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NITROGENATED FERTILIZATION IN PASTURE BRACHIARIA BRIZANTHA CV. MARANDU VIA ORGANIC COMPOUNDS

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Abstract

The objective was to evaluate the quantitative and qualitative effect of fertilization of *Brachiaria brizantha* cv. Marandu using nitrogen from liquid cattle manure and organomineral fertilizer. The experiment was developed in a pasture already established and soil analysis of this area was made for the necessary corrections. The experimental design was randomized blocks in a 4 x 2 factorial scheme. The treatments consisted of control with 0 kg/ha of N, 3 treatments with application of bovine liquid manure and 3 treatments with organomineral fertilizer in the dosages of 60, 120 and 180 kg/ha of N. Three cuts were made in Marandu grass when the pasture reached 30 cm in height, leaving a residue of 15 cm, the production of DM, leaf production, stem, CP, NDF and ADF were evaluated. At the end of the experiment, the cost of fertilizing with manure and organomineral fertilizer was done. To compare the averages obtained and the morphological components of each sample, the Tukey test at 5% significance was used, with the aid of the SISVAR statistical program. With the highest nitrogen levels of organomineral fertilizer and the bovine liquid manure, a higher CP content was obtained, reaching 9.30; 7.78 and 7.90% in the first cut, with organo 180, 120 and manure 180 respectively. Fertilizations with manure 60 and 180, organomineral 120 and 180 showed the lowest values for NDF in the first cut, the ADF only showed a significant difference in the second cut with organo 60, manure 120 and 60 with the highest values. Organomineral fertilizer in different doses provided higher production, but at a higher cost. Fertilization improved the quality of the forage.

Keywords

bovine liquid manure, dry matter, organomineral fertilizer

ADUBAÇÃO NITROGENADA EM PASTAGEM DE CAPIM - MARANDU VIA COMPOSTOS ORGÂNICOS

Resumo

Objetivou-se avaliar o efeito quantitativo e qualitativo da *Brachiaria brizantha* cv. Marandu adubada com nitrogênio proveniente de dejeto líquido de bovino e fertilizante organomineral. O experimento foi desenvolvido em uma pastagem já implantada, foi feito análise de solo desta área para as devidas correções. O delineamento experimental foi de blocos casualizados em esquema de fatorial de 4 x 2 sendo 4 dosagens de adubações e dois tios de fertilizante. Os tratamentos consistiram em testemunha com 0 kg/ha de N, 3 tratamentos com aplicação de dejeto líquido de bovino e 3 tratamentos com fertilizante organomineral nas dosagens de 60, 120 e 180 kg/ha de N. Foram realizados três cortes no capim Marandu quando a pastagem atingia 30 cm de altura, deixando um resíduo de 15 cm, foram avaliadas a produção de MS, produção de folha, colmo, PB, FDN e FDA. E ao final do experimento foi feito o custo das adubações com dejeto líquido de bovino e fertilizante organomineral. Para comparação das médias obtidas e dos componentes morfológicos de cada amostra, foi utilizado o teste de Tukey a 5% de significância, com o auxílio do programa estatístico SISVAR. Com as maiores dosagens de nitrogênio do fertilizante organomineral e do dejeto líquido de bovino, obteve-se maior teor de PB, chegando a 9,30; 7,78 e 7,90% no primeiro corte, com o fertilizante organomineral nas doses de 180 e 120 kg/ha de N e com o dejeto líquido de bovino na dose de 180 kg/ha de N respectivamente. As adubações com dejeto líquido de bovino nas dosagens de 60 e 180 kg/ha de N e fertilizante organomineral nas doses de 120 e 180 kg/ha de N, apresentaram os menores valores para FDN no primeiro corte, o FDA só houve diferença significativa no segundo corte com fertilizante organomineral na dose de 60 kg/ha de N, dejeto líquido nas dosagens de 120 e 60 kg/ha de N com os maiores valores. O fertilizante organomineral nas diferentes doses proporcionou maior produção, porém com maior custo. As adubações promoveram melhoria na qualidade da forragem.

Palavras-chave

dejeto líquido de bovino, fertilizante organomineral, matéria seca.

INTRODUCTION

Pastures represent the most practical and economical way of feeding cattle and constitute the basis for supporting livestock farming in Brazil, both in meat and milk production. However, the vast majority of these pastures are in some degree of degradation. According to Dias-Filho (2014), it is estimated that between 50 and 70% of pasture areas in Brazil present some level of degradation. At Cerrado, this proportion can reach up to 80% degradation, which is one of the biggest problems in Brazilian livestock farming.

Regarding nutrient replacement and the use of residues generated by the intensification of milk production, Xavier et al. (2009) evaluated the amount of manure produced by lactating dairy cows kept in confinement during the dry period of the year and fed with different roughages: Corn silage, fresh sugar cane, sugar cane hydrolyzed with quicklime, hydrolyzed sugar cane with hydrated lime which respectively produced 29.21; 31.97; 27.80 and 26.10 kg of natural sub product.

The use of animal residues has become a viable alternative for fertilizing crops as a way of taking advantage of their nutrients. Medeiros et al. (2007) evaluated the effects of fertilization with liquid swine manure on Marandu grass where they observed that the highest production of dry matter mass (DM) was obtained with 180 m^3/ha/year of liquid swine manure, which provided an increase of 30% in DM production in relation to chemical fertilization with 100 kg/ha of N, 40 kg/ha of P_2O_5 and 60 kg/ha of K_2O.

Given this, there is a need to seek more information regarding the effect of fertilization with organomineral fertilizers and liquid cattle manure on the production and quality of cattle pasture *Brachiaria brizantha* cv. Marandu.

MATERIAL AND METHODS

The experiment was conducted on a dairy farm in the municipality of Itapagipe-MG, which has an Aw climate, according to Koppen, the soil was a dystrophic red latosol. The liquid cattle manure used in the experiment was separated and stored in 200 liters plastic drums for a period of 30 days and then sent to the laboratory for analysis before each application in the pasture.

Soil samples were collected in the experiment area, at depths of 0 to 20 cm and 20 to 40 cm. The results of the soil analysis were interpreted following the recommendations for pasture in soil correction with limestone (Cantarutti et al., 1999). The experiment was carried out in a pasture already established for around 10 years with *Brachiaria brizantha* cv. Marandu.

According to the results of the soil analysis presented in table 1, it was necessary to apply 344 kg/ha of dolomitic limestone with 36% CaO and 12% MgO to correct the soil. After 60 days, an initial correction fertilization was carried out in the entire experimental area with application of 30 kg/ha of P_2O_5 and 60 kg/ha of K_2O to level the levels of phosphorus and potassium that were low in accordance with the recommendation of the 5th approximation (Cantarutti et al., 1999).

Table 1 - Chemical and physical characterization of the red oxisol during the implementation of the experiment in Itapagipe-MG.

Sample	Chemical									Physical		
Depth	pH	P	K	M.O	Ca	Mg	H+Al	T	V	Sand	Silt	Clay
Cm	$CaCl_2$	$mg.dm^3$	$dag.kg^{-1}$		$cmolc.dm^3$					%		
0-20	5.6	1.8	36	1.7	1.0	0.4	2.6	4.1	36.5	72.0	11.0	17.0
20-40	5.0	0.7	17	1.4	0.3	0.1	2.6	3.0	14.6	70.0	11.0	19.0

Source: EPAMIG soil analysis laboratory

To quantify precipitation, a rain gauge was installed in the center of the experimental area to monitor precipitation, as shown in figure 1.

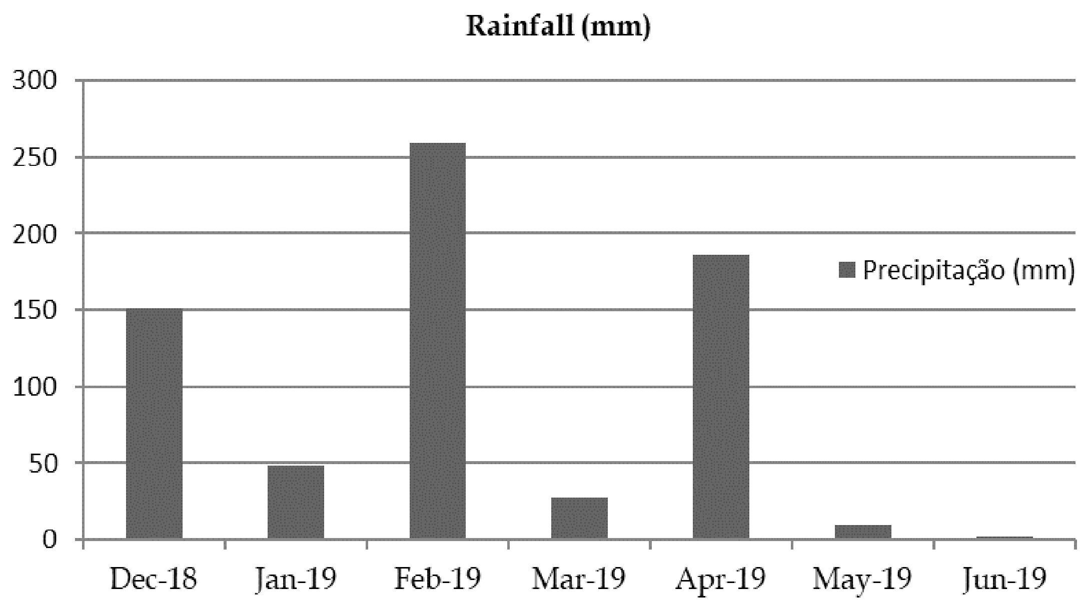

Figure 1 – Rainfall (mm) accumulated during the experimental period in Itapagipe-MG.

The experimental plots were divided into 3 m wide by 3 m long with 1.5 m corridors between the plots. The experiment was implemented in a randomized block experimental design in a 4 x 2 factorial scheme, with the following treatments:

Treatment 1(T): control, without any fertilizer application

Treatment 2 (D 60): application of 60 kg/ha of N in the form of liquid cattle manure

Treatment 3 (O 60): application of 60 kg/ha of N in the form of organomineral fertilizer

Treatment 4 (D 120): application of 120 kg/ha of N in the form of liquid cattle manure

Treatment 5 (O 120): application of 120 kg/ha of N in the form of organomineral fertilizer

Treatment 6 (D 180): application of 180 kg/ha of N in the form of liquid cattle manure

Treatment 7 (O 180): application of 180 kg/ha of N in the form of organomineral fertilizer.

With the results of analysis of liquid bovine manure (N=0.30%, P=0.02%, K=0.34% and Ca=0.06%) the amount to be applied was calculated, according to the concentration of nitrogen (N) in the manure in kg/ha, proportionally to the area of each plot (9m²).

For the amount of 60 kg/ha of N, 20 m³/ha of liquid cattle manure was applied, corresponding to 18 liters of manure, divided into 3 applications.

For the amount of 120 kg/ha of N, 40 m³/ha of liquid cattle manure was applied, corresponding to 36 liters of manure, divided into 3 applications.

For the amount of 180 kg/ha of N, 60 m³/ha of liquid cattle manure was applied, corresponding to 54 liters of manure, divided into 3 applications.

A uniform cut was done in the pasture at a height of 15 cm, immediately after which liquid cattle manure and organomineral fertilizer were applied. The liquid manure was applied manually using watering cans.

The same amount of N applied via liquid cattle manure was also applied in each treatment with organomineral fertilizer. For the treatment with 60 kg/ha of N, 393.23 grams of organomineral fertilizer was applied to each plot, divided into 3 applications.

For the treatment with 120 kg/ha of N, twice the amount of the treatment with 60 kg/ha of N was applied, that is, 873.84 grams of organomineral fertilizer.

For the treatment with 180 kg/ha of N, 1,310.76 grams of organomineral fertilizer were applied to each plot.

Upon reaching a height of 30 cm from the ground level, the plots were cut, in a total of 3 cuts, using a 0.50 x 0.50 m (0.25 m²) square placed at two points different in each plot.

Table 2 – Cutting interval in days of Brachiaria brizantha cv. Marandu fertilized with different doses of liquid cattle manure and organomineral fertilizer.

Polite	Treatments						
	Test.	D60	D120	D 180	Org 60	Org 120	Org 180
1st Cut	79.66	70.33	74.33	77.66	71.66	70.0	52.66
2st Cut	50.0	48.33	44.33	46.0	42.66	31.66	23.66
3st Cut	30.33	41	41.66	36.66	45.33	58.33	34.66

Source: Research data

After collecting the two samples per plot, mixing was carried out, and after taking a sub-sample of 100 grams of forage to separate the leaves and stems and weigh them, and another sub-sample of 100 grams to determine the content. of dry matter according to Lacerda (2009). The samples were packaged in closed and identified plastic bags and sent to the animal food analysis laboratory of the Academic Department of Animal Science (DZO) of the Federal Institute of Southeast MG – Campus Rio Pomba.

To determine the percentage of crude protein (CP) the Kjeldahl method was used (CAMPOS et al. 2004) and for neutral detergent fiber (NDF) and acid detergent fiber (ADF) the method of Van Soest, (1994).

The data were subjected to analysis of variance, with subsequent regression analysis. To compare the means obtained on the cutting dates and the morphological components of each sample, the Tukey test was used at 5% significance, with the help of the SISVAR statistical program (FERREIRA, 2011).

RESULTS AND DISCUSSION

For dry matter production in the first cut, treatments with manure 120 and 180 kg/ha of N and with organomineral fertilizer 60, 120 and 180 kg/ha of N showed the same productivity, but the control and manure 60 kg/ha of N with lower productions.

Fertilization with organomineral fertilizer in the first cut did not show a significant difference (P<0.05), even with larger fertilizations, there was no greater production, perhaps due to the fact that the experiment was carried out in a pasture area that presents with uneven development already implemented around 10 years ago, where the producer had not been correcting the soil or maintaining maintenance fertilizers, based on soil analysis it is an area that needs corrections and improvement in soil fertility.

In the second cut there was no significant difference (P<0.05) between fertilizations with organomineral fertilizer and liquid cattle manure, with a difference only for the control that presented the lowest production 1292.46 kg/ha of DM. With 180 kg/ha of organomineral N, a production of 2021.06 kg/ha of DM was observed, a similar result was observed by Benett et al. (2008). In the second cut of *Brachiaria brizantha* cv. Marandu at a dosage of 179 kg/ha of N and with a production of 2097.00 kg/ha of DM, a value higher than that in this work.

It was observed in the first and second cuts that there may have been losses of nutrients from the moment of application until their absorption by the roots of the plant, which is why there is no difference in production in the highest dosages of organomineral fertilizer and liquid cattle manure.

In the third pasture cut, the portion fertilized with organomineral 180 kg/ha of N was superior to the other plots, producing 2986.00 kg/ha and again the control showed the lowest production (table 3). In this cut it was observed a great variation in the dry matter mass production, one of the factors that may have influenced the production could be the greater tillering of the plots with organomineral due to having a slow release nitrogen and lower loss compared to manure and therefore lower loss of nitrogen, greater tillering resulting in increased production, as all plots were cut at the same height.

Germano et al. (2018) achieved it with 4 cuts in *Brachiaria brizantha* cv. Paiaguás fertilized with 250 kg/ha of N via chemical fertilizer (urea) a production of 5860 kg/ha of DM, a lower result than that achieved in this work which reached 6995.66 kg/ha of DM with 180 kg/ha of N coming of organomineral fertilizer, this may be due to the greater use of N in organic form.

In the accumulated production over the five months of the experiment, fertilization with organomineral fertilizer resulted in greater production of dry matter

Table 3 – Production of dry matter, leaves and stalks (kg/ha) in *Brachiaria brizantha* cv. Marandu fertilized with different doses of liquid cattle manure and organomineral fertilizer.

Treatments	Analytics					
	PDM			Sheet		
	Polite					
	1	2	3	1	2	3
T	1482.26 b	1292.46 b	273.29 e	1173.86 c	977.13 b	174,73 e
D 60	1675.53 b	1782.33 a	524.65 de	1379.98 bc	1368.07 a	366.21 de
D 120	2029.13 a	1985.06 a	690.53 cd	1513.88 ab	1558.80 a	557.78 cd
D 180	2134.66 a	2019.06 a	753.74 cd	1541.20 ab	1539.77 a	560.13 cd
O 60	2000.86 a	2025.00 a	868.00 c	1555.36 ab	1534.09 a	678.07 c
O 120	2008.40 a	2015.93 a	1722.00 b	1234.57 c	1518.93 a	1351.78 b
O 180	1988.60 a	2021.06 a	2986.00 a	1705.55 a	1496.07 a	2278.78 a
Treatments	Thatch					
	Polite					
	1	2	3			
T	308.07 bc	332.00 a	101.00 a			
D 60	296.54 c	414.26 a	152.66 a			
D 120	516.12 ab	426.26 a	132.66 a			
D 180	593.46 a	489.29 a	193.00 a			
O 60	445.50 abc	457.57 a	193.66 a			
O 120	407.15 abc	497.00 a	419.62 b			
O 180	281.38 c	524.99 a	713.16 c			

T= witness; D 60 = liquid cattle manure with 60 kg/ha of N; D 120 = liquid cattle manure with 120 kg/ha of N; D 180 = liquid cattle manure with 180 kg/ha of N; O 60 = organomineral fertilizer with 60 kg/ha of N; O 120 = organomineral fertilizer with 120 kg/ha of N; O 180 = organomineral fertilizer with 180 kg/ha of N.
Means in columns followed by different letters differ statistically using the *Tukey* test ($p<0.05$).

mass (figure 2), compared to fertilization made with liquid bovine manure. The manure provided an increase of 30.66%, 54.31% and 61.00% in the accumulated DM production with dosages of 60, 120 and 180 kg/ha of N, respectively. Organomineral fertilizer increased production by 60.55%, 88.52% and 129.51% with dosages of 60, 120 and 180 kg/ha of N respectively compared to the plot without fertilization.

Barnabé et al. (2007) used liquid pig manure to fertilize *Brachiaria brizantha* cv. Marandu with dosages of 50, 100 and 250 m^3/ha of manure and achieved an increase of 41.9%, 109.3% and 156.1% in the accumulated production of dry matter mass compared to the plot without any fertilization. In this work with liquid bovine manure with dosages of 20, 40 and 60 m^3 there was an increase of 30.66; 54.31 and 61.00% respectively in the accumulated production of DM.

In the accumulated production of dry matter mass, fertilization with zero N

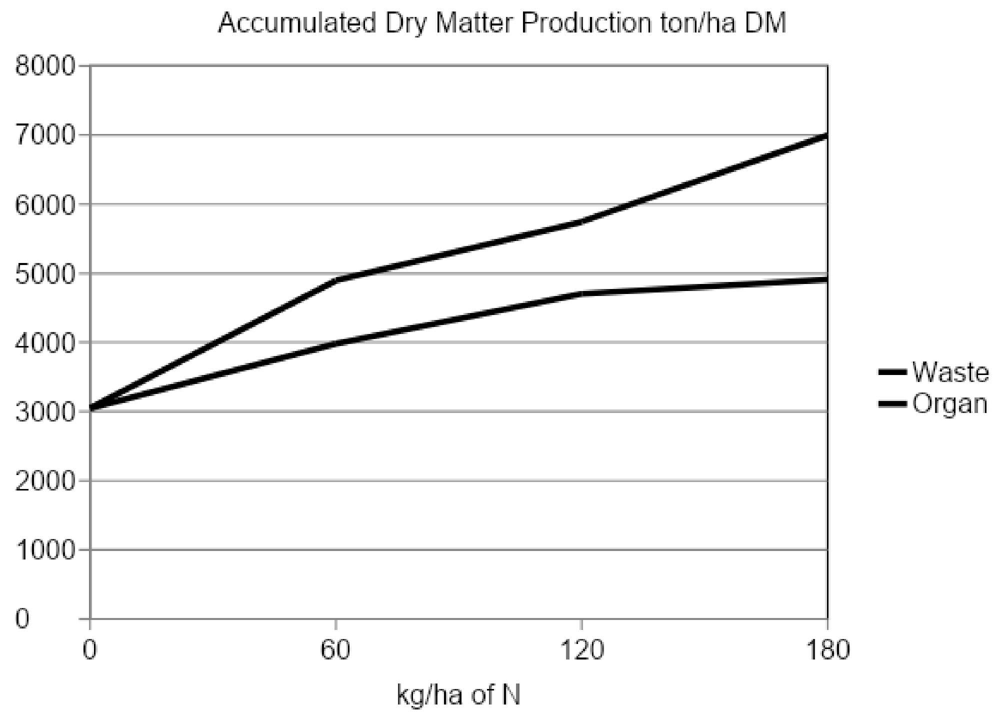

Figure 2 – Accumulated dry matter production from *Brachiaria brizantha* cv. Marandu without fertilization and fertilized with different doses of liquid bovine manure and organomineral fertilizer.

refers to the control that presented the lowest production, the organomineral fertilizer was superior to liquid bovine manure, one explanation for this would be the loss of N from the liquid manure of cattle by volatilization of NH3, which according to Basso et al. (2004), working with liquid swine manure, found N losses in December of up to 33%, which may be favored by high temperatures and summer periods, such as what occurred at the time this work was developed (figure 1).

The highest production of leaves/ha in the first cut occurred when fertilized with 180, 60 kg/ha of N via organomineral, manure 180 and 120, in the second cut there was no difference $p<0.05$ between treatments only for the control, in the third cut, the highest production was with organomineral 180 and the lowest production with the control together with manure 60. Bonfim-Silva and Monteiro 2006 observed a linear increase in the production of leaf blade and stem with an increase in N fertilization, in brachiaria grass, indicating that the supply of N stimulates not only the appearance and development of leaves, but also the development of stems. With the highest N dosages, we obtained greater leaf production, possibly due to greater tillering in response to nitrogen fertilization.

In stalk production/ha, the lowest production in the first cut was with organomineral 180; 120; 60; manure 60 and the control, in the second cut all treatments showed the same production with no significant difference $p<0.05$, in the third cut the plot with organomineral 180 showed the highest production followed by organomineral 120 with the second highest stalk production, the rest of the treatments did not show a significant difference $p<0.05$.

In the third cut, this higher production of both leaves and stalks was already expected in the plot with organomineral 180 followed by 120, due to the fact that these plots present the highest mass production of dry matter.

The dose of 180 kg/ha of organomineral N had a leaf production in the 3 cuts of 5479.62 kg/ha, Silva et al. (2013) with the application of 300 kg/ha of N, achieved a production of 4872; 7273 and 4204 kg/ha of dry mass of leaf blade in the years 2004, 2005 and 2006 respectively, again showing that N in organic form can have greater use.

The percentages of dry matter in the three pasture cuts did not show a significant difference $p<0.05$, in the general average of the three cuts, the portion with organomineral 180 presented a value of 25.17%, which was statistically equal to the others, except for manure 60, which in turn, it was also the same as the other treatments except organo 180.

Castagnara et al. (2011) working with *Brachiaria brizantha* cv. Mulato with increasing doses of N observed a reduction in DM percentages with increasing N dosages, in this work a reduction in DM percentage was observed only in pasture fertilized with organomineral, this reduction in the percentage of dry matter occurs possibly because the higher availability Nitrogen stimulates plant growth, leading to higher water accumulation.

For crude protein contents with the highest doses of nitrogen from organomineral fertilizer and liquid cattle manure, a higher crude protein content was obtained, reaching 9.30; 7.78 and 7.90% in the first cut, with organ 180, 120 and waste 180 respectively (table 4). Nitrogen is the main constituent of proteins that actively participate in the synthesis of organic compounds that constitute the plant structure - (MATTOS 2001). Thus, nitrogen fertilization can improve the quality of pasture by increasing its crude protein content (CHAGAS and BOTELHO 2005).

Contents of less than 7% in the dry matter of some tropical grasses lead to a reduction in their digestion, due to inadequate nitrogen levels for microorganisms in the rumen (GERDES et al., 2000).

Table 4 – Nutritional quality of *Brachiaria brizantha* cv. Marandu fertilized with liquid cattle manure and organomineral fertilizer.

Treatments	Analysis			
	DM Content	Crude Protein		
	Polite			
	average	1	2	3
T	29.12 ab	4.70 c	5.14 b	6.75 b
D 60	29.74 a	7.40 b	7.40 a	7.85 ab
D 120	28.52 ab	7.41 b	7.45 a	7.79 ab
D 180	29.13 ab	7.90 ab	8.0 a	8.29 ab
O 60	29.05 ab	7.13 b	7.13 a	7.66 ab
O 120	26.87 ab	7.78 ab	7.78 a	8.12 ab
O 180	25.17 b	9.30 a	8.73 a	8.76 a

Treatments	NDF			ADF		
	Polite					
	1	2	3	1	2	3
T	65.73 ab	65.33 abc	63.29 a	40.44 a	37.40 b	37.54 a
D 60	64.40 bc	64.47 abc	63.41 a	38.67 a	39.41 ab	36.66 a
D 120	65.50 ab	65.50 ab	63.50 a	36.97 a	38.20 ab	36.75 a
D 180	62.68 c	62.68 c	62.68 a	37.69 a	37.70 b	35.67 a
O 60	67.27 a	67.18 a	62.60 a	39.55 a	42.51 a	39.40 a
O 120	63.15 bc	63.15 bc	64.71 a	38.03 a	37.38 b	36.74 a
O 180	64.06 bc	64.06 bc	64.80 a	37.19 a	37.19 b	37.19 a

T= witness; D 60 = liquid cattle manure with 60 kg/ha of N; D 120 = liquid cattle manure with 120 kg/ha of N; D 180 = liquid cattle manure with 180 kg/ha of N; O 60 = organomineral fertilizer with 60 kg/ha of N; O 120 = organomineral fertilizer with 120 kg/ha of N; O 180 = organomineral fertilizer with 180 kg/ha of N.
Averages in columns followed by different letters differ statistically using the *Tukey* test ($p<0.05$).

In the second cut, all treatments presented similar results except the control which presented the lowest CP value of 5.14% in DM. In the third cut, the portion with organomineral 180 was the same as all other dosages, but different from the control and all other dosages were equal to the control.

Similar results were found by Barnabé et al. (2007) with liquid pig manure where CP values of 7.9; 8.9 and 9.8% with dosages of 50, 100 and 150 m^3 respectively.

The long summer period that occurred in January, with only 49 mm of rain (figure 1) and the long interval of pasture cuts lasting more than 70 days (table 2), may have harmed the nutritional quality of this pasture, Costa et al. al. (2007) working with *Brachiaria brizantha* cv. MG 5, with cutting intervals of 15, 20, 30 and 60 days, found that CP values decreased with increasing pasture cutting age, showing percentages of 16.02; 15.48; 12.34 and 8.86% respectively.

The NDF levels found in this work in the first cut ranged from 67.27 to 62.68%, with the highest value in organomineral 60, followed by manure 120 and control and the lowest value with manure 180, followed by organomineral 180, organo120 and waste 60. Medeiros et al. (2007), working with liquid pig manure, observed with a dosage of 180 m³/ha, divided into 3 applications per year, a result of 63.65% NDF in the first cut. In the second cut, organo 60, manure 120, manure 60 and control plots presented the highest values for NDF.

In the third cut there was no significant difference (P<0.05) between any of the treatments, a result similar to that found by Medeiros et al. (2007) who also found no significant difference (P<0.05) for NDF in the fourth cut of Marandu grass fertilized with liquid pig manure and chemical fertilizer.

A decrease in NDF content was observed in the highest N dosages of the organomineral, where the dosage of 120 and 180 showed a reduction in relation to the organomineral 60, which can be observed in the first and second cut. Medeiros et al. (2011) found a linear reduction in NDF contents as N dosages increased and also found higher values for larger cut-off intervals. In this work, the long cut-off intervals may have influenced the NDF values.

In the first cut of the pasture, the unfertilized portion showed the highest ADF value of 40.44%, although there was no statistically significant effect (P<0.05) between all treatments, similar behavior occurred in the third cut, which also did not show significant effect (P<0.05) between all treatments, a result similar to that found by Medeiros et al. (2007) who also found no significant difference (P<0.05) in the second and third cuts of Marandu pasture fertilized with liquid cattle manure.

For ADF levels, there was a significant difference (P<0.05) only in the second cut, where the highest values, presented were for organomineral 60, manure 120 and manure 60, which presented results of 42.51; 38.20 and 39.41% in MS of ADF respectively.

Medeiros et al. (2011) working with *Brachiaria brizantha* cv. Marandu and *Brachiaria brizantha* cv. MG 5 – Vitória, with increasing doses of N, observed that only the MG-5 Vitória grass reduced ADF values with increasing doses of N. A slightly different result from that found in this work where we observed a reduction in ADF values in the second cut with fertilization made with organomineral, the highest dosages of N with 120 and 180 showed a reduction in ADF in relation to the dosage with 60 N. However, Barnabé et al. (2007), working with liquid swine manure, observed a reduction in ADF and NDF values with increasing fertilizer dosages.

Fertilization with organomineral fertilizer showed a total mass production of dry matter higher than liquid cattle manure, making a comparison of productions, the organomineral with 60, 120 and 180 kg/ha of N was 22.88%, 22.13% and 42.55% higher than manure 60, 120 and 180 kg/ha of N respectively.

The implement used to apply liquid waste had 5000 liters capacity, in the treatment of waste 60 liters were applied, 20 m^3/ha requiring 4 trips of the implement, 18 minutes per trip, reaching a total of 72 minutes or 1.20 hours. With a price of R$ 120.00/implement hour, an application cost of R$ 144.00/ha is reached.

For the use of organomineral fertilizer, the formulations 04-15-08, 20-00-00, and potassium chloride were applied with a cost per ton of R$ 2300.00; R$ 1450.00 and R$ 1960.00 respectively. The application of organomineral fertilizer had an hourly implementation cost of R$ 120.00.

In the analysis of fertilization costs, organomineral fertilizer presented a higher cost than liquid cattle manure, due to the fact that the manure is practically free of cost for the producer, presenting only the application cost (table 5).

Table 5 - Cost of fertilization and application with liquid cattle manure and organomineral fertilizer in *Brachiaria brizantha* cv. Marandu

Treatment	Inputs	Services (tractor hour)	TOTAL	Cost/Kg DM
D 60		1.2 x 120.00	144.00	0.03
D 120		2.4 x 120.00	288.00	0.06
D 180		3.6 x 120.00	432.00	0.08
O 60	715.12	120.00	835.12	0.17
O 120	1430.26	120.00	1550.26	0.27
O 180	2145.39	120.00	2265.39	0.32

Source: Research data

Organomineral fertilizer presented the highest DM production, but it also presented a higher cost than liquid bovine manure, with a dosage of 180 kg/ha of N, the manure presented a cost of R$ 0.08/kg of DM produced, while organomineral presented a cost of R$ 0.32/kg of DM produced, this cost being four times higher than that presented by manure.

CONCLUSIONS

Liquid cattle manure, at low cost for the farmer, increases the mass production of dry matter in the pasture and becomes an interesting alternative for pasture fertilization.

Organomineral fertilizer in different doses provided better production, but at a higher cost. Fertilization promoted improvements in forage quality.

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