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Production, morphology and chemical-bromatological characteristics of Urochloa brizantha cv. Marandu under doses of compost from dairy cows

Produção, morfologia e características químico-bromatológicas de *Urochloa brizantha* cv. Marandu sob doses de composto de cama de vacas leiteiras

Producción, morfología y características químico-bromatológicas de Urochloa brizantha cv. Marandu bajo dosis de compost de vacas lecheras

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Abstract

Confinement of dairy cows in Brazil is significant, with the compost badded pack barn being the most used model, generating a large amount of good quality organic compost that can be used as a fertilizer in the pastures of the farms, reducing the use of industrialized fertilizers and mitigating the environmental impacts of dairy activity. An experiment was carried out in pots under greenhouse conditions to evaluate the effect of compost doses on the production, morphology and chemical-bromatological characteristics of Urochloa brizantha cv. Marandu A completely randomized design with 3 replications and 6 treatments consisting of 6 doses of the compost: 0; 50; 10; 20; 40 and 80 g.vaso^{-1}. Increasing compost doses resulted in higher dry matter yield, higher tillers density and higher potassium and phosphorus contents in the forage. Dairy cow compost can be used for pasture fertilization, partially replacing industrialized fertilizers.

Keywords: Urochloa brizantha; Compost barn; Fertilizatio.

Resumo

A produção de leite em confinamento no Brasil é expressiva, sendo o sistema de compost barn o mais utilizado, gerando uma grande quantidade de composto orgânico de boa qualidade que pode ser utilizado como fertilizante nas pastagens das propriedades, proporcionando redução do uso de fertilizantes industrializados e mitigando os impactos ambientais da atividade leiteira. Um experimento foi instalado em vasos, em casa de vegetação, com o objetivo de avaliar o efeito de doses de composto na produção, morfologia e características químico-bromatológicas do capim *Urochloa brizantha* cv. Marandu. Foi utilizado o delineamento inteiramente casualizado com 3 repetições e 6 tratamentos constituídos por 6 doses do composto : 0; 50; 10; 20; 40 e 80 g.vaso^{-1}. O Aumento nas doses de composto

proporcionou maior produção de matéria seca, maior densidade de perfilhos e maiores teores de Potássio e Fósforo parte aérea. O composto de cama de vacas leiteiras pode ser utilizado na adubação de pastagens, substituindo parcialmente os fertilizantes industrializados.

Palavras-chave: *Urochloa brizantha*; Compost barn; Adubação.

Resumen

La producción de leche confinada en Brasil es significativa, siendo el sistema de compost de granero el más utilizado, generando una gran cantidad de compost orgánico de buena calidad que puede ser utilizado como fertilizante en los pastos de las propiedades, proporcionando una reducción en el uso de fertilizantes. y mitigar los impactos ambientales de la producción lechera. Se instaló un experimento en macetas, en invernadero, con el objetivo de evaluar el efecto de dosis de compost sobre la producción, morfología y características químico-bromatológicas de Urochloa brizantha cv. Marandu. Se utilizó un diseño completamente al azar con 3 repeticiones y 6 tratamientos que consistieron en 6 dosis del compuesto: 0; 50; 10; 20; 40 y 80 g. Vaso-1. El incremento en las dosis de compost proporcionó mayor producción de materia seca, mayor densidad de macollos y mayores contenidos de Potasio y Fósforo. El abono de lechería se puede usar para fertilizar pastos, reemplazando parcialmente los fertilizantes industrializados.

Palabras clave: Urochloa brizantha; Granero de abono; Fertilizante.

1. Introduction

Brazil has the second largest herd of cattle in the world, predominantly raised on pasture and occupying 13.2% of its territorial area, most of these pastures present a certain degree of degradation. Industrialized fertilizers have a high cost and present a risk of loss, which may cause environmental damage. Milk production is quite expressive but with low average productivity.

Due to the high cost of land, the adoption of confinement of dairy cows, whether in the free stall model or in the compost barn (compost bedded pack barn), has grown, the latter has been preferred by feeders in the last decade, due to its lower cost of implementation, making better use of manure in a simpler way, since the animals rest on a composting bed.

The compost barn is a confinement alternative that emerged to offer good comfort for lactating, dry cows or animals with special needs (Endres et al., 2008). Economic results by

area and per unit of worker used have been shown to be greater in this containment system to the detriment of semi-confinement and free stall (Breintenbach, 2018).

The large amount of compost produced can be used on the farm itself, either in fertilizing crops for silage (corn, sorghum) or in maintaining pastures for the creation of heifers or dry cows. The composition of the compost is very variable, it depends on the type of material used as bedding (shavings, sawdust, peanut shells, rice husks), composting time. In general, the producer discards the material in the crop areas without prior knowledge of its composition, which can generate soil and water contamination, in addition to economic losses.

The objective of this work is to evaluate the production and composition of Urochloa brizantha cv Marandu grass submitted to fertilization with organic compost from dairy cows.

2. Material and Methods

The experiment was carried out in a greenhouse at UNESP / Faculdade de Engenharia de Ilha Solteira, located at latitude 20 ° 25 '5.3" S, longitude 51 ° 20' 30.6" W and 347m altitude, with a tropical climate with dry season, Aw (Köppen-Geiger).

Cultivation was carried out in pots filled with 5 dm³ of OROSOLO QUARTZARENIC Ortic soil (Santos., Et al 2018), collected at a depth of 0 to 0.20 m, evenly. Before the pots were filled, a composite sample was taken for chemical analysis to assess soil fertility, as described in Raij et al. (2001). The soil showed phosphorus contents: 1 mg dm-3, Potassium: 0.3 mmolc dm-3, Magnesium: 7 mmolc dm-3, Calcium: 4 mmolc dm-3, Hydrogen + Aluminum: 10 mmolc dm-3, Aluminum : 0 mmolc dm-3, Organic Matter: 15 g dm-3, pH (CaCl2): 5.5; Sum of Bases: 11.3 mmolc dm-3, Sulfur: 1 mg dm-3, Boron: 0.10 mg dm-3, Copper: 0.3 mg dm-3, Iron: 14 mg dm-3, Manganese: 3.1 mg dm-3 and Zinc: 0.4 mg dm-3, CTC: 21.3 mmolc dm-3, V: 53%.

Considering the ideal saturation for implantation of the cultivar indicated by Raij (1997), of 60%, with the soil with a lower saturation, however close, it was decided not to use acidity correctives for this experiment.

The compost used was sampled and sent to the plant nutrition laboratory to determine the elements present in the compost. Where they are shown in table 1.

Table 1. Composition of the bovine feedlot compound.

N ($g\ kg^{-1}$)	P ($g\ kg^{-1}$)	K ($g\ kg^{-1}$)	Ca ($g\ kg^{-1}$)	Mg ($g\ kg^{-1}$)	S ($g\ kg^{-1}$)
17,2	9,3	23,0	14,6	5,7	6,8
B ($mg\ kg^{-1}$)	**Cu ($mg\ kg^{-1}$)**	**Fe ($mg\ kg^{-1}$)**	**Mn ($mg\ kg^{-1}$)**	**Zn ($mg\ kg^{-1}$)**	
124	115	2789	617	436	

Source: Authors.

The design used was completely randomized, with four replications, with six treatments being used, totaling 24 experimental units. The treatments consist of the doses of the containment compound, 0, 5, 10, 20, 40 and 80 g vaso-3, which corresponds to 0, 2, 4, 8, 16 and 32 t ha-1 respectively.

Assessments

Two cuts were made, the first 30 days after the emergence of the plants, and the second 30 days after the first. When making the cuts, they were evaluated (i) counting the number of live tillers per plant; (ii) recording the average height of the plants by measuring the distances between the soil surface and the curvature of the last recently expanded leaf, of four leaves per pot; (iii) estimate of the average dry matter productivity (DM) per plant, collecting the aerial part of the forage of each pot with the aid of scissors, with 0.10 m of cut height in relation to the soil, allowing to dry in an oven at 65 ° C for 72 hours; (iv) SPAD index with the aid of a chlorophyllometer (vi) nutritional composition of the plants, the dry and ground material was subjected to nitroperchloric digestion by reading on a spectrophotometer for sulfur and phosphorus, and in atomic absorption for calcium, magnesium and potassium (Malavolta, Vitti and Oliveira, 1997), and sulfuric digestion followed by distillation by the micro-Kjeldahl method to determine nitrogen and consequently estimate crude protein. (vii) Fibers in neutral detergent and Fibers in acid detergent (FDN and FDA), according to Silva and Queiroz (2009).

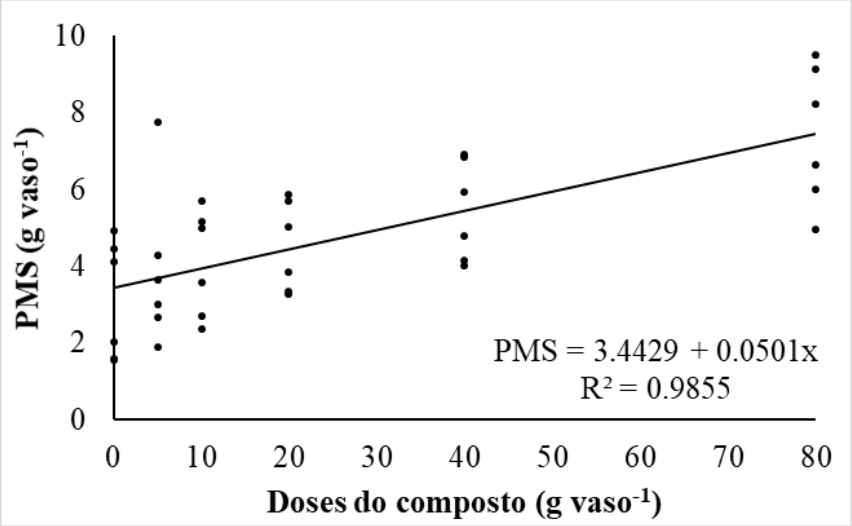
Statistical analysis

The data were submitted to analysis of variance and regression test ($P \leq 0.05$) for the doses of the compound through the SISVAR program. Tukey's test at 5% probability was applied to test the mean of the cuts.

3. Results and discussion

It can be seen in Figure 1 that the production of dry matter increased linearly as a function of the doses of compost applied, with the maximum productivity of 7.41 g.vaso-1 observed with the maximum dose of 80 g.vaso-1 or 16 g.dm³ -1 of soil. A similar answer was found by Da Silva Castro et al. (2016) when using a dose of 24.3 ton.ha-1 of bovine manure.

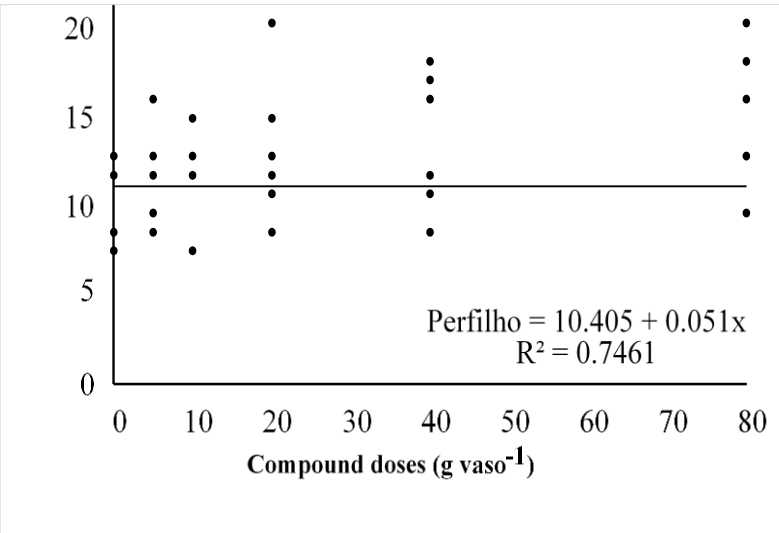
Figure 1. Production of Dry Matter (PMS) of Marandu grass as a function of doses of bovine manure compost. Average of two cuts. Significant R^2 at $p < 0.05$.



Source: Authors.

There was an increase in the number of tillers in response to the applied compound doses, as shown in Figure 1, the increase was linear. Dos Santos Araujo et al. (2011) observed an increase in tiller density when replacing the source of nitrogen urea by bovine manure in Marandu grass, with the best result being 50% substitution of the industrial source by the organic source.

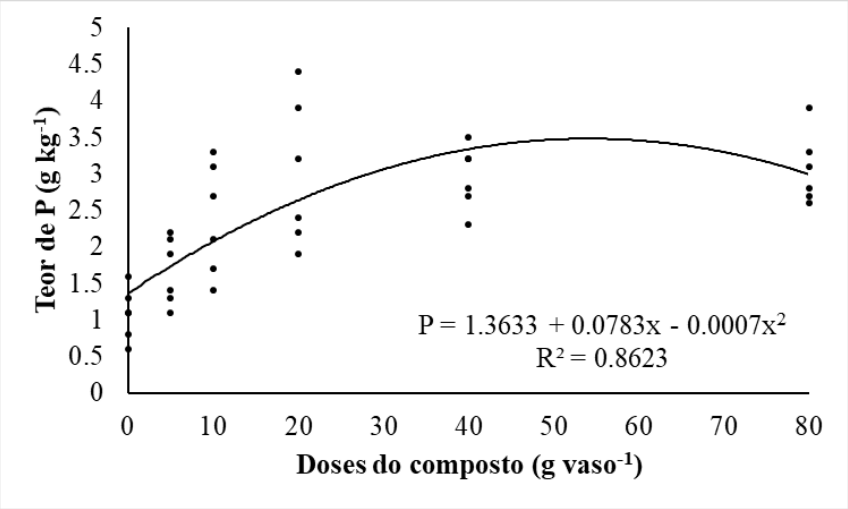
Figure 2. Number of Marandu grass tillers as a function of bovine manure compost doses. Average of two cuts. Significant R^2 at $p < 0.05$.



Source: Authors.

The phosphorus content in the aerial part showed a quadratic response, as shown in Figure 3, with the maximum estimated content achieved with the dose of 50 g.vase-1 of the compound used. The increase in the concentration of phosphorus in the aerial part is explained by the low level of this element in the soil (1 mg.dm-3) and the reasonable content of the nutrient in the compound (9.3 g.kg-1), behaving as a good source of the nutrient. Da Silva et al. (2018) found an increase in the level of phosphorus available in the soil, in the 0 to 20 cm layer after using increasing doses of bovine manure in degraded pasture of Marandu grass.

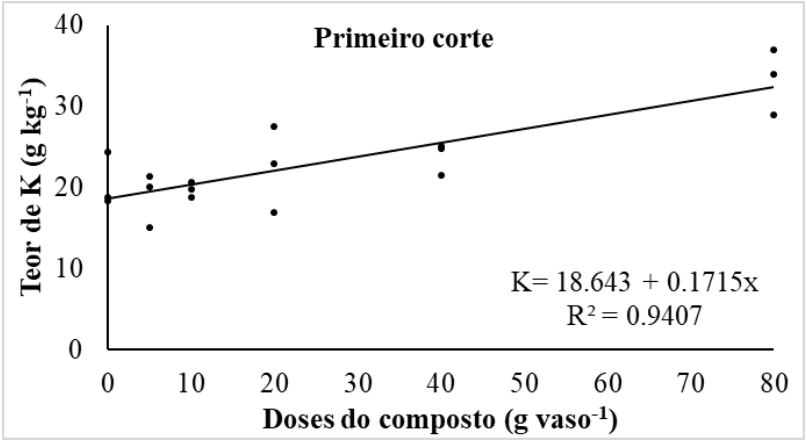
Figure 3. Phosphorus content in the aerial part of Marandu grass as a function of bovine manure compost doses. Average of two cuts. Significant R^2 at $p < 0.05$.



Source: Authors.

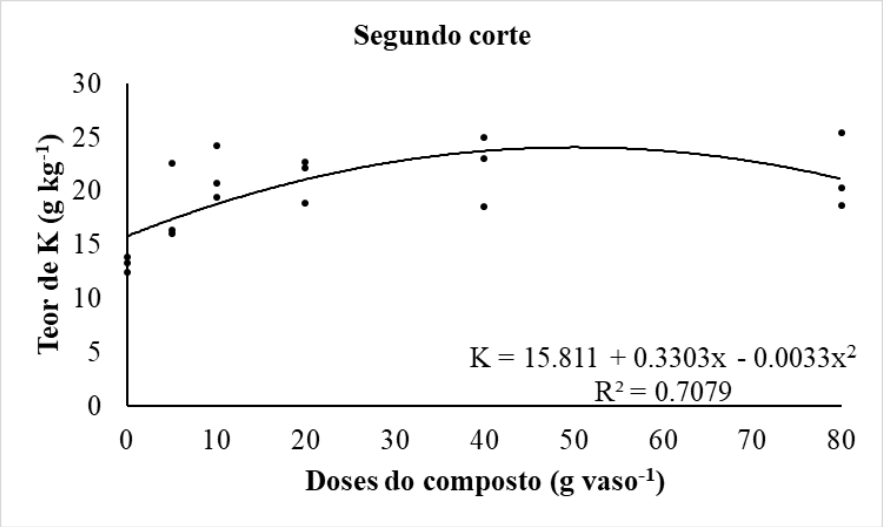
The potassium content in the aerial part also responded positively to the increasing dosages of compost, however in the first cut the response was linear while in the second the response was quadratic, as shown in figures 4 and 5 respectively. This performance is also explained by the level of the element found in the soil (0.3 mmolc.dm-3 and by the reasonable level of the nutrient in the compost. Mota et al. (2019) observed an increase in the potassium content in the soil at 77 days after sowing of maize grown under fertilization with compost from litter of dairy cows (compost barn).

Figure 4. Potassium content in the aerial part of Marandu grass as a function of doses of bovine manure compound. First cut. Significant R^2 at $p < 0.05$.



Source: Authors.

Figure 5. Potassium content in the aerial part of Marandu grass as a function of bovine manure compost doses. Second cut. Significant R^2 at $p<0,05$.



Source: Authors.

As for the other variables evaluated, there was no significant effect of doses of compound used. For the Ca, Mg and S contents in the aerial part, there was no significant difference by the Tukey test at $p <0.05$ between the first and the second cut. The height of the plants was higher in the first cut. FDA, FDN, N, PB, SPAD showed higher results in the first cut, while the leaf blade: Colmo + Sheath ratio showed higher results in the second cut.

4. Conclusions

Fertilization with compost from dairy cows provided increased productivity of Marandu grass. There was an increase in tiller density as a function of the applied compost doses. The contents of P and K in the aerial part of the grass were increased with the use of fertilization with the compost. The fertilization with increasing doses of the compound did not interfere in the results of: SPAD, FDN, FDA, PB, N, Ca, Mg, S, plant height and leaf blade ratio: Stalk + sheath.

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