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Structure of piatã palisadegrass deferred for two periods and fertilised with nitrogen

Estrutura do capim-piatã diferido por dois períodos e adubado com nitrogênio

Gabriel de Oliveira Rocha[1]; Manoel Eduardo Rozalino Santos[2*]; Hélio Henrique Vilela[3]; Bruno Humberto Rezende Carvalho[1]; Braulio Maia de Lana Sousa[4]; Jailson Lara Fagundes[4]; Alfredo Acosta Backes[4]; Pryanka Thuyra Nascimento Fontes[5]

Highlights:
The falling index was higher in the canopy under the long deferment period.
The number of tillers was less in canopies deferred for the longer period.
The forage mass was higher in the canopy deferred for the longer period and with fertilisation.
Fertilisation and the shorter deferment period provided the higher percentage of live leaves.
There was better morphological composition in short-term deferred piatã palisadegrass.

Abstract

The deferred pasture structure determines the consumption and performance of grazing animals and, in addition, can be influenced by the duration of the deferment period and nitrogen (N) fertilisation. The objective of this work was to evaluate the structural characteristics of *Brachiaria brizantha* syn. *Urochloa brizantha* cv. Piatã (piatã palisadegrass) deferred for two periods (79 and 127 days) and with four N doses (0, 40, 80 and 120 kg ha^{-1}) in the Zona da Mata of Minas Gerais, Brazil. The experimental design involved complete randomised blocks and a subdivided plot scheme, with three replications. The 127-day period of deferment resulted in a higher forage mass, falling index, stem percentage and density, but a lower number of tillers, percentage and volumetric density of live leaf blade. The N dose increment, in general, worsened the structural characteristics of the piatã palisadegrass deferred for 127 days. However, with the 79-day period, the N fertilisation increased the volumetric density of live leaf blades and reduced the stem percentage in the forage mass. As a preliminary recommendation, piatã palisadegrass can be deferred for 79 days and fertilised with up to 90 kg ha^{-1} of N in the region of Zona da Mata de Minas Gerais, Brazil.
Key words: *Brachiaria brizantha* syn. *Urochloa brizantha* cv. Piatã. Forage bulk density. Forage mass. Morphological composition. Plant falling.

[1] Discentes do Curso de Doutorado do Programa de Pós-Graduação em Ciências Veterinárias, Universidade Federal de Uberlândia, UFU, Uberlândia, MG, Brasil. E-mail: gabriel.o.rocha@hotmail.com.br; brunohrc16@hotmail.com
[2] Prof. Dr., UFU, Faculdade de Medicina Veterinária, Programa de Pós-Graduação em Ciências Veterinárias, Uberlândia, MG, Brasil. E-mail: manoel.rozalino@ufu.br
[3] Prof. Dr., Centro Universitário de Patos de Minas, UNIPAM, Patos de Minas, MG, Brasil. E-mail: heliohv@unipam.edu.br
[4] Profs. Drs., Departamento de Zootecnia, Programa de Pós-Graduação em Zootecnia, Universidade Federal de Sergipe, UFS, São Cristóvão, SE, Brasil. E-mail: bmaiasousa@yahoo.com.br; ratinhojlf@yahoo.com.br; alfredoaab_67@yahoo.com.br
[5] Discente do Curso de Doutorado do Programa de Pós-Graduação em Zootecnia, UFS, São Cristóvão, SE, Brasil. E-mail:pryankafontes@yahoo.com.br
[*] Author for correspondence

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Resumo

A estrutura do pasto diferido determina o consumo e o desempenho dos animais em pastejo e, ademais, pode ser influenciada pela duração do período de diferimento e pela adubação nitrogenada. O objetivo com este trabalho foi avaliar as características estruturais da *Brachiaria brizantha* syn. *Urochloa brizantha* cv. Piatã (capim-piatã) diferida por dois períodos (79 e 127 dias) e com quatro doses de nitrogênio (0, 40, 80 e 120 kg ha^{-1}) na Zona da Mata de Minas Gerais, Brasil. O experimento foi em blocos completos casualizados e em esquema de parcela subdividida, com três repetições. O período de 127 dias de diferimento resultou em maiores massa de forragem, índice de tombamento, porcentagem e densidade volumétrica de colmo, porém em menores número de perfilho, porcentagem e densidade volumétrica de lâmina foliar viva. O incremento da dose de N reduziu a porcentagem de lâmina foliar viva na massa de forragem do capim-piatã diferido por 127 dias. Porém, com o período de 79 dias, a adubação aumentou a densidade volumétrica de lâmina foliar viva e reduziu a porcentagem de colmo na massa de forragem. Como recomendação preliminar, o capim-piatã pode ser diferido por 79 dias e com adubação de até 90 kg ha^{-1} de N na região da Zona da Mata de Minas Gerais, Brasil.

Palavras-chave: *Brachiaria brizantha* syn. *Urochloa brizantha* cv. Piatã. Composição morfológica.

Introduction

Efficiently conducted livestock production requires the supply of quantity and quality food throughout the year. However, when the pasture is used as the main food source, it has little growth opportunity and may not meet the demand of the herd during the winter of the Southeast and Midwest of Brazil. In this context, deferment of pasture, which consists in removing animals from pasture at the end of the growing season in order to accumulate fodder for use in the off season, can be a viable, easy and relatively low cost alternative to ensure pasture supply in the winter (Euclides, Flores, Medeiros, & Oliveira, 2007; Silva, Montagner, Euclides, Queiroz, & Andrade, 2016).

Deferred pasture, when mismanaged, is characterised by large forage mass, but with low nutritional value and favourable structure for forage losses during winter grazing (Santos et al., 2010). This occurs when a long deferment period is adopted, in which many tillers complete their phenological cycle, from vegetative to reproductive. Moreover, the increase in intraspecific light competition during deferment intensifies stem elongation and leaf senescence (Congio et al., 2019) and inhibits tillering (Sousa et al., 2013, 2019).

Thus, to improve the structure of deferred pasture, the length of the deferment period should be shortened. However, this management strategy may result in low forage mass for offer to the herd during the winter period. In this context, nitrogen (N) fertilisation, by increasing pasture growth rate (Freitas, Fonseca, Braz, Martuscello, & Santos, 2012; Rovetta et al., 2012), could be employed to avoid this problem, as found by Santos, Fonseca, Balbino, Monnerat, & Silva (2009a). These authors found that deferment of *Brachiaria decumbens* syn. *Urochloa decumbens* cv. Basilisk pasture for 116 days and without N fertilisation generated similar forage mass (4979 kg ha^{-1} of dry matter, DM) at the end of the deferment period, when compared to that deferred by 73 days and fertilised with 80 kg ha^{-1} of N, which resulted in 4901 kg ha^{-1} of DM at the end of the deferment period.

With N fertilisation, pasture development is intensified, which causes its stem elongation and leaf senescence rates to increase per unit of time (Santos & Fonseca, 2016), which has negative consequences on pasture structure, i.e. how the pasture will be offered to grazing animals. In this sense, the reduction of the deferment period in a higher N fertilised pasture also has the advantage of preventing the structural characteristics of the pasture from deteriorating during deferment.

Considering that the time the pasture remains deferred (Santos et al., 2009b; Gouveia, Fonseca, Santos, Gomes, & Carvalho, 2017) and N fertilisation (Carvalho et al., 2017; Sousa et al., 2019) interfere with the dynamics of forage grass growth and also modify the structure of the deferred pasture, the hypotheses of this work are: i) the reduction of the deferment period can be partially compensated by the application of higher N doses, so as to result in a relatively constant forage mass at the end of the deferment period; and ii) the adoption of a short deferment period, combined with N fertilisation, improves the structural characteristics of the deferred canopy.

Therefore, this work was conducted to test the two hypotheses previously presented, as well as to evaluate the structural characteristics of *Brachiaria brizantha* syn. *Urochloa brizantha* cv. Piatã deferred for two periods and with four N doses in order to determine a preliminary recommendation for the management of this forage grass under deferred pasture conditions.

Materials and Methods

This work was conducted from February to July 2012 at the Forage Department of the Department of Animal Science of the Federal University of Viçosa, which is located in the Zona da Mata of Minas Gerais State, Brazil (20º 45' south latitude, 42º 51' west longitude and 651 m altitude). The site used was established with *Brachiaria brizantha* syn. *Urochloa brizantha* cv. Piatã (piatã palisadegrass) in 2009 and its soil was classified as Red-Yellow Latosol of clay texture (Empresa Brasileira de Pesquisa Agropecuária [EMBRAPA], 2006). According to the Köppen classification, the region's climate is Cwa (Alvares, Stape, Sentelhas, Gonçalves, & Sparovek, 2013), with an annual precipitation of 1,340 mm and average relative humidity of 80%. The climatic data recorded during the experimental period were obtained from the meteorological station located 1,000 m from the experimental area (Table 1).

Table 1
Monthly average daily minimum, average and maximum temperatures, and monthly rainfall between February and July 2012

Month	Average temperature (°C)	Minimum Temperature (ºC)	Maximum temperature (ºC)	Rainfall (mm)
February	22.5	18.2	29.7	41.1
March	21.5	18.0	29.4	112.0
April	19.9	17.3	28.9	52.0
May	18.1	14.8	23.9	120.0
June	18.3	14.8	24.1	12.0
July	17,8	14.6	25.0	5.0

At the beginning of the experiment the soil was sampled for chemical analysis, in a layer from 0 to 20 cm deep, which presented the following characteristics: pH in H_2O: 5.50; P (Mehlich-1): 1.40 mg dm^{-3} and K: 36.00 mg dm^{-3}; Ca^{2+}: 2.10 $cmol_c$ dm^{-3}; Mg^{2+}: 0.70 $cmol_c$ dm^{-3} and Al^{3+}: 0.00 $cmol_c$ dm^{-3} (KCl 1 mol L^{-1}). Based on these results, liming was not necessary. The treatments were allocated in 3 x 4 m plots, totalling 24 experimental units of 12 m^2.

Combinations between deferment periods and N fertilisation conditions were evaluated. The beginning of the deferment period occurred on 25/02/12 and 25/04/12, with deferred piatã palisadegrass remaining until 01/07/12. Thus, two deferment periods were evaluated: long (127 days) and short (79 days). N doses were 40, 80 and 120 kg ha^{-1}, plus a control without N. A randomised complete block design with three replications was used in a split plot scheme. The criterion used to define the blocks was the relief variation of the experimental area.

At the beginning of each deferment period, 60 kg ha^{-1} of P_2O_5 in the form of single superphosphate and 60 kg ha^{-1} of K_2O in the form of potassium chloride were applied at a single dose and in the late afternoon.

At the beginning of each deferment period, piatã grass was lowered to 20 cm (Vilela et al., 2012) by mechanical cutting. On this date, the N doses (urea form) were also applied in a single dose and in the evening. After fertilisation, and only on the first day of the experimental period, the area was manually wetted to increase soil moisture and increase the use efficiency of N fertiliser. Thus, the objective was to simulate a water supply to the soil corresponding to a rainfall of 5 mm. This strategy was also used to simulate what usually occurs in practice, i.e. the application of fertilisers on pastures at the beginning of the deferment period and after the occurrence of rainfall, when the soil still has satisfactory humidity.

On 01/07/2012, all evaluations were performed. Canopy height and extended tiller measurements were taken at five points per experimental unit at random on a ‘W’ path in the experimental unit. The canopy height at each point was determined with a graduated ruler and was based on the distance between the horizon of the highest living leaves of the plants and the soil. At the same canopy height measurement points, the extended tiller height was measured by extending the grass tillers vertically and noting the greatest distance from the ground to the leaf tip. Canopy height variation was estimated by the difference between post and pre-deferral heights. The plant falling index was calculated by the quotient between the extended tiller height and canopy height (Santos et al., 2009b).

For the determination of the forage mass and morphological composition, all the tillers were cut from the ground within two frames of 0.40 m side, allocated in areas representative of the average height of the canopy, in each experimental unit. The samples were placed in a plastic bag and weighed in the laboratory. From each sample, two subsamples were taken, one of which was weighed, placed in a paper bag and placed in an oven with forced-air ventilation at 55 ºC for 72 h. The other subsample was manually separated into live leaf blade, live stem and dead forage. Inflorescence and live leaf sheath were incorporated into the live stem fraction. The part of the leaf blade that showed no signs of senescence, organ of green colour, was incorporated into the live leaf blade fraction. The parts of the dead and senescent stem and leaf blades were incorporated into the dead forage fraction. After separation, the components were dried in a forced-air oven at 55 °C for 72 h and weighed.

The bulk density of forage and morphological components, expressed in kg ha^{-1}cm^{-1} of DM, was calculated by dividing the forage mass or their morphological components’ masses by canopy height, respectively.

The total tiller number was evaluated by collecting two samples at points that represented the average canopy height. All tillers contained within a 0.25 m side frame were harvested by cut close to the ground. These tillers were placed in identified plastic bags and taken to the laboratory, where they were quantified.

Data analysis was performed using the statistical package SAEG - System of Statistical and Genetic Analysis, version 8.1. The dataset was tested to ensure that the basic prerogatives of variance analysis were met, and when necessary the data were transformed. Thus, canopy height, variation in canopy height and volumetric density of the live leaf blade were transformed to base log 10 for the variance analysis. However, for the presentation of the results, the means of unprocessed values were used. The falling index, even transformed, did not meet the basic assumptions of variance analysis and, therefore, was analysed by non-parametric statistics. For the deferment period factor (long or short), the comparison between the means was performed by Tukey's test. For the N fertilisation factor, regression analysis was performed considering models that best fit the data. The significance level of a 5% probability of the occurrence of a type I error was adopted.

Results and Discussion

Long-term deferred piatã palisadegrass (127 days) presented higher canopy height, variation in canopy height and extended tiller height, compared to that deferred for a short period (79 days) (Table 2). The long deferment period allows the plant to grow longer, as well as increasing intraspecific light competition. In addition, long-term deferred plants enjoyed the best weather conditions in February and March, i.e. received more rainfall and grew at higher average temperatures compared to those deferred in April (Table 1). These conditions favoured the development of a higher leaf area index (LAI) and light interception by the canopy, predisposing it to greater light competition between tillers and, in effect, to greater stem elongation to allocate new leaves at the canopy top (Vilela et al., 2012).

Table 2
Canopy height, extended tiller height and height variation of piatã palisadegrass differed in two periods and with four nitrogen doses

Deferment Period	Nitrogen Dose (kg ha[1] de N)				Equation	r^2
	0	40	80	120		
			Canopy Height (cm)[1]			
Short	28.7 b	31.2 b	37.3 b	40.3 b	$\hat{Y} = 28.21 + 0.10267{*}N$	0.97
Long	87.7 a	95.9 a	100.5 a	112.6 a	$\hat{Y} = 87.27 + 0.19833{*}N$	0.97
			Canopy Height Variation (cm)[1]			
Short	8.7 b	11.2 b	17.3 b	20.3 b	$\hat{Y} = 8.21 + 0.10267{*}N$	0.97
Long	67.7 a	75.9 a	80.5 a	92.6 a	$\hat{Y} = 67.27 + 0.19833{*}N$	0.96
			Extended Tiller Height (cm)			
Short	38.9 b	43.3 b	56.4 b	64.1 b	$\hat{Y} = 37.386 + 0.22133{*}N$	0.97
Long	99.3 a	107.3 a	112.8 a	124.7 a	$\hat{Y} = 98.800 + 0.20416{*}N$	0.98

[1] Analysis of variance performed on transformed data (Log); For each variable, means followed by the same letter in the column do not differ by the t test (P> 0.05); * Significant (P <0.05).

Improvement in the fertilisation condition linearly increased canopy height, canopy height variation and extended tiller height, both in canopies under short and long deferment periods (Table 2). Higher N input increases photosynthetic potential and forage grass growth (Silva et al., 2009). As a consequence, N fertilisation also increases LAI and light competition between tillers; thus, triggering their stem elongation. These factors justify the fact that N doses increased canopy and extended tiller heights, as well as the variation in canopy height during deferment.

The falling index was influenced only by the deferment period, being higher in the canopy managed with the long deferment period (1.46), compared to the short one (1.12). With the longer deferment period, the plants became larger and heavier and thus, its structural organ, the culm, was unable to keep it erect. Plant falling is a common feature in pastures under long deferment periods but is undesirable because it is associated with worse nutritional value, higher forage losses and a negative influence on grazing (Santos et al., 2009c; Vilela et al., 2012). Therefore, a shorter deferment period is an appropriate strategy to minimise falling of the deferred piatã palisadegrass pasture.

With the exception of the zero N dose, tiller population density was lower in the long canopy than in the short deferment period (Table 3). Self-shading is high in more developed canopies and in this condition, tillering is inhibited, because the plant prioritises growth of older tillers rather than forming new tillers. Furthermore, in more developed canopies, many older and longer tillers shade the young and smaller ones, which contributes to canopy tiller mortality (Sousa et al., 2013).

Table 3
Tiller population density (tiller m^{-2}) of piatã palisadegrass deferred by two periods and with four nitrogen doses

Deferment Period	Nitrogen Dose (kg ha^{-1} of N)				Equation	R^2
	0	40	80	120		
Shot	577.1 a	875.0 a	877.1 a	920.8 a	$\hat{Y} = 593.98 + 7.3494^{*}N - 0.0397^{*}N^2$	0.92
Long	402.1 a	393.8 b	470.8 b	529.2 b	$\overline{Y} = 449.0$	-

Means followed by the same letter in the column do not differ by the t test (P> 0.05); * Significant (P <0.05).

N fertilisation had a quadratic effect on the tiller number in the canopy managed with a short deferment period but did not influence the tiller population density in the long deferment period (Table 3). N increases the growth rate of forage grass (Freitas et al., 2012; Rovetta et al., 2012), so that at low N doses and under a short deferment period, tillering can be stimulated, because there is incidence of light on the grass canopy base, which stimulates the development of axillary buds in new tillers (Matthew, Assuero, Black, & Sackville Hamilton, 2000). On the other hand, high N doses excessively increase the canopy growth rate, which culminates in the increase of the LAI, with a consequent decrease in the amount and quality of light reaching the canopy base, which inhibits the development of axillary buds in tillers (Deregibus, Sanchez, & Casal, 1983). These arguments explain the quadratic effect of N doses on the number of tillers, with a maximum of 1614 tillers m^{-2} at the 93 kg ha^{-1} of N. The lack of effect of N doses on the canopy under the long deferment period is due to the higher stage of development of these plants, where self-shading within the canopy was probably high. Thus, there is inhibition of tillering, as already discussed.

Forage mass was higher in the long-term deferred canopy and the effect of N dose for this variable was linear and positive (Table 4). The longer deferment period allows more time for plants to harness environmental resources and grow more, while N fertilisation increases photosynthetic rate (C. C. F. Silva et al., 2009) and tiller growth rate (Freitas et al., 2012; Rovetta et al., 2012), which results in increased forage mass.

Piatã palisadegrass, under the short deferment period, presented a higher percentage of live leaf blade when fertilised with N. Additionally, the percentage of live stem was lower in these canopies, while the percentage of dead forage did not vary between the deferment periods (Table 4). During forage grass development, the leaves are formed first and, after the canopy intercepts 95% of the incident light, the stem stretching and senescence processes increase (Carnevalli et al., 2006; Congio et al., 2019). In this sense, it is possible that the short-term deferred piatã palisadegrass intercepted less light when compared to that under the long deferment period. With that, the stem elongation was reduced and the leaf growth was higher in the canopy submitted to the shorter deferment period.

Table 4
Forage mass and morphological composition of piatã palisadegrass deferred by two periods and with four nitrogen doses

Deferment Period	Nitrogen Dose ($kg\ ha^{-1}$ ofN)				Equation	r^2
	0	40	80	120		
			Forage Mass ($kg\ ha^{-1}$ of DM)			
Shot	7.536 b	8.240 b	11.425 b	14.746 b	$\hat{Y} = 6{,}764.69 + 62.0357^*N$	0.94
Long	9.335 a	11.867 a	14.559 a	17.709 a	$\hat{Y} = 9{,}195.71 + 69.5314^*N$	0.99
			Live Leaf Blade (%)			
Shot	21.1 a	38.9 a	38.5 a	41.8 a	$\hat{Y} = 22.24 + 0{,}4256^*N - 0.0023^*N^2$	0.91
Long	30.1 a	27.8 b	27.0 b	20.4 b	$\hat{Y} = 30.81 - 0.0745^*N$	0.86
			Live Stem (%)			
Shot	26.2 b	30.8 b	31.2 b	37,5 b	$\hat{Y} = 26.27 + 0.0858^*N$	0.91
Long	55.3 a	57.2 a	50.6 a	56.5 a	$\overline{Y} = 54.9$	-
			Dead Forage (%)			
Shot	52.6 a	30.3 a	30.3 a	20.7 a	$\hat{Y} = 47.85 - 0.2394^*N$	0,83
Long	14.6 b	15.0 a	22.4 a	23.1 a	$\overline{Y} = 18.8$	-

For each variable, means followed by the same letter in the column do not differ by the t test ($P > 0.05$); * Significant ($P < 0.05$).

The morphological composition of the piatã palisadegrass under the short deferment period, which presented a higher percentage of live leaf blade, was better than the canopy under the long deferment period. The live leaf blade is the morphological component of the plant with the best nutritional value (Santos et al., 2010), the most easily accessed by grazing animals, because it is located in the upper canopy stratum (Palhano et al., 2007); it also has lower shear force compared to the stem (Nave, Pedreira, & Pedreira, 2010), which facilitates its apprehension by the grazing animal. On the other hand, the stem has worse nutritional value (Santos et al., 2010) and may be a physical barrier that prevents the deepening of the bite during grazing (Benvenutti, Gordon, & Poppi, 2008). Dead tissue has the worst nutritional value and encompasses dead leaf and stem. The stem can be considered as lost forage because the animals reject it because of its worse nutritional value (Santos et al., 2010). However, dead leaves can still be consumed by grazing animals during the winter period, when live leaves are reduced markedly in deferred pasture (Afonso et al., 2018).

In the canopy under the short deferment period, N fertilisation had a quadratic effect on the percentage of live leaf blade, while its effect was linear and negative in the canopy under the long deferment period (Table 4). N fertilisation promoted a positive linear effect on the percentage of live stem and a negative linear effect on the percentage of dead tissue when the canopy was deferred for a short period (Table 4). These effects are apparently desirable as they contribute to the increase of live forage compared to dead forage. However, a large percentage of live forage was made up of live stem, which characterises an undesirable structure in deferred pasture, as already discussed.

In general, the canopy under the short deferment period presented higher volumetric densities of forage and its morphological components (Table 5). Even with smaller or similar forage mass as the canopy under the long deferment period (Table 4), the lower canopy height under the short deferment period (Table 2) resulted in its higher volumetric density. In addition, the higher tiller population density of the canopy deferred for a short period, compared to that under the long deferment period (Table 3), also justifies the higher volumetric density of deferred piatã palisadegrass for less time. The higher density of live leaf blade can be advantageous, since the animal would have a larger amount of forage with good nutritional value, which is easily accessible, with a possible increase of consumption. However, the high volumetric stem density, verified in the canopies with the highest N dose, can make consumption difficult (Benvenutti et al., 2008) and worsen the nutritional value of the deferred pasture.

Table 5
Volumetric density of forage and its morphological components, in kg ha^{-1} cm^{-1} of DM, of piatã palisadegrass deferred by two periods and with four nitrogen doses

Deferment Period	Nitrogen Dose (kg ha^{-1} of N)				Equation	r^2
	0	40	80	120		
			Total Forage			
Shot	263.3 a	264.4 a	307.2 a	367.5 a	$\hat{Y} = 247.26 + 0.8890^{*}N$	0.88
Long	106.9 b	124.0 b	147.2 b	157,9 b	$\hat{Y} = 107.55 + 0.4404^{*}N$	0.98
			Live Leaf Blade[1]			
Shot	56.2 a	102.0 a	118.8 a	153.4 a	$\hat{Y} = 61.29 + 0.77150^{*}N$	0.97
Long	32.1 b	34,2. b	40.1 b	32.7 b	$\overline{Y} = 34.8$	-
			Live Stem			
Shot	70.3 a	81.2 a	95.1 a	138.9 a	$\hat{Y} = 63.38 + 0.5495^{*}N$	0.89
Long	59.1 a	71.2 a	73.6 a	89.6 b	$\hat{Y} = 59.31 + 0.2344^{*}N$	0.93
			Dead Forage			
Shot	136.8 a	81.3 a	93.4 a	75.3 a	$\hat{Y} = 122.59 - 0.4315^{*}N$	0.64
Long	15.8 b	18.5 b	33.5 b	35.7 a	$\overline{Y} = 25.9$	-

[1] Analysis of variance performed on transformed data (Log); For each variable, means followed by the same letter in the column do not differ by the t test (P> 0.05); * Significant (P <0.05).

In the canopy managed with a short deferment period, N fertilisation had a linear and positive effect on the forage density and its morphological components, except for dead tissue (Table 5). The increase of tillering (Table 3) and, possibly, the growth rate of tillers are effects of N in the plant (C. C. F. Silva et al., 2009) and justify the higher volumetric density of deferred and fertilised piatã palisadegrass.

Conversely, in the short-term deferred canopy, the reduction in dead tissue volume density with N application (Table 5) may have occurred due to the N effect in increasing leaf lifespan (Garcez et al., 2002), especially in times with a less favourable climate for canopy growth.

Under the long deferment period, the effect of N fertilisation was linear and positive on the forage and stem densities, but nil for the other variables (Table

5). The advanced stage of plant development may explain the lack of N response on the volumetric densities of live leaf and dead tissue.

From the data of this work, it was found that the deferment period and N fertilisation influence the deferred pasture structure. Although the long deferment period increases the forage mass (Table 4), its structural characteristics had deteriorated because they were characterised by high falling index, lower tiller density (Table 3), high stem percentage and density, and low percentage and density of live leaf blade (Tables 4 and 5). All these characteristics have a negative effect on the nutritional value and behaviour of grazing animals. In addition, high-dose N fertilisation generally worsens the structural characteristics of long-deferred piatã palisadegrass due to its stimulation of stem production.

On the other hand, the adoption of the short deferment period resulted in better canopy structural characteristics, such as higher volumetric densities of forage and live leaf blade (Table 5), higher percentage of live leaf blade and lower percentage of live stem, despite having lower forage mass (Table 4). Even in the canopy deferred for a short period, N fertilisation should be done with moderate doses, because in excess it decreases tiller population density (Table 3) and the percentage of live leaf blade (Table 4).

The hypotheses listed in this paper were accepted. In fact, long-term deferred piatã palisadegrass fertilised with 40 kg ha^{-1} of N resulted in similar forage mass (11867 kg ha^{-1} ^{of} DM) to short-term deferred piatã grass fertilised with 80 kg ha^{-1} of N (11425 kg ha^{-1} of MS) (Table 4). Similarly, the forage masses at the end of the deferment were also similar in the canopy deferred by 127 days with fertilisation of 80 kg ha^{-1} of N (14559 kg ha^{-1} of DM) and in that deferred by 79 days and fertilised with 120 kg ha^{-1} of N (14746 kg ha^{-1} of DM) (Table 4). Thus, it was possible to obtain a similar forage mass at the end of the deferment period, provided that the reduction of the deferment period is compensated by the application of higher N doses.

The other hypothesis presented, that the adoption of a short deferment period combined with N fertilisation improves the structural characteristics of the deferred canopy, was also accepted in this work. In fact, the falling index did not increase when piatã palisadegrass was fertilised and deferred for 79 days. In this condition, there were also increases in tiller population density (Table 3) and percentage of live leaf blade, but a reduction in percentage of dead forage of the deferred canopy (Table 4).

Conclusion

To improve the structural characteristics of the canopy, *Brachiaria brizantha* syn. *Urochloa brizantha* cv. Piatã can be deferred for 79 days in the Zona da Mata region of Minas Gerais, Brazil, with a deferment period beginning at the end of March, and the application of up to 90 kg ha^{-1} of N.

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