Evaluation of commercial product in the foliar fertilization of Brachiaria

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ABSTRACT
Knowing about the benefits of a good bioactivator on forage cultivation is extremely important to obtain more satisfactory results. As a result, this study aims to know the the performance of foliar fertilization with the product Raizal® in forages of the genus Brachiaria in Tocantins, making research on the action of this product in forage crops necessary both for the improvement of new plantations and in the increase of regrowth power for the recovery of degraded pastures. The study will be carried out in the field at Centro Universitário Presidente Antônio Carlos, where experimental posts will be used to determine the productivity of grass with the use of Raizal® foliar fertilizer in different doses, following the dose indicated by the manufactures, half of the dose anda the dosage higher than recommended, as well as a sample without fertilizer application so that the effects of the Raizal® product on the plants used in the experiment can be demonstrated through greaterperformance and productivity according to the amount of product applied.

Keywords: Foliar Fertilizer, Livestock, Pasture degradation, Biostimulators.

1 INTRODUCTION

Brazilian livestock is characterized by the extensive exploitation of pastures, which are outdated due to the excess of animals per hectare, fragile soils and by its use as the main source of food because it contains the fundamental nutrients that help for an advantageous performance of both beef and milk animals (RUBENICH, 2015).

This amplitude in the exploitation of pastures, according to Ferreira and Zanine (2007), is due to the economic viability and feeding habits offered to the herd, requiring greater quantity and better quality of products.

In recent years in Brazil the pastures have shown growth, however they are still well below the real production capacity in tropical climate, being able to achieve a higher productivity (BARBOSA., et al, 2007).

For this to happen it is necessary that the soil and labor are more efficient, making use of technologies and appropriate management practices that contribute to the increase and improvement in production (OLIVEIRA, 2016).

According to Silva et al., (2012), among the technologies that contribute to the increase of forage productivity is the use of bioactivators, which is the anointing of vegetables to biochemical compounds that can alter the productivity, growth and quality of plants.

Bioactivating products include formulations of compounds with microorganisms and substances that promote better conditions in the development of forages acting in the activation of cell metabolism, helping the plant in physiological processes at different stages of development (EBIC, 2010). They stimulate the formation of shoots, induce root growth due to a higher rate in cell development (ROSE et al., 2014).

The relationship between bioactivators and the various agricultural crops enables the balance hormonal plants, contributing to the genetic potential in order to stimulate the evolution of the same both shoot and roots (CASTRO AND VIEIRA, 2001).

Thus, having knowledge of the action and the specific effects of the use of bioactivators intentionally used in pastures can establish mechanisms that optimize production, making Brazilian livestock more sustainable, since instead of new pastures they present the possibility of recovery of degraded pastures.

For Oliveira (2016), it is evident the increased productivity due to the use of bioactivators in the most diverse crops and this makes them promising, making it noticeable the need to conduct research that addresses the use of these products in forages, verifying their effectiveness and the ideal amount to be applied, in the search to present a new way to improve and strengthen the systems used in the cultivation of forages in Brazil.

Thus, there is a need to carry out the research, which seeks to study new techniques to enable the production of grass on a larger scale and in a shorter time, also assisting in the process of recovery of degraded pastures through the use of a rooting fertilizer that demonstrates that it can be a good alternative to significantly increase the performance of forages.

In this scenario, the theme is justified by the need to expose by means of studies the performance of the bioactivator Raizal® which stands out for being a mixed mineral foliar fertilizer, associated with NPK fertilizer, composed of plant extracts with biologically active phytohormones in the performance of a grass crop of the genus *Brachiaria Brizantha* cv. Marandu, selected for its practicality of management, its potential for regrowth and for adapting better to the tropical climate with development entirely exposed to the sun, where it will seek to obtain results of the performance of the same both in the gain of dry matter, leaf length, number of tillers, chlorophyll measurement, leaf and stem ratio, weight and root length through the analysis of collected data that will be as a basis for producers and students, who seek to have greater knowledge about the effects and results and application of this product to the cultivation of forages.

Thus, the objective of this research is to evaluate the three dosages of the leaf bioactivator Raizal® at different times of application in *Brachiaria Brizantha* cv. Marandu, exposing the minimalist analysis on the productivity, the degree of recovery and structure of the grass achieved during the research.

2 LITERATURE REVIEW

2.1 PASTURE AREA IN BRAZIL

According to IBGE data (2006), the exploitation of livestock in Brazil corresponds to most of the economy, and pastures are equivalent to the largest agricultural practice in the country, because grazing represents the largest food base of the herd, which makes them of paramount importance.

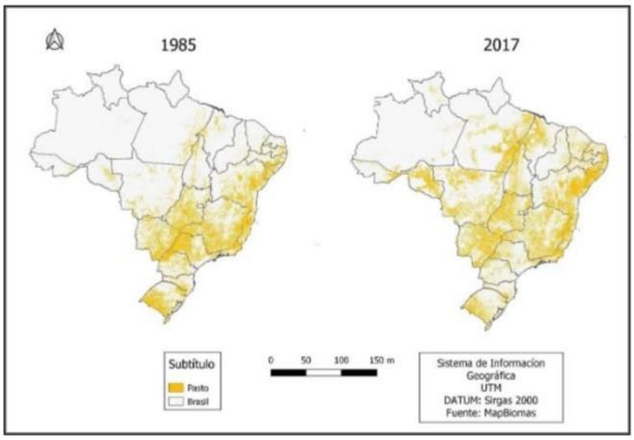
According to the Brazilian Agricultural Census in 2006, the total area of pastures in Brazil was about 172.3 million hectares, however, despite the important role of pastures for Brazilian livestock, degradations of about 80% of the planted areas are observed, resulting from extractive activity present in livestock. (IBGE, 2007)

Currently the pastures in Brazil occupy about 154 million hectares, being present in the six different biomes, and can be considered even greater when taking into account the natural fields, especially in the Pampa and Pantanal that occupy about 46.6 million hectares and 45 million hectares that correspond to areas where it is not possible to define between agriculture and pasture, called the "mosaic of agriculture and grazing." (BRAGANÇA, 2021)

Bragança (2021) states that according to Mapbiomas data between the years 1985 to 2020 it was identified that about 252 million hectares are pasture or have already been occupied by them.

To better understand the distribution of pasture areas in the Brazilian territory, follows a mapping done by Mapbiomas, where it is possible to know the reality of pastures in the national territory in the year 1985 and 2017.

Figure 1: Distribution of pasture in Brazil in 1985 and 2017



Through the map it is possible to identify that initially the Pastures Brazilian they met, but in the coastal regions and with the passage of time moved to the South and Southeast, still reaching the North of the country, expanding borders.

About degradation, Nogueira (2022) says that it will always be a problem and that about 50% to 70% of the pasture area is in the process of degradation. The same states that the way they deal with the subject hinders the diagnosis that leads to solve the problem more adequately, because for him the degradation process is gradual, losing vigor of regrowth, productive capacity of leaves and tillers and support capacity consequently with worsening in quality.

With this, the degradation of pastures becomes one of the major obstacles faced by cattle ranching, since its great majority is conducted in poor soils with low productivity (IEIRI *et al*., 2010).

Another factor that favors degradation was cited by Rezende *et al*., (2015), who highlights the lack of fertilization, which according to him are usually only carried out in planting.

Fagundes *et al*., (2005) states that for a Better development and expansion of livestock is necessary an adequate management that aims at higher productivity and quality of pastures in order to enhance the use of natural resources and inputs.

For the author, the productivity of pastures does not depend solely on genetic factors and points out that to preserve and increase the productive capacity of the soil it is essential to fertilize, because they supply the deficiencies of the soil by providing the nutrients they need.

2.2 RAIZAL® BIOACTIVATOR

Among the techniques used to improve forage productivity is the use of foliar fertilizers and bioactivators. According to Silva (2016), foliar fertilizers have the function of correcting soil nutritional deficiencies not achieved through base fertilization, being the most advantageous form of supplementation, Correcting Deficiencies Increasing the levels of dry mass, the speed of growth and the quality of the product, already the bioactivators provide water and hormones to the plants influencing their growth and development due to the hormonal balance it provides, favoring the genetic factors and consequently the performance of the root system.

Despite the functions of bioactivators Orlando Filho (1993) makes his considerations where he states that even if hormonal products are very efficient in improving plant productivity, they are limited by some factors and highlights one of them, nutrition, which is essential to achieve satisfactory results.

For Silva *et al.*, (2012) these products are a combination of biochemical compounds and plant regulators that act as hormones modifying the quality, productivity and growth of crops. However, Castro and Vieira (2001) say that the use of the same has shown in the most diverse crops an increase in productivity, and this is due to the favoring of the genetic potential, which promotes a hormonal balance of the plant.

Castro and Vieira (2001), also states that it is possible to attribute the good performance of forages to the action of bioactivators due to presence of phytohormones in its composition, which acts in order to stimulate division and lengthen cells, which makes them interesting as an object of study to evaluate their influence on increased productivity of forage grasses.

Knowing the action of these products in pasture crops can establish other options in order to optimize productivity. With this it is necessary to study the properties of these products under the forages, evaluating their effectiveness, determining the amount for application in order to potentiate and improve the productivity of forages in the northern region of the state of Tocantins.

In the context, a leaf bioactivator was evaluated on the production, chemical and structural composition of *Brachiaria Brizantha* Marandu grass. Among the various "bioactivating" products present in the market, Raizal® was chosen because it is a bioactivator whose function is to provide nutrients for a better performance of plants, providing adequate nutritional supplementation in order to favor the root and vegetative performance of the plant. (UPL, [N.D])

Figure 2: Raizal® Product

Source: Own author

As for its chemical composition:

Table 1: Chemical composition of fertilizer

Nutrients	Amount (%)
Water-soluble nitrogen (N)	9,00
Phosphorus soluble in water (P_2O_5)	45,00
Potassium oxide soluble in water (K_2O)	11,00

Source:Arysta LifeScince

2.3 BRACHIARIA BRIZANTHA CV. MARANDU

The grasses of the genus *Brachiaria Brizantha*, according to Bonfim da Silva and Monteiro (2006) occupy about 20% of the degraded pastures throughout the Brazilian territory.

From the group of grasses of the genus *Brachiaria Brizatha*, one of them is differentiated, the CV. Marandu, also known as brachiarão, because it is a resistant and burly plant being one of the most used in Brazil, due to its climatic adaptability and its high productivity, increasing the capacity of livestock in Brazil (WALNUT, 2019).

Figure 3: CV. Marandu

Source: NOGUEIRA (2019)

As for the characteristics of the plant, Costa (2005) cites:

> [...] it is a perennial forage grass of cespitous growth habit, forming caps of up to 1.0 m in diameter and tillers with a height of up to 1.5 m. It presents short, hard, curved horizontal rhizomes, covered by glabrous scales of yellow to purple color. Its roots are deep, which favors its survival during periods of prolonged drought."

As for its agronomic characteristics, the author also points out good adaptation and productivity in soil of medium fertility, with good adaptation in sandy soils, deep root that allows the capture of water in the dry period, being resistant to leafhoppers, with greater palatability, but presenting as a disadvantage not to support soaked soils for a long term, which can cause root rot, leading to the death of the grass. (COSTA, 2005)

2.4 SOIL CHARACTERISTICS AND CLIMATE

To perform the performance analysis of Raizal® in the forage chosen, initially an evaluation of the soil and climatic conditions was made.

For this soil analysis, a sample quantity of the same was removed from the arable layer for data collection. This is one of the ways to measure the production capacity of the soil to be exploited, to obtain a higher productivity.

Through the analysis it was possible to observe that the soil conditions of the region from where the sample was taken, presented a mixed soil, with little fertility, like much of the soil of Tocantins.

As for the climatic characteristics, it could be observed that the rainy season usually begins in mid-October, stabilizing normally at the end of November, having at the beginning of December a small drought in the case of summer, presenting in the months of January, February and March a much higher percentage of rainfall.

Through the rain gauge it was possible to calculate the achieved index of the annual rainfall variation, being between 1900 and 2400mm.

As for the temperature according to EMBRAPA (n.d.), the climate corresponds to that of the savannah, presenting in the coldest months temperatures always above 18 ºC, with an annual average that varies between 24 ºC and 28 ºC, with a maximum of 38ºC.

Fagundes et al., (2010) clarifies how climate change can modify forage productivity, stating:

> [...] it will likely be accompanied by an increase in air temperature due to the increase in the concentration of carbon dioxide (CO2), directly influencing the development, growth and yield of agriculture.

3 MATERIALS AND METHODS

The study was conducted in the experimental field at the Centro Universitário Presidente Antônio Carlos in the municipality of Araguaína in the state of Tocantins.

For the region where the study was directed the average altitude is 180 meters and the koppen classification is Aw (tropical climate with dry season) 06º 46' 25" S and 48º 17' 49" W.

For forage performance analysis, one of the challenges is an adequate diagnosis. Because of this, a classification of the climatic conditions of the state was made, and of the soil conditions of the experimental field, through laboratory analysis, where samples were taken from the soil and sent to Gurupi-TO.

Soil analysis corresponds to one of the means of evaluating how fertile the soil to be exploited is, enabling a more effective liming and fertilization. The soil undergoes constant variations due to the various corrections using the addition of concealers and fertilizers from other crops and because of this the sample was removed from the arable part of the land for analysis.

Through the analysis performed, the results were obtained, with the following chemical and physical characteristics where: as for the chemical characteristics of the layer 0.8 mg dm-3 of P meh; 1.6 dag. Kg-1 of M.O.; 4.4 of Ph (CaCl2); 0.08; 1.7; 1.4; 2.50; 5.80 cmolc dm-3 of K, Ca, Mg, Al and H+Al, respectively; 1.9 mg dm-3 of Zn and 35% saturation per base; as for the physical characteristics of the granulometry: 175, 50, 775 g. kg-1 of clay, silt and total sand, respectively, as can be seen in the analysis below

Figure 4: Soil Analysis Experimental Field

sellar análises agrícolas

Laboratório Aprovado PAQLF Embrapa Solos Programa de Análise de Qualidade de Laboratórios de Fertilidade da Embrapa

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Laudo de Análise Solo

Laudo Nº 2052/2022
Solicitante: AURIONE BARBOSA GUEDES
Proprietário: AURIONE BARBOSA GUEDES
Propriedade: FACULDADE UNITPAC
Entrada: 15/03/2022
Gerado: 18/03/2022
Município: Araguaína - TO
Convênio: PARTICULAR

PROGRAMA DE QUALIDADE DE ANÁLISE DE SOLO BÁSICA + MICRONUTRIENTES 2021 IAC

Número Sellar		4615
Identificação da Amostra		01
Determinação	**Unidade**	
pH Água	-	
pH $CaCl_2$	-	4,4
P Total	%	
P meh	$mg.dm^{-3}$	0,8
P resina	$mg.dm^{-3}$	
$S\text{-}SO_4^{-2}$	$mg.dm^{-3}$	7
K	$mg.dm^{-3}$	32
K	$cmol_c.dm^{-3}$	0,08
Ca	$cmol_c.dm^{-3}$	1,7
Mg	$cmol_c.dm^{-3}$	1,4
Al	$cmol_c.dm^{-3}$	2,50
H+Al	$cmol_c.dm^{-3}$	5,80
M.O.	$dag.kg^{-1}$	1,6
C.O.	$dag.kg^{-1}$	0,9
B	$mg.dm^{-3}$	0,17
Cu	$mg.dm^{-3}$	1,2
Fe	$mg.dm^{-3}$	6
Mn	$mg.dm^{-3}$	6,1
Zn	$mg.dm^{-3}$	1,9
SB	$cmol_c.dm^{-3}$	3,18
CTC_t	$cmol_c.dm^{-3}$	8,98
V	%	35
m	%	44
Ca/T	%	19
Mg/T	%	16
K/T	%	1
Ca/Mg		1,2
Ca/K		21,3
Mg/K		17,5
Análise Granulométrica		
Argila	$g.kg^{-1}$	175
Silte	$g.kg^{-1}$	50
Areia Total	$g.kg^{-1}$	775
Classificação		Média
Tipo de Solo (MAPA)		1

Extratores:
P, K : Mehlich 1;
Cu, Fe, Mn e Zn: DTPA;
Ca, Mg e Al: KCl 1M;
S: Fosfato monobásico de Cálcio;
B: Água quente;
P(Res): Resina;

Simbologia:
CTC_t = CTC total
C.O. = Carbono Orgânico total
V% = Sat. Bases
m% = Sat. Alumínio

Conversão de unidades:
$mg.dm^{-3}$ = ppm
$dag.kg^{-1}$ = %

Observações:
-O laboratório não responsabiliza por interpretações dos resultados das análises.
-Este laudo não tem fins jurídicos.
-Após 90 dias todas as amostras serão descartadas.
-Tipo de análise (MAPA) de acordo com a instrução normativa nº2, de 9 de outubro de 2008(*).

Weberson Ribeiro
Responsável Técnico
CREA/CRQ: 124003422

Página 1

Source: Sellar Laboratory (2022)

In this way it was possible to observe that the soil of the experimental field corresponds to a soil with a higher percentage of sand and silt than clay, characterizing a very sandy soil.

The study was set up on February 17, 2022, where it was conducted in a completely randomized design with a 3x2 factorial arrangement with additional treatment being the factors kg/ha (1, 2 and 3), days after germination with 15 and 30 days for application, with the additional treatment being the control.

Data were submitted to analysis of variance followed by the T-Student mean comparison test (P=0.05).

For the experiment, 21 pots (11 L) were used, with hillside soil free of weed seed bank and classified as red-yellow latosol.

Figure 5: Soil separation for the experiment

Source: The author

Figure 6: Design Vessels

Source: The author

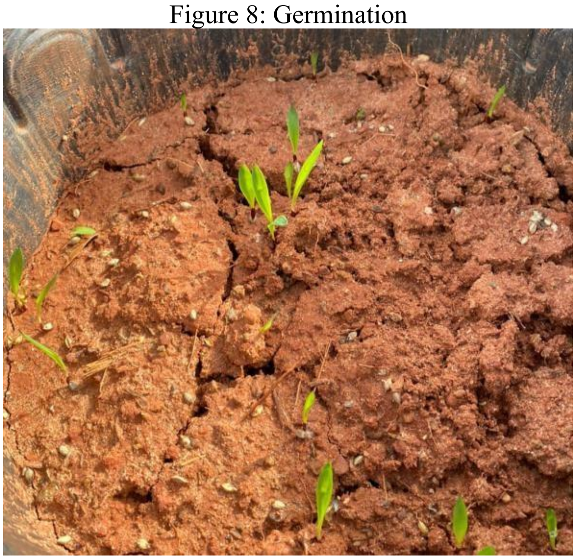
Sowing was carried out on March 12, where it was done with 30 seeds per pot, with an average of 10 viable seeds in each pot.

Figure 7: Sowing

Source: The author

In order to separate only the plants necessary for the experiment, thinning was done, where 5 plants with 9 days after germination were randomly chosen, that is, separated on March 23, without taking any specific characteristic into consideration.

Figure 8: Germination



Source: The author

Figure 9: Thinning

Source: The author

The pots were irrigated whenever necessary to maintain the field capacity in the experimental vessels.

The treatments were:

T1. Application of Raizal® with dosage of 1 kg/ha, with 15 days after germination.

T2. Application of Raizal® with dosage of 2 kg/ha, dose recommended by the manufacturer with 15 days after germination.

T3. Application of Raizal® with dosage of 3 kg/ha, with 15 days after germination.

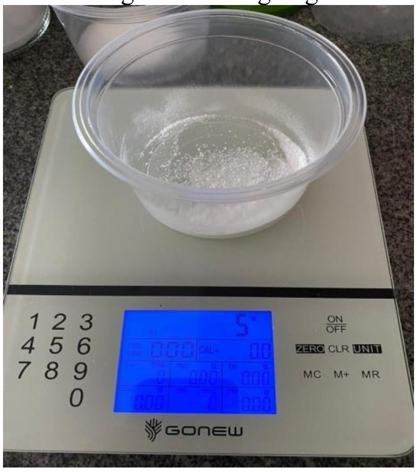
T4. Application of Raizal® with dosage of 1 kg/ha, with 30 days after germination.

T5. Application of Raizal® with dosage of 2 kg/ha, dose recommended by the manufacturer with 30 days after germination.

T6. Application of Raizal® with dosage of 3 kg/ha with 30 days after germination.

T7. Experiment without any application called Witness.

Figure 10: Weighing



Source: The author

Figure 11: Application-ready products

Source: The author

Figure 12: Application

Source: The author

The treatments were applied according to the recommendation of the manufacturers except for the doses, as it is one of the factors of the study.

During the forage performance process, the attack of ants was identified and then the application of insecticide in the dosage recommended by the manufacturer was made.

Figure 13: Ant attack

Source: The author

Figure 14: Insecticide

Source: The author

With this it is seen that management techniques are made that involve the application of pesticides and other techniques that aim at good performance, without considering the interference of external factors that can influence the result of the study, not following a pattern, but acting according to the need of the plants.

The data were submitted to the Shapiro and Wilk normality test (1965) and Levene homoscedasticity (1960). After accepting these assumptions, the data will be submitted to analysis of variance and the means compared by the t-student test at 5% probability of type 1 error.

4 RESULTS ACHIEVED

The conduct of the study was focused on the performance of forage production of the genera *Brachiaria* through the application of the foliar fertilizer Raizal® observing their performance.

At the end of the study it was possible to identify how the forages were responsive to the bioactivator Raizal®, in different dosages and period of application.

As can be seen in the table below regarding the results of fresh matter (MF):

Table 2: MF Root Weight, MF Leaf Weight, SMB Weight MFe Sheath Weight MF

Days	Fertilizer Conc. (kg/ha)			Averages	Control	P[1]			CV (%)
	1	2	3			Conc.	Days	Conc. X Days	
MF Root Weight									
15	2,3833	1,7667	1,5767 *	1,8700 A					
30	1,7067	2,6800	1,2233 *	1,9089 A	0,6567*	0,065	0,887	0,074	30,93
Averages	2,0450 a	2,2233 a	1,4000b						
MF Sheet Weight									
15	1,8633	1,8600	2,3000	2,0077 A					
30	2,3066	3,1666	2,2300	2,5677 A	0,6600*	0,438	0,056	0,141	25,40
Averages	1,86333 a	1,86000 a	2,3000 a						
MF Stem Weight									
15	1,0033	1,1067	1,0800	1,0367A					
30	0,8400	1,4567	0,8133	1,0633A	0,2267*	0,018	0,789	0,053	20,88
Averages	0,9216 b	1,2817a	0,9467b						
MF Sheath Weight									
15	0,3767*	0,2800*	0,5933	0,4167A					
30	0,6033	0,7367	0,5433	0,6278A	1,733*	0,798	0,053	0,152	42,36
Averages	0,49000a	0,50833a	0,56833 a						

Source: The author

In table 2, it can be said that as for the MF root weight, the treatments with 1 and 2 kg/ha obtained statistically equal results, regardless of the time of application. In the treatments that were administered with 3 kg/ha there is a difference in the total weight of roots, that is, this dosage does not favor the development of root. When compared to the control, the application with the use of 3 kg/ha presented similar results.

As for the MF leaf weight, all results were the same regardless of the dosage and period of application, differing only from the control.

In the MF Colmo weight, only the treatments conducted with 2 kg/ha obtained a satisfactory result, and in the treatments with 1 and 3 kg/ha the results were equal. However, it can be noted that even without satisfactory results, they were better than the control.

As for the MF Sheath Weight, all results were the same, but in the treatments with 1 and 2 kg/ha, administered in the period of 15 days, the results were equal to the control.

Figure 15: Weighing of root, leaves, stem and Sheath MF

Source: The author

Table with dry matter results (MS);

Table 3: MS Root Weight, MS Leaf Weight, MS Stem Weight, and MS Sheath Weight

Days	Fertilizer Conc. (kg/ha)			Averages	Control	P[1]			CV
	1	2	3			Conc.	Days	Conc. X Days	(%)
MF Root Weight									
15	2,2733	1,6500	1,4167	1,7800 A					
30	1,4267	2,0933	0,9767*	1,4989 A	0,5900*	0,062	0,255	0,114	31,19
Averages	1,8500a	1,8717a	1,1967 b						
MF Sheet Weight									
Days	1	2	3	Averages	Control	Conc.	Days	Conc. X Days	CV (%)
15	1,1933	0,8967	1,0967	1,0622 A					
30	1,0767	1,0367	0,8900	1,0011 A	0,3067*	0,515	0,633	0,519	26,88
Averages	1,1350a	0,9667a	0,9333 a						
MF Stem Weight									
Days	1	2	3	Averages	Control	Conc.	Days	Conc. X Days	CV (%)
15	0,3133	0,3467	0,3600	0,3400 A					
30	0,2400	0,3833	0,2000	0,2744 A	0,021*	0,213	0,160	0,221	32,48
Averages	0,2767a	0,3650a	0,2800 a						
MF Sheath Weight									
Days	1	2	3	Averages	Control	Conc.	Days	Conc. X Days	CV (%)
15	0,2367	0,1867	0,3133	0,2456 A					
30	0,2567	0,2633	0,2200	0,2467 A	0,015*	0,647	0,976	0,185	33,31
Averages	0,2467a	0,2250a	0,2667 a						

Source: The author

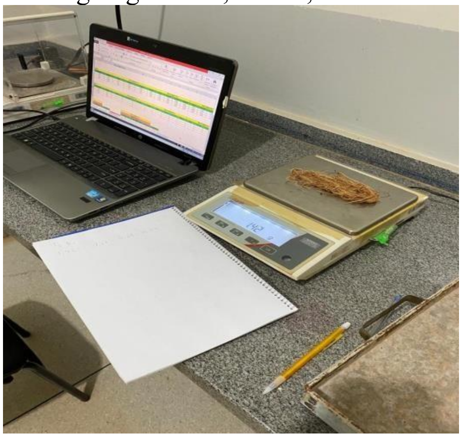
The following results were obtained in table 3:

As for the weight of MS root, the dosages of

1 and 2 kg/ha were equal and better than those directed with 3 kg/ha, which presented a similar result to the control with application of 30 days, which may indicate phytotoxicity for the plant.

As for the weight of MS leaf, stem and Sheath there was no significant difference in performance, being only better than the control.

Figure 16: Weighing of root, leaves, stem and Sheath MS



Source: The author

Table with results of the other items analyzed:

Table 4: Stem Height, Number of Tillers, Root in cm and Chlorophyll

CM Height

Days	Fertilizer Conc. (kg/ha) 1	2	3	Averages	Control	P[1] Conc.	Days	Conc. X Days	CV (%)
15	55,6667	51,8000	56,7333	54,7333 A					
30	54,0000	53,2667	47,2000	51,4889 A	35,80*	0,561	0,175	0,164	9,87
Averages	54,8333a	52,5333a	51,9667a						

N tillers

Days	Fertilizer Conc. (kg/ha) 1	2	3	Averages	Control	P[1] Conc.	Days	Conc. X Days	CV (%)
15	3,533* Aa	3,333* Ba	3,733* Ba	3,533					
30	4,600 Ab	6,467 Aa	5,333 Ab	5,466	3,367*	0,116	<0,001	0,040	14,31
Averages	4,067	4,900	4,533						

CM Root

Days	Fertilizer Conc. (kg/ha) 1	2	3	Averages	Control	P[1] Conc.	Days	Conc. X Days	CV (%)
15	24,8667Ab	24,9333Bb	30,6667 Aa	26,8222					
30	27,4000Ab	30,2667 Aa	26,7333Bb	28,1333	20,3333*	0,049	0,107	0,001	6,05
Averages	26,1333	27,6000	28,7000						

Chlorophyll

Days	Fertilizer Conc. (kg/ha) 1	2	3	Averages	Control	P[1] Conc.	Days / Dias	Conc. X Days / Conc. X Dias	CV (%)
15	21,5933	23,8133	24,8733	23,4267 B					
30	25,7000	26,6133	28,3867	26,9000 A	19,7400*	0,001	<0,001	0,573	4,13
Averages	23,6467 c	25,2133 b	26,6300 a						

Source: The author

In what corresponds to the height in cm, in all dosages the results were equal regardless of the period of application and better than the control.

As for the root in cm, with the application of 1 kg/ha the results presented were the same, regardless of the period of application, but when using 2 kg/ha of the product the best is that the application is made with 30 days after germination, but when applying 3 kg/ha the ideal is that the application is made with 15 days after germination.

In the evaluation of the number of profiles, all dosages applied with 15 days were equal to the control, not being feasible the application, since if application is made with 30 days after germination the results will be better than the control, with better tillering, providing better ground cover.

As for Chlorophyll, it was observed that the treatment with 3 kg/ha had better results, presenting in the period of 30 days of application better result than with 15 days, making it evident that there was no interaction, but the product and the time of application influence on the chlorophyll content of the plant, that is, the more administered the product the more chlorophyll there will be in it.

Figure 17: Chlorophyll measurement

Source: Own author

5 CONCLUSION

Through the interpretation of the analysis it was possible to reach the conclusion that statistically the application of the product with the amount of 2 kg/ha in the period of 30 days after germination generated a better result, but when taken into account the cost benefit the application with 1 kg/ha with 30 days after germination is economically more viable due to little difference in forage performance.

Regarding the dosage of application with 3kg/ha, the plants showed characteristics of intoxication by the product, being identified spots and necrosis in the tillers.

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