximized the height of the cotton plants. Compared with those of the BRS Rubi cultivar, the stem diameter and number of leaves of the BRS 433FLB2RF cultivar were greater.

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