

## POTASSIUM FERTILIZATION AND SOIL MANAGEMENT SYSTEMS FOR COTTON CROPS<sup>1</sup>

VITOR MARQUES VIDAL<sup>2\*</sup>, FREDERICO ANTONIO LOUREIRO SOARES<sup>2</sup>, MARCONI BATISTA TEIXEIRA<sup>2</sup>, ANTONIO EVAMI CAVALCANTE SOUSA<sup>3</sup>, FERNANDO NOBRE CUNHA<sup>2</sup>

**ABSTRACT** - Cotton has great socio-economic importance due to its use in textile industry, edible oil and biodiesel production and animal feed. Thus, the objective of this work was to identify the best potassium rate and soil management for cotton crops and select among cultivars, the one that better develops in the climatic conditions of the Cerrado biome in the State of Goiás, Brazil. Thus, the effect of five potassium rates (100, 150, 200, 250 and 300 kg ha<sup>-1</sup> of K<sub>2</sub>O) and two soil management systems (no-till and conventional tillage) on the growth, development and reproduction of four cotton cultivars (*BRS-371*, *BRS-372*, *BRS-286* and *BRS-201*) was evaluated. The data on cotton growth and development were subjected to analysis of variance; the data on potassium rates were subjected to regression analysis; and the data on cultivars and soil management to mean test. The correlation between the vegetative and reproductive variables was also assessed. The conventional tillage system provides the best results for the herbaceous cotton, regardless of the others factors evaluated. The cultivar *BRS-286* has the best results in the conditions evaluated. The cultivar *BRS-371* under no-till system present the highest number of fruiting branches at a potassium rate of 105.5% and highest number of floral buds at a potassium rate of 96.16%. The specific leaf area was positively correlated with the number of bolls per plant at 120 days after emergence of the herbaceous cotton.

**Keywords:** *Gossypium hirsutum* L. KCl. No-till. Conventional tillage. Boll production.

## ADUBAÇÃO POTÁSSICA E SISTEMA DE MANEJO DO SOLO NA CULTURA DO ALGODÃO

**RESUMO** - O algodão possui grande importância social e econômica, devido a sua utilização na indústria têxtil, produção de óleo comestível, biodiesel e alimentação animal, dessa forma é de grande importância selecionar a cultivar que apresenta o melhor desempenho nas condições climáticas do Cerrado goiano e estudar seu comportamento em função de doses de potássio pelas inúmeras funções na planta e ainda identificar o manejo do solo que proporcione as melhores condições visando um maior desempenho da cultura. Dessa forma, objetivou-se com o experimento, avaliar cinco doses de potássio (100; 150; 200; 250; 300 kg ha<sup>-1</sup> de K<sub>2</sub>O), dois sistemas de manejo do solo (plantio direto e plantio convencional) no crescimento, desenvolvimento e reprodução de quatro cultivares de algodão (*BRS-371*, *BRS-372*, *BRS-286* e *BRS-201*). Os dados de crescimento e desenvolvimento do algodoeiro foram submetidos à análise de variância e para os dados referentes às doses de potássio, realizou-se análise de regressão, e referentes às cultivares e sistemas de manejo do solo teste de média, ainda avaliou-se a correlação entre as variáveis vegetativas e reprodutivas analisadas. O sistema de plantio convencional proporciona melhores respostas ao algodoeiro herbáceo independentemente dos demais fatores avaliados. A cultivar *BRS-286* apresenta melhor resposta nas condições avaliadas. A cultivar *BRS-371* no sistema de plantio direto apresenta maior número de ramo frutífero na dose de potássio de 105,5% e botão floral na dose de potássio de 96,16%. A área foliar específica é positivamente correlacionada com o número de capulho aos 120 dias após emergência do algodoeiro herbáceo.

**Palavras-chave:** *Gossypium hirsutum* L. KCl. Plantio direto. Plantio convencional. Produção de capulho.

\*Corresponding author

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<sup>2</sup>Department of Hydraulics and Irrigation, Instituto Federal Goiano, Rio Verde, GO, Brazil; vmarquesvidal@gmail.com, fredalsoles@hotmail.com, marconibt@gmail.com, fernandonobrecunha@hotmail.com.

<sup>3</sup>Department of Hydraulics and Irrigation, Instituto Federal Goiano, Ceres, GO, Brazil; evami.sousa@gmail.com.

## INTRODUCTION

Cotton (*Gossypium hirsutum* L.) is a plant that belongs to the Malvaceae family, which has great socio-economic importance and is one of the main Brazilian agricultural products, with significantly increasing exports, especially due to the use of cotton fiber as raw material for the textile industry, and its seeds for animal feed and vegetable oil for human consumption (FREIRE, 2011).

Cotton has a 160-day average cycle and requires temperatures of 22-26°C and water supply of 750-900 mm (IAC, 2016). The irregularity of precipitation is one of the main limiting factors to the cotton yield, and the use of irrigation may result in cotton crops less dependent on climatic factors and consequently, significantly increase the crop yield (ZONTA et al., 2015).

The nutrient potassium (K) is absorbed in large amounts by the cotton crops and is essential for the plant development, production and fiber quality (CARVALHO; FERREIRA; STAUT, 2011). According to Furlani Junior et al. (2001), K is the second most required nutrient by the plant, requiring about 150 kg ha<sup>-1</sup> of K<sub>2</sub>O to an approximate yield of 3.5 Mg ha<sup>-1</sup>.

According to Ernani et al. (2007), K has various functions in the plant, such as the activation of several enzyme systems, many of them acting in the photosynthesis and respiration processes. K also contributes to osmotic regulation, controlling the stomata opening and closing. An appropriate potassium rate in cotton crop may increase the number of bolls of larger diameter, boll weight and weight of 100 seeds (STAUT; ATHAYDE, 1999).

However, to establish calibration curves for potassium fertilization in cotton is needed, aiming higher yields and lower production costs.

According to Brown et al. (1995), the erosion control is the main advantage of the no-till system in cotton crops, since they found no significant differences of yield and fiber quality between the no-till and conventional tillage systems. However, Yamaoka (1991) found higher cotton yield under no-till compared with conventional tillage system. Thus, results on the effects of soil management systems on cotton crops are inconsistent, requiring further studies.

Moreover, to select suitable cotton cultivars for each region is essential, aiming their best development. According to Araújo et al. (2013), the good development of plants depends on the cultivar choice and its adaptation to different edaphoclimatic conditions and cultural and management practices.

Thus, the objective of this work was to select

the cotton cultivar that has the best results in the climatic conditions of the Cerrado biome in the State of Goiás, Brazil, and identify the potassium rate and soil management that provide the best development to cotton crops, and the vegetative variable that best relates to the cotton reproductive organs (boll and floral bud).

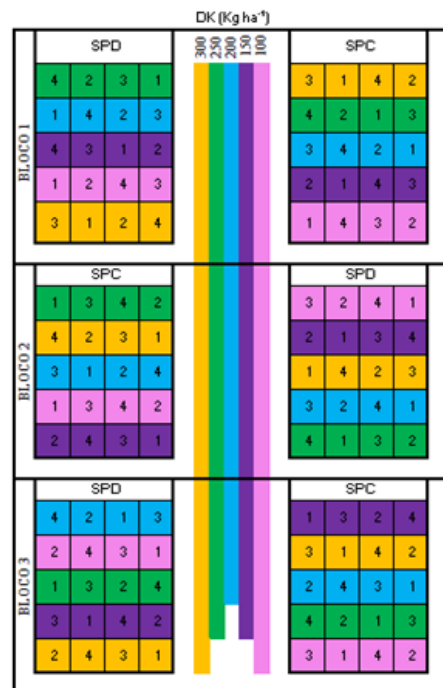
## MATERIAL AND METHODS

The experiment was conducted under field conditions in the experimental area of the Federal Institute of Goiás, Rio Verde campus, State of Goiás, Brazil. According to the Köppen classification, the region has an Aw, tropical climate, with annual average precipitation of 1200-1660 mm, concentrated from October to May, representing over 80% of the total precipitation. The soil of the experimental area was classified as Oxisol (typic distroferic Red Latosol; SANTOS et al. 2013) of medium texture.

The experiment was conducted in a randomized block design in a split plot arrangement (5x2x4) with 3 replications, totaling 120 experimental units of 20 m<sup>2</sup> (5x4 m), which consisted of five rows of plants spaced 1.0 apart, with 0.25 m between plants. The evaluated area consisted of the central 2.0 m of the 3 central rows.

The potassium (K) rates was considered as plots, with rates of 50, 75, 100, 125 and 150% of the rate recommended by Sousa and Lobato (2004), which resulted in 100, 150, 200, 250 and 300 kg ha<sup>-1</sup> of K<sub>2</sub>O, respectively. The potassium source used was potassium chloride (KCl). The fertilization was divided into two applications, at 60 and 90 days after planting (DAP). The sub-plots consisted of the soil management systems (SMS) conventional tillage system (CTS), which consisted of a heavy and two light harrowing, and no-till system (NTS), which was implemented over an area cultivated with *Uruchoa brizantha* cv. Marandu for three years, which were planted with a seed density of 10 Kg ha<sup>-1</sup>, without fertilization, and desiccated at 130 days after emergence with the herbicide glyphosate (2.400 g ha<sup>-1</sup>). The sub-sub-plots consisted of the cultivars *BRS-371*, *BRS-372*, *BRS-286* and *BRS-201* (Figure 1).

Fertigation was carried out by a Venturi system, using the fertilizers monoammonium phosphate (MAP) (104 kg ha<sup>-1</sup>) and urea (81.2 kg ha<sup>-1</sup>) in two applications, according to the soil chemical analysis (Table 1) and the recommendations of Sousa and Lobato (2004).



**Figure 1.** Layout of the experimental plots [(Potassium rates (KR)], sub-plots [no-till system (NTS) and conventional tillage system (CTS)] and sub-sub-plots [cultivars 1 (*BRS-371*), 2 (*BRS-372*), 3 (*BRS-286*) and 4 (*BRS-201*)].

**Table 1.** Chemical and physical characteristics of the soil of the experimental area.

Layer	Density	Total Porosity	Sand	Silt	Clay	Sorptive complex						
						Ca <sup>+2</sup>	Mg <sup>+2</sup>	Na <sup>+</sup>	K <sup>+</sup>	H+Al	OM	pH <sub>ps</sub>
cm	g cm <sup>-3</sup>	%	g kg <sup>-1</sup>			cmolc kg <sup>-1</sup>				%		
0 - 20	1.21	53.03	46.3	17.4	32.2	3.55	3.26	0.13	0.58	0.3	0.19	5.72

Ca<sup>2+</sup> and Mg<sup>2+</sup> extracted with KCl 1 mol L<sup>-1</sup> pH 7.0; Na<sup>+</sup> and K<sup>+</sup> extracted using NH<sub>4</sub>OAc 1 mol L<sup>-1</sup> determined in CaCl<sub>2</sub> solution.

Undisturbed soil samples of both soil management systems (SMS) were collected at 60 DAP in the soil layers 0-10, 10-20 and 20-40 cm, with four replications, to determine the soil density by the volumetric ring method (PAULA; DUARTE, 1997) and the soil resistance to penetration, applying tensions, representing decreasing levels of moisture, with amplitudes of 0.5-0.05 kg kg<sup>-1</sup>, using a bench penetrometer (TORMENA; ROLOFF, 1996).

Growth regulator (inhibitor of the gibberellic acid synthesis) was applied according to the methodology described by Furlani Júnior et al. (2003). Phytosanitary control (preventive and curative) was carried out according to the incidence of pests and diseases, following the recommendations of Almeida, Domingues and Ramalho (2013).

The irrigation method used was the surface drip, which consists of emitters spaced 30 cm apart, with flow rate of 1.1 L h<sup>-1</sup>, at pressure of 10 meters of water column (mwc). The irrigation system was evaluated by the coefficient of absolute uniformity of application, which was 90.01%, according methodology described by Keller and Karmeli (1974).

The irrigation depth applied was based on the Pichet's evaporimeter (MENDONÇA; RASSINI,

2009), using the crop coefficient (kc) values described by Oliveira et al. (2013). The total precipitation during the experiment was 817.19 mm, and the total irrigation depth applied was 83.03 mm.

The decomposition of the *Urochloa brizantha* cv. Marandu straw was also evaluated. Samples of the shoots were cut near to the ground, placed in 24 0.25x0.25-m nylon bags and randomly spread in the NTS sub-plots to evaluate their decomposition. The evaluations were performed at 60, 90 and 120 DAP in eight samples, which were dried in a forced-air circulation oven at 65°C for 24 hours and subsequently, weighed on a precision balance (0.01 g).

The constant of decomposition (K) of the straw was then determinate by the Equation 1 (WIEDER; LANG, 1982),

$$P = P_0 \exp^{-kt} \tag{1}$$

in which P is the concentration of the remaining substrate at the time t (Mg ha<sup>-1</sup>), P<sub>0</sub> is the amount of substrate at time zero (Mg ha<sup>-1</sup>), t is the decomposition time (days).

Subsequently, the straw weight loss was determinate by the Dalal and Mayer (1986) model

(Equation 2), originally used to simulate soil organic matter decomposition,

$$Y_t = Y_\epsilon + (Y_0 - Y_\epsilon) \exp^{-kt} \quad (2)$$

in which  $Y_t$  is the straw weight loss at the time  $t$  ( $\text{kg ha}^{-1}$ ),  $Y_0$  is the straw initial weight, soon after the plant cutting ( $\text{Mg ha}^{-1}$ ),  $Y_\epsilon$  is the straw weight at equilibrium condition ( $\text{Mg ha}^{-1}$ ) and  $k$  is the constant of decomposition (days).

The leaf area to leaf dry weight ratio, i.e., specific leaf area (SLA), and the SLA to leaf weight ratio, i.e., leaf area ratio (LAR), were determinate at 60 and 120 DAP. The leaf area was quantified by the Equation 3 (GRIMES; CARTER, 1969),

$$Y = 0.4322 x^{2.3002} \quad (3)$$

in which  $Y$  is the leaf area ( $\text{cm}^2$ ),  $x$  is the length of the main vein of the cotton leaf (cm).

The samples were dried in a forced-air circulation oven at  $65^\circ\text{C}$  for 48 hours and then, their dry weights were evaluated in a precision balance (0.01 g). The number of fruiting branches (NFB<sub>r</sub>), total number of branches (TNB<sub>r</sub>), number of floral buds (NFB<sub>u</sub>) and number of bolls per plant (NBP)

were determinate by visual counting.

The data were subjected to analysis of variance by the F test ( $p < 0.05$ ), with subsequent regression analysis by the orthogonal polynomial method for the potassium rates and Tukey's test ( $p < 0.05$ ) for the cultivars and soil management systems, for the analysis of plants and soil management systems and sampling layers to the soil properties.

Significance test ( $p\text{-value} < 0.05$ ) was carried out with by the Pearson's correlation analysis ( $r$ ), using the supplement Action 2.7 of the software Excel, and when significant, the correlation magnitude was classified according to Cohen (1988).

## RESULTS AND DISCUSSION

The soil management systems (SMS) and layers evaluated presented similar soil density (SD). The soil under conventional tillage system (CTS) presented resistance to penetration 46.7% higher than the soil under the no-till system (NTS) in the layer 20-40 cm. The layer 0-10 cm showed resistance to penetration 34.3% higher (NTS) and 35.5% lower (CTS) than the layer 20-40 cm (Table 2).

**Table 2.** Soil density and resistance to penetration under different management system and layers.

Soil management system	Sample layer (cm)		
	0-10	10-20	20-40
Soil density ( $\text{g cm}^{-3}$ )			
NTS	1.1392aA	1.0666aA	1.1084aA
CTS	1.1009aA	1.1607aA	1.1368aA
Resistance to penetration (MPa)			
NTS	1.0623aA	0.8680aAB	0.6984bB
CTS	0.8451aB	1.0207aAB	1.3106aA

Averages followed by the same lowercase letter in the column and uppercase in the row do not differ by the Tukey's test ( $p < 0.05$ ). NTS = no-till system, CTS = conventional tillage system.

Ferrari et al. (2014) evaluated physical properties of an Oxisol (typic dystrophic Red Latosol - SiBCS) of clayey texture and the cotton development (NTS) over crops of oat, black oat and radish and found no effects of the treatments on the soil resistance to penetration, with similar results for all layers evaluated (0-15, 15-30, 30-45 and 45-60 cm). These results differ from those in the present study, in which the soil management systems presented differences of resistance to penetration, probably due to the seven years of *Jatropha curcas* crop before the experiment implementation.

According to Rosolem et al. (1998), an increased soil resistance to penetration affects the root distribution and growth and nutrient absorption by the cotton, however, they found no reduction in shoot and root growth caused by soil compaction up to the density of  $1.82 \text{ Mg m}^{-3}$ .

The *Uruchoa brizantha* cv. Marandu straw

decomposition presented weight of  $1318.64 \text{ kg ha}^{-1}$  at 60 days after planting (DAP),  $2340.41 \text{ kg ha}^{-1}$  at 90 DAP and  $2716.66 \text{ kg ha}^{-1}$  at 120 DAP, with constant of decomposition ( $k$ ) of 0.00125, 0.005 and  $0.0075 \text{ kg day}^{-1}$ , respectively. Kliemann, Braz and Silveira (2006) found an invariant index ( $\text{kg day}^{-1}$ ) of weight loss (decomposition) of 0.0097 for a sole cultivation of *Uruchoa brizantha*.

Ferreira et al. (2010) evaluated the production, dry matter persistence and desiccation efficiency of plant species for soil cover crops, and their effects on cotton yield under NTS in an Oxisol (Red Latosol - SibCS) in Santa Helena de Goiás GO, Brazil, and found satisfactory production and dry matter persistence of *Uruchoa brizantha* cv. Marandu for cotton crops under NTS in the Brazilian Cerrado biome.

According to the analysis of variance (Table 3), the SMS affected the number of floral buds

(NFBu) at 60 DAP and the number of bolls per plant (NBP) at 120 DAP. The cultivars (C) presented different specific leaf area (SLA) and leaf area ratio

(LAR) at 120 DAP. The interaction of potassium rates (KR), SMS and C affected the TNBr, NFBu and NFBu at 120 DAP.

**Table 3.** Analysis of variance of the specific leaf area (SLA), leaf area ratio (LAR), number of fruiting branches (NFBu), total number of branches (TNBr), number of floral buds (NFBu) and number of bolls per plant (NBP) of cotton cultivars (C) subjected to potassium rates (KR) and soil management systems (SMS).

Variation source	DF	Mean square (60 Days After Planting)					
		SLA	LAR	NFBu	TNBr	NFBu	NBP
KR	4	517.46 <sup>NS</sup>	52.52 <sup>NS</sup>	2.45 <sup>NS</sup>	9.32 <sup>NS</sup>	27.66 <sup>NS</sup>	-
Block	2	304.85 <sup>NS</sup>	451.86 <sup>NS</sup>	4.34 <sup>NS</sup>	7.88 <sup>NS</sup>	90.10 <sup>NS</sup>	-
Residue 1	8	541.37	139.67	4.83	6.26	18.09	-
SMS	1	2925.10 <sup>NS</sup>	78.21 <sup>NS</sup>	7.01 <sup>NS</sup>	17.37 <sup>NS</sup>	420.62*	-
KR x SMS	4	1305.97 <sup>NS</sup>	258.62 <sup>NS</sup>	1.59 <sup>NS</sup>	2.39 <sup>NS</sup>	26.35 <sup>NS</sup>	-
Residue 2	4	1305.97	258.62	1.59	2.39	26.35	-
C	3	1085.29 <sup>NS</sup>	280.82 <sup>NS</sup>	9.46*	13.31 <sup>NS</sup>	29.43 <sup>NS</sup>	-
KR x C	12	675.69 <sup>NS</sup>	124.40 <sup>NS</sup>	1.69 <sup>NS</sup>	4.12 <sup>NS</sup>	19.66 <sup>NS</sup>	-
SMS x C	3	844.94 <sup>NS</sup>	144.18 <sup>NS</sup>	1.79 <sup>NS</sup>	12.30 <sup>NS</sup>	22.93 <sup>NS</sup>	-
KR x SMS x C	12	846.97 <sup>NS</sup>	171.34 <sup>NS</sup>	1.09 <sup>NS</sup>	3.77 <sup>NS</sup>	11.63 <sup>NS</sup>	-
Residue 3	66	740.36	150.48	2.03	6.29	15.22	-
CV1(%)		19.21	23.59	29.73	14.95	32.74	-
CV2(%)		29.83	32.09	17.04	9.24	39.52	-
CV3(%)		22.46	24.48	19.31	14.99	30.04	-

Variation source	DF	Mean square (120 Days After Planting)					
		SLA	LAR	NFBu	TNBr	NFBu	NBP
KR	4	643.37 <sup>NS</sup>	46.57 <sup>NS</sup>	22.65 <sup>NS</sup>	125.16 <sup>NS</sup>	367.21 <sup>NS</sup>	6.68 <sup>NS</sup>
Block	2	1185.08 <sup>NS</sup>	75.39 <sup>NS</sup>	437.89 <sup>NS</sup>	249.74 <sup>NS</sup>	126.06 <sup>NS</sup>	9.27 <sup>NS</sup>
Residue 1	8	873.59	76.77	5.91	48.33	118.35	2.61
SMS	1	2141.19 <sup>NS</sup>	0.90 <sup>NS</sup>	112.76 <sup>NS</sup>	2.40 <sup>NS</sup>	3089.55 <sup>NS</sup>	33.97*
KR x SMS	4	1679.62 <sup>NS</sup>	88.51 <sup>NS</sup>	36.46 <sup>NS</sup>	23.41 <sup>NS</sup>	461.22 <sup>NS</sup>	4.20 <sup>NS</sup>
Residue 2	4	1679.62	88.51	36.46	23.41	461.22	4.20
C	3	2437.80*	109.81*	16.81 <sup>NS</sup>	117.35 <sup>NS</sup>	240.82 <sup>NS</sup>	2.94 <sup>NS</sup>
KR x C	12	1015.65 <sup>NS</sup>	51.71 <sup>NS</sup>	10.74 <sup>NS</sup>	98.30*	264.31 <sup>NS</sup>	1.63 <sup>NS</sup>
SMS x C	3	497.45 <sup>NS</sup>	2.14 <sup>NS</sup>	27.82 <sup>NS</sup>	3.12 <sup>NS</sup>	40.30 <sup>NS</sup>	2.26 <sup>NS</sup>
KR x SMS x C	12	1291.59 <sup>NS</sup>	38.63 <sup>NS</sup>	26.09*	104.92*	207.32*	2.92 <sup>NS</sup>
Residue 3	66	704.63	31.62	13.03	46.79	94.26	3.55
CV1(%)		40.60	34.49	16.40	18.26	32.27	38.52
CV2(%)		36.29	38.51	40.73	12.71	33.45	36.92
CV3(%)		36.46	34.97	24.35	17.96	37.73	39.91

<sup>NS</sup> = not significant, \* = significant at 5% of probability by the F test, CV (%) = coefficient of variation, DF = degrees of freedom.

The CTS had NFBu 25.2% higher (60 DAP), and NBP 37% higher (120 DAP) than the NTS, regardless of the others treatments. The cultivar *BRS-286* presented SLA 3.2% higher than the

*BRS-371* at 120 DAP, and the cultivars *BRS-372* and *BRS-201* had higher LAR (23.3%) at 120 DAS than the *BRS-371*, however, not differing from the *BRS-286* (Table 4).

**Table 4.** Number of floral buds (NFBu), number of bolls per plant (NBP), specific leaf area (SLA) and leaf area ratio (LAR) of cotton plants, at 60 and 120 days after planting (DAP), depending on the cultivar and soil management system (SMS).

Treatment	NFBu	NBP	SLA	LAR
	60 DAP	120 DAP	120 DAP	120 DAP
SMS			(cm <sup>2</sup> g <sup>-1</sup> )	(cm <sup>2</sup> g <sup>-1</sup> )
NTS	11.11b	1.82b	68.58a	16.16a
CTS	14.86a	2.89a	77.03a	15.99a
Cultivars				
<i>BRS-371</i>	11.97a	2.34a	60.59b	13.57b
<i>BRS-372</i>	12.29a	2.59a	78.23ab	17.69a
<i>BRS-286</i>	13.81a	1.92a	80.80a	15.61ab
<i>BRS-201</i>	13.86a	2.57a	71.61ab	17.45a

Averages followed by the same letter in the column do not differ by the Tukey's test (p<0.05). NTS = no-till system, CTS = conventional tillage system.

Carvalho, et al. (2004) assessed the effects of SMS [(no-till and conventional tillage (one heavy and two light harrowing)] with green manures on the cotton crop development in an Oxisol (dystrophic Red Latosol - SiBCS), and found no significant effects on the cotton characteristics in any of the years evaluated, differing from the present study for the variables NFBu (60 DAP) and NBP (120 DAP).

According to the triple correlation (KR x SMS x C) (Table 5), the cultivar *BRS-286* had a TNBr 34.7% higher than the other cultivars (NTS with KR of 100%); the cultivar *BRS-371* had a TNBr approximately 30% higher than the *BRS-286* and *BRS-201* (NTS with KR of 125%) at 120 DAP; and the *BRS-371* had higher TNBr than the other cultivars, comparing the NTS with KR of 125%.

These different TNBr of the cultivars under different K rates are related to the cultivar responses to K, since the genetic factor probably contributed to these differences.

The cultivar *BRS-286* had a NFBr 34.7% higher than the *BRS-371* (NTS with KR of 75%), and a NFBr 40% higher in the NTS (KR of 75%) compared with the CTS (Table 5). The cultivar *BRS-286* had a NFBu 45% higher than the others cultivars (NTS with KR of 75%), and a NFBu of 44.2% (*BRS-372*), 75% (*BRS-286*) and 50% (*BRS-201*) higher in the NTS (KR of 75%) compared with the CTS. The cultivar *BRS-286* had a NFBu 52.8% higher than the *BRS-371* (NTS with KR of 100%).

**Table 5.** Total number of branches (TNBr), number of fruiting branches (NFBr) and number of floral buds (NFBu) of cotton cultivars (C), 120 days after planting, depending on the potassium rates (KR) and soil management systems (SMS); and SMS depending on the KR and C.

Cultivar	Potassium rate (%)									
	50		75		100		125		150	
	CTS	NTS	CTS	NTS	CTS	NTS	CTS	NTS	CTS	NTS
Total number of branches (unit)										
<i>BRS-371</i>	32.9aA	28.0aA	40.8aA	36.5aA	37.3aA	35.4bA	31.9aB	53.1aA	37.8aA	32.5aA
<i>BRS-372</i>	34.5aA	33.5aA	39.1aA	39.2aA	35.9aA	36.2bA	41.1aA	41.7abA	39.3aA	37.2aA
<i>BRS-286</i>	35.4aA	34.4aA	40.9aA	46.0aA	44.5aA	55.4aA	40.7aA	29.8bA	41.7aA	40.7aA
<i>BRS-201</i>	38.3aA	36.7aA	35.0aA	42.1aA	38.0aA	30.2bA	38.5aA	37.2bA	36.7aA	36.7aA
Number of fruiting branches (unit)										
<i>BRS-371</i>	14.2aA	11.7aA	12.7aA	14.7bA	11.1aA	22.2aA	9.4aA	19.2aA	15.5aA	13.4aA
<i>BRS-372</i>	12.9aA	13.3aA	12.7aA	16.7abA	14.9aA	18.3aA	16.1aA	16.8aA	15.7aA	16.1aA
<i>BRS-286</i>	12.8aA	15.4aA	13.5aB	22.5aA	14.4aA	19.5aA	16.3aA	12.1aA	13.1aA	15.7aA
<i>BRS-201</i>	12.1aA	13.1aA	13.4aA	16.8abA	13.2aA	11.9aA	16.7aA	13.4aA	16.2aA	12.9aA
Number of floral buds (unit)										
<i>BRS-371</i>	22.5aA	27.5aA	20.8aA	29.3bA	14.2aA	20.8bA	14.2aB	35.00aA	25.8aA	25.1aA
<i>BRS-372</i>	14.8aA	26.8aA	22.2aB	39.8bA	16.8aA	25.4abA	19.1aA	22.2aA	18.8aA	29.6aA
<i>BRS-286</i>	17.2aA	17.5aA	18.1aB	72.3aA	33.1aA	44.1aA	19.2aA	21.7aA	26.5aA	25.0aA
<i>BRS-201</i>	16.4aB	32.9aA	18.8aB	37.7bA	19.9aA	26.7abA	30.0aA	36.3aA	24.7aA	20.3aA

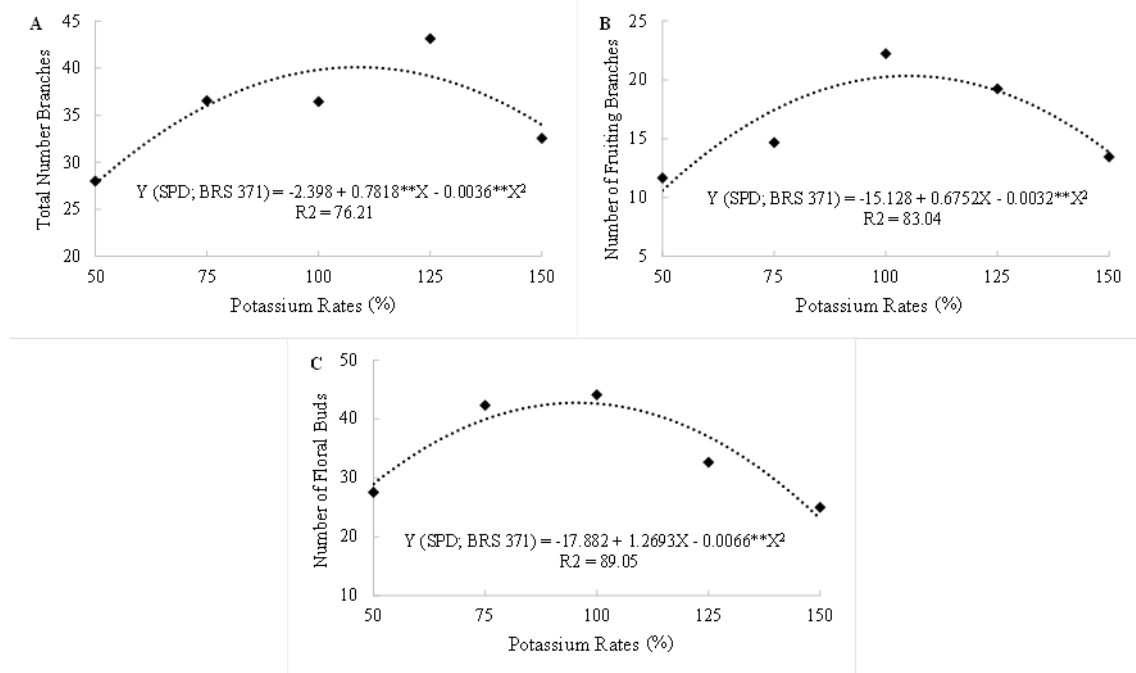
Averages followed by the same lowercase letter in the column (cotton cultivars depending on potassium rates and soil management systems), and the same uppercase letter in the row (soil management systems depending on potassium rates and cultivars) do not differ by the Tukey's test (p<0.05). CTS = conventional tillage system, NTS = no-till system.

Araújo et al. (2013) reaffirmed the importance of selecting appropriate cultivars to regional conditions. They assessed the phenology of herbaceous cotton cultivars (*BRS-Cedro*, *BRS-Itaúba*, *BRS-Araçá*, *BRS-Ipê-Cerrado* and *BRS-Seridó*) in an experiment conducted in 2010 (April to August) in the semi-arid region of the Brazilian Northeast and the cultivars *BRS-Seridó* and *BRS-Araripe*, which are recommended for this region, presented the best results for the characteristics evaluated.

Based on Rosolem et al. (1998) and Ferreira et al. (2010), the greater soil resistance to penetration

of the CTS (layer 20-40 cm) probably affected the root growth and nutrient absorption, since the highest TNBr, NFBr and NFBu were found in the NTS.

The *BRS-371* in NTS had highest TNBr (KR of 108.58%) (Figure 2A), NFBr (KR of 105.5%) (Figure 2B) and NFBu (KR of 96.16%) (Figure 2C), with values estimated by polynomial models of 40.05, 20.49 and 43.14 respectively. The lowest TNBr, NFBr and NFBu of the *BRS-371* in the NTS were found with KR of 50, 50, and 150% respectively.



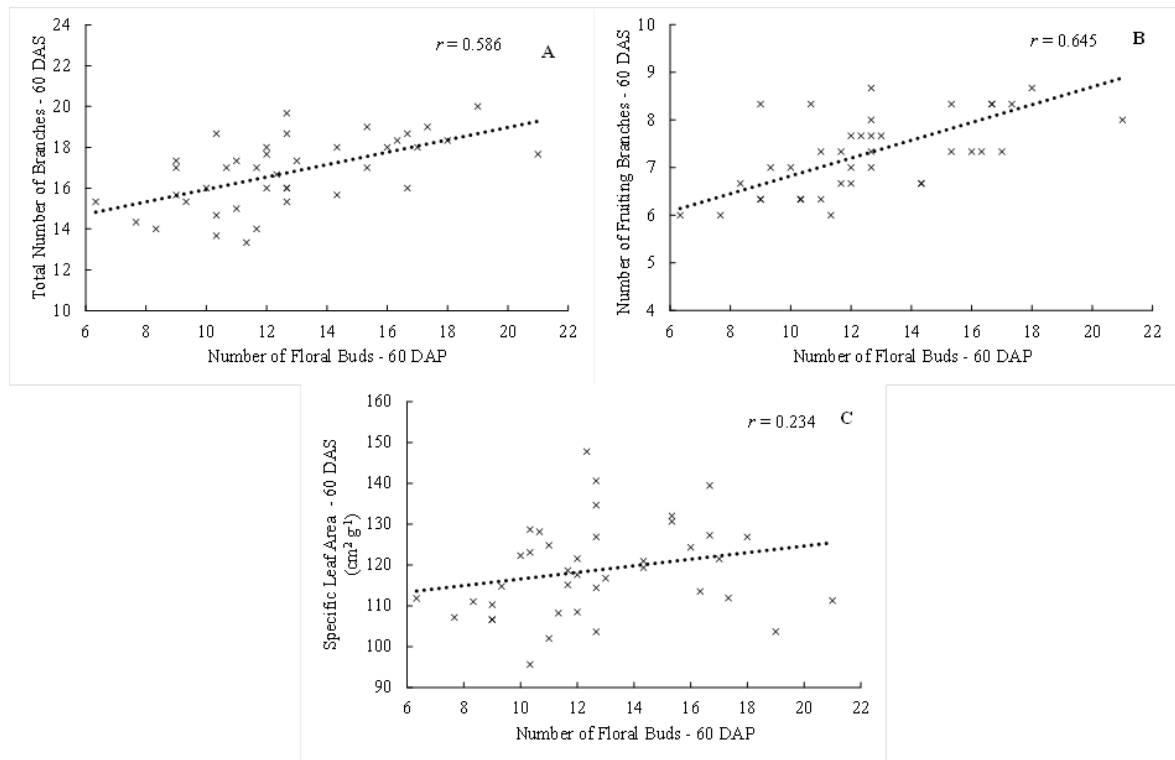
**Figure 2.** Experimental data and regression analysis for the variables total number of branches (A), number of fruiting branches (B) and number of floral buds (C) of the cultivar *BRS-371* in the no-till system (NTS) depending on the potassium rates (KR).

Kaneko et al. (2014) studied the response of a high-density cotton crop to potassium rates (0, 60, 80, 100 and 120 kg ha<sup>-1</sup>) regarding its reproductive variables and found no responses to potassium fertilization. However, the climatic conditions were more limiting to cotton yield than the nutrient rates in the soil. According to Malavolta, Vitti and Oliveira (1997), when the soil fertility, regarding potassium contents, is adequate in cultivated areas of Cerrado biome with cotton crop, a fertilization for replacing the amounts exported by the crop, making the necessary corrections, is recommended.

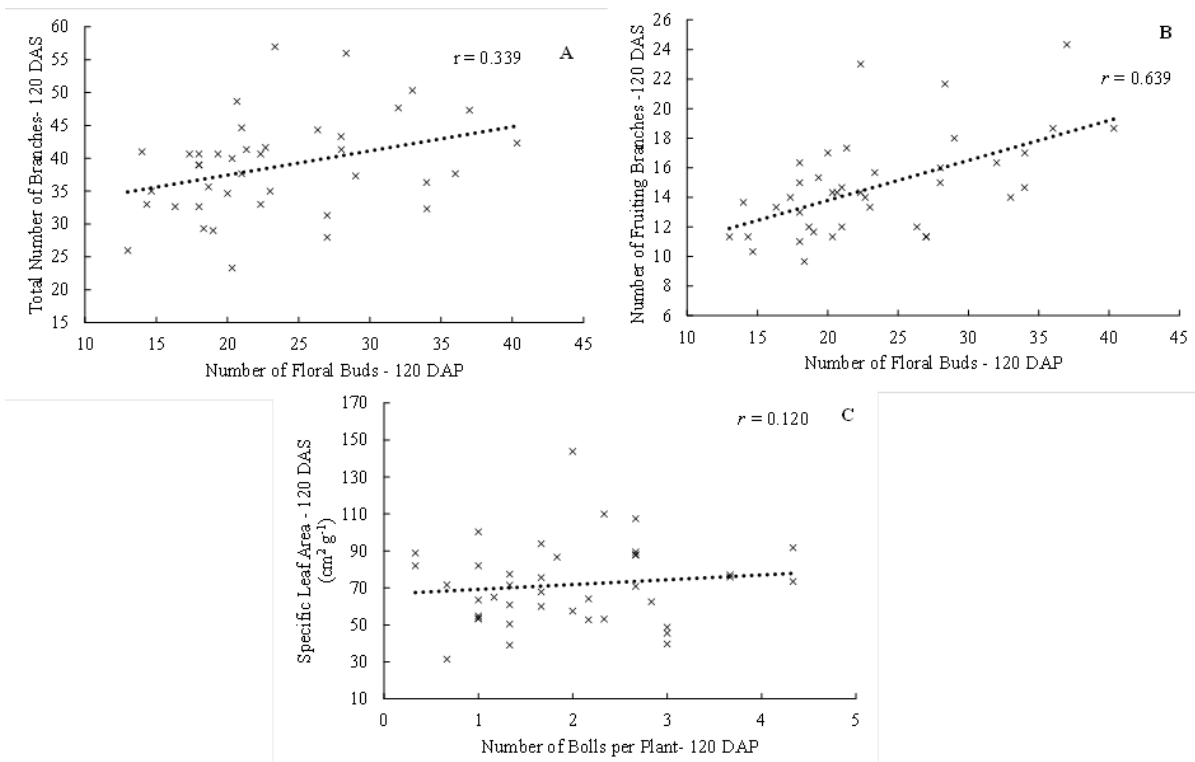
Figures 3 and 4 show the variables that showed significant correlations ( $p < 0.05$ ), based on the magnitude correlation (COHEN, 1988). The

variables TNBr and NFB<sub>r</sub> at 60 DAP had high correlation with the NFB<sub>u</sub> at 60 DAP (Figures 3A and 3B). These positive correlations denote the possibility of increasing the cotton production, since the greater the total number of branches, greater the number of floral buds. The variables SLA and NFB<sub>u</sub> at 60 DAP had a medium correlation (Figure 3C), probably due to the plant senescence with consequent leaf fall.

The TNBr had a medium correlation with NFB<sub>u</sub> at 120 DAP (Figure 4A), the NFB<sub>r</sub> had high correlation with the NFB<sub>u</sub> at the 120 DAP (Figure 4B) and the SLA presented low correlation with the NBP at 120 DAP (Figure 4C).



**Figure 3.** Significant correlations at 60 days after planting between the variables total number of branches and number of floral buds (A), number of fruiting branches and number of floral buds (B), and specific leaf area and number of floral buds (C).



**Figure 4.** Significant correlations at 120 DAP between the variables total number of branches and number of floral buds (A), number of fruiting branches and number of floral buds (B), and specific leaf area and number of bolls (C).

**CONCLUSIONS**

The conventional tillage system provides the best results for the herbaceous cotton, regardless of

the others factors evaluated.

The cultivar *BRS-286* has the best results in the conditions evaluated.

The cultivar *BRS-371* under no-till system present the highest number of fruiting branches at a



potassium rate of 105.5% and highest number of floral buds at a potassium rate of 96.16%.

The specific leaf area was positively correlated with the number of bolls per plant at 120 days after emergence of the herbaceous cotton.

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