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MULTIVARIATE ANALYSIS OF SUGAR CANE CULTIVARS YIELD UNDER TWO SOIL PREPARATIONS SYSTEMS

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ABSTRACT: The knowledge of sugarcane cultivars performance under different soil preparation systems and climatic conditions plays a great role for the correct varietal management in the farming units. Thus, this study aims to characterize the performance of eight sugarcane cultivars, in a Dystroferric Red Latosol under non-tillage and reduced tillage, based on multivariate statistical analysis. To achieve this goal, a trial was conducted at FAECA-UFGD, splitting the area into two sub-areas, which composed the non-tillage and reduced tillage sub-areas. Then, eight sugarcane cultivars were planted in each sub-area basing on a completely randomized design with four replications. To evaluated the trial the data of the stalks length, stalks diameter, number of tillers per meter, yield, soluble solids level content, total recoverable sugars and sucrose content, was collected and submitted to descriptive statistics and then to correlation statistics and the normality test, to verify the analyses of hierarchical and factorial cluster assumptions. The statistical technique of factorial analysis applied into the sugarcane production components, identified three retained factors related to sucrose production, yield and stalks growth, respectively. The statistical technique of hierarchical grouping allows the formation of groups of cultivars according to soil preparation systems, evidencing superior performance in non-tillage, with a major target to the early cultivars (RB965902, RB966928, RB855156) and medium-cycle cultivar (RB985476).

Keywords: *Saccharum spp,* cane-plant, management systems, non-tillage.

ANÁLISE MULTIVARIADA DA PRODUÇÃO DE CULTIVARES DE CANA-DE-AÇÚCAR SOB DOIS SISTEMAS DE PREPAROS DO SOLO

RESUMO: O conhecimento do desempenho de diferentes cultivares de cana-de-açúcar nas distintas condições edafoclimáticas e de manejo do solo serve de subsídio para o correto manejo varietal nas unidades de produção. Objetivou-se caracterizar o desempenho de oito cultivares de cana-de-açúcar, em cana-planta, cultivadas em um Latossolo Vermelho Distroférrico sob plantio direto e preparo reduzido, baseando-se em técnicas estatísticas de análise multivariada. O trabalho foi conduzido na FAECA-UFGD onde a área experimental foi dividida em duas subáreas, compostas pelo plantio direto e preparo reduzido. Em cada preparo foram cultivadas oito cultivares de cana-de-açúcar em um delineamento inteiramente casualizado, com quatro repetições. Foram avaliados comprimento de colmos, diâmetro de colmos, número de perfilhos por metro, produtividade de colmos, teor de sólidos solúveis, açúcares totais recuperáveis e teor de sacarose, cujos dados coletados foram submetidos a descritiva e de correlação, e o teste de normalidade, que serviram como pressupostos para as análises de agrupamento hierárquico e fatorial. A técnica estatística de análise fatorial aplicada para os componentes de produção de cana-de-açúcar identificou três fatores retidos referentes à produção de sacarose, produtividade e crescimento de colmos, respectivamente. A técnica estatística de agrupamento hierárquica permitiu a formação de grupos de cultivares em função do preparo do solo, evidenciando desempenho superior em plantio direto, com maior

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desempenho para as cultivares precoce (RB965902, RB966928, RB855156) e cultivar de ciclo médio (RB985476).

Palavras-chaves: *Saccharum spp.*, cana-planta, sistemas de manejo, plantio direto.

1 INTRODUCTION

One of the current important factors in sugarcane growth in area and yield is the development of new varieties by genetic breeding programs. This process, allowed the ongoing varietal management regarding the distinct production environments, aiming to evaluate the maximal crop expression of its genetic potential (VERÍSSIMO et al. 2012; ABREU et al. 2013).

In this process, planting varieties with high yields and better technological characteristics enables to generate high significant gains, which are attractive for the sugarcane payment basing on its yield and sucrose content and stalks purity (SILVA et al. 2015).

As well as an adequate choice of a variety, in function of the production environment, the plan of the operations involved throughout the sugarcane cycle (from the soil preparation to the harvest), is fundamental to the production, aiming to provide the demand of raw material for the industry, either in quantity or in quality. The soil preparation plays a great role, standing out with high implantation costs carried out only at the planting time or at the crop renewal, after at least 5 or 6 crop cycles, thus, longevity of sugar cane is fundamental when selecting varieties (CARVALHO et al. 2011).

Soil preparation systems, when carried out at sugarcane planting generally consist on a sequence of different combinations of agricultural implements, such as plower and successive harrowing, which alter the soil structure due to the high degree of mobilization that can affect the development of the crop (CAMILOTTI et al. 2005; TAVARES et al. 2010). The conservationist tillage systems, such as reduced tillage or minimum tillage, has been a sustainable option as it reduces soil tillage, preserving soil structure, and reducing the farming cost of the crop, when compared to conventional tillage (CARVALHO et al. 2011).

Despite the widely known benefits of the adoption of conservationist soil, tillage systems in annual crops, such as soybeans and corn, there are few information related to perennial crops, such as sugarcane reporting its interactions to soil preparation systems, and the performance of different cultivars. Researches in this button line are important considering the large number of varieties recommended by breeding programs and the high variability of soil classes in their various management practices associated with the regional climate characteristics (PRADO et al. 2010).

Despite all, this study aims to characterize the performance of eight sugarcane cultivars, in a Dystroferric Red Latosol, under non-tillage and reduced tillage, using the multivariate statistical analysis techniques analysis.

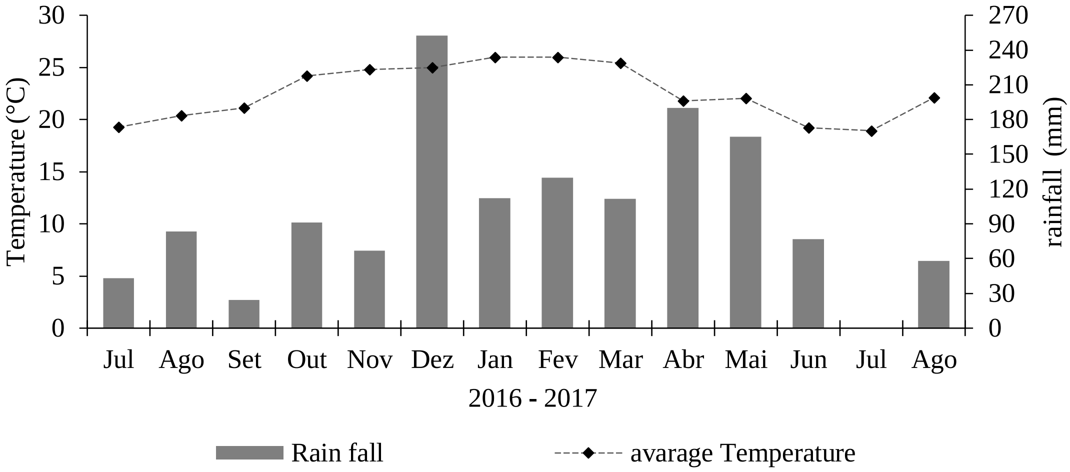
2 MATERIAL AND METHODS

The trial was carried out from July 2016 to August 2017 at the Experimental Farm of Agricultural Sciences of the Federal University of Grande Dourados, MS (22º13'58 "S, 54º 59'57W", 418 m). The soil from this area is classified as Dystroferric Red Latosoil, with a very clayey texture.

To analyse the soil chemical attributes, were collected three soil samples per hectare throughout the experimental area, in the depths of 0 to 30 cm, which were observed the following results: pH (H2O) = 4.5; 3.1 cmolc dm^{-3} of Ca^{2+}; 1.3 cmolc $dm^{-3}$of Mg^{2+}; 0.4 cmolc.dm^{-3} of Al^{3+}; 4.9 cmolc.dm^{-3} of H^{+} Al^{3+}; 6.5 mg dm^{-3} of P ; 0.1 cmolc.dm^{-3} of K + ; 30 g kg^{-1} of MO. Additionally, were performed the granolometric analysis in the same depth, which were recorded 250,3 g for sand, 146,4 g for silt 603,3 g for clay.

Additionally, the climate of this region is classified as Am, monsoon, with dry winter, with an average annual rainfall of 1500 mm, and annual average temperature of 22ºC (ALVARES et al. 2013). During the experimental period, was recorded the accumulated annual rainfall average of 1400 mm and an annual average temperature of 23 ° C as showed in the Figure 1.

Figure 1. Monthly meteorological data of the average rain, average temperature at the farming area.



The experimental area had been in fallow for about two years, after decades of soybean and corn cultivation, in crop succession systems. After this period was set the trial, based in a completely randomized design with four replications. Each experimental unit contained five (5) sugarcane lines of 5 meters long, spaced 1.50 m (37.5 m^2), adding up 32 experimental units per soil preparation systems. The area was divided into two sub-areas of non-tillage and reduced tillage. In each sub-area, were planted eight sugarcane cultivars (RB965902, RB985476, RB966928, RB855156, RB975201, RB975242, RB036066 and RB855536), in July 21, 2016, considering the density of 15 buds per meter. Then, for the soil fertilization, was applied a uniform dosage in the entire experimental area, of 0.3 Mg ha^{-1} of 10-25-26 NPK formulation in the planting furrows.

The soil preparation systems consisted on reduced soil preparation systems (RP) with heavy harrower, and non-tillage (NT) with weed crushing, furrows opening for planting. Then, to prepare the plots, was used a straw grinder equipped with rotor of steel curved knives; furrower; and an off-set trawl, with 16 discs of 0.76 m diameter (30") in each section, at the depth of 0.15 m. Additionally, was performed manual weed control during the trial, when tractor traffic was limited.

In August 2017, at 395 days after planting (DAP) the crop was manual harvested. Then, was collected the data of length of stalks, diameter of stalks in 10 tillers of the three central lines (discarding 1.0 m at the ends of each line as borders) of each experimental unit. The stalks length was measured the with a graduated tape measure, of 0.1 mm resolution, by measuring the distance from the base of the stalk to the collar of leaf +1 (ABREU et al. 2013). The stalks diameter was measured with pachymeter, by measuring the stalks thickness, 5 cm from the ground.

The number of tillers per meter (nTm), was performed counting the tillers of the five central lines (considering 1 m at the ends of each line as border), of the experimental unit according to (ABREU et al. 2013).

Additionally, were evaluated the stalks number at the cutting time (395 DAP), counting the numbers of tillers. Then were collected 10 stalks from each treatment to determine the mass of the stalks, which were then sent to the Laboratory of chemical analysis for the soluble solids content (Brix, %), total recoverable sugars (TRS), sucrose content (Pol, %) as recommended by (FERNANDES, 2003; SOUZA et al. 2012).

Finally the yield of Pol (SC) was obtained from Equation 1, as established by Souza et al. (2012); Silva et al. (2014) and Campos et al. (2014).

TPH – TCH*Pol/100
(1)

Considering,

TPH –ton of Pol (%) per hectare;

TCH – sugarcane yield, Mg per hectare;

Pol - sugarcane sucrose content (%).

The data of the variables was submitted to normality test, using the Ryan-Joiner test at 1% probability, linearity of the data, identification of outliers and observation of significant values with the correlation matrix, and then was submitted into multivariate analysis statistic, of factorial and cluster analysis with Ward's hierarchical method.

Moreover, the mean value and standard deviation of the production components, we analyzed through factor analysis, using the maximal variation (Varimax) methods of rotation and orthogonalization of the factors, adopting as a selection criterion to the factorial loads and the total variation - commonality (FREITAS et al. 2006).

In the cluster analysis of Ward, the production components were considered as significant when loads the values were equal or greater than 0.70, in similarity given by the Euclidean distance. This method enabled to define the cutting off distance to 50% of the maximum Euclidean distance, grouping the cultivars into their respective soil preparation systems, degree of similarity and homogeneous groups (OLIVEIRA et al. 2015).

3 RESULTS AND DISCUSSION

Themean values and standard deviation of the stalks length, stalks diameter and number of tillers per meter (nTm) of the eight sugarcane cultivars under reduced tillage (RT) and non-tillage (NT) are presented on Table 1. The cultivar RB985476 stood out with the highest stalks length value of 3.16 m in the RT, while in NT the cultivar RB966928 stood out with 3.21 m. Moreover, was observed that among the cultivars in the soil preparation systems, the mean values of the stalks length in NT was higher (2.99) than in RT (2.96 m).

By the other side, the stalks diameter in the cultivar RB985476 was higher (35.64 mm) in 10.78% in the trial (32.17 mm), while in NT, a larger diameter value was observed in the cultivar RB975201 (33.51 mm), which was 3.11% higher than the average obtained in the trial (32.50 mm).

Table 1. Descriptive statistics, showing the mean values and standard divisions of the stalks length, stalks diameter, number of tillers of the eight sugarcane cultivars under RT and NT.

Cultivar	Reduced Tillage (RT)					
	Length[N]		Diameter		nTm[N]	
	Mean	SD	Mean	SD	Mean	SD
RB965902	2,92	0,16	29,30	1,25	18,02	0,87
RB985476	3,16	0,06	35,64	1,26	14,38	1,14
RB966928	3,07	0,16	32,15	2,47	15,80	1,26
RB855156	2,64	0,20	32,66	1,57	15,27	2,15
RB975201	2,98	0,09	32,81	1,45	13,12	0,92
RB975242	2,92	0,12	31,57	2,00	12,18	0,67
RB036066	3,01	0,09	32,34	0,36	14,12	2,66
RB855536	2,94	0,08	30,91	0,36	13,55	2,51
Mean	2,96	0,12	32,17	1,34	14,56	1,52
	Non-tillage (NT)					
	Length[N]		Diameter		nTm[N]	
	Mean	SD	Mean	SD	Mean	SD
RB965902	2,89	0,13	32,57	3,37	17,00	3,52
RB985476	3,08	0,06	32,08	2,00	16,98	1,58
RB966928	3,21	0,10	32,36	2,02	16,85	1,87
RB855156	2,89	0,16	33,06	0,82	19,82	2,66
RB975201	3,03	0,14	33,51	0,82	12,85	2,62
RB975242	2,98	0,12	33,34	0,40	15,50	2,46
RB036066	2,85	0,04	32,04	1,00	12,02	2,14
RB855536	2,99	0,06	31,04	1,33	15,85	4,37
Mean	2,99	0,10	32,50	1,47	15,86	2,65

SD: standard deviation. N: normal distribution by the Ryan-Joiner test.

The results from Table 1 show that the stalks diameter presented less variation, being influenced mostly by genetic characteristics of the plant, the number of tillers, spacing between crops, plant height, leaf area and climatic conditions corroborating to (COSTA et al. 2011).

The cultivars RB965902, RB985476, RB966928 and RB855156 presented high mean values for nTm, with the highest score for RB965902 (18.02) in RT, and the RB855156 (19.82) in NT with the higher average mean value of (15.86), when compared to RT (14, 56). Additionally, the lowest values of nTm was observed for RB975242 cultivar, in RT, and for RB036066, in NT.

High values were also observed to TCH, Pol, TPH, Brix and TRS for RB965902, RB985476, and RB966928, while for RB855156 and RB036066 presented lower values for both soil preparations systems (Table 2). The mean values of the production components of the 8 cultivars were higher in NT than in RT. Additionally, was observed that the RB855156 cultivar obtained a gain of 50 Mg ha^{-1} for TCH in NT when compared to the value obtained in RT. (Table 2).

The genetic divergence among the different cultivars, for maturation cycles, may be a great issue that may possibly have influenced the above results. Silva et al. (2014), observed the same evidences when evaluating the production of different sugarcane varieties during two cycles under fully drip irrigation and besides these, identified differences in TPH responses due to the genetic distinction, thus, highlighted that RB855536 is less productive when compared to SP85-1115, IACSP96-3060, RB867515 and IAC91-1099 cultivars. Albuquerque et al. (2016) also verified similar, differences between the genotypes for TCH and TPH characters, associating these results to the genetic variability and not to the production environmental issues.

Moreover, was observed high mean values for TCH and TPH for both soils preparation systems. These results were higher when compared to those verified by Silva Junior et al. (2013), when studying the agronomic performance of SP81-3250 cultivar in a clayey dystrophic Red Latosoil, under different conventional and minimum tillage. They observed lower TCH values (145.05 Mg ha^{-1}) and TPH (17.41 Mg ha^{-1}) in no-tillage, when compared to other soil tillage systems, especially in sugarcane plantations.

Additionally, was also observed that the RB036066 cultivar obtained the lowest values for the variables Pol, ATR and Brix among the cultivars, for both RT and NT. Furthermore, in RT, we observed similar values of Pol, ATR and Brix the RB965902, RB985476, RB966928, RB855156, RB975201 and RB975242 cultivars, while in NT we observed similar results to RB965902, RB985476, RB966928 and RB855156 cultivars (Table 2).

Silva et al. (2014) pointed out that attributes such as TCH and TPH are more determined by the cultivar, the production environment and, above all, by the availability of water since the sugar content is usually adversely affected by excess of moisture at the maturation stage.

Studies carried out by Veríssimo et al. (2012), when evaluating fifteen varieties of early maturation in the 2009/2010 and 2010/2011 harvests, found that the RB966928 cultivar scored high Brix content and yield values, moderate stability and wide adaptability, while the standard RB855156 cultivar showed specific adaptation and moderate stability. Several authors commented that one of the tools to support this stage of genetic improvements of sugarcane is to skim the interaction of genotype x environment (GxE), aiming to understand their behavior, regarding to the adaptability-ability of genotypes response to positive environmental stimulus and stability, what is the ability of genotypes to perform predictably due to environmental stimulus.

Table 2. Mean values and standard deviations of stalks yield - (TCH, Mg ha-1), sucrose content - (Pol,%), Pol productivity - (TPH, Mg ha^{-1}), soluble solids content - (Brix, %) and total recoverable sugars - (ATR, kg Mg^{-1}) for the eight sugarcane cultivars (C). (1-RB965902, 2-RB985476, 3-RB966928, 4-RB855156, 5-RB975201, 6-RB975242, 7 - RB036066 and 8 - RB855536), under reduced tillage (RT) and non-tillage (NT).

C	Reduced tillage (RT)									
	TCH^N		Pol^N		TPH^N		$Brix^N$		ATR^N	
	M	DP	M	DP	M	DP	M	DP	M	DP
1	166,68	27,47	14,97	0,44	24,90	3,77	16,58	0,47	148,42	4,20
2	170,39	29,65	15,09	0,72	25,60	3,86	16,60	0,79	149,35	6,97
3	158,50	24,80	15,22	0,45	24,15	3,99	16,77	0,12	151,14	3,65
4	149,28	20,41	15,70	1,04	23,43	3,58	17,04	0,53	155,00	9,11
5	134,74	18,27	14,15	0,47	19,09	3,00	15,85	0,19	140,80	3,85
6	127,21	16,32	14,52	0,70	18,51	2,84	16,16	0,35	144,17	6,04
7	146,87	31,02	12,07	1,09	17,94	4,89	13,66	0,72	121,00	9,42
8	120,47	32,04	13,46	1,17	16,40	5,18	15,05	1,02	134,12	10,76
M	146,77	25,00	14,40	0,76	21,25	3,89	15,96	0,52	143,00	6,75
	No Tillage (NT)									
C	TCH^N		Pol^N		TPH^N		$Brix^N$		ATR^N	
	M	SD	M	SD	M	SD	M	SD	M	SD
1	176,46	16,14	14,98	0,49	26,38	1,71	17,10	0,43	148,27	4,71
2	179,09	27,93	15,20	0,95	27,15	3,83	16,98	0,63	150,90	8,52
3	175,02	32,77	15,63	0,38	27,29	4,69	16,90	0,41	154,21	0,38
4	196,52	31,39	15,57	0,77	30,71	6,14	17,05	0,53	153,94	6,91
5	145,47	29,04	13,72	0,33	20,03	4,45	15,57	0,48	135,49	4,23
6	172,84	39,78	14,33	0,61	24,80	5,96	15,98	0,61	142,46	5,80
7	130,35	26,95	12,12	0,49	15,72	2,68	13,59	0,26	121,26	3,92
8	142,69	34,94	14,15	1,00	20,17	5,05	15,75	0,91	140,59	9,31
M	164,81	29,87	14,46	0,63	24,03	4,31	16,12	0,53	143,39	5,47

M: mean value; SD: standard deviation. N: normal distribution - Ryan-Joiner test.

The Table 2, shows that, among the cultivars, only RB036066 cultivar obtained less than 13% Pol value, what is industrially considered viable, and when evaluating the Brix, among the cultivars was observed lower values of 18%, ranked as adequate.

Moreover, was performed the correlations analysis between the productions attributes using the factorial analysis, what showed significant values in the correlation matrix, with strong and positive correlation between TCH, Pol, TPH and nTm; TPH with TCH; Brix, TRS with Pol; TRS and Brix for both soil managements (Table 3).

Additionally, the Table 3 shows the correlation coefficients between the length of stalks (LS), number of tillers per meter (nTm), stalks yield (TCH), sucrose content (Pol) , soluble solids content (Brix) and soluble solids content (TRS).

Table 3. Correlation coefficients between the length of stalks (LS), number of tillers per meter (nTm), stalks yield (TCH), sucrose content (Pol) , soluble solids content (Brix) and soluble solids content (TRS).

	LS	**sD**	**nTm**	**TCH**	**Pol**	**TPH**	**Brix**	**TRS**
Reduced tillage								
LS	1,0							
sD	0,27	1,0						
nTm	-0,18	-0,048	1,0					
TCH	0,15	0,46**	0,73**	1,0				
Pol	-0,30	0,15	0,36*	0,34	1,0			
TPH	0,02	0,44*	0,73**	0,94**	0,63**	1,0		
Brix	-0,24	0,08	0,30	0,29	0,97**	0,58**	1,0	
TRS	-0,28	0,14	0,36*	0,33	0,99**	0,63**	0,98**	1,0
No tillage								
	LS	**sD**	**nTm**	**TCH**	**Pol**	**TPH**	**Brix**	**TRS**
LS	1,0							
sD	0,13	1,0						
nTm	0,14	-0,21	1,0					
TCH	0,25	0,17	0,84**	1,0				
Pol	0,33	0,01	0,59**	0,46**	1,0			
TPH	0,30	0,15	0,87**	0,96**	0,69**	1,0		
Brix	0,33	0,02	0,62**	0,53**	0,94**	0,72**	1,0	
TRS	0,32	0,00	0,60**	0,48**	0,99**	0,70**	0,93**	1,0

* and ** significant at 5 and 1% probability, respectively, by the t-test.

The results from Table 3 show TCH x TPH (0,98), TCH x ATR (0.99), TPH x ATR (0.99), Pol x ATR (0.98), Pol x BRIX (0.98) and TRS x BRIX (0.97), showing a strong and positive correlation between number of stalks per meter with TCH and TPH, corroborating with those obtained by Dutra Filho et al. (2011), which used such characteristics for selection of sugarcane genotypes by means of statistical techniques, adopting the Pearson correlation to infer the results.

According to Bressiani et al. (2002), sugarcane yield per hectare (TCH) and sucrose content (Pol), are positively correlated with the soluble solids content (Brix), and the variable TCH is subdivided into numbers of stalks per hectare and mass of stalks.

Additionally, was performed a factorial analysis (Table 4) showing the matrix of rotational factor loads of the production components for the eight cultivars of the factorial loads for each attribute. Thus, are also showed the commonalities values, indicating the rate variance of each attribute. The TCH, Pol, TRS, Brix and nTm components showed a strong correlation with the retained factors, what is explained from their high commonalities (ARCOVERDE et al., 2015). The eigenvalues indicate the relative score of each factor explaining the variance associated with the attributes analyzed, extracting the factors in order of their importance.

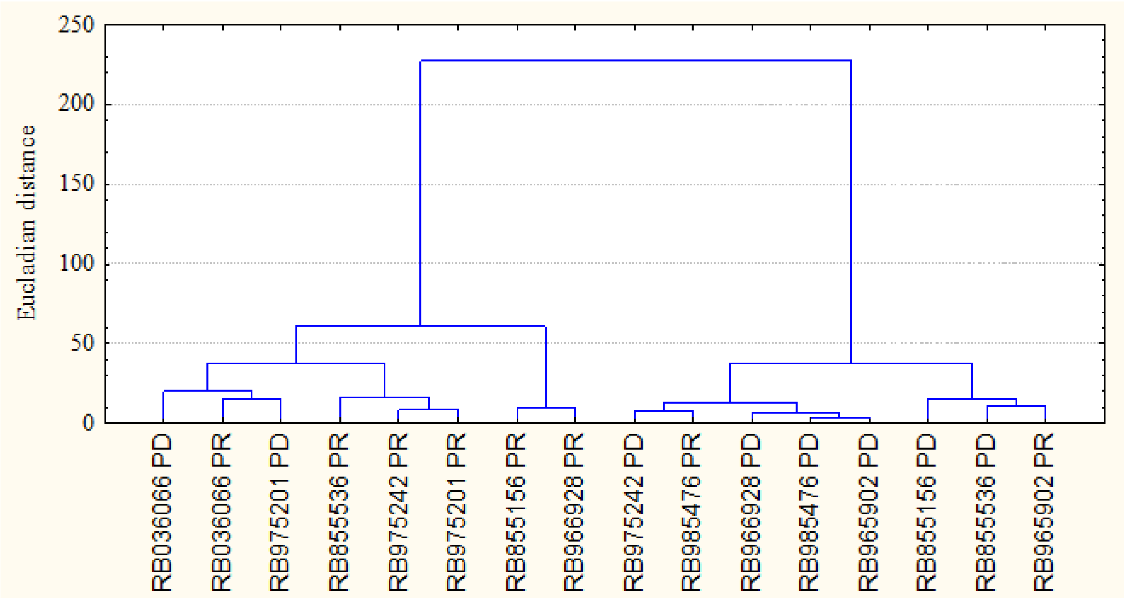
The factor 1, represents the largest share of the total data variance, what composes the components Pol, ATR and Brix varying together in both sets with 39.02 and 35.72% of the total data variance. Additionally, this shows a strong evidence that the results refer to parameters involved in the production of sucrose, while, the factor 2, indicates that the yield, is positively correlated with TCH and nTm, with 20.12 and 24.82% of the total data variance. Finally, the factor 3, represents the growth, what is composed of soil preparations systems, showing a positive correlation in RT for stalks diameter and length stalks, and also lately in NT, with 16.04% and 17.26% of the total data variance, respectively. Such result shows that the preparation systems evaluated differently influenced the composition of factor 3 (stalks growth), so that in RT there was a positive correlation between stalks diameter and length stalks. However, a negative correlation between such biometric characteristics is commonly observed (COSTA et al., 2011). Thus, it may be interesting for genetic improvement, once growth in diameter and length stalks is desirable in order increase the availability of sucrose accumulation in plant.

Table 4. Matrix of factorial loads after orthogonal rotation by the varimax method for production component data: final yield of stalks (TCH), sucrose content (Pol), total recoverable sugars (TRS), soluble solids content (Brix) , number of tillers per meter (nTm), length stalks, stalks diameter in reduced (RT) and non-tillage (NT) systems.

Reduced tillage				
Variable	**Factor 1**	**Factor 2**	**Factor 3**	**Communality**
TCH	0,20	**0,86**	0,39	0,94
Pol	**0,98**	0,17	-0,033	0,99
TRS	**0,98**	0,17	-0,30	0,99
Brix	**0,96**	0,11	-0,028	0,94
nTm	0,20	**0,94**	-0,19	0,96
Length	0,31	-0,041	**0,74**	0,65
Diameter	0,19	0,10	**0,83**	0,75
Auto-values	3,51	1,81	1,44	6,76
% Variance	39,02	20,12	16,04	75,19
No tillage				
Variable	**Factor 1**	**Factor 2**	**Factor 3**	**Communality**
TCH	0,20	**0,89**	0,23	0,88
Pol	**0,91**	0,37	0,010	0,97
TRS	**0,90**	0,38	0,10	0,96
Brix	**0,80**	0,48	0,050	0,88
nTm	0,30	**0,90**	-0,18	0,81
Length	0,36	0,13	**0,88**	0,16
Diameter	0,091	-0,14	0,11	0,94
Auto-values	3,22	2,23	1,55	7,00
% Variance	35,72	24,82	17,26	77,81

In the Table 4 is observed that the production components were ordered into two groups (Figure 2). The first group composes RB975201 and RB036066 cultivars in RT and NT, and RB966928, RB855156, RB975242 and RB855536 in RT while the second composes RB965902 and RB985476 cultivars in RT and NT and RB966928, RB855156, RB975242 and RB855536 in NT. In general, the second group composes cultivars with superior performance than the first group, with cultivars in no-tillage, what possibly due to the higher values of soil moisture verified up to 180 days after planting in this soil preparation systems.

Figure 2. Dendrogram showing the of hierarchy groups of eight sugarcane cultivars, in reduced soil preparation (RT) and non-tillage (NT) systems.



According to Prado et al. (2010), the knowledge of the performance of different sugarcane cultivars in different classes and soil management contributes on decisions taking and for the correct allocation of cultivars in the farming units. Therefore, under the environmental conditions that the cultivars were submitted during the crop cycle, all expressed better productive potential when cultivated in non-tillage than under reduced tillage. However, under soil management the best options were the early cultivars (RB965902, RB966928, RB855156) and the medium - cycle cultivar (RB985476), which showed a better varietal management performance for winter planting in the Dourados - MS, regarding on their growth and production characteristics.

4 CONCLUSIONS

The statistical technique of factorial analysis applied to the components of sugarcane production enables, identifying three retained factors related to sucrose production, yield and stalks growth.

The statistical technique of hierarchical grouping allows the formation of groups of cultivars according to soil preparation systems, evidencing superior performance in non-tillage, with a major target to the early cultivars (RB965902, RB966928, RB855156) and medium-cycle cultivar (RB985476), which scored as the best options regarding on the varietal management for winter planting in the Dourados - MS region, due to their growth and yield performance.

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