Chapter 152

Nutritive value of elephant grass obtained at different cutting ages in the transitional climate and soil of savae/forest of the state of Roraima

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ABSTRACT
The objective of this study was to evaluate the nutritive value of elephant grass obtained at different cutting ages, being cultivated in the transition region of the state of Roraima, leaving the forest of the South of the state to the north savannah , from chemical-bromatological analyses and *in* situ degradability. For this purpose, a randomized block design was used, being evaluated at five cutting ages (35, 45, 55, 65, and 75 days of cutting age), each with 4 replications. Weeding scans already established on campus were used. After collection on the predetermined days, the samples were pre-seed for subsequent chemical-bromatological analyses (DM, MM, Mo EE, PB and EDF) and in situ degradability of DM and THD were performed. A significant difference (P<0.05) was observed for MM, OM and CP and (P<0.01) for the degradability of DM and THS. Thus, with the advancing age of cutting of elephant grass, it was found that there are reductions in the contents of CP, MM and degradability of DM and THD, as well as an increase in OM and THD levels.

Keywords: Characterization, degradability, fodder, Pennisetum *purpureum*

1 INTRODUCTION

The ephemerate grass (Pennisetum purpureum Schum.) one of the most widely used perennial forage plants with high growth potential (REZENDE et al., 2002). Adapts to various types of soil, being an exception poorly drained soils, with possible floods, demanding in nutritional parameters, does not tolerate low pH and aluminum in the soil, without propagated mainly by stems (LOPES, 2004). Ultilized for animal supply in regioes, which can be in the form of silage, when and stored the grass, and also naturally, when and cut and destined directly to the animals, and can be mixed with some other product, such as sugarcane sugar, as well as other types of additive.

According to Lopes (2004), the main culivares of elephant grass are, amid group, cameroon group, mercker group, napier group and hybrid group, which can be associated with some legumes, when maintained a good spacing between lines.

It is a forage with excellent dry matter production potential, widespread throughout Brazil and constitutes an excellent alternative to annual crops for silage production (MONTEIRO et al., 2011). According to RODRIGUES et al. (2001), elephant grass is native to the African continent, specifically tropical Africa, between 10ºN and 20ºS latitude. It was discovered by Colonel Napier in 1905. After this it spread throughout Africa, being introduced to Brazil in 1920, coming from Cuba. Today and found in all Brazilian territory.

In the region where the Federal Institute of Education, Science and Technology of Roraima - IFRR/Campus Novo Paraíso is located, we have an ecosystem developed on sandy, hydromorphic and essentially oligotrophic soils, where soil organic matter plays an important role in maintaining these environments. It is located in a transition zone between the Open Ombrófila Forest and Campinaranas, where it is possible to identify a lowland forest or terra firme forest that occur in non-flooded areas, and may present more open stretches, discontinuous canopy, with the presence or not of palm trees or vines. It can also be identified, a vegetation of Campinarana in sandy tabular areas, ranging from Campinarana Florestada and Campinarana Gramíneo-Woodyana (MENDONÇA et al., 2013). The Campus is located in a transition area of soils with different types of vegetation, where we can identify more south of the state regions of dense forests, with trees of greater diamentros, passing through the campus where we can identify forests with trees of smaller diameter and presensa of peasants, and finally, further north, we have the savannas of the state.

When conducting a study on the soils of IFRR/Campus Novo Paraíso, Pereira (2014), classified the soils up to the 4th categorical level. The Neosols and Gleissolos studied presenting a textural variation from frank to francosandy sand, being more indicated for the preservation of fauna and flora. Plinthosols and Latosol, with francosandy textural variation, francoargilosa and clay-clayey, were indicated for agricultural cultivation , adopting conservation techniques of management of the lo.

The formation of pastures in tropical and subtropical regions is almost always restricted to low fertility lands, resulting in the slow development of grasses, leaving animals raised without pasture, requiring fertilization, mainly nitrogen and potassium, to accelerate the growth process (ANDRADE et al., 2000). However, it can be carried out other practices, in this case, feeding supplemented with elephant grass, reducing pasture costs and feeding the rest time for recovery .

The low production of fodder in the time of the allied drought is a reduction in the quality of this in the field with the advance of age, are factors responsible for the low rates of meat and milk productivity throughout Brazil. Therefore, there is a need for storage of forage of high nutritional value to provide animals in the most critical times of the year. The main form of storage is with the silage process, when grass is cut and stored anaerobically for some time. For this to happen in a safe and relevant way for the producer and important that the forage presents good leaf/stem ratio, good nutritional value and high dry matter yields. However, this technique presents a high production cost, especially for small producers who do not mechanize in their rural properties (PEREIRA et al., 2007).

Elephant grass silage is a food produced in much of Brazil, due to the statism of forage production. In northern Brazil there are two well-defined epócas of the year, and from July to March is marked by drought, where animals suffer from the lack of food in the pasture. However, most producers in the region do not have the practice of producing silage, thus requiring alternatives that lead them to know the importance of silage for animal alimetation, mainly through regional productions and studies related to the theme in the literature.

In the Brazilian territory pastures are very important, given that 70% of the land of the agricultural sector, which constitutes 30% of the national territory, is occupied by pastures (FAO, 2002), and that about

90% of the cattle slaughtered are raised exclusively in pastures or only with small weaning (LOPES, 2004).

The quality analysis of forage plants, conditioned by their physiological and morphological development, can be evaluated through and their bromatological composition. With advancing age, morphological and bromatological changes occur in grasses, such as the reduction of crude protein and phosphorus contents and dry matter digestibility and increased neutral detergent fiber, compromising the final nutritive value of the forage. It is then necessary to reconcile the forage yield with the nutritive value of the plant, in order to obtain higher animal production per unit of area (RIBEIRO; GOMIDE and PACIULLO, 1999).

With the increased demand for better quality silage in all regions, mainly for food scarcity in drought, and for pasture food supplementation, which often becomes excasso, it is important to study elephant grass, which one of the most used forage in the literature. Therefore, the objective of this work is to determine the bromatological characteristics of elephant grass grown in southern Roraima at different cutting ages.

1.1 GENERAL OBJECTIVE

This work was carried out with the objective of determining the bromatological characteristics of elephant grass at different cutting ages.

1.2 SPECIFIC OBJECTIVES

Evaluate the nutritional characteristics of elephant grass with different growth ages for use in the feeding of local animals.

Determine the contents of dry matter (DM), mineral matter (MM), organic matter (OM), ether extract (EE), crude protein (CP), neutral detergent fiber (NDF) and the degradability of neutral detergent fiber dry matter.

2 MATERIAL AND METHODS

The experiment was carried out in the premises of the Federal Institute of Education, Science and Technology of Roraima, Novo Paraíso Campus, in the City of Caracaraí - Roraima. In the geographical coordinates N 01°14'51,6" and W 60°28'20.4", altitude of 105 m. According to Barbosa (1997), the climate is classified as seasonal tropical type – Am in the Köppen classification. Typically a hot and humid climate, with precipitation between 1700 and 2000 mm annually The average annual temperature of 27.3°C (BRASIL, 2002). The soil chemical analyses were carried out at the Soil Laboratory of the Novo Paraíso campus and the bromatological chemistry at the Forage Laboratory of the State University of Southwest Bahia - Campus Juvino Oliveira, Itapetinga, Bahia.

The experiment was developed using an elephant grass weed (Pennisetum purpureum, Schum.) cv. Purple already established in the Agrostological Field of IFRR/CNP.

The weeding sump were divided into a total of 20 plots and with a total area of 150 m². The weed was divided into plots/blocks of 7.5 m², adopting the criterion of a randomized block design, with quantitative parameters. When the cutting ages were reached, the edges were considered , in this case the most extreme lines/plants of the plots, collecting for analysis only the most central plants of the area.

Five treatments were tested, considering the cutting age: Treatment 1 – Elephant grass with 35 days. Treatment 2 - Elephant grass with 45 days. Treatment 3 - Elephant grass with 55 days. Treatment 4 - Elephant grass with 65 days. Treatment 5 - Elephant grass with 75 days. Each with 4 repetitions.

Immediately after the uniformity cut at 10 cm from the soil, the weed was properly fertilized with 200 kg/ha of N (urea), 50 kg/ha of P2O5 (simple superphosphate) and 200 kg/ha of K2O (potassium chloride), according to the recommendation Embrapa Information Agency (MARTINS, et al., 2020). The grass was harvested manually with 35, 45, 55, 65, 75 days of growth, after the uniformity cut. After being harvested, the grass was chopped into pieces of approximately 2 cm, in electric forage, separated into plastic bags, past, identified and kept preserved in freezer, for subsequent defrosting, pre-drying and subsequent analysis.

The samples were placed in an oven at 60+5°C for 72 hours for pre-drying, packed, identified and sent for bromatological chemical analyses of (MS, MM, MO EE, PB and fdn) following the procedures described by SILVA & QUEIROZ (2002).

The samples were ground in mills equipped with sieves with 4mm sieves and placed in nylon bags in the amount of approximately 3.0g of dry matter (DM)/bag, in order to maintain a close ratio of 20mg of MS/cm2 of superficial sac area. (NOCEK, 1988). The incubation period corresponded to the time of 144 hours, after the bags were removed, from the rumen, where the bags were attached to a nylon cord with 30cm attached to the cannula cover and anchored with a weight of 0.5kg attached to the end of the nylon cord.

A 500±50kg Girolando cattle, canulate in the rumen and kept in Brachiaria brizantha.

After removal of all the rumen bags, the bags were thoroughly washed under running water and then subjected to drying in an air oven with forced ventilation, at 60ºC for 72 hours, and weighed to determine the disappearance of DM. The residue obtained after this stage was used for NDF analyses according to methodologies described by Silva & Queiroz (2002).

The experimental design used was randomized blocks. The data obtained were submitted to analysis of variance and regression, at 5% probability.

3 RESULTS AND DISCUSSION

Table 1 shows the chemical composition and degradability of elephant grass with the variables dry matter (DM), mineral matter (MM), organic matter (OM), ether extract (EE), crude protein (CP), neutral detergent fiber (NF) and the degradability of dry matter and neutral detergent fiber.

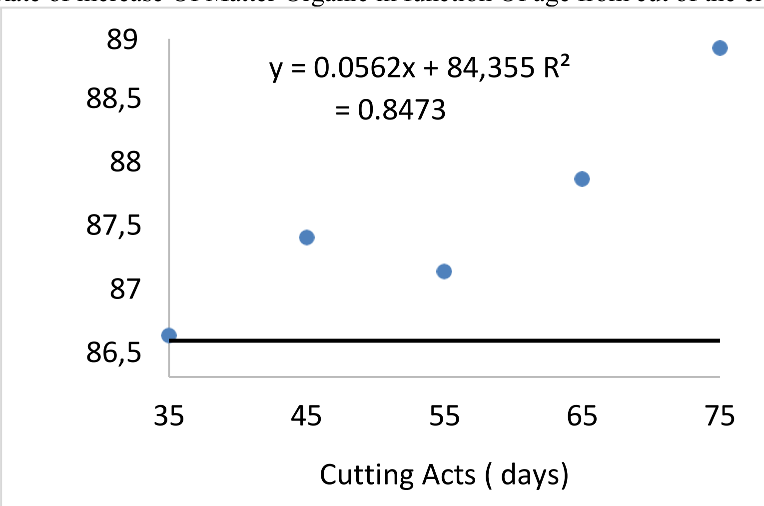
Table 1 - Means, standard error (EP) and descriptive probability levels (P-value) for chemical composition of elephant grass obtained at different ages of cuts in the climate and transitional soil savanna/floreta of the state of Roraima.

	Cutting age (days)						P-value
Items	35	45	55	65	75	EP	L
MS	13,45	12,53	12,39	12,78	13,16	0,001	0,929
MM	13,62	12,75	13,05	12,23	11,07	0,120	0,047
MO	86,37	87,24	86,94	87,76	88,92	0,120	0,047
PB	13,55	10,79	9,04	7,88	6,33	0,004	0,000
EE	2,49	1,82	1,37	1,87	1,74	0,068	0,092
FDN	62,06	62,2	62,64	64,48	66,25	0,084	0,071
Degradability							
MS	16,3	20,5	21,68	22,90	28,69	0,027	0,000
FDN	12,86	16,33	16,99	18,81	23,78	0,047	0,000

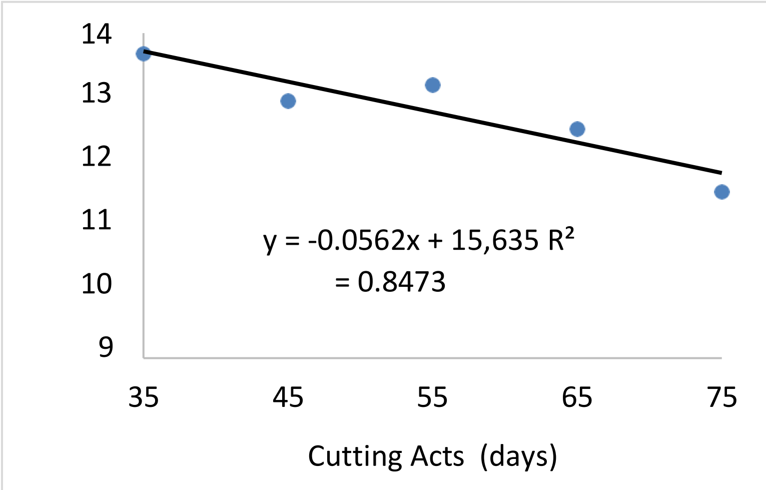
EP: Standard error; L: linear; MS, dry matter; MM, Mineral matter; OM, organic matter; PB, protein brute; EE, ether extract; FDN, neutral detergent fiber;

There was a significant difference (P<0.05) for the variables OM, MM and CP. As noted in Table 1, while the mineral matter was slightly reduced, the organic matter was increasing (graph 1 and 2), this is due to being inversely proportional, since to obtain the OM value, the equation: 100-MM is used.

Graph 1 – Rate of increase Of Matter Organic in function Of age from cut of the elephant grass

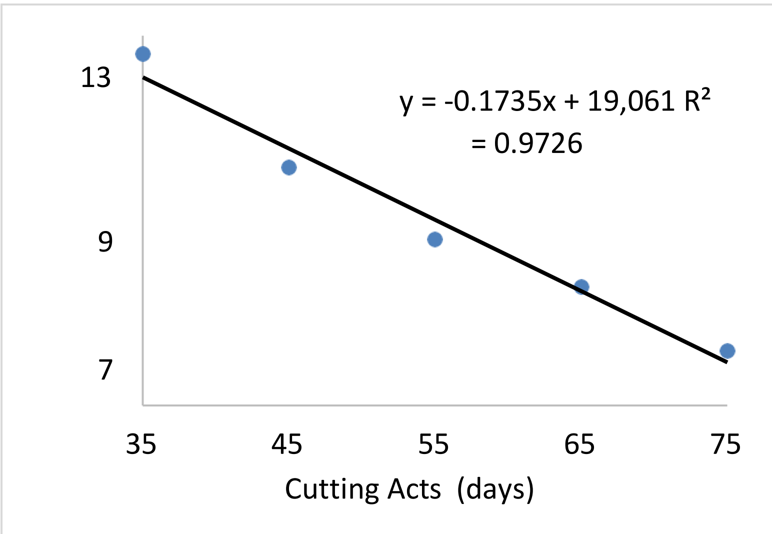


Graph 2 – Rate of reduction in Mineral matter in function Of age from cut of the elephant grass



Crude protein (CP) was also influenced as a function of the cutting age ($P<0.05$) decreasing linearly as shown in graph 3. The treatment with 35 days of growth was the one that presented crude protein level of 13.55%, decreasing to 6.33% when the cutting age of 75 days reached. As can be seen in Table 1, most protein values are above the value recommended by Van Soest (1994) which is 7%, a value considered as a minimum limit so that the digestibility of a forage does not limit the consumption of ruminants.

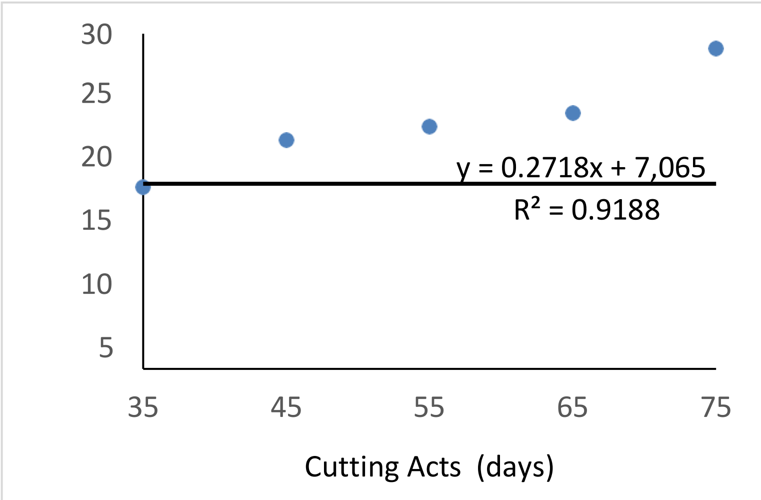
Graph 3 –Rate from reduction in Protein gross in function Of age from cut of the elephant grass



Only the treatment at 75 days of cutting age did not present relevant results, making it impossible to supply only the forage to the animal, being indicated the use of additives in order to increase the availability protein. As widely published in the literature, elephant grass is widely used in the preparation of silage because it presents high production of green matter, however it is necessary to use additives to reduce moisture and increase the level of protein. All the variables mentioned presented results mentioned above had influence of the growth days, due to the increase in plant age, however, with 75 days of growth the plant still has low levels of dry matter, which makes it impossible to use for silage, and therefore, having to increase its period for cutting, also implying a pronounced reduction of protein levels, ethereal extract and fiber increase, influencing the increase in neutral detergent fiber as shown in the table, in addition to reducing the ruminal degradability of dry matter and neutral detergent fiber.

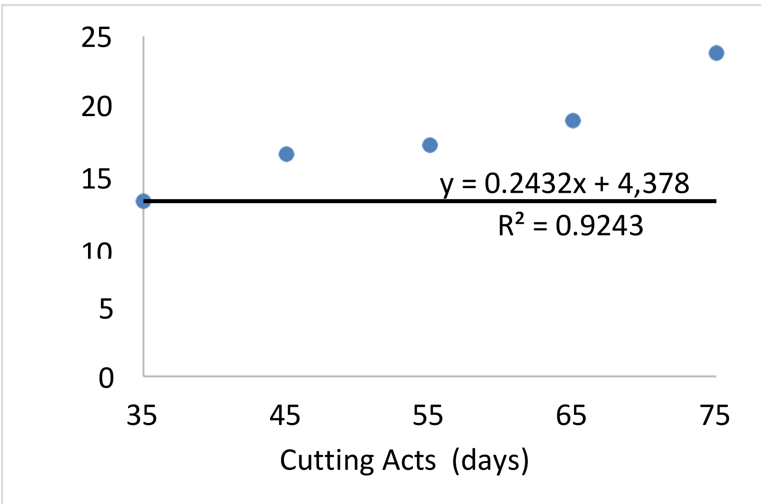
As can be seen in table 1, for the in situ degradability of DM and NDF, a significant difference was observed (P<0.01), a behavior that can be better verified in graphs 3 and 4. There was a linear increase in the indigestible fraction for both DM and THE as a function of cutting age, since plants with advancing cutting age present lignification index to reduce the degradability of the components.

Graph 4 – Degradability Of matter drought in function Of age from cutting the Elephant grass.



Plants with advanced age have a high lignification index, reducing the attack of ruminal bacteria on soluble plant components. Another factor to be considered is lignin and the relationship between the carbohydrates of the plant cell wall (cellulose, hemicellulose and lignin). The increase in cell wall components, especially lignin, causes a reduction in the development and attack of cellulolytic bacteria, causing the food to have low degradation.

Graph 5 – Degradability Of Fibre in detergent neutral in function Of age from cut elephant grass



The dry matter and the portion of the grass without water in its composition, with the increase in the age of the grass, also increases the portion of indigestible dry matter, the part of the dry matter that the ruminant animal cannot digest. Whereas within the MS is the FDN, with this component occurs situation similar to the increase in lignin in its composition. The neutral detergent fiber, and the indicative to know the fiber content in the grass, therefore, the lower the VALUES of EDF, the better the result, however, a part of the ERF and soluble (hemicellulose and part of cellulose), the remainder and insoluble, being called indigestible neutral detergent fiber.

For the values of degradability of dm and for THD, when the lower the values obtained the best will be the nutritive value of the forage and the quality of the forage, thus, the best value found for these paraments was in the treatment with 35 days of cutting age, increasing linearly and increasingly.

Comparing the treatments studied, the treatment with 35 days of growth cut-age was the one that presented the best results, with higher level of CP and lower DM and indigestible RDF values, however, reduced DM values, i.e. high amounts of water, which indicates that the animal would have to consume a very large amount of fodder to consume the necessary nutrients.

Similar results were found by CABRAL et al. (2008), when studying the nutritive value of elephant grass obtained at different cutting ages, in the municipality of Santo Antônio de Leverger - MT, with cutting treatments of 30, 45, 60, 75, 90 and 105 days. They observed that, with the advance in the cutting age of elephant grass, the nutritive value decreased, characterized by the reduction of the soluble fractions of DM, and potentially degradable of THE, by the increase of the indigestible fractions of dm and the DN.

4 FINAL CONSIDERATIONS

Therefore, with progress in the cutting age, the nutritive value of elephant grass decreased, characterized by linear reduction of crude protein (CP) value and linear increase of insoluble fractions of dry matter and neutral detergent fiber.

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