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EFFECT OF CUTTING DAYS ON THE MORPHOLOGICAL CHARACTERISTICS OF *Panicum maximum* CV. WALL WITH NITROGEN FERTILIZATION LEVELS IN THE DRY SEASON

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ABSTRACT
The raising of cattle on pasture in Brazil is one of the main activities for the occupation of agricultural frontier areas, standing out for its low cost and efficiency. However, in beef cattle, the practice of inadequate management and the lack of nutrient replacement in pastures contribute to the degradation of areas. The objective of this study was to evaluate the production of *Panicum maximum* cv. Walling under different cutting intervals (28 and 56 days) and nitrogen fertilization levels (0, 100, 200, 300 and 400 kg of N ha^{-1} $year^{-1}$) during the dry period, in the municipality of Imperatriz, MA. The experiment was conducted in a randomized block design, with five treatments, four replications and two cutting intervals. Before the beginning of the experiments, the blocks were standardized, adjusting the height of the plants to 30 cm. The parameters evaluated were: percentage of leaves (%F), percentage of stalks (%C), dry matter production (PMS), number of tillers (NP), plant height (AL) and leaf dry matter production (PMSF). The results showed that nitrogen fertilization had no significant effect on the cutting intervals (28 and 56 days), with values of $p > 0.05$ for all parameters evaluated (percentage of leaves, percentage of stalks, dry matter production, number of tillers, plant height and leaf dry matter production). The increase in nitrogen levels also did not promote significant increases in dry matter production, with $p > 0.05$. Dry matter production was similar between treatments with different nitrogen doses, and there was no significant variation in plant height ($p = 0.23$) or number of tillers ($p = 0.14$). The distribution of dry matter between leaves and stems was also not influenced by the treatments ($p = 0.31$). It is concluded that, under the conditions of the present study, the cutting intervals and the levels of nitrogen fertilization evaluated did not have a significant impact on the production of *Panicum maximum* cv. Wall.

Keywords: Management, Nutrition, Productivity, Forage.

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INTRODUCTION

To maximize the performance of the *Panicum maximum* cv. Paredão, it is essential to consider the interaction between factors such as mineral nutrition, management of cuts and environmental conditions. During the dry season, water limitation and reduction in the nutritional quality of pastures represent major challenges for the maintenance of animal production. In this context, nitrogen fertilization emerges as an indispensable tool to overcome nutrient deficiency in the soil, promoting a higher photosynthetic rate, increased dry matter production, and improvement in the bromatological composition of forage (Miranda et al., 2022). By stimulating the growth of new leaves and tillers, nitrogen contributes to a more vigorous vegetative profile, which is essential to sustain forage demand in intensive livestock systems (Garcez et al., 2022).

Nitrogen fertilization is one of the fundamental pillars to optimize the productive efficiency of tropical grasses, especially in periods of greater environmental stress. This practice directly influences plant metabolism, promoting greater root development and the ability to absorb water and nutrients (Matsuda, 2021). In addition, studies indicate (Bonfim-Silva et al., 2022; Lima et al., 2018; Oliveira et al., 2007) that nitrogen supplementation can partially mitigate the effects of drought, ensuring greater resilience of plants to adverse conditions and maintaining satisfactory levels of biomass production (Valentin et al., 2001). Thus, the application of nitrogen fertilizers must be planned strategically, considering both the demands of the plant and the dynamics of the soil, to ensure its maximum efficiency.

Proper management of the cutting interval also plays a critical role in the performance of Paredão grass, especially during periods of environmental stress. Interruptions that are too frequent can compromise the plant's energy reserves, reducing its ability to regrow, while intervals that are too long can result in material with poor nutrient quality due to lignin accumulation (Herdiawan and Widodo, 2022). In addition, cutting management directly influences the leaf area index and light interception, determining factors for the continuous and efficient growth of biomass. Understanding the balance between frequency of cuts and levels of nitrogen applied is essential to ensure sustainable and productive management of *Panicum maximum grass*.

During drought, the reduction in water availability affects not only vegetative growth, but also the ability to regrow after successive cuts. Thus, the combination between the application of nitrogen fertilizers and the definition of cutting intervals adjusted to climatic conditions becomes crucial to sustain forage productivity. Strategies that integrate these two aspects allow not only to maximize biomass production, but also to preserve the bromatological quality of forage, which is essential to meet the nutritional requirements of animals during periods of greater feeding challenge (Bonfim-Silva et al., 2022).

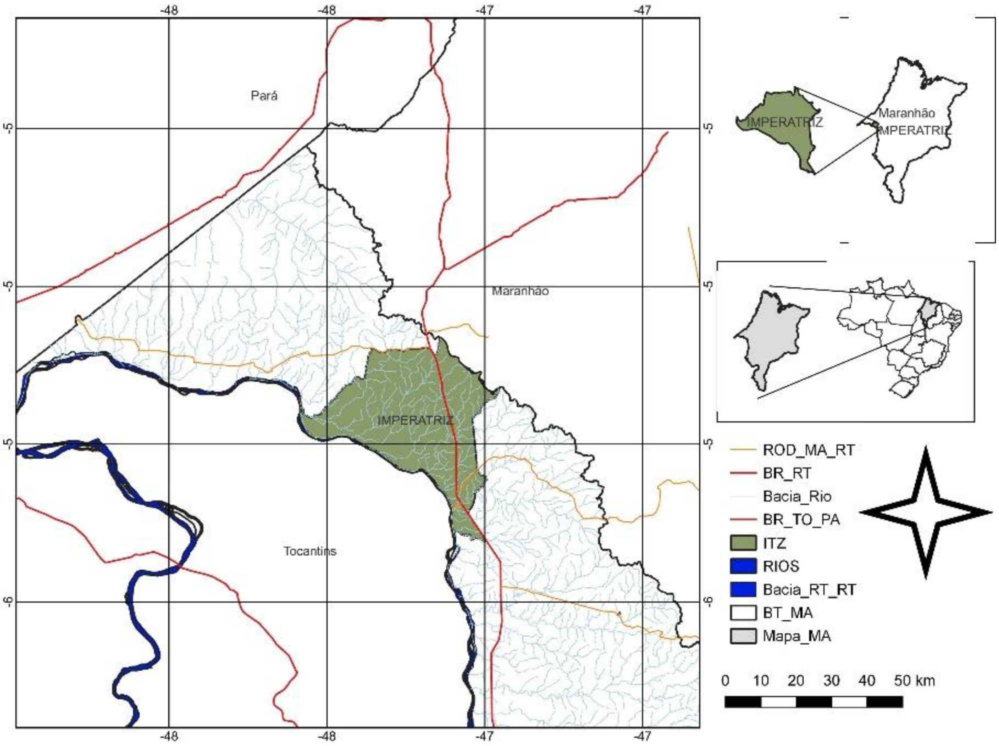
In view of this, the search for integrated strategies that combine nitrogen fertilization and management of adequate cuts is gaining increasing relevance in tropical livestock. Studies have highlighted that the rational use of fertilizers and the definition of well-planned cutting intervals not only ensure the nutritional quality and productivity of grasses, but also contribute to environmental sustainability by minimizing the waste of resources and emissions associated with the excessive use of inputs (Zhang et al., 2023). This scenario reinforces the need for research that elucidates how the morphological characteristics of Paredão grass, such as height, number of tillers and leaf density, respond to different management combinations during drought, expanding the possibilities of practical application for producers and agricultural technicians.

Therefore, this study not only seeks to advance the technical knowledge about the management of *Panicum maximum*, but also proposes to provide subsidies that contribute to production systems in tropical conditions. By investigating the combined effects of nitrogen fertilization levels and different cutting intervals in the dry season, it is intended to offer practical recommendations to maximize yield and forage quality. This integrated approach aims to meet the growing demand for more productive and efficient systems, while promoting environmental and economic sustainability in tropical livestock farming.

METHODOLOGY

The experiment was carried out in an experimental area at the Rural Union of Imperatriz (SINRURAL), located in the municipality of Imperatriz, MA, in a medium-textured soil (670 g/kg of sand, 140 g/kg of silt and 190 g/kg of clay), at the geographic coordinates of latitude 5°33'40.29"S, longitude 47°27'25.10"W and average altitude of 118 meters above sea level, as shown in Figure 1. The climate of the region is classified according to Köppen-Geiger as Aw, characterized by two predominant seasons: one dry and the other rainy, with an average annual temperature of 27.1°C and an average annual precipitation of 1221 mm.

Figure 1: Location of the city of Imperatriz-MA.



Source: Prepared by the authors.

The experiment was conducted using a c-structured block design. Each block had an area of 12 m² (4 m x 3 m), separated by 1-meter corridors. 20 experimental units were established, corresponding to five nitrogen fertilization treatments (0, 100, 200, 300, and 400 kg/ha/year), with four replicates per treatment. The treatments were applied to the grass *Panicum maximum* cv. Wall, with two cut-off intervals (28 and 56 days) being evaluated.

To establish the experimental area, a heavy harrowing of the soil was initially carried out, followed by leveling with the use of a leveling harrow, aiming to leave the soil in adequate conditions for planting. To correct soil acidity, 1 t/ha of limestone was applied (500 kg in total) over an area of approximately 5000 m², 75 days before sowing. This procedure was carried out to favor the proper establishment of the forage.

Phosphate fertilization was applied with a dosage of 330 kg/ha of fertilizer with formulation 04-30-10, in order to correct the phosphorus levels, which were low in soil analyses, and to promote the initial development of the plants. Planting was carried out by throw, using 16 kg/ha of encrusted seeds, with the distribution of 20 g per experimental block.

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The plots were divided into two sections: one for cuts with an interval of 28 days and another with cuts of 56 days, both using the grass *Panicum maximum cv. Wall.* In May 2021, a uniformization cut was carried out at a height of 30 cm with the use of a brush cutter, and, from that moment on, the experimental evaluations began, which took place between the months of July and November 2021. Cuts were evaluated at intervals of 28 and 56 days, allowing comparisons of grass responses over these periods.

Evaluations were performed monthly between July and November for the treatment with cutting every 28 days, while data from the months of July, September, and November were used for comparisons with cutting treatments every 56 days. For the evaluation, an area of each experimental plot was randomly selected, using a square area of 50 cm x 50 cm, randomly thrown over the plots. The variables analyzed included plant height, number of tillers and weight of the sample in the field.

The average height of the grass was measured with a ruler, and the number of tillers was counted within the area delimited by the square. The plants were cut at a height of 30 cm from the ground, using pruning shears. The samples were weighed in the field with a portable digital scale to determine the green matter, and later stored in bags for transport to the seed laboratory of the State University of the Tocantina Region of Maranhão (UEMASUL), where they were analyzed.

The weight of the samples in the field was used to calculate the Green Matter Production per hectare (VMP ha) in kilograms. After each cut and standardization of the treatment area, nitrogen fertilization (urea) was carried out, applied in a throw according to the dosage of each treatment. In the laboratory, the samples were separated into stem, leaf, dead matter and inflorescence, and weighed separately on a precision scale. Subsequently, the samples were dried in a forced ventilation oven at 55 °C for 72 hours, to determine the dry matter. After drying, the material was weighed again, allowing the determination of the dry matter content of the samples.

The variables were submitted to analysis of variance (ANOVA) with the aid of the statistical program SISVAR, version 5.8 Build 92. When significant differences were identified by the F-test, the means were compared using Tukey's test, at the 5% probability level.

$$Yij=\mu+Bi+Tj+\varepsilon ij \quad (1)$$

Where:

Yij: Observation in repeat (block) iii and treatment jjj.

μ: Overall average.

Bi: Effect of block iii (i = 1, 2, 3, 4).

Tj: Effect of jjj fertilization treatment (j = 1, 2, 3, 4, 5).

εij: Experimental error associated with ijijij observation, assumed to be normally distributed with zero mean and constant variance (σ2).

RESULTS AND DISCUSSION

Evaluating the plant height parameter in the first two cuts (tables 1 and 2), no statistically significant differences were observed between the fertilization levels, both in the cut made at 28 and 56 days, indicating that, in this time interval, the grass height remained consistent between the treatments. However, when comparing the different cutting ages, there was a statistically significant difference in all fertilization levels (0, 100, 200, 300 and 400 kg/ha of urea), with the cutting plants at 56 days showing greater height, which was expected due to the higher maturity of the plants.

According to Matsuda (2022), grazing should be started when the plants reach between 80 and 90 cm in height, or after a maximum of 28 days of rest, during the rainy season. The removal of the animals should occur when the plants are between 20 and 25 cm tall. During the first two cuts of the experiment, the plants did not reach the ideal height recommended for the beginning of grazing, according to the guidelines of the seed manufacturer. Only in the third cut was this height reached, coinciding with the increase in precipitation in the region.

In the third cut (Table 3), a statistically significant difference was observed between the treatments with different levels of fertilization, both in the 28 and 56-day cuts. In both, the treatment without nitrogen fertilization (0 kg/ha of urea) differed from the others, presenting the lowest mean height. This result can be attributed to the increase in rainfall, which intensified the response of the plants to fertilization, promoting greater growth in the fertilized plots.

Regarding the number of tillers, no significant differences were identified between the treatments with different levels of fertilization in the 28 and 56-day cuts in the first cut (Table 1). However, when comparing the mean cutting ages, the treatments with 0, 100 and 400 kg/ha in the 56-day cut showed significantly higher numbers of tillers compared to the 28-

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day cut. This demonstrates the influence of cutting age on tillering, even under conditions of moderate nitrogen fertilization.

As discussed by Langer (1963), tillering is a process that depends on both internal (genotype, hormonal balance, flowering) and external (light, temperature, photoperiod, water, mineral nutrition, and defoliation) factors. During the experiment, carried out in the summer, humidity and temperature were determinant for the increase in tillering, since these factors were favorable to the development of forage in this period.

Table 1. Average values of the structural and productive characteristics of Panicum Paredão in the first comparison between fertilization levels and cutting ages 28 and 56 days.

Height							
Age	**Levels**						**CV**
	0	100	200	300	400		13,04
28	42,50B	45,00B	47,50B	50,00B	45,00B		
56	60,00A	67,50A	67,50A	65,00A	70,00A		
Number of tiller							
Age	**Levels**						**CV**
	0	100	200	300	400		24,54
28	43,25B	58,00B	59,00	64,75	57,75B		
56	84,75A	84,00A	70,50	79,50	88,25A		
% Leaf							
Age	**Levels**						**CV**
	0	100	200	300	400		19,43
28	80,00	100,00A	82,25	100,00	82,75		
56	84,75	69,75B	91,25	81,25	81,25		
% Material morto							
Age	**Levels**						**CV**
	0	100	200	300	400		113,00
28	20,00	0,00B	17,75	0,00	17,25		
56	15,25	30,25A	8,75	18,75	18,75		
Dry matter production							
Age	**Levels**						**CV**
	0	100	200	300	400		38,00
28	1407,85	1377,85	1597,73	1561,76	1431,42		
56	2002,40	2311,33	1662,26	2196,87	1953,54		
Leaf dry matter production							
Age	**Levels**						**CV**
	0	100	200	300	400		39,06
28	1337,47	1159,50	1340,08	1692,50	1364,30		
56	1622,68	1743,19	1610,94	1871,50	1665,07		

Averages followed by distinct uppercase letters in rows and distinct lowercase letters in columns differ from each other, according to Tukey's test at 5% probability. Means without letters indicate the absence of a significant difference.

Source: Prepared by the authors.

In the second cut (Table 2), the number of tillers did not present statistical difference between the treatments with different levels of fertilization, regardless of the cutting period. Likewise, the comparison between ages also revealed no significant difference. However, in

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the third cut, a statistical difference was observed in the comparison of the cutting ages for the treatments with 100 and 200 kg/ha, with the means of the cut made at 56 days being higher.

According to Hundertmarck et al. (2017), tillering can be influenced by factors such as temperature, light, water availability, stage of development and soil nutrients, especially nitrogen. In the present study, the development period coincided with high temperatures and low rainfall, conditions that impacted both the tillering process and the plant's response to the fertilization applied. Nitrogen availability is a determining factor in plant growth and development processes, especially due to the faster formation of axillary buds and initiation of the corresponding tillers. However, it is essential to highlight that environmental conditions directly affect the effectiveness of fertilization; The low rainfall recorded during the experiment, for example, may have limited the potential of nitrogen fertilization.

Humphreys (1991) also observed a reduction in the number of tillers from the beginning to the end of the collection period, which can be attributed, in part, to the decrease in precipitation over time. Environmental conditions, including low temperature, reduced light intensity and water deficit, exert an important influence on tillering, negatively affecting tiller density and weight.

Regarding the percentage of leave, no significant difference was found between the treatments, either for grass at 28 days or at 56 days, in any of the three cuts (Tables 1, 2 and 3). In the comparison between cutting ages, the treatment with 100 kg/ha of urea in the first cut showed a statistically higher mean at 28 days (100.0) compared to 56 days (69.75). In the second cut-off, all experimental units showed a leaf percentage of 100%, with no statistical difference and absence of dead matter and stalk. In the third cut, there was no difference between the treatments; However, a significant difference was observed between the cutting ages for the 100 kg/ha and 400 kg/ha treatments, with the averages at 28 days surpassing those observed at 56 days.

According to Da Silva (2008), the increase in temperature increases the rate of appearance of leaves on plants. However, water scarcity may limit this response by restricting leaf growth. Although the cuts carried out in July and September occurred during periods of high temperature, the rainfall was very low, which certainly influenced the results. In September, rainfall began to rise, albeit moderately, which confirms the observation of Da Silva (2008): water availability together with high temperatures stimulates leaf growth in forages, increasing the rate of elongation and the final size of leaves until stabilization.

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The presence of dead material was observed only in the first cut (Table 1), where the samples were composed mainly of leaves and dead material, with no statistical difference between the treatments, except for the ages at the level of 100 kg/ha, which registered an average of 100.0 due to the absence of dead material and stem. The cuts were made at a height of 30 cm, where the occurrence of senescence was noted, especially at the tips of the leaves. Machado et al. (1983) state that in tropical regions, high temperatures and intense luminosity favor high rates of evapotranspiration, which can result in seasonal water deficits, affecting plant development. Thus, the high temperature and the absence of rain in the first cut, the period with the lowest rainfall, may have contributed to the senescence observed in the forage.

The presence of stalks was significant only in the third cycle (November). There was no statistical difference between the treatments, and the difference was observed only between the ages for the levels of 100 kg/ha and 400 kg/ha, in which the averages at 28 days were higher. According to Bezerra (2014), the increase in stalks in pastures has both negative and positive points. The negative aspect is related to the nutritional value, since the stalks are less digestible and palatable to the animal. On the other hand, the increase in culms also has a positive aspect, as it contributes to the total production of dry mass. In situations where direct grazing is not feasible, this material can be processed, allowing the full use of the pasture components.

Table 2. Average values of the structural and productive characteristics of Panicum Paredão in the second comparison between the 28 and 56-day cuts.

Height							
Age	**Levels**						**CV**
	0	100	200	300	400		15,56
28	36,25^{B}	40,00B	38,75B	45,00^{B}	47,50B		
56	56,25A	57,50A	60,00A	61,25A	61,25A		
Number of tiller							
Age	**Levels**						**CV**
	0	100	200	300	400		22,13
28	71,00B	70,25B	60,75	77,25	66,25		
56	60,75A	67,25	65,50	57,00	71,25		
% Leaf							
Age	**Levels**						**CV**
	0	100	200	300	400		0,00
28	100,00	100,00A	100,00	100,00	100,00		
56	100,00	100,00	100,00	100,00	100,00		
Dry matter production							
Age	**Levels**						**CV**
	0	100	200	300	400		42,30
28	755,32	560,77B	656,05B	907,05	586,23B		
56	1169,22	1321,43A	1516,34A	1131,59	1350,89A		

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Leaf dry matter production						
Age	Levels					CV
	0	100	200	300	400	
28	789,88	572,00B	566,90B	904,55	543,50	39,35
56	1139,24	1343,93A	1541,42A	1102,92	1317,13A	

Means followed by different letters uppercase in the rows and lowercase letters in the column, differed from each other, without letters there was no difference between the comparisons of means, by the Tukey test, at 5% probability.

Source: Prepared by the authors

In the first and third cuts, the dry matter production per hectare did not show significant difference between the treatments with different levels of fertilization, nor between the ages evaluated (Tables 1 and 3). In a study by Assmann et al. (2004), when analyzing the effects of nitrogen doses in an integrated crop-livestock system, results were observed below the expected in dry matter production. These authors justify that unfavorable climatic conditions, especially with regard to soil moisture, limited the use of nitrogen, compromising forage production. The absence of rainfall in this experiment may justify the low nitrogen utilization observed, since, even with different urea levels and cutting periods, the dry matter production remained similar between the treatments.

In the second cut, dry matter production also did not show statistical difference between the treatments (Table 2), although it varied statistically between the cutting ages, with the highest averages observed at 56 days. The samples of this cut were formed exclusively by leaves, without the presence of dead material or stem. There was a numerical reduction in the average dry matter production in the second cut in relation to the previous one, possibly due to the water deficit resulting from the lack of rain in the previous months, which may have limited the development of grass and, consequently, the production of dry matter.

According to Teixeira (2011), the scarcity of forage during the dry season is the main factor that limits the production of cattle in pastures. In non-irrigated tropical grasses, forage accumulation rates are generally higher in summer, intermediate in autumn and spring, and very low in winter. As the feed demand per animal unit remains relatively constant throughout the year, there is an imbalance between the supply and demand of forage.

The climatic conditions during the experimental period, with the absence of rainfall and high temperatures, presumably exerted a great influence on the production of dry matter. Costa et al. (2001) point out that the growth rate of a pasture depends not only on nutrition, but also on the structure and physiology of the plants, and on the interaction of

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these factors with the climate. This set of conditions affects the production of green matter, which directly influences the production of dry matter.

Table 3. Average values of the structural and productive characteristics of Panicum Paredão in the third comparison between the 28 and 56-day cuts.

Height							
Age	**Levels**						**CV**
	0	100	200	300	400		9,99
28	0,80Bb	1.02Bab	0.97Bab	1.07M	1.05M		
56	1,10From	1,35Aa	1.27Aab	1,37Aa	1,35Aa		
Number of tiller							
Age	**Levels**						**CV**
	0	100	200	300	400		24,60
28	57,50	70,25A	73,25	55,50	51,00		
56	41,75	35,75B	53,50	46,00	36,75		
% Leaf							
Age	**Levels**						**CV**
	0	100	200	300	400		10,38
28	86,50	93,75A	89,25	82,75	87,50A		
56	78,25	74,00B	77,75	76,00	63,75B		
Full %							
Age	**Levels**						**CV**
	0	100	200	300	400		48,95
28	13,50	6,25B	10,75	17,25	12,50B		
56	21,75	26,00A	22,50	24,00	36,25A		
Dry matter production							
Age	**Levels**						**CV**
	0	100	200	300	400		39,24
28	4721,42	6060,44	3170,27	4236,24	5099,78		
56	3651,26	3875,69	5223,43	5665,92	4238,02		
Leaf dry matter production							
Age	**Levels**						**CV**
	0	100	200	300	400		35,84
28	4376,40	5015,74	2683,07	3212,09 B	3482,46		
56	4964,20from	4551,78from	3435,28from	6203,97aA	2414,71B		

Means followed by different letters uppercase in the rows and lowercase letters in the column, differed from each other, without letters there was no difference between the comparisons of means, by the Tukey test, at 5% probability.

Source: Prepared by the authors.

CONCLUSION

Nitrogen fertilization does not present a significant response for the 28 and 56-day cut-off intervals. The increase in fertilization levels does not promote a significant increase in dry matter production, although the grass averages at 56 days are higher, a result related to the longer rest time between cuts.

The structural parameters evaluated are not influenced by nitrogen fertilization, and the cutting period (28/56 days) was not responsible for significant differences, although the grass with the longest resting time presented numerically higher values. The application of nitrogen fertilization in the dry season was not able to reach its maximum potential due to water deficit.

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REFERENCES

1. Assmann, A. L., Pelissari, A., Moraes, A. D., Assmann, T. S., Oliveira, E. B. D., & Sandini, I. (2004). Produção de gado de corte e acúmulo de matéria seca em sistema de integração lavoura-pecuária em presença e ausência de trevo branco e nitrogênio. Revista Brasileira de Zootecnia, 33, 37-44. https://doi.org/10.1590/S1516-35982004000100006

2. Bezerra, M. G. S. (2014). Água residuária de mandioca como fertilizante orgânico em pasto de Brachiaria brizantha cv. Marandu (Dissertação de Mestrado em Produção Animal). Universidade Federal do Rio Grande do Norte. Available at: https://repositorio.ufrn.br/bitstream/123456789/19874/1/MarcioGleybsonDaSilvaBezerra_DISSERT.pdf

3. Bonfim-Silva, E. M., Oliveira, N. P. R., Mazero, H. M., Alves, D. J., Oliveira, J. R., & Silva, T. J. A. (2022). Production and morphophysiological responses of Panicum maximum cv. BRS Zuri to water availability. Australian Journal of Crop Science, 16, 3703. https://doi.org/10.21475/ajcs.22.16.11.p3703

4. Costa, M. N. X., et al. (2001). Influência de doses e épocas de adubação nitrogenada na produção estacional do capim Mombaça – composição mineral. In Reunião Anual da Sociedade Brasileira de Zootecnia, 38 (CD-ROM). Piracicaba: FEALQ.

5. Da Silva, S. C., Nascimento Júnior, D., Sbrissia, A. F., et al. (2008). Dinâmica de população de plantas forrageiras em pastagens. In Simpósio sobre Manejo Estratégico da Pastagem, 4 (pp. 75-100). Universidade Federal de Viçosa. Available at: https://www.researchgate.net/publication/237722930

6. Garcez, T. B., & Monteiro, F. A. (2022). Nitrogen metabolism of two tropical forage grass species: nitrogen availability × cultivars. Australian Journal of Crop Science. https://doi.org/10.21475/ajcs.22.16.08.p3239

7. Herdiawan, I., & Widodo, S. (2022). Utilization of various levels of shading and organic fertilizer on morphology, production, and nutrient composition of Panicum maximum cv. Mombasa. Buletin Peternakan, 46, 222-227. https://doi.org/10.21059/buletinpeternak.v46i4.76367

8. Humphreys, L. R. (1991). Tropical pasture utilization (1st ed.). Australia: Cambridge University Press. https://doi.org/10.1017/CBO9780511525810

9. Hundertmarck, A. P., Rocha, M. G., Potter, L., Salvador, P. R., Bergoli, T. L., Moura, E. D., Nunes, P. A. A., & Sichonany, M. J. O. (2017). Biomass flow and defoliation pattern in Alexandergrass fertilized with nitrogen. Bioscience Journal, 33, 14-152. https://doi.org/10.14393/BJ-v33n1a2017-34021

10. Langer, R. H. M. (1963). Tillering in herbage grasses. Herbage Abstracts, 33(3), 141-148.

11. Lima, A. F., Santos, M. V. F., Lira, M. A., Cunha, M. V., Mello, A. C. L., Ferreira, R. L. C., Ferrez, A. P. F., Dubeux Júnior, J. C. B., & Moura, J. G. (2018). Morphology of Panicum genotypes submitted to periods of cessation of irrigation. Revista de Ciências Agrárias, 41(3), 789-797. https://doi.org/10.19084/RCA18002

12. Machado, R. C. R., Souza, H. M. F., Moreno, M. A., & Alvim, P. T. (1983). Variáveis relacionadas com a tolerância de gramíneas forrageiras ao déficit hídrico. Pesquisa Agropecuária Brasileira, 18(6), 603-608.

13. Matsuda. (2022). MG Paredão. Boletim Técnico Informativos. Available at: https://www.matsuda.com.br/sementes-forrageiras/produto/mg12-paredao. Accessed on: November 18, 2024.

14. Miranda, B. E. C., Rodrigues, R. C., Costa, C. D. S., Silva, E. C. D., Lana, R. D. P., Jesus, A. P. R. D., Marinho, I. R., Costa, K. A. P. D., Ribeiro, I. G. D. A., Araujo, J. S., & Araújo, R. A. D. (2022). Structural and production characteristics and nutritive value of two tropical grasses submitted to different levels of nitrogen. Australian Journal of Crop Science, 16(9), 1117-1126. https://doi.org/10.21475/ajcs.22.16.09.p3624

15. Oliveira, A. B., Pires, A. J. V., Matos Neto, U., et al. (2007). Morfogênese do capim-tanzânia submetido a adubações e intensidades de corte. Revista Brasileira de Zootecnia, 36(4), 1006-1013. https://doi.org/10.1590/S1516-35982007000500004

16. Teixeira, F. A., Bonomo, P., Pires, A. J. V., Silva, F. F., Fries, D., & Hora, D. S. (2011). Produção anual e qualidade de pastagem de Brachiaria decumbens diferida e estratégias de adubação nitrogenada. Acta Scientiarum. Animal Sciences, 33(3), 241-248. https://doi.org/10.4025/actascianimsci.v33i3.10194

17. Zhang, K., Zhai, C., Li, Y., Li, Y., Qu, H., & Shen, Y. (2023). Effect of nitrogen application and cutting frequency on the yield and forage quality of alfalfa in seasonal cultivation. Agriculture, 13, 1063. https://doi.org/10.3390/agriculture13051063