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Ruminal degradability of neutral detergent fiber of *Cynodon* spp. grasses at four regrowth ages

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ABSTRACT. The aim of this work was to determine ruminal degradation of neutral detergent fiber of grasses of the genus *Cynodon*, harvested at four cutting ages. It was used a randomized block design, with five treatments arranged in a split plot, the five evaluated genotypes: Tifton 85, Jiggs, Russel, Tifton 68 and Vaquero; were the plots and ages of cutting were the subplots: 28, 48, 63 and 79 days. By adding one day in the cutting age, there was a linear reduction in the effective degradability of neutral detergent fiber of blade and stem of 0.16 and 0.18%, respectively. The increase in the cutting age had a linear and positive influence on the undegradable neutral detergent fiber with daily increments for leaf and stem of 0.12 and 0.18%, respectively. At the 28 regrowth day, all genotypes showed higher content of potentially degradable insoluble fraction, effective degradability and lower undegradable fraction of the neutral detergent fiber of blade and stem in relation to other ages, in this way this interval is recommended for cutting management.

Keywords: degradation, forage, ruminants, management.

Degradabilidade ruminal da fibra em detergente neutro de gramíneas *Cynodon* spp. em quatro idades de rebrota

RESUMO. Objetivou-se por meio deste trabalho determinar a degradação ruminal da fibra em detergente neutro de gramíneas do gênero *Cynodon*, colhidas em quatro idades de corte. Foi utilizado o delineamento em blocos ao acaso, com cinco tratamentos arranjados em um esquema de parcelas subdivididas, sendo os cinco genótipos: Tifton 85, Jiggs, Russel, Tifton 68 e Vaqueiro; estudadas as parcelas e as quatro idades de corte as subparcelas: 28, 48, 63 e 79 dias. À medida que aumentou um dia na idade de corte, houve redução linear da degradabilidade efetiva da fibra em detergente neutro da lâmina e do colmo em 0,16 e 0,18%, respectivamente. O avanço na idade de corte influenciou linearmente e positivamente a fração indegradável da fibra em detergente neutro com incrementos diários para a lâmina foliar e para o colmo de 0,12 e 0,18%, respectivamente. Na idade de 28 dias de rebrota, todos os genótipos apresentaram maiores teores de fração insolúvel potencialmente degradável, degradabilidade efetiva e menor fração indegradável da fibra em detergente neutro da lâmina e do colmo em relação às demais idades, sendo desta forma recomendado esse intervalo para manejo de corte.

Palavras-chave: degradação, forragem, ruminantes, manejo.

Introduction

Pastures are the main component of ruminants diet, especially in tropical regions, where, except in areas with high population density, and when properly managed livestock becomes more lucrative (GERON; BRANCHER, 2007). The climate is characterized by two well-defined seasons, one wet and the other dry, and pastures are formed by tropical grasses with high biomass accumulation. In this sense, livestock production has been an important development factor in the region (MARTINS-COSTA et al., 2008).

However, quantitative and qualitative changes of forage throughout the year are the major factors in the productivity of Brazilian cattle, either beef or dairy. One of the recommended strategies to achieve balance between supply and demand for forage during the shortage period is the production of grasses with high nutritional value and high dry matter accumulation.

There are several forages with potential for animal nutrition; however, emphasis is given to the grasses of the *Cynodon* genus, characterized by high dry matter production of forage, with high nutritional value (FERREIRA et al., 2005).

Nevertheless, the age of the plant is a considerable factor on forages used to produce hay because both the dry matter production and the nutritional characteristics change according to the plant age. The optimal age for cutting should be investigated, since it represents the balance between the nutritional value and dry matter production (DMP) because in forages, the DMP increases, and the nutritional value reduces when the cutting age increases (VAN SOEST, 1994). Moreover, the knowledge of the 'in situ' degradability of nutritional components in forages harvested at different ages becomes an important parameter when taking a decision to cut and produce hay from the material, obtaining a quality product that meets the nutritional requirements of the animals.

The 'in situ' technique has been widespread, mainly due to its simplicity and economy, besides the results from tropical conditions provide data that contribute to improve national tables of food composition (GOES et al., 2011). In Brazil, studies are conducted with the use of this technique for evaluating forages, crop residues and industrial products, probably by providing more accurate estimate of the degradation of neutral detergent fiber in the rumen than those determined in laboratories, justifying its use as a reference technique (GOES et al., 2010).

Therefore, the aim of this work was to determine ruminal degradation of neutral detergent fiber (NDF) of *Cynodon* grasses harvested in four cutting ages.

Material and methods

The experiment was carried out from May to July 2009 in the sector of Animal Science, Faculty of Agricultural Sciences (FCA) at the Federal University of Grande Dourados (UFGD), Dourados, state of Mato Grosso do Sul, 22° 11' S latitude, 54° 56' W longitude and altitude 450 m. The soil was classified as a distroferric red Latosol (EMBRAPA, 2006) and had the following chemical characteristics (Table 1).

Table 1. Chemical analysis of soil from the experimental area in Dourados, Mato Grosso do Sul State.

Depth	pH	P	Ca	Mg	K	Al	H+Al	SB	T	V
cm		mg dm^{-3}	----------	----------	----------	cmol$_c$ dm^{-3}	----------	----------	----------	%
0-20	5.70	2.00	3.70	0.20	0.17	0.24	5.00	9.31	9.20	45.50

pH = pH in water; H+Al = potential acidity; Al^{+3} exchangeable aluminum; SB = sum of bases; T = cation exchange capacity at pH = 7; V = base saturation. Source: Prepared by the authors.

The forages (Jiggs, Russel, Tifton 68, Tifton 85 and Vaquero) were sampled in areas where grasses were already established in the experimental field of the Federal University of Grande Dourados.

The experiment was a randomized block design, with five treatments in a split plot arrangement. The five genotypes (treatments) were evaluated as plots and the ages of cutting (28, 48, 63 and 79 days) as subplots.

The experimental area was divided into four blocks totaling 540 m^2. Each plot was 9 x 3 m, totaling 27 m^2 per plot, and each subplot was 2.25 x 3 m, totaling 6.75 m^2 with a useful area of 1 m^2, located at the center of the subplot.

Before starting the trial, soil was amended based on the results of soil analysis using limestone in the amount of 2.932 kg ha^{-1} increasing the base saturation to 70%, and on April 16, 2009, uniformity cut was held close to the ground, followed by maintenance fertilization, which consisted on the application of the equivalent of 50 kg ha^{-1} nitrogen as urea and NPK (8-20-20) (CANTARUTTI et al., 2007).

The forage cuttings were performed close to the soil (2 cm) in four pre-established dates, at 28 (June 5, 2009), 48 (July 2, 2009), 63 (July 17, 2009) and 79 (August 3, 2009) days of regrowth, with a pruning shears, in a delimited area of 1 x 1 m using a metal frame. After collection, with four replications for each genotype at each cutting age, the material was placed in paper bags, properly identified and taken to the Food Analysis and Animal Nutrition Laboratory, being weighed and then separated into leaf blade and stem (stem + sheath). Subsequently, samples were weighed, identified and placed in a forced ventilation oven at 55° C until constant weight. The material was milled in a knife mill equipped with sieve of 5 mm diameter and packed in glass vials for later study of degradability. Part of the samples were ground again in knife mill with sieve of 1 mm diameter for the determination of dry matter (DM) and crude protein (CP), according to the methods described by Silva and Queiroz (2006) and Association of Official Agricultural Chemists (AOAC, 1984), respectively. To determine the neutral detergent fiber (NDF), acid detergent fiber (ADF) and lignin (LIG), we used the sequential method described by Van Soest et al. (1991). The data of chemical composition can be observed in Table 2 and 3.

During the experimental period, data related to maximum (Tmax), minimum (Tmin) and average (Tavg) temperature, average relative humidity (RHavg) and precipitation (Prec) were collected from the UFGD meteorological station, located 50 m from the experimental field (Table 4).

Table 2. Chemical composition of five grasses of the genus *Cynodon* in four regrowth ages.

Variable	Cutting age	Tifton 85	Jiggs	Russel	Tifton 68	Vaquero
DMP	28	1105.76	1674.52	1204.26	1756.10	1449.19
	48	1607.50	2092.50	1540.00	1987.50	1707.50
	63	2435.00	2622.50	2082.50	2370.00	2037.50
	79	2582.50	2835.00	2187.50	2437.50	2167.50
BDM[1]	28	14.87	19.79	22.74	12.39	21.15
	48	21.69	23.94	27.64	19.04	26.48
	63	24.87	24.08	28.67	21.16	28.63
	79	29.38	28.73	25.16	32.71	31.81
SDM[1]	28	23.63	26.16	28.50	23.35	30.34
	48	27.77	31.66	30.45	24.03	32.36
	63	31.36	32.35	31.86	25.63	29.92
	79	34.46	34.40	34.25	26.34	34.36
CPB[1]	28	18.23	19.69	22.48	19.87	21.88
	48	14.81	15.37	17.13	15.49	17.34
	63	14.12	17.33	16.74	12.73	15.58
	79	13.65	15.94	16.50	12.09	15.27
CPS[1]	28	12.30	10.02	12.78	11.17	9.80
	48	8.71	9.54	10.83	8.66	8.75
	63	8.03	8.75	10.59	7.98	7.23
	79	7.56	7.71	7.06	5.61	6.77

DMP - Dry matter production (kg of DM ha^{-1}); BDM - Dry matter of leaf blade and stem (SDM); CPB–Crude protein of leaf blade and stem (CPS); [1]% of dry matter. Source: Prepared by the authors.

Table 3. Chemical composition of five grasses of the genus *Cynodon* in four regrowth ages.

Variable	Cutting age	Tifton 85	Jiggs	Russel	Tifton 68	Vaquero
NDFB[1]	28	72.16	69.72	75.45	65.86	77.61
	48	74.36	78.59	76.55	72.61	79.41
	63	74.55	58.61	76.24	72.56	80.74
	79	77.57	78.84	79.76	69.98	81.16
NDFS[1]	28	77.72	78.16	78.96	74.29	81.91
	48	78.01	76.66	79.78	77.33	80.28
	63	78.83	76.78	79.68	76.56	84.31
	79	78.98	78.32	80.25	77.99	85.02
ADFB[1]	28	29.72	35.22	31.88	23.65	30.59
	48	34.24	31.27	34.02	29.66	31.90
	63	34.72	23.45	34.89	29.83	33.78
	79	34.99	45.20	34.89	29.92	32.91
ADFS[1]	28	39.84	36.14	36.50	37.44	33.39
	48	40.20	36.88	37.18	36.10	31.97
	63	40.60	36.77	36.90	40.11	35.48
	79	41.09	40.70	38.84	41.58	38.08
LIGL[1]	28	6.10	5.60	6.60	5.50	6.80
	48	6.40	7.80	7.00	5.70	7.90
	63	6.70	9.10	7.20	6.00	9.30
	79	7.90	9.2	7.30	7.30	9.40
LIGC[1]	28	8.00	8.30	8.20	6.90	8.40
	48	8.20	9.90	8.30	7.10	8.50
	63	8.50	10.20	8.90	7.50	10.10
	79	8.70	11.00	10.20	8.60	10.90

Neutral detergent fiber of leaf blade (NDFB) and stem (NDFS); acid detergent fiber of leaf blade (ADFB) and stem (ADFS); and lignin of leaf blade (LIGL) and stem (LIGS); [1]% of dry matter. Source: Prepared by the authors.

Table 4. Monthly mean values of temperature, relative humidity and precipitation in the region of Dourados-MS during the study period.

Date	Tmax	Tmin (°C)	Tavg	Relative Humidity %	Precipitation mm
May 2009	27.90	15.80	21.40	70.30	51.30
June 2009	23.20	11.80	17.20	74.20	57.90
July 2009	22.75	13.90	17.42	79.21	152.10

Source: UFGD (2009).

For the ‘in situ’ degradability, three crossbred, ruminally cannulated steers aged about 38 months and average weight of 400 kg, were housed in a pen equiped with drinkers and feeders. Steers were fed three times a day with hay produced with the grasses under study, and underwent an adaptation period to the diets for 14 days.

We used non-woven fabric (TNT - 100 g m^{-2}) according to Casali et al. (2008) to make a 7.5 x 7.5 cm bag and the ratio of forage used was 20 mg dry matter cm^{-2} as proposed by Nocek (1988).

The little bags were placed in a 15.00 x 30.00 cm tulle bag, together with 100 g of lead weights. Bags were tied with a nylon thread, leaving a free length of 1 m in order to give them free movement in the solid and liquid phases of the rumen. Bags were placed in the ventral rumen for 96, 72, 48, 36, 12, 6 and 0 hours, incubated in descending order and withdrawn all together.

After the incubation period, tulle bags were removed from the rumen, opened, and the TNT bags containing the degradation residues were immediately placed in a bucket with ice water to stop the action of microorganisms. Then, they were rinsed in tap water and placed in an oven at 55° C for 72 hours, cooled in a desiccator and weighed.

The bags concerning the zero time, to determine the readily soluble fraction, were introduced into the rumen mass and immediately removed, receiving then the same procedure intended for the others.

The degradability residues were analyzed for concentrations of neutral detergent fiber (NDF) according to Van Soest et al. (1991). The procedures for estimating the degradability of the NDF were obtained by weight differences found for each component between the weighing, before and after rumen incubation, and expressed as a percentage. According to the calculated difference between the substrate and the residue, data of the NDF disappearance during incubation were obtained.

With the aid of the statistical program SAEG (GOMES, 1992), were calculated the rates of degradation of NDF using the model of Mertens and Loften (1980):

$$Rt = B \times e^{-ct},$$

where

Rt = degraded fraction in time t;
B = potentially degradable insoluble fraction (%);
c = degradation rate of the fraction B (h^{-1});
t = time (h).

After the settings of the equation of NDF degradation, we conducted the standardization of fractions, according to the proposal of Waldo et al. (1972), as the equations:

$$BP = B / (B+I) \times 100; IP = I / (B+I) \times 100,$$

where:

BP = potentially standardized degradable fraction (%);

IP = undegradable fraction (%);

B, I = as previously defined.

The non-linear coefficients B and c were estimated by means of Gauss-Newton interactive procedures (NETER et al., 1985), and means compared by using confidence intervals with 95%. For effective degradability (ED) we used the model:

$$ED = Bp \times c / (c+k),$$

where:

Bp is the potentially degradable fraction (%) standardized;

k corresponds to the estimated rate of passage (5% / time) of particles in the rumen.

It was used a split-plot randomized block design (genotypes as plots and cutting ages as subplots) with three replicates (animal).

The data were analyzed using the statistical package SISVAR (FERREIRA, 2011). Once determined the degree of significance of the sources of variation, developments and means comparison tests were made, using the Scott-Knott test at 5% significance. To evaluate the behavior of ages for different genotypes of *Cynodon*, the averages of the data obtained for the characteristic significant ($p < 0.05$) were subjected to regression analysis using the following model:

$$Y = \mu + E_i + B_j + e_{ij} + V_k + EV_{ik} + e_{ijk}$$

where:

Y_{ijk}= Note for the genotype in sub-plot k age on the parcel i in the block j;

μ = constant associated with all submissions;

E_i = Effect of cutting age i, with i=1, 2,.., 4;

B_j = Effect of block j, with j = 1, 2,..., 4;

e_{ij} = experimental error associated with ace plots by hypothesis, has a normal distribution with zero mean and variance s^2.

V_k = Effect of variety k, with k = 1, 2, e 3;

EV_{ik} = Effect of interaction of the age level i with the k level of the genotype;

e_{ijk} = experimental error associated with all the comments that by chance has a normal distribution with zero mean and variance s^2;

Results and discussion

There were significant differences for the insoluble degradable fraction standardized (Bp) of neutral detergent fiber (NDF) of the blade and stem between and within genotypes in different cutting ages (Table 5). With increased the cutting age, it was reduced ($p < 0.05$) the Bp of NDF of the leaf and stem, significant interaction genotype x cutting age (Figure 1).

Table 5. Mean values of potentially degradable insoluble fraction standardized (Bp) neutral detergent fiber of grasses of the genus *Cynodon* at different cutting ages.

Leaf blade				
	Cutting age			
Genotypes	28	48	63	79
Tifton 85	71.00 A	69.14 A	67.13 A	66.04 A
Jiggs	60.33 B	58.14 B	56.52 B	54.85 B
Russel	53.70 C	49.52 C	43.98 C	44.65 C
Tifton 68	70.29 A	68.44 A	67.82 A	63.79 A
Vaquero	56.05 B	52.97 C	50.37 C	48.52 C
CV (%) = 5.42				
Stem				
	28	48	63	79
Tifton 85	63.11 A	60.98 A	60.53 A	52.96 A
Jiggs	57.44 B	53.41 B	52.30 B	47.10 B
Russel	51.77 B	49.06 B	46.28 C	41.05 C
Tifton 68	63.84 A	64.87 A	62.82 A	57.34 A
Vaquero	55.10 B	52.06 B	49.84 B	47.47 B
CV (%) = 5.67				

Means followed by the same letter in the column are not significantly different by the Scott-Knott test at 5% significance. CV = Coefficient of Variation.

Both for the Bp blade as the stem, the Tifton 85 and Tifton 68 had better results within each cutting age. For all genotypes, the highest values of Bp blade and stem were observed at 28 days of age, and most notably the leaf blade of Tifton 85 had a percentage of 15.02, 24.36 and 21.05% higher than Jiggs, Russel and Vaquero, respectively.

In relation to Tifton 68, this increase was of the order of 14.16; 23.60 and 20.25% respectively compared to Jiggs, Russel and Vaquero. Carvalho et al. (2006) evaluated the degradability of tropical forage, and found values of 62.17% for the insoluble fraction of NDF of Tifton 85. These results corroborate those obtained in this experiment, and suggest that small variations are explained by differences in plant part, age and environmental conditions.

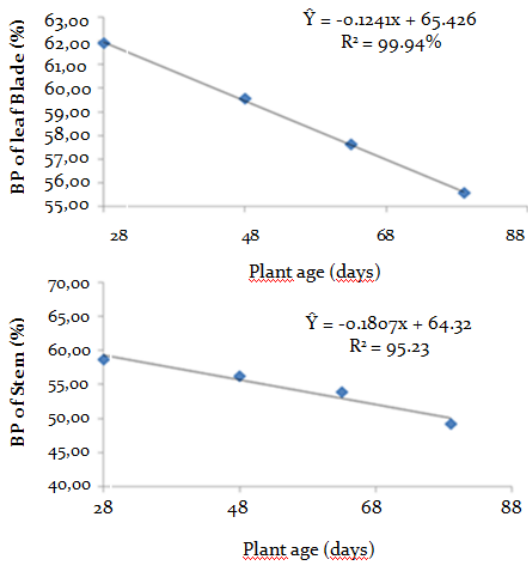

Figure 1. Values of potentially degradable insoluble fraction (Bp) of neutral detergent fiber (NDF) of the blade and stem of grasses of the genus *Cynodon* in four cutting ages. Source: Prepared by the authors.

The genotypes Russel and Vaquero, at the ages of 48; 63 and 79 cutting days, showed the lowest results of Bp of NDF of the blade in relation to the other genotypes. For the Bp of the stem, minor results were observed in the genotype Russel from the 63 cutting day.

Observing the contents of NDF and FDA (Table 3), the genotypes Russel and Vaquero showed high values of these cell wall components in relation to the other genotypes, which probably could have negatively influenced the ruminal degradation of Bp of NDF of the blade.

There was a decreasing linear effect ($p < 0.05$) of the Bp of NDF for blade and stem with advancing cutting age. As there was a significant interaction ($p < 0.05$) between genotypes and cutting ages, it was generated a single regression equation for all genotypes (Figure 1). It is observed that for each day increased on the cutting age, there was reduction of 0.12 and 0.18% of Bp of NDF of blade and stem, respectively.

This decrease on the fraction 'Bp' content can be due to the cell wall thickening, especially by lignin. Brito and Deschamps (2001), working with three genotypes of elephant grass, found that the area occupied by lignified tissue increased with plant growth, both in leaves and stem. The maturity stage is an important factor that influences the nutritional value of the forage grass and the degradation rate of the potentially degradable fraction (fraction 'Bp').

These results demonstrated that the interval between cuts is a management factor that contributes to determine forage quality. It is well known that, with the aging of the plant, the moisture content is reduced, resulting in less ruminal degradation of forage (OLIVEIRA et al., 2013).

Even though it is perceptible the decline in the quality of leaf blades and stems with increasing age, there were no changes in tissue degradation rates ($p > 0.05$) (Table 6), which could be related to the low relative contribution of each tissue in the leaf and stem that, according to Wilson (1994), does not change with the age.

Table 6. Degradation rate 'c' of the insoluble but potentially degradable fraction of *Cynodon* grasses harvested at different cutting ages.

Leaf blade				
	Cutting age			
Genotypes	28	48	63	79
Tifton 85	0.048	0.044	0.040	0.031
Jiggs	0.058	0.053	0.047	0.043
Russel	0.038	0.036	0.032	0.025
Tifton 68	0.056	0.047	0.04	0.038
Vaquero	0.051	0.046	0.037	0.032
CV (%) = 18.03				
Stem				
Genotypes	28	48	63	79
Tifton 85	0.056	0.045	0.044	0.039
Jiggs	0.054	0.053	0.044	0.035
Russel	0.051	0.050	0.045	0.045
Tifton 68	0.058	0.050	0.036	0.032
Vaquero	0.058	0.050	0.049	0.048
CV (%) = 28.52				

CV - Coefficient of variation. Source: Prepared by the authors.

The averages for the degradation rate of the 'c' fraction 'b' NDF blade were 4.07; 5.02; 3.27; 4.52 and 4.15% h^{-1}, and stem of 4.60; 4.65; 4.77; 4.40 and 5.12% h^{-1}, respectively, for genotypes Tifton 85, Jiggs, Russel, Tifton 68 and Vaquero.

Even with no significant difference, the degradation rate of the fraction 'Bp' of NDF for blade and stem of bare ground genotypes at 28 days was higher than the other age groups, which could provide greater intake of dry matter by ruminant animals in function of the high rate of disappearance.

Regarding the effective degradability (ED), there was a significant difference ($p < 0.05$) for leaf and stem of genotypes within and between each cutting age (Table 7). The highest results for ED of the NDF of the leaf blade were observed at 28 days, being this interval recommended for cutting of the evaluated genotypes.

The Tifton 85, Tifton 68 and Jiggs exhibited better results for ED of NDF of the leaf blade at all ages studied, differing significantly ($p < 0.05$) from the other grasses.

Table 7. Effective degradability (ED) of neutral detergent fiber (NDF) of leaf blade and stem of *Cynodon* grasses at different cutting ages.

	Leaf blade			
	Cutting age			
Genotypes	28	48	63	79
Tifton 85	34.36 A	32.00 A	29.64 A	25.19 A
Jiggs	32.28 A	29.55 A	27.38 A	24.96 A
Russel	22.00 C	20.41 C	17.98 B	14.99 B
Tifton 68	37.06 A	32.94 A	30.262 A	27.73 A
Vaquero	28.10 B	25.50 B	20.82 B	18.84 B
CV (%) = 10.68				
	Stem			
	28	48	63	79
Tifton 85	32.72 A	28.88 B	28.32 A	23.12 A
Jiggs	29.47 B	27.34 B	24.08 A	18.87 A
Russel	27.15 B	24.70 B	20.17 B	19.33 A
Tifton 68	34.24 A	32.54 A	26.12 A	22.54 A
Vaquero	29.32 B	26.12 B	24.60 A	22.81 A
CV (%) = 10.81				

Means followed by the same letter in the column are not significantly different by the Scott-Knott test at 5% significance. CV = coefficient of variation. Source: Prepared by the authors.

As we increased the cutting age, it was reduced ($p < 0.05$) ED of NDF genotypes, but there was a significant interaction ($p < 0.05$) between genotypes x cutting age, and thus we set a single regression equation for all genotypes. Daily reductions were 0.16 and 0.18% for ED NDF leaf blade and stem, respectively (Figure 2).

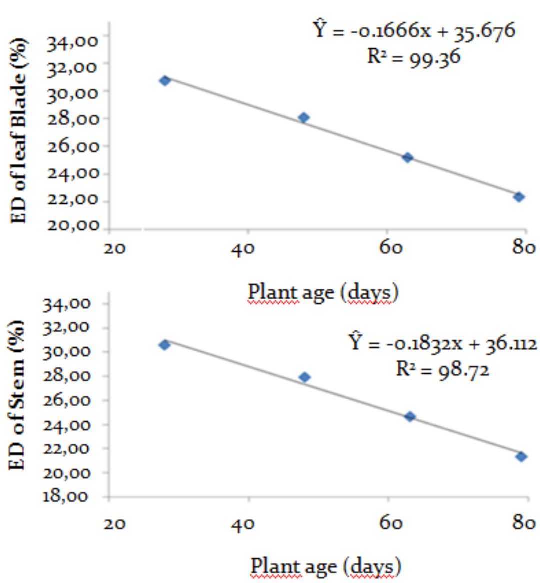

Figure 2. Values of effective degradability (ED) of neutral detergent fiber (NDF) of the blade and stem of the grasses *Cynodon* at four cutting ages. Source: Prepared by the authors.

In agreement with Valente et al. (2011), the degradation of tissues in different structures decline with plant age. This reduction could be related to factors that affect forage quality, such as the plant age, which is the isolated factor with the greatest contribution, especially in altering the leaf blade: stem ratio, increasing the participation of the stem as a nutrients source. However, soil and climatic conditions play an important role, according to Carvalho and Pires (2008). The area occupied by the epidermal tissue in the leaf blade decreases with increasing maturity stage of the leaves, and the area of lignified vascular tissue increases with its age, especially in the stem, in a study with three elephant grass cultivars (BRITO; DESCHAMPS, 2001).

This increase in lignified vascular tissue can be seen in Table 8, in which the genotypes showed increasing effect on the content of non-degradable standardized fraction (Ip) in rumen with the increase of plant age. The daily increments of the Ip of the NDF of the genotypes were 0.12% and 0.18% for leaf and stem, respectively (Figure 3). These results can be confirmed by the data on the chemical composition (Table 2 and 3), in which the genotypes showed higher lignin contents with advanced age.

Table 8. Mean values of the standardized undegradable fraction (IP) of neutral detergent fiber of grasses of the genus *Cynodon* at different cutting ages.

	Leaf blade			
	Cutting age			
Genotypes	28	48	63	79
Tifton 85	28.99 C	30.85 C	32.86 C	33.95 C
Jiggs	39.66 B	41.85 B	43.47 B	45.14 B
Russel	48.22 A	50.93 A	53.71 A	55.34 A
Tifton 68	29.70 C	31.55 C	32.17 C	36.20 C
Vaquero	43.94 B	47.02 A	49.62 A	51.47 A
CV (%) = 7.69				
	Stem			
	28	48	63	79
Tifton 85	36.88 B	39.01 B	39.46 C	47.03 C
Jiggs	42.55 A	46.58 A	47.69 B	52.89 B
Russel	46.29 A	50.47 A	56.01 A	58.94 A
Tifton 68	36.15 B	35.12 B	37.17 C	42.65 C
Vaquero	44.89 A	47.93 A	50.15 B	52.52 B
CV (%) = 6.79				

Means followed by the same letter in the column are not significantly different by the Scott-Knott test at 5% significance. CV = Coefficient of Variation. Source: Prepared by the authors.

The increase in the percentage Ip with increasing cutting age indicates reduction in the proportion of forage that can be digested by the animal. This fact can be attributed, probably, to the thickening and lignification of the cell wall with increasing plant age, mainly by reducing leaf blade, stem and, consequently, increasing the proportion of stems in the harvested material, as determined by Bhering et al. (2008).

The Ip contributes significantly to the effect of rumen fill, characterized by the time food stays in the rumen suffering the physical effects arising from the passage of chewing during rumination and degradation by microorganisms in the rumen

(PEREIRA et al., 2002), besides not being available as an energy source for microbial growth (MARTINS-COSTA et al., 2008). Thus, probably, animals fed of *Cynodon* genotypes at ages above 28 days suffer strong effect of rumen fill by that fraction, and have, thus, reducing energy consumption by the physical effect of digesta (VIEIRA et al., 1997).

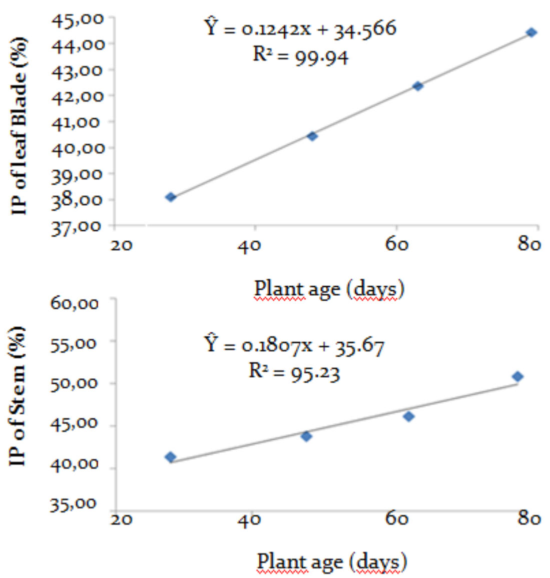

Figure 3. Values of the standardized undegradable fraction (Ip) of neutral detergent fiber (NDF) of the blade and stem of the grasses *Cynodon* at four cutting ages. Source: Prepared by the authors.

Conclusion

Based on the data obtained, in relation to potentially degradable insoluble fraction and effective degradability, there were a linear decrease with increasing regrowth age, except that insoluble fraction increased. It is recommended the cutting of all genotypes at the age of 28 days, due to the higher nutritional value of the plants.

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