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SUGARCANE MPB PRODUCTION UNDER IRRIGATION FREQUENCIES AT DIFFERENT SEEDLING AGES

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ABSTRACT
Sugarcane production in Brazil, estimated for the 2019/20 harvest, is 615.98 million tons, with Goiás being the second state with the highest production. According to estimates, the areas destined for seedlings in the sugar-alcohol sector are representative, having been 48 thousand hectares in the 2018/2019 harvest. Sugarcane is the crop with the largest irrigated area in the country. Studies report that the frequency and depth of irrigation should vary with the periods of sugarcane growth. The cultivation of sugarcane from seedlings has allowed the reduction of the volume spent on stalks, as it provides a high multiplication rate. Thus, the present study aims to clarify some of the points of interference in the development of sugarcane, seeking to evaluate the quality characteristics of pre-sprouted seedlings from two irrigation frequencies, verifying the nursery age with the best performances for seedling production and the interference of the parts of the stem from which the buds are extracted for production. In the pre-trial, 16 varieties were planted at the Federal Institute of Goiás-Campus Ceres-Goiás . In the second stage, the experiments were installed in a protected environment, in the city of Goianésia, on February 19, 2019, and evaluated in the initial phase for 21 days, with the evaluations made at three-day intervals and validation on March 19, 2019. The following data are from the original experiment. The variety determined was CTC 4. The experimental design for the experiment was DBC in 3x2 split-plots, with 4 replications, irrigation frequency (1x and 2x), with three ages - 14 months, 10 months and 6 months. All data were analyzed using the SISVAR software. Irrigation frequencies influenced the initial germination evaluations. The age of the propagative material at 6 months is 19.98% higher than the 10-month-old buds and 12.88% higher than the 14-month-old ones. As for the position of the buds in the stalk. As for the Dickson quality index (DQI), seedlings from younger nurseries were superior to the others.

Keywords: Healthy seedlings. Sugarcane nurseries. *Saccharum officinarum.* Irrigated sugarcane. Mini Grindstone.

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INTRODUCTION

Worldwide, sugarcane occupies about 24 million hectares, with Brazil being the largest producer, followed by India, China, Thailand, Mexico and Pakistan. Sugarcane is of great relevance to Brazilian and global agribusiness (FAOSTAT, 2010 and ROJAS LEVI, 2009). Regarding the areas destined to the production of sugarcane, there is a projection of an increase of 1.6 million hectares for the next 10 years, and the State of Goiás will be the largest responsible for the expansion area, with an increase of 37.8% (BRASIL, 2018).

Sugarcane production in Brazil, estimated for the 2019/20 harvest, is 615.98 million tons, for a harvested area of 8.38 million hectares. In Goiás, the total area occupied by the crop is 1.146 million hectares and the harvest area is 949.2 thousand hectares, with an estimated productivity of 76.92 t ha^{-1}, being the second state with the highest production, surpassed only by São Paulo, and the third state with the highest productivity for this crop, surpassed only by Bahia and Tocantins (CONAB, 2019).

According to estimates from the latest CONAB bulletin (2019), the areas destined for seedlings in the sugarcane sector are representative, having been 48 thousand hectares in the 2018/2019 harvest and 33.7 thousand hectares planned for the 2019/2020 harvest, which, according to the average productivity of Goiás, is a production of approximately 2.5 million tons, because nowadays sugarcane nurseries are formed in the conventional way, using part of the stem (vegetative propagation), with the size of 30-50 cm, which, in manual planting, requires about 14 t ha8 a^{-1}, with about 21 buds/meter, however, in mechanized planting, high volumes of material are used, ranging from 20 t ha12 a8 a^{-1}, with 60 buds/meter, reducing the amount of raw material destined for the industry, increasing the spread of diseases transmitted by stalkers in the spread (RIPOLI AND RIPOLI, 2004; COLETI, 1987; LANDELL et al, 2012) 24 a

The cultivation of sugarcane from seedlings (LANDELL et al., 2012) has allowed the reduction of the volume spent on stalks, as it provides a high multiplication rate, no longer using up to 20 t $^{ha-1,}$ using only 2 tons to plant one hectare. That is, the multiplication ratio, which was about 1:4 (one hectare originates four hectares), changed to 1:20 in the MPB system. In addition, it increases the health of the seedlings and the uniformity of planting, with the choice of non-deteriorated buds and free of pathogens.

The quality of the seedlings influences the percentage of survival, the speed of growth and the final production. In addition, better quality seedlings have greater growth

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potential, which highlights the importance of seedling quality in crop formation (SANGUINO 2006.

The dependence on the nutritional reserves of the grinding wheel varies according to the development of the aerial and root parts and, for approximately 60 days, the reserves of the grinding wheels are fundamental for the evolution of the budding process. Other factors also interfere with sprouting and can be classified as environmental, genetic, physiological and phytotechnical. In fact, these factors are interrelated and can act complementarily. Among them, temperature, humidity, aeration and soil texture can be mentioned (PRADO, 2006; CASAGRANDE, 1991; SING and SRIVASTAVA, 1973; WHITMAN et al., 1963).

If there are favorable conditions, the bud becomes active and growth and development occurs due to the presence of nutritional reserves, activation of enzymes and growth regulators (DILLEWININJ, 1952). The main favorable condition is the adequate availability of water. After the moment when the grinding wheel is covered with soil, if water is available, the activation of enzymes and the production of hormones that control cell division and growth are initiated, both of the bud and also of the points of the primordia of the roots in the root zone.

Irrigation can be defined as the artificial application of water to the soil, according to its retention and infiltration capacity, in order to ensure the plant's water supply throughout its vegetative cycle, providing better development and greater production (VIEIRA, 1986).

The water requirement of sugarcane varies according to the different phenological stages of the crop. According to Ometto (1980), depending on the climate, the volume of water that the crop needs varies from 1,500 to 2,500 mm. Of the many techniques developed in food production, none is as old and more important as irrigation. The basic idea of irrigation is to meet the water needs of plants in the right quantity and at the right time, to obtain maximum production and the best quality of the product (TELLES, 1986).

According to Scardua (1985), the frequency and depth of irrigation should vary with the periods of sugarcane growth. During the establishment period, including emergence and seedling establishment, it is preferable to make light and frequent irrigation applications. Thus, the localized irrigation system made by micro-sprinklers is able to meet the water demand and the recommendations of the crop need in its initial stage, providing little volume in alternative frequencies in the following stage.

According to Elia (2016), production losses can be aggravated by the lack of efficient varietal management and adequate care in relation to the health of seedlings used for the

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multiplication of nurseries. Thus, in recent years, the use of irrigation in sugarcane cultivation, associated with other planting technologies, such as the formation of nurseries with pre-sprouted seedlings, has contributed to increased productivity, longevity of sugarcane fields and reduced cost per ton of sugarcane produced.

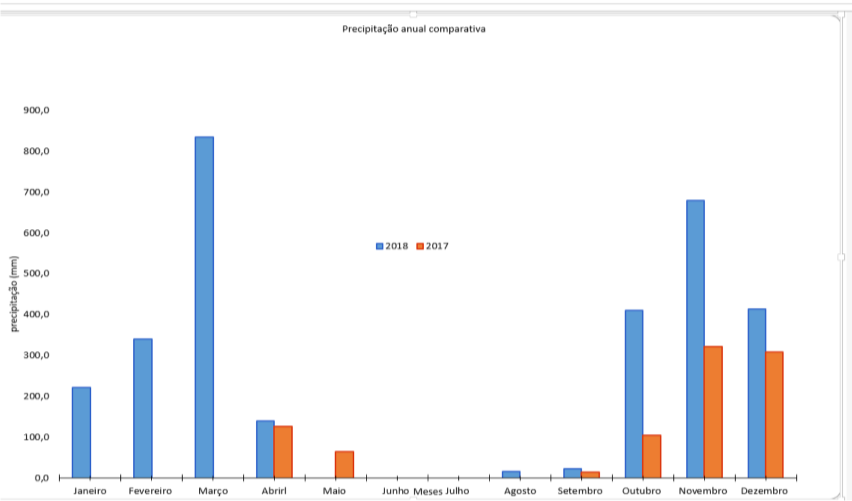
The present study aims to evaluate the influence on the characteristics on the quality of pre-sprouted seedlings, at different ages of sugarcane propagative material, and place of extraction of propagative material, when submitted to splitting of the irrigation depth by a localized irrigation system.

MATERIAL AND METHODS

LOCATION AND CHARACTERIZATION OF THE NURSERY AREA

In the first stage, corresponding to the production of a base nursery, nurseries were planted in the experimental area of the Federal Institute of Goiano-Campus Ceres-GO, located in the Microregion of Ceres and in the Mesoregion of Vale São Patricio, mesoregion of the Center-North of Goiás, at the coordinates South latitude 15º21'00.67", West longitude 49º35´56.98", altitude of 580m, with smooth undulating relief, Dark red latosol, medium textured. The climate of the place, according to Koeppen's classification, is of the AW type (hot and semi-humid, with a well-defined season), with the dry period from May to September and the rainy period from October to April, with an average annual temperature of 25.4ºC, with minimum and maximum averages of 19.3 and 31.5ºC, respectively, with an average annual precipitation of 1700 mm (Figure 2).

Figure 4. Annual rainfall 2017/2018



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INSTALLATION OF THE EXPERIMENTS

The experiment, which consisted of the production and evaluation of the development of pre-sprouted seedlings (MPB), was conducted at the School Farm of the Evangelical Faculty of Goianésia (Faceg), located in the city of Goianésia, state of Goiás, with the following geographic coordinates: 15°19'22"S and 49°08'20" W. The climate is of the Aw type (according to the Köppen-Geiger classification), characterized as tropical, with a dry season from April-May to September-October and the rainy season from October-November to March-April, with two well-defined seasons. Average rainfall of 1502 mm per year and 24.4º C of average temperature. The experiment was conducted in a protected environment, with a transparent canvas cover, surrounded by a screen, with the floor covered by gravel.

The experiment was installed in a protected environment, in the city of Goianésia, on February 19, 2019, and the evaluation was carried out on March 19, 2019. The following data are from the original experiment. The experiment was carried out under controlled greenhouse conditions at the experimental campus of the Faculty of Agronomy, FACEG, in Goianésia, Goiás, Brazil. The variety planted in the experiment was CEC 4, due to its standardization, availability of propagative material and its economic expression in the sugarcane sector. The size of the protected environment was 216 m2, with a transparent canvas cover suitable for greenhouses, with protective screens on the sides and a floor covered with gravel.

The criteria for choosing the variety to be used were: growth in planted area, participation in regional and national varietal management, incidence of pests and diseases, number of seedlings available, available bibliographies, productive impact and uniformity response to irrigation management.

For the experiment of pre-sprouted seedlings, he used three different ages of the propagative materials: 6 months, 10 and 14 months of age. Plastic boxes with 28 centimeters in width, length and height were used, according to the recommendation of Landell et al. (2012). The commercial substrate Tropstrato, composed of pine bark, vermiculite and slow-release nutrients, was used, with the formulation of 14-16-18 NPK, with the sources potassium nitrate, peat and simple superphosphate. 39 centímetros10 centímetros

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IRRIGATION MANAGEMENT: IN A PROTECTED ENVIRONMENT

The micro-sprinkler irrigation system was used, using micro-sprinklers with Irritec nebulizers, green nozzle, with an application radius of 1.15 meters and a flow rate of 1.15 meters58 litros[1] A. To keep the substrate in field capacity, temperature and humidity evaluations were made with a thermo-hygrometer, at two frequencies, fixed shift (1x a day) and with frequency (2x a day). Evapotranspiration was evaluated by climate management, with a class A mini-tank, installed inside the greenhouse.

The efficiency of the system was calculated at 80% by the equation $Q = \frac{V/1000}{T/60}$, where Q is the flow rate in L $^{h-1}$, V is the collection flow rate in the emitters in ml and T is the collection time in minutes.

CUD, which is the distribution uniformity coefficient, was performed by the equation, we obtained a result of 85.72% of uniformity, and to increase the percentage, the position of the experiments was adjusted as soon as we differentiated the frequencies.

$$CUD = 100 \frac{q_{25\%}}{\bar{q}}$$

CUD = uniformity of distribution (%);

q25% = mean of the 25% lowest flow values observed (L h-1);

q= general average of the emitters collected (SALOMÃO, 2012).

EXPERIMENTAL DESIGN: EXPERIMENT AGES OF PROPAGATIVE MATERIAL

DBC Randomized Block Design in a 3x2 factorial with 4 replications and experimental unit composed of 20 experimental units, each plot consisting of 60 experimental units in total, split-plots, irrigation frequency (1x and 2x a day), with three ages 14 months, 10 months and 6 months DAP. The plots are the frequencies and the subplots are the ages of the mini-grindstones.

All data will be analyzed by the Shapiro Wilk normality test, submitted to analysis of variance and the means compared by Tukey's test at 5% probability of error. By the SISVAR 5.6 software (FERREIRA, 2011).

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DATA ANALYZED

The evaluation of the stem diameter will be determined with the aid of a caliper at the median height of the stem (between 1st and 2nd thirds) (OLIVEIRA et al., 2014). For plant height, measurements will be made by measuring the distance from the soil surface to the last visible auricular region of leaf +1 (COSTA et al., 2011). The number of green leaves will be obtained by means of visual counting (leaves with visible ligula and with more than 50% of the green area) (MACHADO et al., 2009).

The leaf area per plant (FA) will be determined by measuring the length and width in the median portion of the leaf +3, and counting the number of green leaves, applying the formula:

AF = C.L.0.75. (N+2) where:

C is the length of the sheet; L is the width of the sheet; 0.75 is the correction factor for leaf area of the crop; and N is the number of green leaves (HERMANN; CÂMARA, 1999).

leaf area per tiller (FA) - from the count of the number of green leaves (fully expanded leaf with a minimum of 20% of green area, counted from leaf +1), and by measurements on leaves + 3, obtaining the length and width of the leaf in the median portion, estimating the leaf area according to equation 1: (1) where C is the length of the +3 sheet; L is the width of the +3 sheet; 0.75 is the correction factor for leaf area of the crop; and N is the number of open leaves with at least 20% green area.

3 RELATIVE GROWTH RATE

The relative crop growth rate (RGR) was obtained from the fresh stem matter based on Ramesh (2000), through the equation: TCR = (In P2 – In P1) (t t^{-1} $^{ha-1}$) / (T2 - T1). Where P1 and P2 represent the weight of fresh stem matter, in tons per hectare (t $^{ha-1}$) of two successive samples at T1 and T2 time intervals.

For the characterization of the quality for seedling production, periodic (non-destructive) evaluations will be carried out, such as: mortality; seedling height; leaf area; number of leaves, germination percentage, diameter, stem height and bud development speed. In addition to evaluations at the 21 DAP, these (destructive), such as: evaluation, root volume; dry mass of the root; fresh root mass, shoot dry mass; fresh pasta aerial part.

The Dickson Quality Index (DQI) (DICKSON et al., 1960) was determined as a function of shoot height (H), stem diameter (DC), shoot dry matter weight (PMSPA) and root

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dry matter weight (PMSR), using the formula (Dickson et al., 1960): IQD= PMST(g)/ H (cm)/ DC(mm)+ PMSPA (g)/ PMSR (g).

Sprouting speed index (BVI) Sprouting was evaluated daily, and with the values accounted for, the germination speed index of Maguire (1962), here called the sprouting speed index (IVB), (VIEIRA & CARVALHO, 1994) was calculated. According to the following equation: IVB=(B1/N1+B2/N2+B3/N3+...+Bn/ Nn), where Bn is the number of shoots computed in the "n" counts and Nn is the number of days from bud planting to "n" counts.

Ratio of shoot dry mass to root dry mass, and the ratio between shoot and root system dry matter (RPASR) was calculated by dividing these plant components (LUCCHESI, 1984).

RESULT AND DISCUSSION

EXPERIMENT II MPB PRODUCTION AT DIFFERENT NURSERY AGES AND IRRIGATION FREQUENCIES

For the variable, Dickson's quality index (DQI), it is observed in Table 9, that there was a significant difference for the effect of nursery ages, the isolated effect of irrigation frequency there was no significant difference, and in the interpellation of the correlated effects for the variable DQI.

Table 1 - Summary of the analysis and variance table for the MPB production experiment of different nursery ages for the variables, Dickson quality index (IQD)

	Medium Square	
Source of Variation	GL	IQD[1]
Frequency (Fq)	1	0.0008ns
Block	3	0.0004ns
Residue A	3	0,0005
Ages of nurseries	2	0,0057**
Fq x Iv Interaction	2	0,0067*
Residue b	12	0,0001
CV (a)%		28,57
CV (b)%		16,10

** and * significant at 1 and 5% probability by the F test, ns not significant at 5% probability by the F test. [1] Data transformed into Root of X.

In the periodic evaluations with metrics for AP (plant height), it was observed in Table 10 that there is a significant difference being ($p<0.05$) in the effect of the nursery age factor, at 8, 14 and 20DAP. Therefore, for the isolated effect of the frequency factor on all days evaluated, there was no significance of the data, demonstrating that the values of ($p<0.05$).

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Based on observations made in the table above, it was found that the variables in DI, CA and PA suffered different effects when submitted to isolated factors, with the unfolding of the interaction only for the CA variable being significant. The DI obtained a significant effect value for the statistics only under the factor of ages of nurseries, in the case of the variable CA the heats of ($p<0.05$) were significant both in the effects of the isolated factors and in the interaction, and the variable PA obtained significant values under statistical analysis only when under the effect of the isolated factor of irrigation frequency.

Table 2 - Summary of the analysis table and variance of Irrigation Frequency (Fq) and Nursery Ages on the variables: Plant Height (AP), Diameter (DI), Stem Height (AC) and Leaf Area (AF)

		Medium Square							
Source of Variation	GL	AP(8)¹	AP(11)¹	AP(14)	AP(17)	AP(20)	DI¹	AC	AF¹
Frequency	1	0.02ns	0.02ns	6.98ns	93.02ns	13.50ns	0.25 ns	19.53*	29,28*
Block	3	12.43**	1.07ns	585.97**	495.51*	414.50*	0.32 ns	16.93ns	16.30ns
Residue A	3	0,12	0,82	6,6	23,21	27,88	0,10	1,82	2,45
Ages	2	3.25**	1.59ns	75,39*	58.48ns	122.13**	0,61*	6.94*	5.71ns
FxI Interaction	2	0.01**	0.06ns	27.41ns	15.25ns	11.84ns	0.13 ns	8.78*	10.80ns
Residue b	84	0,14	0,67	18,67	37,47	22,07	0,15	2,11	7,25
CV (a)		21,58	31,55	16,15	23,68	18,80	20,32	18,95	22,57
CV (b)		23,30	28,50	27,15	30,08	16,73	23,92	20,39	38,77

** and * significant at 1 and 5% probability by the F test, ns not significant at 5% probability by the F test. [1] Data transformed into Root of X.

The variables under the effect of the factor of (F) in Table 11 were only significant for the root volume (RV, and there was no significance for the other variables, MFPA, MSPA, MFR, MSR and RPASR. The variables under the isolated factor of age of the ponds caused effects on all variables except only the RPASR. And the joint effect of the factors (F x I) did not occur

Table 3 - Summary of the anova table Frequency (Fq) and Nursery Ages for the variables: Shoot Fresh Mass (MFPA), Shoot Dry Mass (MSPA), Root Fresh Mass (MFR), Root Dry Mass (MSR), Root Volume (RV) and Ratio or Ratio of Shoot Root System

		Medium Square					
Source of Variation	GL	MFPA	MSPA	MFR	MSR	VR	RPASR
Frequency	1	2.83ns	0.03ns	0.02ns	0.12ns	37,50*	0.12ns
Block	3	25.39ns	0.55ns	22.97ns	0.24ns	58,33**	0.09ns

Residue A	3	21,04	0,87	7,13	0,03	1,38	0,55
Ages	2	391,40**	17,21**	285,31**	0,43**	544,79**	0.19ns
F x I Interaction	2	23.52ns	0.78ns	33.42ns	0.01ns	9.37ns	0.04ns
Residue b	12	30,26	0,66	16,17	0,008	38,19	0,43
CV (a)		18,56	1,48	10,78	15,61	5,44	27,27
CV (b)		22,26	18,78	16,22	7,26	28,52	24,11

** and * significant at 1 and 5% probability by the F test, ns not significant at 5% probability by the F test.

For the GD variable, shown in Table 12, there was no significant difference for the isolated factor of Irrigation Frequency (Fq) and for the interaction between the factors, Irrigation Frequency and x Nursery Ages. However, the effect of the nursery age factor on this variable is evidenced: p<0.05) for all evaluations from the 8DAP, there was only no significant effect of this factor in the first evaluation, even after the data transformation.

Table 4 - Summary of the analysis and variance table for Irrigation Frequency (Fq) and different Nursery Ages (I) for the variable: Developed buds (DG).

		Medium Square					
Source of Variation	GL	GD[1](5 DAP)	%GD(8DAP)	GD(11DAP)	GD(14DAP)	GD(17DAP)	GD(20DAP)
Frequency	1	1.70ns	51.04ns	16.66ns	4.08ns	1.00ns	1.00ns
Block	3	5.42ns	345.48ns	163.88ns	122.11ns	78.61ns	59.33ns
Residue A	3	1,26	53,81	30,55	81,86	45,27	109,22
Ages	2	7.07ns	696,87*	1116,66*	1332,93**	786,37*	824,93*
F x I Interaction	2	5.38ns	51.04ns	54.16ns	32.14ns	129.00ns	63.56ns
Residue b	12	1,86	130,90	165,97	116,40	135,88	152,86
CV (a)		29,38	16,08	8,96	13,92	10,06	14,89
CV (b)		35,74	25,08	20,89	16,60	17,43	17,61

** and * significant at 1 and 5% probability by the F test, ns not significant at 5% probability by the F test. [1] Data transformed into Root of X.

As we observed in Table 13, the first evaluation of bud count developed at 5DAP there was no significant difference between the ages of nurseries, but in the evaluations of the subsequent count from 8 to 20 DAP, the buds from 6-month-old nurseries differed statistically, in the 8DAP evaluations, the age of 6 months was different from that of 14 months, in the evaluation periods of days 11, 14 and 17 DAP the statistical differences were both for 10 and 14 months, and at 20DAP the 6-month nursery continued to show higher values. In other words, the buds of origin from newer ponds contribute to a higher percentage of development, lower mortality, consequently lower losses of inputs and labor savings. We can justify this fact to several factors, but some we have eliminated by standardizing the environment.

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Being a protected environment, uniformity in irrigation, variety (CEC 4) equal for all treatments, with the guarantee carried out by roguing eliminating varietal mixture, the origin of the material for planting the nurseries, was from the seedling nursery of the Jalles Machado Plant in the municipality of Goianésia, and also the proof of the planted varieties, by the evaluation of varietal identification by a professional made available by the Plant supplier of the initial seedlings, type of substrate used in standard quantity at the bottom of the box, regarding brightness coverage. Câmara (1993) highlighted the various factors inherent to the plant, whether by management or by the environment, which interfere in the percentage of bud development, namely: Health, nutritional status, period between cutting the seedlings and planting, planting depth, covering the seedlings with soil or substrate.

For Câmara (1993), the genetic characteristics related to sprouting vary according to the age of the seedling, age difference of the bud, degree of moisture of the stem, concentration of sugars and mineral nutrients. Thus, we found in our research that age was a factor that influenced the effect on the percentage of buds developed or, as reported in other literatures, number of shoots, which corroborates several studies in which younger buds have greater development, because the concentration of sugars and mineral nutrients are processed by plant metabolism more quickly, because humidity was standard, the age of the bud was medium and the distinct and uncontrolled factor was the nutritional issue of the buds planted, and also what is not mentioned in current works on the production of mini-stalks, mini grinding wheels or MPB, are the difference and amount of hormone receptors that can change according to the position, nursery age and several other factors that affect this bioregulator.

Table 5 - Statistical analysis for MPB production, from different ages of nurseries ID (age), for measurement evaluations in days after planting (DAP) , for the variable in evidence DG, buds developed.

ID	(5DAP)	(8DAP)	(11DAP)	(14DAP)	(17DAP)	(20DAP)
6	20.00 to	56.25 to	75.00 to	79.36 to	79.36 to	81.23 to
10	23.75 to	41.87 abs	52.5 b	54.37 b	59.37 b	61.25 b
14	8.75 to	38.75 b	57.5 b	61.25 b	63.12 b	68.12 abs

Averages followed by equal lowercase letters in the columns do not differ from each other by Tukey's test, at 5% probability.

The characteristics of PA leaf area shown in Table 14 did not differ between seedlings originated from buds of different nursery ages. The diameter of the stalk, although in the initial stage it does not match the terms of productivity, represents characteristics of mass and vigor of the seedlings. We can observe that for both DI, IVB, IQD and AP, the buds from the 6-month-old nursery were higher than the 14-month-old nursery,

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demonstrating that seedlings produced by buds from younger nurseries have characteristics that accelerate the IVB process, and consequently higher values of morphological characteristics of the seedlings evaluated.

Santi et al. (2016), used the HEI in their experiments with sugarcane varieties and different substrates, proving that this index can also be used to evaluate the quality of the sugarcane seedling, as described by Fonseca (2000), who says that because the calculation considers robustness and the balance of the biomass distribution, the higher the index, the higher the quality of the seedling formed. Thus, we can verify and analyze that seedlings obtained from younger nurseries about 6 months after planting and irrigated to 100% of their evapotranspiration, can reach higher values from nurseries over 6 months old, such as the present study of 10 and 14 month nurseries.

Table 6 - Analysis for MPB quality and morphology traits from different ages of nurseries. ID (age), AF (leaf area), DI (diameter), IVB (budding speed index), IQD (Dickson quality index), AP (plant height), DBH (days after planting)

ID	AF	DI	IVB	IQD	AP(8DAP)	AP(14DAP)	AP(20DAP)
6	68.01 to	3.28 to	0.81 to	6.20 to	0.42 c	16.62 abs	29.43 to
10	50.59 to	2.84 abs	0.61 b	4.79ab	2.77 b	16.96 to	28.96 to
14	48.97 to	2.34 b	0.68 AB	3.89 b	4.59 to	14.15 b	25.84 b

Averages followed by equal lowercase letters in the columns do not differ from each other by Tukey's test, at 5% probability.

Sprouting of billets occurs at soil temperatures between 27°C and . The temperatures that impair the emergence and sprouting of sugarcane are lower than and higher than . Sprouts occur 30 days after planting (DBH), being influenced by factors such as; planting depth, temperature, bud position along the stem and soil moisture. During this period, the plant develops using the existing energy reserves (sugars) and nutrients (CASAGRANDE, 1991; AUDE, 1993).33°C20°C35°C20 a

At the beginning of the evaluations, we can observe in Table 15, that for the variable plant height at 8DAP, and also stem height, that due to the joint interaction between the factors on the variable, the difference between plants being higher in the 14-month-old seedlings being lower than the other ages applied to this research. Later, the ages did not differ between their evaluations and frequency of irrigation.

Table 7 - Unfolding of ages within each frequency, and frequency between ages for variable Plant height with 8 DBH-Days after planting and CA (stem height)

8 DAP		
AGES	FREQUENCY 1	FREQUENCY 2

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6	3.71 Aa	2.75 Ba
10	4.79 Aa	4.13 Aa
14	1.90 Bb	2.52 Ba
	AC (Height of thatch)	
6	7.53 Aa	7.65 tab
10	6.11 Bb	8.2 Aa
14	6.4 Ba	6.90 Ba

Averages followed by equal lowercase letters in the rows, and equal uppercase letters in the columns, do not differ from each other by Tukey's test, at 5% probability.

The morphological characteristics related to the biomass of the seedlings produced in each of the ages, shows in Table 16, that the seedlings from ponds with a lower age have a higher biomass production than the others, which is directly related to the higher percentage of DG and IVB demonstrated in the previous tables, thus all variables in the table being MFPA, MSPA, MFR and MSR, the 6-month age was higher than the 10- and 14-month age. The morphological characteristics demonstrate a higher seedling vigor for seedlings produced from nurseries aged 6 months.

Table 8 - Statistical analysis for different ages of irrigated ponds, in MPB: ID (age) DBH (days after planting), MSPA (shoot dry mass), MFR (root fresh mass), MSR (root dry mass), RV (root volume).

ID	MFPA	MSPA	MFR	MSR	VR
6	32.36 to	5.98 to	31.06 to	2.03 to	13.33 b
10	23.11 b	3.88b	24.12 b	1.50 b	16.66 abs
14	18.64 b	3.15 b	19.17 b	1.11 c	20.62 to

Averages followed by equal lowercase letters in the columns do not differ from each other by Tukey's test, at 5% probability.

For the effect of irrigation frequencies on root volume or root volume, showing in Table 17, the statistical difference when analyzed in isolation, however, we can observe that the highest RV was found with the higher age of the seedling, which cannot be directly correlated with the fresh or dry root mass, which were inversely proportional. The difference found in the frequencies shows that frequency 2 obtained greater root volume when compared to frequency 1, which we can verify by the fact that in frequency 2 with irrigation intervals occurring every 12 hours, the bud conditioning sites had a longer period of moist substrate, that is, greater ease of root growth, with shorter root lengths. Thus, it corroborates with the data expressed by CASAGRANDE and VASCONSELOS, 2010; CASAGRANDE, 1991).

The ages of the nurseries influence the general characteristics and quality of the seedlings, with the youngest nursery buds (6 months) being superior to the others.

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The position of the buds in the stem causes positive effects on the morphological characteristics and quality indices of the seedlings, and the apical buds perform superior data compared to the buds of the middle and basal portions of the stalk.

Irrigation frequencies influenced the initial germination evaluations, demonstrating that the environmental effect is crucial for bud development. In the variables in the experiment of different ages in: CA, PA and RV, there was also interaction between ages and frequency in the evaluation of 8 DBH for AP. And for the experiment of different parts of the stem, the frequencies had effects on the percentages of initial DG at 8 and 11 DAP, in the initial PA, but on the morphological characteristics of biomass of both shoots and root part had effects on them, and the single frequency was higher than the splitting.

Developed buds: GD ages for 6-month nursery buds 19.98% higher than 10-month-old buds and 12.88% for 14-month-old gems.

Developed buds stem parts: Apical buds higher in 28.34% than the median and 64.17% of the basal ones. IQD represents the balanced distribution of seedling biomass, in which seedlings from younger nurseries and apical parts of the stem were superior to the others.

Table 9 - Statistical analysis for Irrigation frequency (FQ) in MPB for the variable RV (root volume).

FQ	VR
Frequency 1	20.41 b
Frequency 2	22.91 to

Averages followed by equal lowercase letters in the columns do not differ from each other by Tukey's test, at 5% probability.

CONCLUSION

The ages of the nurseries influence the general characteristics and quality of the seedlings, with the youngest nursery buds (6 months) being superior to the others.

Irrigation frequencies influenced the initial germination evaluations, demonstrating that the environmental effect is crucial for bud development. In the variables in the experiment of different ages in: CA, PA and RV, there was also interaction between ages and frequency in the evaluation of 8 DBH for AP.

Developed buds: GD ages for 6-month nursery buds 19.98% higher than 10-month-old buds and 12.88% for 14-month-old gems.

Developed buds, the IQD, represents the balanced distribution of seedling biomass, in which seedlings from younger nurseries were superior to the others.

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