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(Organizadores)

Investigación, tecnología e innovación EN CIENCIAS AGRÍCOLAS 4

Atena Editora
Ano 2022

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APRESENTAÇÃO

A agronomia desde os tempos remotos atua como uma área de conhecimento que além de ampla, é necessária para o desenvolvimento econômico e social. Desse modo, a pesquisa e inovação nos segmentos que fazem parte do setor agrário são indispensáveis para promover um melhor desempenho no futuro.

Nos últimos anos, a inclusão da tecnologia tem impulsionado a grade de estudo no campo das ciências agrárias. Tal avanço, evidentemente, permitiu que novas técnicas e melhorias chegassem até produtores, de forma a garantir um novo cenário, a fim de aliar produtividade e rendimento econômico.

As ciências agrárias, em sua totalidade, agrupam um conjunto de conhecimentos que permitem uma melhor utilização dos recursos naturais. Assim, este livro intitulado "ORGANIZACIÓN, INVESTIGACIÓN, TECNOLOGÍA Y INNOVACIÓN EM CIENCIAS AGRÍCOLAS 4" tem como finalidade abranger uma série de estudos focados em apresentar métodos e tecnologias para impulsionar os processos agrícolas já existentes, desde técnicas no campo e laboratório.

Os temas aqui abordados refletem estudos de artigos científicos e revisões bibliográficas, de maneira a reunir informações precisas e fundamentais para uma estratégia de aproveitamento dos recursos naturais. Nesse sentido, ao longo da obra são apresentados 10 trabalhos que objetivam imergir o (a) leitor (a) dentro de um panorama agronômico.

Espera-se que este estudo permita ao presente leitor (a) a possibilidade de conhecer novos mecanismos de pesquisa para fins agropecuários, além de agregar mais conhecimento e um novo olhar sobre a importância da tecnologia no meio agrário.

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SUMÁRIO

CAPÍTULO 9

THIAMINE AND SOIL AMENDMENTS ON *Urochloa brizantha* PRODUCTION

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ABSTRACT: Brazil occupies a prominent position in the world scenario of beef production, most of the brazilian production is based on animals raised on pasture, because of this, the country started to invest more in technologies to improve production and began to intensify the launch of new pasture cultivars. Given the above, the objective of this research was to evaluate the effect of different sources of soil amendments (limestone and calcium silicate) and doses of thiamine on the initial development of *Urochloa brizantha*. The experiment was conducted in the municipality of Cassilândia (MS), from August to December 2018. The experimental design was in randomized blocks, arranged in a 4x3 factorial scheme, with four replications, with treatments consisting of two sources of concealer and without. The selected sources were limestone and calcium silicate, applied at doses equivalent to 3.75 mg vase^{-1} or 1.5 Mg ha^{-1}. The second variation factor was the use of four doses of thiamine, applied as foliar treatment, at concentrations of 0, 100, 200 and 300 mg L^{-1}, ten days after emergence. The biometric variables analyzed were: number of tillers, plant height, root fresh mass, shoot fresh mass, shoot dry mass, root dry mass, shoot dry mass and root dry mass ratio, while the bromatological variables were made for crude protein, neutral detergent fibe , acid detergent fiber and the ratio of crude protein to neutral detergent fiber and crude protein to acid detergent fibe . The use of limestone and silicate is beneficial for plant development and improvement of *Urochloa brizantha* digestibility. Also, thiamine decreases the relationship between shoot dry mass and root dry mass and it can reflect on a technique for increasing resistance to water deficit, which can be studied in the future.

KEYWORDS: Tropical grasses, vitamin B1, plant protection, forage production, livestock.

RESUMO: O Brasil ocupa posição de destaque no cenário mundial da produção de carne bovina, a maior parte da produção brasileira é baseada em animais criados a pasto, por conta disso, o país passou a investir mais em tecnologias para melhorar a produção e passou a intensificar o lançamento de novas pastagens cultivares. Diante do exposto, o objetivo desta pesquisa foi

avaliar o efeito de diferentes fontes de corretivos do solo (calcário e silicato de cálcio) e doses de tiamina no desenvolvimento inicial de Urochloa brizantha. O experimento foi conduzido no município de Cassilândia (MS), no período de agosto a dezembro de 2018. O delineamento experimental foi em blocos casualizados, dispostos em esquema fatorial 4x3, com quatro repetições, com tratamentos constituídos por duas fontes de corretivo e sem corretivo. As fontes selecionadas foram calcário e silicato de cálcio, aplicados em doses equivalentes a 3,75 mg $vaso^{-1}$ ou 1,5 Mg ha^{-1}. O segundo fator de variação foi o uso de quatro doses de tiamina, aplicadas como tratamento foliar, nas concentrações de 0, 100, 200 e 300 mg L^{-1}, dez dias após a emergência. As variáveis biométricas analisadas foram: número de perfilhos, altura da planta, massa fresca da raiz, massa fresca da parte aérea, massa seca da parte aérea, massa seca da raiz, massa seca da parte aérea e razão da massa seca da raiz, enquanto as variáveis bromatológicas foram feitas para proteína bruta, detergente neutro fibra, fibra em detergente ácido e a proporção de proteína bruta para fibra em detergente neutro e proteína bruta para fibra em detergente ácido. O uso de calcário e silicato é benéfico para o desenvolvimento das plantas e melhoria da digestibilidade de *Urochloa brizantha*. Além disso, a tiamina diminui a relação entre massa seca da parte aérea e massa seca da raiz e pode refletir em uma técnica para aumentar a resistência ao déficit hídrico, que pode ser estudada futuramente.
PALAVRAS-CHAVE: Forrageira tropica, vitamina B1, proteção vegetal, produção de forragem, gado.

INTRODUCTION

Brazil occupies a prominent position in the world scenario of beef production, since the country has the largest commercial herd, is the largest exporter and second largest producer in the world (Carvalho; Zen, 2017). Most of the Brazilian production is based on animals raised on pasture, which is the most economical and practical way of offering food to cattle, making the cost of the Brazilian activity one of the lowest (Dias-Filho, 2014). Given the characteristics of extensive beef cattle, the country began to invest more in technologies to improve production, and from the 1980s onwards, public and private institutions in Brazil began to intensify the launch of new cultivars of pasture such as Marandu, Mombasa and Tanzania, which currently account for most of the Brazilian pasture area, especially the cultivar Marandu (Valle et al., 2014).

Livestock farming is an activity that can be implemented and conducted without adequate preparation of the area or intensive use of agricultural inputs, even if this practice does not provide success in the implantation and establishment of the culture. Thus, livestock allows farmers to produce, even with low efficienc , extensively (Dias-Filho, 2014). However, to avoid soil degradation and ensure high productivity of pastures over the years, some management practices must be adopted, allowing the maintenance of productivity, with a view to the export of nutrients caused by the grazing of animals (Artur; Monteiro, 2011). In this context, soil amendment is an essential step in the establishment of pasture, as it is a monoculture.

In the search for alternative sources that can replace limestone as a soil improver and/or nutrient supplier, some studies developed show that calcium silicate ($CaSiO_3$) is promising, both as a soil amendment and as a supplier of calcium, magnesium and silicon for the implanted crops, and the silicon available to the plant increases resistance to diseases and pests and decreases its transpiration rate (Corrêa et al., 2007; Moraes et al., 2018). It is also a nutrient considered beneficial for plants that accumulate this element, such as tropical grasses (Fortes et al., 2008). Concomitantly with the good practices of implantation of the culture, it appears that new technologies are being explored in order to improve the quality of the pastures, as is the case of vitamins.

The use of vitamins exogenously in agricultural crops is a practice that is being studied, among these vitamins are those belonging to the B complex, such as thiamine (vitamin B1). According to Goyer (2010), this vitamin plays a key role as an enzymatic cofactor acting on amino acids and carbohydrates, in addition to being directly linked to plant responses to biotic and abiotic stresses. In grasses such as sweet corn, the application of thiamine in seed treatment, either alone or together with *Azospirillum brasilense*, provides a positive economic return, since the cost of production is practically not affected by its use (Vendruscolo et al., 2018). Also, for *Urochloa decumbens* the treatment with thiamine, combined with the inoculation with *A. brasilense*, promoted a higher chlorophyll concentration Vendruscolo et al., 2021).

Given the above, the objective of this research was to evaluate the effect of different sources of soil amendments (limestone and calcium silicate) and doses of thiamine on the initial development of *Urochloa brizantha.*

MATERIAL AND METHODS

The experiment was carried out in a greenhouse covered with a polyethylene screen, at the State University of Mato Grosso do Sul- UEMS, in the Agronomy Department of the University Unit of Cassilândia, Brazil (19º 06' 48"S; 51º 44' 03"W and average altitude of 510 m), from August to December 2018. The climate of the region is defined as rainy tropical (AW) with rainy summers and dry winters (winter precipitation less than 60 mm). The experimental environment is characterized by dimensions 18.0 x 8.0 m and a ceiling height of 3.5 m, containing a black polyethylene screen on the sides and transparent plastic in the upper portion.

Polyethylene pots with a capacity of 5 dm³ were used, filled with ravine soil (Neosolo quartzarênico), sieved in a 5 mm mesh, from the 0.20-0.40 m layer, which has a pH ($CaCl_2$) = 4.5, organic matter = 10.1 g dm^{-3}, P (Mehlich-1) = 6.6 mg dm^{-3} , K^+ = 0.18 $cmol_c$ dm^{-3} , Ca^{2+} = 0.50 $cmol_c$ dm^{-3} , Mg^{2+} = 1.00 $cmol_c$ dm^{-3} , H+Al = 2.9 $cmol_c$ dm^{-3} , Al^{3+} = 0.44 $cmol_c$ dm^{-3} , cation exchange capacity = 4.6 $cmol_c$ dm^{-3} and base saturation = 36.7%. In treatments where the soil was corrected, the base saturation increased to 60%, being considered ideal

for the cultivation of *Urochloa brizantha* (Werner et al., 1997).

The experimental design was randomized blocks, arranged in a 4x3 factorial scheme, with four replications. Being the treatments constituted by two sources of soil amendments and without amendment. The selected sources were limestone and calcium silicate, applied in doses equivalent to 3.75 mg $vase^{-1}$ or 1.5 Mg ha^{-1}. In order to allow the soil amendments to react with the soil, it will be incubated for three weeks with approximately 70% of the retention capacity. The second variation factor is the use of four doses of thiamine (vitamin B1), applied as foliar treatment, at concentrations of 0, 100, 200 and 300 mg L^{-1}, ten days after emergence.

Each experimental unit consisted of a pot, with a total of 48 units and each one received eight seeds. After germination and establishment of the plants, thinning was performed leaving only four plants per pot. The cultural treatments were similar between all treatments, using 1g dm^{-1} of soil formulated 04-14-08.

The biometric variables analyzed were tiller number (TN), plant height (PH), root fresh mass (RFM), shoot fresh mass (SFM), shoot dry mass (SDM), root dry mass (RDM), shoot dry mass and root dry mass ratio (MSPA/MSR), while the bromatological variables were made for crude protein (CP), neutral detergent fiber (NDF), acid detergent fiber (ADF) and the CP/NDF (PNR) and CP/ADF (PAR) ratios.

The measurement of plant height in centimeters was determined from the ground level to the maximum height of the plants, with a graduated ruler. The number of tillers was counted at the time of cutting the plants, which was carried out when the plants reached 50 days. The fresh mass of the shoot was obtained by cutting close to the ground and later weighing, the fresh mass of the root was obtained after washing and weighing, both results were expressed in g $vase^{-1}$.

To obtain the dry mass of both shoots and roots, an oven with forced air circulation at 65º for 72 hours was used. For total dry mass, the sum of SDM+RDM was made, obtaining the results all in g $vase^{-1}$. The SDM/RDM ratio consisted of the simple division between these characteristics.

The data were submitted to analysis of variance and the means compared by the LSD test at 5% of probability, in the case of significant effects of the F test ($p \leq 0.05$) for soil amendments and thiamine concentrations, using the statistical software Sisvar version 5.6 for Windows (Ferreira et al., 2014).

RESULTS

There was no interaction between the variables analyzed for all characteristics. However, there was an effect of soil amendment application in relation to plant height, root fresh and dry mass, crude protein, acid detergent fiber and CP/PAR ratio (Table 1). These results can be related to the application technique, as the application was performed without

the addition of an adjuvant to the solutions.

Factor of variation	DF	TN	PH	SFM	RFM	SDM	RDM
Block	3	ns	ns	ns	ns	ns	ns
Sources (S)	2	ns	**	ns	**	ns	*
Thiamine (T)	3	ns	ns	ns	ns	ns	ns
S x T	6	ns	ns	ns	ns	ns	ns
error	33						
C.V. (%)		23.29	7.07	21.79	16.27	10.95	16.29

Factor of variation	G.L.	SDM/RDM	CP	NDF	ADF	PNR	PAR
Block	3	ns	ns	ns	ns	ns	ns
Sources (S)	2	ns	*	ns	**	ns	**
Thiamine (T)	3	*	ns	ns	ns	ns	ns
S x T	6	ns	ns	ns	ns	ns	ns
error	33						
C.V. (%)		17.28	10.60	3.28	3.93	12.06	5.22

Ns = non-significant; DF = degree of freedom. * and ** = significant at 0.10 and 0.05 levels, respective .

Table 1. Analysis of variance for developmental characteristics and bromatology of *Urochloa brizantha* subjected to different sources of soil amendments and foliar application of thiamine.

For plant height, the superiority of the application of calcium silicate in relation to the control was observed, with no significant difference for limestone. In addition, there was a superiority of treatments with soil amendments when the characteristics of fresh and dry root mass were evaluated, without, however, any significant difference between the application of silicate and the control treatment for root dry mass (Figure 1).

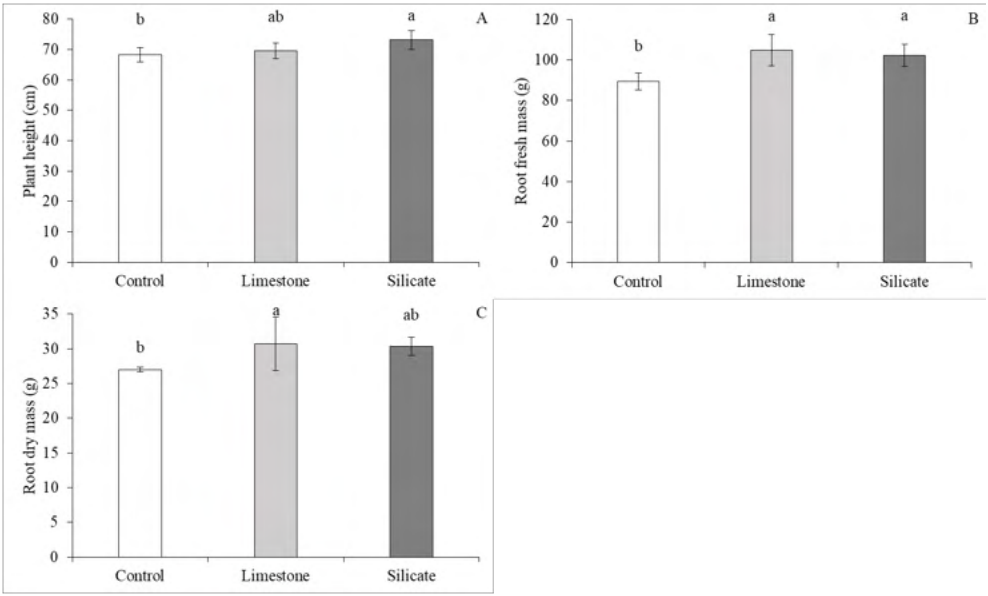

Figure 1. Height, fresh and dry mass of *Urochloa brizantha* roots subjected to different soil amendments. Bar represented mean ± SE (n = 4); Different letter on bars represent significant deference between means.

Treatments with different concentrations of thiamine significantly affected the SDM/RDM ratio, with the lowest value obtained at the dose of 300 mg L^{-1} (Figure 2). In this concentration, there was an average reduction of 15.15% of the value, in relation to the other treatments.

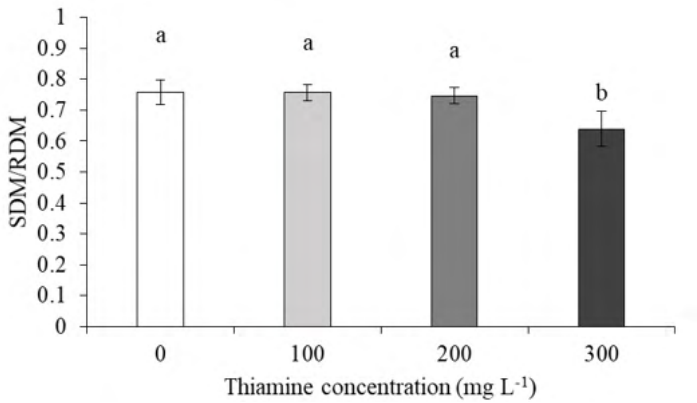

Figure 2. Relationship between shoot dry mass and root dry mass of *Urochloa brizantha* subjected to different thiamine concentrations. Bar represented mean ± SE (n = 4); Different letter on bars represent significant deference between means

The control treatment stood out in terms of crude protein and acid detergent fibe content, but without significantly differing from the limestone and silicate treatments,

respectively. On the other hand, there was superiority of the limestone treatment over the control treatment when the CP/ADF ratio was evaluated, without any significant difference for the silicate treatment (Figure 3).

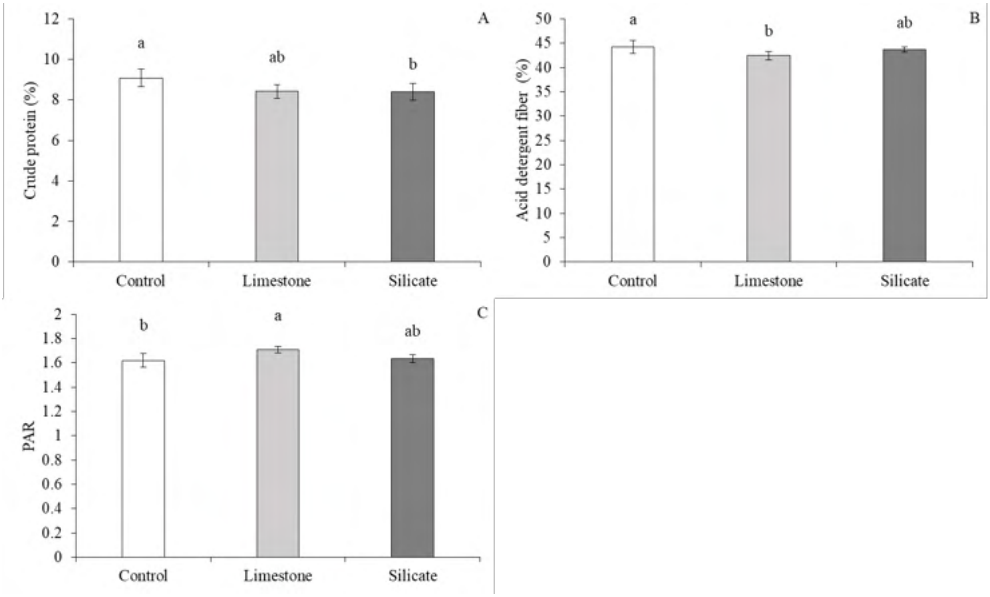

Figure 3. Crude protein (A), acid detergent fiber (B) and CP/ADF ratio (C) in *Urochloa brizantha* subjected to different soil amendments. Bar represented mean ± SE (n = 4); Different letter on bars represent significant deference between means

DISCUSSION

Pasture management has been carried out with the aim of intensifying animal production, reducing production seasonality, preventing degradation and/or recovering degraded pasture areas (Berça et al., 2021). The vast majority of Brazilian soils have medium to high acidity (Zambrosi et al., 2014), that is, the content of free hydrogen ions (H+) gives the soil a low hydrogenic potential (pH), being characterized by acidic solutions. The importance of this attribute is strictly related to the availability of nutrients in the soil, the influence on root growth and the development of microorganisms in the soil (Taiz et al., 2017).

In view of the above, for plant height, the superiority of the application of calcium silicate in relation to the control was observed, with no significant difference for limestone (Figure 1). Studies show that in bromatological analysis by plants of *B. brizantha* at heights of 0.60 meters, they observed that the plants submitted to the application of limestone and agricultural gypsum showed better performance than the control (without application). This is probably due to the fact that soil amendment improved acidity conditions, which

immediately made possible a greater amount of nutrients for *Brachiaria*, since soil acidity impairs the availability of nutrients to plants (Castro; Rezende, 2021).

Treatments with different thiamine concentrations significantly affected the SDM/RDM ratio (Figure 2). The application of thiamine in some species can provide the effect of biostimulant, increasing biometric and reproductive characteristics. Therefore, the exogenous application of thiamine increases the chlorophyll content in the leaf tissues, boosts the height and the accumulation of dry mass in the tissues, in addition to promoting the development of branches, flowers and grains. (Hendawy & El-Din 2010, Bedour & Rawia 2011, Mahgoub et al. 2011, Soltani et al. 2014, Vendruscolo et al. 2017).

When the CP/ADF ratio was evaluated, the limestone treatment was superior to the control treatment (Figure 3). This was possibly due to the amendment of the soil profil having favored the root growth of the plant and, therefore, a better use of the nutrients found in the soil was obtained. Castro and Rezende, 2021, testing the application of liming and gypsum in *Brachiaria brizantha*, were able to conclude that, if significant results were obtained when the soil amendment applications were carried out and in the absence of gypsum, the crude protein concentration in the plant was 31% lower than that observed in the treatment with isolated use of liming, these results affirm the benefit of liming and plastering in pasture areas.

In addition to the chemical and physical characteristics mentioned, the change in soil pH can negatively and intensely modify the microbial biomass of the soil, its activity and the bacteria/fungus ratio. The amount and composition of soil microbial biomass can be affected according to the amount of organic material, aeration, humidity, temperature, pH, cultivation system, fertilization, crop rotation, soil texture, among others (Moreira et al., 2006; Kamble et al., 2018).

The exogenous application of thiamine may appear as a technique, both aiming at the better development of plants, as well as a greater productivity of the same, when considering the alleviation of the effects from environmental stresses. Although there are studies demonstrating the feasibility of applying this element (Vendruscolo et al. 2018), the constancy of research, under different experimental conditions, is essential for the implementation of vitamins in plant production.

In conclusion, it is possible that the use of limestone and silicate is beneficial for plant development and improvement of *Urochloa brizantha* digestibility. In addition, under the conditions in which the experiment was carried out, thiamine did not significantly affect the development and bromatological quality of the plants. However, the reduction effect on the relationship between shoot dry mass and root dry mass may reflect on a technique for increasing resistance to water deficit, which can be studied in the future.

REFERENCES

Artur, A. G., & Monteiro, F. A. (2014). Marandu palisadegrass growth and nutrient accumulation as affect by nitrogen and sulfur fertilizations. Australian Journal of Crop Science, 8(3), 422-429.

Berça, A. S., Cardoso, A. D. S., Longhini, V. Z., Tedeschi, L. O., Boddey, R. M., Reis, R. A., & Ruggieri, A. C. (2021). Protein and carbohydrate fractions in warm-season pastures: effects of nitrogen management strategies. Agronomy, 11(5), 847. DOI: 10.3390/agronomy11050847

Bedour, A. A. L., & Rawia, A. E. (2011). Improving gladiolus growth, flower keeping quality by using some vitamins application. The Journal of American Science, 7(3), 169-174.

Carvalho, T. B., & De Zen, S. (2017). A cadeia de Pecuária de Corte no Brasil: evolução e tendências. Revista iPecege, 3(1), 85-99. DOI: 10.22167/r.ipecege.2017.1.85

Castro, F. R. de.; Rezende, C. F. A. (2021). Use of soil correctives and the recovery of degraded pasture of *Braquiaria brizantha* . Research, Society and Development, 10(15), e76101522617. DOI: 10.33448/rsd-v10i15.22617.

Corrêa, J. C., Büll, L. T., Crusciol, C. A. C., Marcelino, R., & Mauad, M. (2007). Correção da acidez e mobilidade de íons em Latossolo com aplicação superficial de escória, lama cal, lodos de esgoto e calcário. Pesquisa Agropecuária Brasileira, 42, 1307-1317. DOI: 10.1590/S0100-204X2007000900013

Dias-Filho, M. B. (2014). Diagnóstico das pastagens no Brasil. Embrapa Amazônia Oriental-Documentos (INFOTECA-E).

Fortes, C. A., Pinto, J. C., Furtini Neto, A. E., Morais, A. R. D., Evangelista, A. R., & Souza, R. M. D. (2008). Níveis de silicato de cálcio e magnésio na produção das gramídeas Marandu e Tanzânia cultivadas em um Neossolo Quartzarênico. Ciência e Agrotecnologia, 32(1), 267-274. DOI: 10.1590/S1413-70542008000100038

Goyer, A. (2010). Thiamine in plants: aspects of its metabolism and functions. Phytochemistry, 71(14-15), 1615-1624. DOI: 10.1016/j.phytochem.2010.06.022

Gurmessa, B. (2021). Soil acidity challenges and the significance of liming and organic amendments in tropical agricultural lands with reference to Ethiopia. Environment, Development and Sustainability, 23(1), 77-99. DOI:10.1007/s10668-020-00615-2

Hendawy, S. F., & El-Din, A. E. (2010). Growth and yield of Foeniculum vulgare var. azoricum as influenced by some vitamins and amino acids. Ozean Journal Applied Science, 3(1), 113-123.

Kamble, P. N., & BÅÅTH, E. (2018). Carbon and nitrogen amendments lead to differential growth of bacterial and fungal communities in a high-pH soil. Pedosphere, 28(2), 255-260. DOI: 10.1016/S1002-0160(18)60014-1

Mahgoub, M. H., Abd El Aziz, N. G., & Mazhar, M. A. (2011). Response of Dahlia pinnata L. plant to foliar spray with putrescine and thiamine on growth, flowering and photosynthetic pigments. American-Eurasian Journal of Agricultural & Environmental Sciences, 10(5), 769-777.

Moraes, E. R., dos Reis, A. C., da Silva, N. E. P., Ferreira, M., & de Menezes, F. G. (2018). Nutrientes no solo e produção de quiabo conforme doses de silicato de cálcio e magnésio. Revista de Agricultura Neotropical, 5(1), 60-65.

Moreira, F. M. S, & Siqueira, J. O. (2002). Microbiologia e bioquímica do solo. 2 ed. Editora Ufla

Soltani, Y., Saffari, V. R., & Maghsoudi Moud, A. A. (2014). Response of growth, flowering and some biochemical constituents of *Calendula officinalis* L. to foliar application of salicylic acid, ascorbic acid and thiamine. Ethno-Pharmaceutical Products 1: 37-44.

Taiz, L., Zeiger, E., Møller, I. M., & Murphy, A. (2015). Plant physiology and development (No. Ed. 6). Sinauer Associates Incorporated.

Valle, C. D., Barrios, S. C. L., Jank, L., & Santos, M. F. (2014). Melhoramento de plantas forrageiras para uma pecuária de baixa emissão de carbono. Intensificação da produção animal em pastagens. GEPI, Sinop, MT, 109-140.

Vendruscolo EP; Oliveira PR; Rodrigues AHA; Correa SR; Campos LFC; Seleguini A; Lima SF. (2021). Chlorophyll concentration and production of *Urochloa decumbens* treated with diazotrophic bacteria and thiamine in the Brazilian Cerrado. Tropical Grasslands, 9(1):134-137. DOI: 10.17138/tgft(9)134-137

Vendruscolo, E. P., de Oliveira, P. R., & Seleguini, A. (2017). Aplicação de niacina ou tiamina promovem incremento no desenvolvimento de mostarda. Revista Cultura Agronômica, 26(3), 433-442. DOI: 2446-8355.2017v26n3p433-442

Vendruscolo, E. P., Siqueira, A. P. S., Rodrigues, A. H. A., de Oliveira, P. R., Correia, S. R., & Seleguini, A. (2018). Viabilidade econômica do cultivo de milho doce submetido à inoculação com *Azospirillum brasilense* e soluções de tiamina. Amazonian Journal of Agricultural and Environmental Sciences, 61, 1-7. DOI: 10.22491/rca.2018.2674

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