Acta Scientiarum

http://www.uem.br/acta
ISSN printed: 1806-2636
ISSN on-line: 1807-8672
Doi: 10.4025/actascianimsci.v37i3.26872

Nutritive value of pastures of *Cynodon* mixed with forage peanut in southwestern Paraná State

Magnos Fernando Ziech[1*], Clair Jorge Olivo[2], Ana Regina Dahlem Ziech[3], Wagner Paris[1], Carlos Alberto Agnolin[2] and Gilmar Roberto Meinerz[4]

*[1]Universidade Tecnológica Federal do Paraná, Estrada para Boa Esperança, km 4, 85660-000, Dois Vizinhos, Paraná, Brazil. [2]Universidade Federal de Santa Maria, Santa Maria, Rio Grande do Sul, Brazil. [3]Instituto Federal do Mato Grosso do Sul, Ponta Porã, Mato Grosso do Sul, Brazil. [4]Universidade Federal Fronteira Sul, Cerro Largo, Rio Grande do Sul, Brazil. *Autor para correspondência. E-mail: magnos@utfpr.edu.br*

ABSTRACT. This study evaluated the nutritive value of pastures of Coastcross-1 and Tifton 85 mixed with increasing inclusion of forage peanut (0, 25, 50, 75% occupancy area), subjected to cuts, over two study years in Southwestern Paraná State. The experimental design was factorial (three factors) distributed in randomized block. The factors were cultivars (2), the occupancy area of forage peanut (4) and seasons of cuts (5), with three replications. It was evaluated the percentage of crude protein, neutral detergent fiber and *in vitro* digestibility of dry matter of leaf blades, stem + sheath of grasses and available forage mass of pastures. Values of crude protein ranged from 17.0 to 20.4% and from 16.8 to 19.3% for the forage mass available of Coastcross-1 and Tifton 85, respectively. Higher digestibility values were found at the beginning of evaluations. On average, the Coastcross-1 showed better nutritive value compared to Tifton 85, and, the inclusion of forage peanut increased crude protein content in leaf blades of grasses studied, in the second year after planted.

Keywords: chemical composition, digestibility, NDF, CP.

Valor nutritivo de pastagens de *Cynodon* consorciadas com amendoim forrageiro no sudoeste do Estado do Paraná

RESUMO. O objetivo da pesquisa foi avaliar o valor nutritivo de pastagens de Coastcross-1 e Tifton 85 consorciadas com amendoim forrageiro (0, 25, 50 e 75% da área implantada), submetidas a cortes ao longo de dois anos de estudo, em área localizada no Sudoeste do Paraná. O delineamento experimental foi o fatorial (três fatores), distribuídos em blocos ao acaso com três repetições. Os fatores foram as cultivares (2), o percentual de área implantada com o amendoim forrageiro (4) e as estações do ano que apresentaram condições de corte (5). Avaliaram-se os percentuais de proteína bruta, fibra em detergente neutro e digestibilidade *in vitro* da massa seca das lâminas foliares, colmo + bainha das gramíneas e da massa de forragem disponível das pastagens. Os valores de proteína bruta variaram de 17,0 a 20,4% e 16,8 a 19,3 % para a massa de forragem disponível de Coastcross-1 e Tifton 85, respectivamente. Maiores valores de digestibilidade foram verificados no início das avaliações. Em média, a cv. Coastcross-1 apresentou melhor valor nutritivo quando comparada ao capim Tifton 85, e, a maior contribuição de amendoim forrageiro elevou os teores de proteína bruta nas lâminas foliares das gramíneas estudadas, a partir do segundo ano de estabelecimento.

Palavras-chave: composição química, digestibilidade, FDN, PB.

Introduction

In most of the dairy farms that use tropical grasses for cattle feed, the implementation is performed exclusively with the grass, and the response of these forages depends on management conditions(Moreira et al., 2004). Accordingly, the nitrogen (N) fertilization increases productivity by changing the production and nutritive value of the pasture (Barbero et al., 2010) elevating; however, production costs. Also, it is noteworthy that the singular cultivation implies greater variability in the nutritive value of forage compared to intercropping with legumes. Considering these aspects, possibly, the use of more sustainable techniques as intercropping with other species, especially legumes, could minimize the use of nitrogen fertilizers and contribute to balance the diet of animals (Olivo et al., 2009; Steinwandter et al., 2009). In this case, it is necessary that the species used in intercropping have characteristics that allow their development and persistence.

Cynodon grasses, especially the cultivars Coastcross-1 and Tifton 85, have been used because of their quality and production characteristics and their continuity, getting adapted to different regions of the country. In mixed pastures, forage peanut *Arachis pintoi* (Krap. and Greg.) has stood out in research conducted in tropical and subtropical regions, showing satisfactory development with aggressive grasses, such as *Cynodon* species. In addition, studies on the quality of this forage show that the nutritive value is high, with crude protein content between 15 and 22% and digestibility between 62 and 73% (Nascimento, 2014).

Studies on *Cynodon* pastures mixed with forage peanut since planting could contribute effectively to the study of forage systems including these species, providing the qualitative variations, thus contributing to a better understanding of their nutritional capacity. In this way, the goal of this research was to evaluate the effects of the occupancy area with forage peanut in Coastcross-1 or Tifton 85 pastures, evaluated during two growing seasons, on the nutritive value of the structural components and the forage mass available.

Material and methods

This study was conducted in an experimental area, from August 2011 to May 2013, belonging to the Unit for Education and Research (UNER) in Dairy Cattle, Federal Technological University of Paraná (UTFPR) - Dois Vizinhos Campus, located in the physiographic region called Third Plateau of Paraná, with an average altitude of 520 m, latitude 25°44" South and longitude 53°04" West. The climate is Cfa (humid subtropical), according to Köppen, without a well-defined dry season, the average temperature of the warmest month is 22°C. Weather conditions related to temperature and rainfall during the study are similar to the normal of the region (Figure 1).

It was used an area with approximately 400 m^2 and two *Cynodon* cultivars (Tifton 85 and Coastcross-1), considered as a factor A (qualitative). At planting, it was used different occupancy areas (0, 25, 50 and 75%) of stoloniferous forage peanut, cv. Amarillo, considered as Factor B (quantitative). The pastures (both grasses and legume) were planted in 2 x 6 m plots, using seedlings. These were implanted every 33 cm linearly and 50 cm apart between rows, totaling 60,000 seedlings ha^{-1}. Pastures consisted of Tifton 85 in pure culture; Tifton 85 mixed with forage peanut successively of three rows for the grass and one for the legume (providing 25% of the area for the legume development); Tifton 85 mixed with forage peanut successively of two rows for the grass and two for the legume (providing 50% of the area for the legume development); Tifton 85 mixed with forage peanut successively of one row for the grass and three for the legume (providing 75% of the area for the legume development). The same procedure was performed for the Coastcross-1 cultivar.

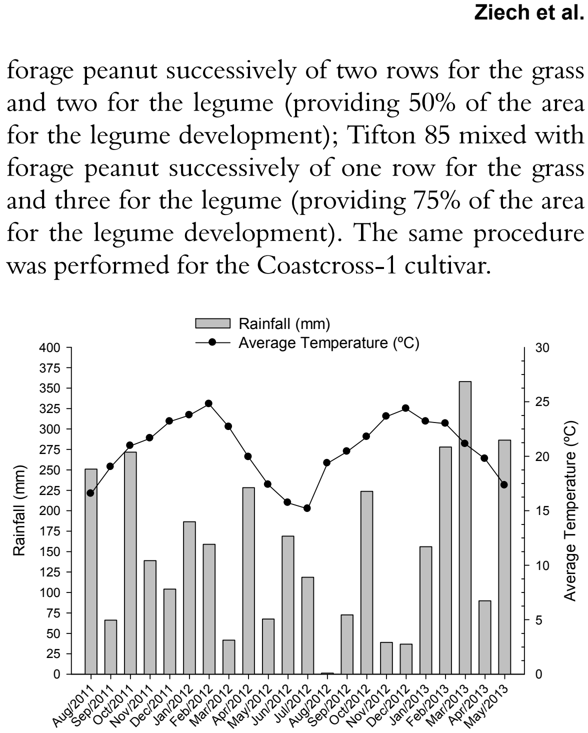

Figure 1. Average monthly temperature (°C) and rainfall (mm). Dois Vizinhos, Paraná State, 2013.

Before the establishment of the pastures, weed control was performed by manual weeding and one desiccation (glyphosate - 3,0 L ha^{-1}). At the time of the experiment, soil analysis (0-20 cm) showed pH (H_2O) = 5.5; OM (%) = 3.9; Clay (%) = 54; Mehlich-P (mg dm^{-3}) = 4.5; K ($cmol_c$ dm^3) = 0.2 Ca ($cmol_c$ dm^{-3}) = 8.8; Mg ($cmol_c$ dm^3) = 3.4; H+Al ($cmol_c$ dm^3) = 3.5; effective CEC ($cmol_c$ dm^3) = 12.6; Al saturation (%) = 0.0; Bases (%) = 78.2. Considering this analysis for the mixed of grasses with tropical legumes, before planting, we applied 2.2 ton ha^{-1} limestone (filler – PRNT > 90%) seeking to reach pH 6.0. For fertilization it was used 120 kg ha^{-1} P_2O_5 and 60 kg ha^{-1} of K_2O in the formulation 05-20-10 at the establishment of the pastures, comprising the first growing year and 60 kg ha^{-1} of both P_2O_5 and K_2O formulation 05-20-20 for the next year. For the establishment of *Arachis* in the system, we used 80 kg ha^{-1} $year^{-1}$ N, avoiding losses on *Rhizobium* nodulation. For the second growing year, it was standardized 20 kg ha^{-1} N every two cuts, totaling 60 kg ha^{-1} $year^{-1}$ N.

The study was conducted from September 3rd, 2011 (planting) and April 14th, 2013 (last cut), totaling 588 days. Pastures were managed under cutting whenever the sward reached 20-25 cm. One random cut (1 m^2) was carried out for each evaluation respecting the occupancy area for forage peanut in the plot, at 7 cm from the ground, composing the available forage mass. After taking the samples, the remaining material (7 cm) was cut off, standardizing the plots. The forage cut was removed from the experimental unit.

After, the collected samples were weighed, homogenized, a sub sample was taken to determine the botanical composition, making the separation between species. For grasses, was separated the structural components (leaf blade, stem + sheath and dead + senescent material). The procedure was carried out immediately after the cut, the samples were weighed and dried in an oven with forced air circulation at 60°C to constant weight to determine the dry matter (DM) of each component. Thus, in proportion to each species or plant component, it was estimated DM percentage of the pasture.

The fractions leaf blade, stem + sheath, in addition to whole plant of forage peanut were ground in Wiley type mill equipped with 2 mm sieve, identified and placed in plastic bags. For analysis, composite samples were formed by blending the materials of the cuts made in each season. Subsequently, total DM was determined in an oven at 105°C for 16 hours; crude protein (CP), by micro Kjeldahl method, neutral detergent fiber (NDF), according to Van Soest et al. (1991) and *in vitro* dry matter digestibility (IVDMD) adapted to artificial rumen (Ankom®).

To estimate CP of the forage mass, we used the equation [(% CP leaf blade x leaf blade participation in the season) + (% PB stem + sheath x stem + sheath participation) + (% CP peanut forage x forage peanut participation)/100], also being applied to other nutritional variables. The data used were obtained after the botanical separation in each period.

The experiment was a randomized block design distributed in a factorial 2 x 4 x 5 arrangement (cultivars x implanted area with forage peanut x seasons) with three replications. Data were subjected to analysis of variance and polynomial regression, adopting the significance level of 5% error probability. The samples were analyzed using the statistical software Genes – UFV, and means were compared by Tukey's test.

The statistical model on the analysis of variables of the pasture was represented by: $Yijk = \mu + Bijk + Ti + Dj + Pk + TiDj + TiPk + DjPk + TiDjPk + \varepsilon ijk$:

In which Yijkl represents the dependent variables; i, factor A index, qualitative (cultivars); j, factor B index, quantitative (occupancy area of forage peanut); k, period index (seasons); l, repetition index; μ is the mean of all observations; Bijk is the effect of the blocks; Ti is the effect of cultivars; Dj, is the effect of the occupancy area of forage peanut; Pk is the effect of seasons; TiDj is the interaction between cultivars and the occupancy area of forage peanut; TiPk is the interaction between cultivars and seasons; DjPk is the interaction between the occupancy area of forage peanut and seasons; TiDjPk is the interaction between cultivars, the occupancy area of forage peanut and the seasons and εijk corresponds to the residual experimental error.

Results and discussion

Pastures reached the height for cut (20-25 cm) about three months after planting, in December 2012. In the second year, cuts started in October 2012. In the period, 14 cuts were made (8 in the first and 6 in the second year). Average weight values of available forage (above 7 cm of soil) in each season were proportionately lower in the first year and higher in the other seasons, in which there was possibility of cutting (Table 1), highlighting the production in the fall, when there is usually shortage of forage, as the winter cycle crops are not always available. In relation to the participation of legumes, there was proportionality with the occupancy area, although with lower mass due to their slow growth and the aggressiveness of grasses.

Regarding the structural composition of grasses, there was a greater participation of leaf blade in most of the evaluated seasons, even in the fall, considered as critical (from the second year, with fully established pastures). In general, it is observed that the legume inclusion had no influence on the structural composition of grasses.

For percent CP values of leaf blades and forage mass, there was a significant interaction ($p < 0.05$) between cultivars and seasons (Table 2). There was higher CP content in the leaf blade of the cv. Coastcross-1 in all periods, averaging 13.2% greater than the cv. Tifton 85. Regardless of cultivar, higher values were found for summer and fall of the first year. This result may be associated with initial soil fertility combined with lower production of mass, with new shoots completing the soil cover. Lenzi et al. (2009) in Paranavaí, Paraná State, analyzed the cv. Coastcross-1 alone under nitrogen fertilization at 200 kg ha^{-1} $year^{-1}$ and intercropped with forage peanut, without N or associated with 100 and 200 kg ha^{-1} N, and found no significant difference in CP of leaf blades between treatments, with an average of 18.7%, lower than in the present study, however, found higher levels for the summer and spring. Carnevalli et al. (2001) in Piracicaba, São Paulo State, studied the cv. Tifton 85 grazed by sheep under a continuous stocking, fertilized with 280 kg ha^{-1} $year^{-1}$ N, and registered 19.2 and 15.4% of CP in the leaf blade for 10 and 20 cm in height, respectively.

Table 1. Average value in each season of forage mass, leaf:stem + sheath ratio, participation (%) of forage peanut and number of cuts in Coastcross-1 and Tifton 85 pastures in two growing years. Dois Vizinhos, Paraná State, 2013.

	Forage mass (kg ha^{-1} DM)									
	Coastcross-1					Tifton 85				
FP (%)	Sum 2011/2012	Fal 2012	Spr 2012	Sum 2012/2013	Fal 2013	Sum 2011/2012	Fal 2012	Spr 2012	Sum 2012/2013	Fal 2013
0	1,492	1,312	2,841	2,464	3,153	1,546	1,087	3,029	2,533	3,170
25	1,374	1,254	2,967	2,922	2,826	1,490	1,136	3,060	2,763	2,922
50	1,238	1,505	2,886	2,573	3,194	1,360	1,369	3,156	2,701	3,140
75	934	1,441	2,907	2,663	3,154	1,023	1,336	3,447	2,818	3,412
	Leaf:stem+sheath ratio									
0	1.93	1.61	1.30	1.27	0.73	1.81	2.12	1.67	1.63	1.71
25	1.85	1.47	1.23	1.20	0.81	1.69	2.34	1.76	1.53	1.70
50	1.87	1.50	1.27	1.16	0.84	1.72	2.13	1.73	1.53	1.70
75	1.73	1.56	1.22	1.20	0.60	1.58	2.09	1.62	1.42	1.35
	Stoloniferous forage peanut (%)									
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	3.45	3.12	5.45	4.30	5.48	1.83	4.80	7.02	3.86	6.00
50	3.64	5.62	11.26	11.59	10.17	6.49	12.57	14.48	10.46	12.27
75	13.81	21.03	24.34	23.71	32.63	9.56	20.63	25.96	26.28	29.90
	Number of cuts									
	4	3	4	2	1	4	3	4	2	1

Data not statistically tested. FP = occupancy area of forage peanut.

Table 2. Means of the interaction for crude protein (CP) in leaf blades and in forage mass between the *Cynodon* cultivars established alone or mixed with forage peanut. Dois Vizinhos, Paraná State, 2013.

	CP Leaf blades (%)				
Cultivars	Summer:2011/2012	Fall:2012	Spring:2012	Summer:2012/2013	Fall:2013
Coastcross-1	22.56aA	22.98aA	20.54aB	21.09aB	20.19aB
Tifton 85	20.69bA	20.50bA	17.02bB	17.90bB	18.74bAB
	CP Forage mass (%)				
Coastcross-1	20.31aA	20.40aA	18.60aB	18.71aB	16.95aC
Tifton 85	18.54bAB	19.33aA	16.82bC	16.91bC	17.18aBC

Values followed by different uppercase letters in the same row and lowercase letters in the same column are significantly different by Tukey's test ($p < 0.05$).

The CP of available forage mass (Table 2), which considers the proportionate participation of the pasture components, showed a trend similar to that of leaf blade, with higher levels for the cv. Coastcross-1. However, in the fall, in both years, there was no significant difference between cultivars, possibly due to the lower participation of stems in pastures established with Tifton 85 in this season (Table 1). Thus, the highest percentage of leaf blade contributed to increase the protein content of the pasture. For Coastcross-1, intermediate values were observed in summer 2012 and spring 2012/2013, being lower in the last period. In Tifton 85, CP content in forage mass was similar between the seasons during the second year. A study of Quaresma et al. (2011) analyzed protein value of Tifton 85 under five levels of N supply (0, 60, 120, 180 and 240 kg ha^{-1}) managed under cutting every 30 days in Cáceres, Mato Grosso State, found that nitrogen fertilization caused a linear increase in CP content for mass 5 cm above the ground and average height close to 50 cm, with a maximum value of 11.8%, lower than in the present study. This result indicates that the height set between 20 and 25 cm for the cut material caused the collection of material with higher protein contents.

For the percentage of CP in leaf blades, a significant interaction ($p < 0.05$) was detected between the percentage of occupancy area of peanut forage in pastures and seasons (Figure 2). For the summer 2011/2012 and the fall 2012 and summer 2012/2013, there was no significant interaction, and the mean values were respectively 21.6; 21.7 and 18.8% CP. In the other periods, there were linear upward effects, thus, higher CP percentages were observed in intercropping with the largest occupancy area of peanut forage, indicating a possible association with this legume from the second year. The lack of significance for the summer 2012/2013 may be related to reduction of regular rainfall early in the season (Figure 1).

For forage mass CP, there was interaction between seasons and occupancy area with peanut forage (Figure 2). For all seasons there was a linear upward effect, indicating that the increasing area and consequent participation of peanut forage in the pasture increased CP content, due to the higher protein value of this species.

In relation to CP of stem + sheath, there was no interaction or effect of the inclusion of peanut in pastures (Table 3). Considering the factors separately, there were higher levels for Coastcross-1, 5.9% higher than Tifton 85. Temporally, there were higher levels for the first year, which was similar to the spring 2012 and summer 2012/2013.

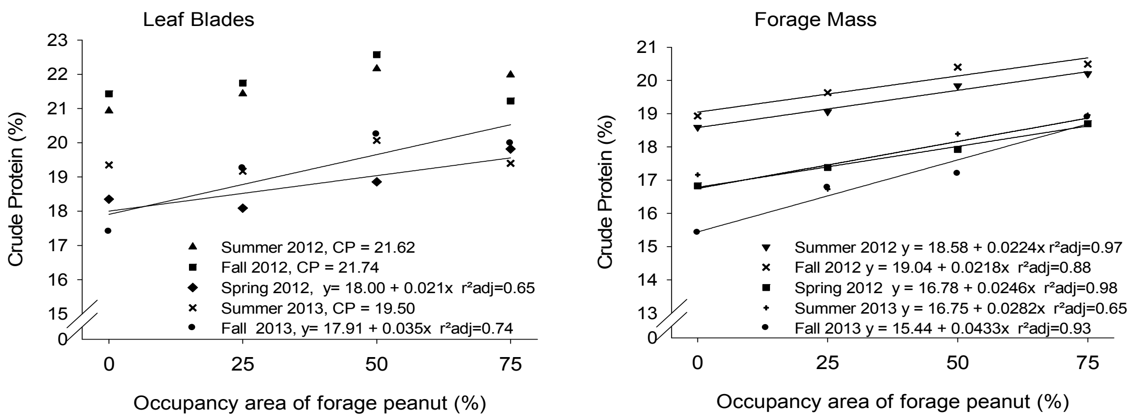

Figure 2. Means and regression equations for crude protein of leaf blades and the forage mass of the interaction between seasons and occupancy area with forage peanut in pastures. Dois Vizinhos, Paraná State, 2013.

Table 3. Crude protein (CP) of stem + sheath (SS), neutral detergent fiber (NDF) of leaf blades (LF) and SS and *in vitro* dry matter digestibility (IVDMD) of LF, SS and forage mass (FM) in Coastcross-1 and Tifton 85 pastures established alone or mixed with peanut along the seasons in two consecutive years. Dois Vizinhos, Paraná State, 2013.

	Variables (%)					
Cultivars	CP SS	NDF LF	NDF SS	IVDMD LF	IVDMD SS	IVDMD FM
Coastcross-1	14.50a	70.37b	75.01ns	65.96a	59.39ns	63.93a
Tifton 85	13.69b	73.02a	75.70	63.41b	59.67	62.92b
Inclusion of FP (%)						
0	14.10ns	71.83ns	74.99ns	64.74ns	59.33ns	62.68ns
25	13.88	71.70	75.49	64.70	60.02	63.22
50	13.98	71.75	73.35	64.22	58.80	62.95
75	14.42	71.50	75.57	65.07	59.96	64.86
Seasons						
Summer 2012	14.76ab	70.57ns	74.29ns	75.53a	67.04a	72.58a
Fall 2012	14.90a	71.40	74.72	66.82b	61.17b	64.87b
Spring 2012	14.59ab	71.79	75.48	63.67c	59.58b	62.78b
Summer 2013	13.57ab	73.68	76.81	59.19d	56.43c	59.24c
Fall 2013	12.63b	71.03	75.46	58.20d	53.44d	57.66c
CV %	6.77	2.46	2.30	4.05	4.17	3.24

Values followed by different lowercase letters in the same column are significantly different by Tukey's test ($p < 0.05$). ns = non-significant.

A study performed by Paciullo et al. (2001) examined Tifton 85 pastures in Viçosa, Minas Gerais State and found values close to 7.0% CP in stems collected close to the ground, lower than in the present study. However, the authors indicate that with the advance in stem development results in reduced CP values. In this research, the values were higher and uniform, with evidence of decrease in protein content after the full establishment of crops, as seen between the fall 2012 and fall 2013. This result can be attributed to the increased percentage of stems in forage mass (Table 1). Branco et al. (2012) investigated the cultivar Coastcross-1 in Luisiana, Paraná State, and found a correlation between CP content of the stem with rainfall. In this study the highest value found for the stem CP was 10.3%.

As for NDF content in the leaf blades, there was also no interaction or effect of the occupancy area of peanut in the pastures (Table 3). Considering the factors separately, there was a higher percentage of NDF for Tifton 85 (73.02%), 6.4% higher than the Coastcross-1. In a study conducted at the Agronomic Institute of Paraná in Paranavaí, Paraná State, using Coastcross-1 alone, intercropped with *Arachis pintoi* and subjected to N fertilization, Paris et al. (2009) found an average of 68.2% NDF for leaf blade. In the same place, Barbero et al. (2010) obtained values of 70.1 and 68.1% in leaf blades of mixed pastures provided or not with 100 kg ha^{-1} year^{-1} N, respectively.

For the present study, throughout the seasons, the results were similar, averaging 71.9% NDF in leaf blades. Lower values were verified by Barbero et al. (2010), with values of 67.9; 68.6 and 67.4% NDF for leaves of Coastcross-1 intercropped with peanut + 100 kg ha^{-1} year^{-1} N in the spring, summer and fall, respectively.

For NDF of stem + sheath, there was no interaction or significant differences for any of the factors separately (Table 3), with an average of 75.3% NDF. Ribeiro & Pereira (2010), in Viçosa, Minas Gerais Stage, studied the Tifton 85 grass in plots managed under cuts 5 cm above the ground and found 80% NDF in stems at 28 days of regrowth, with fertilization of 75 kg ha^{-1} year^{-1} N, increasing with longer rest periods.

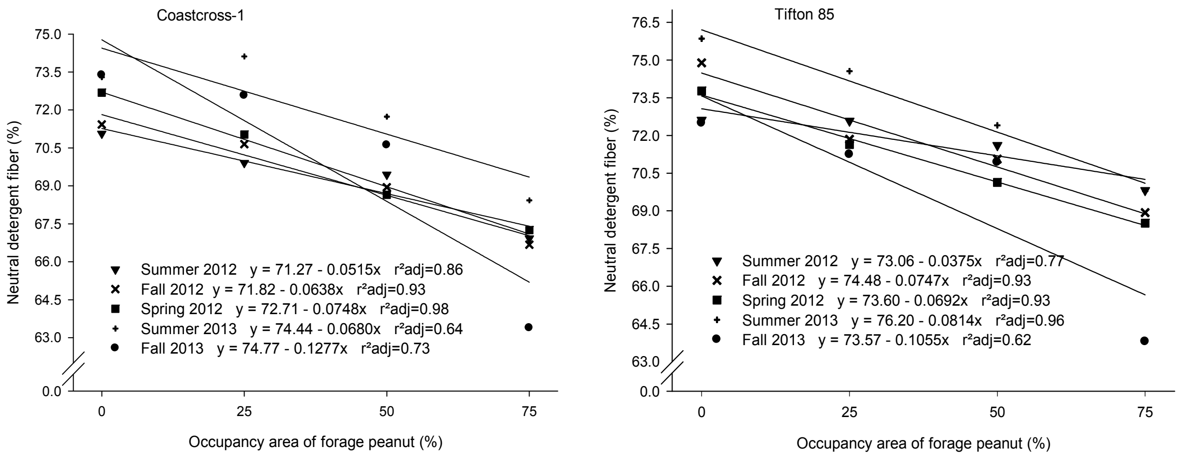

Figure 3. Regression equations for neutral detergent fiber (NDF) in the forage mass of the interaction between *Cynodon* cultivars, seasons and occupancy area of forage peanut. Dois Vizinhos, Paraná State, 2013.

Concerning the participation of the botanical and structural components in the forage mass, there was a significant interaction ($p < 0.05$) among the three factors (cultivars x occupancy area of peanut forage x seasons). In this sense, a greater inclusion and participation of forage peanut, provided a decrease in NDF of forage mass (Figure 3). There was also smaller NDF content in pastures made up of the cv. Coastcross-1.

From the linear equations, we registered an average decrease of 0.065% in the NDF content for each 1% of implanted area of legume in pastures for the first four seasons evaluated for both cultivars. Nevertheless, in the fall 2013, there were reductions above 0.1%, which is explained by the increasing participation of forage peanut in the forage mass of pastures along the seasons (Table 1) and also due to the low percentage of NDF of this legume (Nascimento, 2014). The decrease in NDF, mainly in summer pastures, is desirable because it is associated with the increase in forage intake (Van Soest et al., 1991).

There was no significant interaction for IVDMD (Table 3), and also no effect of the participation of forage peanut on the digestibility of leaf blade and stem + sheath. However, there was a higher IVDMD of leaf blades and forage mass for Coastcross-1, being respectively 4.0 and 1.6% higher than the pastures of Tifton 85. A similar result was found by Paciullo et al. (2001), who applied 60 kg ha^{-1} N and registered, for the summer, 66.1 and 55.5% IVDMD for leaf blade and stem + sheath of Tifton 85, respectively.

For the IVDMD of stem + sheath, there were similar values between cultivars. During the study, there was a higher IVDMD for leaf blades in the beginning of the study, with a subsequent decrease with each new season. This trend was also observed for the same variable in stems and in forage mass. The reduction in IVDMD between the first and last season was 29.8; 25.4 and 25.9% in the leaf blade, the stem + sheath and the pasture, respectively. This decrease can be related to a possible deficit of N in the pasture, since the increase in N doses in *Cynodon dactylon* pasture promotes a greater IVDMD (Oliveira et al., 2011). According to Paris et al. (2009), Coastcross-1 pastures intercropped with forage peanut without nitrogen fertilization exhibit an average of 60.4% of IVDMD in leaf blades, increasing to 63.9% with the addition of 100 kg ha^{-1} N and 66.0% in pasture of Coastcross-1 alone fertilized with 200 kg ha^{-1} N. In turn, for stem + sheath, these same authors found no effect of nitrogen fertilization, registering an average of 54.0% of IVDMD. Ribeiro et al. (2012) found IVDMD values higher than those in the present study, 77.6; 75.1 and 69.0% in leaf blades and 66.4; 64.9 and 61.5% for stem + sheath in the spring, summer and fall, respectively.

Conclusion

The cultivar Coastcross-1 has better nutritive value compared to Tifton 85.

A larger occupancy area of peanut has positive effects, increasing the crude protein content in leaf blades of grasses studied, from the second year after planting.

The increasing participation of peanut forage in mixed pastures increases the crude protein and reduces the percentage of neutral detergent fiber in the forage mass.

References

Barbero, L. M., Cecato, U., Lugão, S. M., Gomes, J. A., Limão, V. A., Abrahão, J. J. & Roma, C. F. (2010). Produção animal e valor nutritivo da forragem de pastagem de coastcross consorciada com amendoim forrageiro: Animal production and nutritive value of a coastcross pasture mixed with forage peanut. *Arquivo Brasileiro de Medicina Veterinaria e Zootecnia, 62*(3), 645-653.

Branco, A. F., Viana, K. B., Castañeda, R. D., Prohmann, P. E., Coneglian, S. M. & Mouro, G. F. (2012). Chemical composition and crude protein fractions of Coastcross grass under grazing on winter, spring and summer in Southern Brazil. *Acta Scientiarum. Animal Sciences, 34*(2), 183-187.

Carnevalli, R. A., Silva, S. C., Fagundes, J. L., Sbrissia, A. F., Carvalho, C., Pinto, L. & Pedreira, C. (2001). Desempenho de ovinos e respostas de pastagens de Tifton 85 (*Cynodon spp.*) sob lotação contínua. *Scientia Agricola, 58*(1), 7-15.

Lenzi, A., Cecato, U., Machado Filho, L. C., Gasparino, E., Roma, C. F., Barbero, L. M. & Limão, V. A. (2009). Produção e qualidade do pasto de coastcross consorciado ou não com amendoim forrageiro com ou sem aplicação de nitrogênio; Production and quality of coastcross pasture associated or not with forage peanut with or without nitrogen. *Arquivo Brasileiro de Medicina Veterinaria e Zootecnia, 61*(4), 918-926.

Moreira, F. B., Prado, I. N., Cecato, U., Wada, F. Y. & Mizubuti, I. Y. (2004). Forage evaluation, chemical composition, and in vitro digestibility of continuously grazed star grass. *Animal Feed Science and Technology, 113*(1), 239-249.

Nascimento, I. S. (2014). O cultivo do amendoim forrageiro. *Current Agricultural Science and Technology, 12*(4), 387-393.

Oliveira, M. A., Pereira, O. G., Ribeiro, K. G., Santos, M. E., Chizzotti, F. H. & Cecon, P. R. (2011). Produção e valor nutritivo do capim-coastcross sob doses de nitrogênio e idades de rebrotação; Production and nutritional value of bermudagrass cv. coastcross grown under different nitrogen doses and regrowth ages. *Arquivo Brasileiro de Medicina Veterinaria e Zootecnia, 63*(3), 694-703.

Olivo, C. J., Ziech, M. F., Meinerz, G. R., Agnolin, C. A., Tyska, D. & Both, J. F. (2009). Valor nutritivo de pastagens consorciadas com diferentes espécies de leguminosas. *Revista Brasileira de Zootecnia, 38*(8), 1543-1552.

Paciullo, D. S. C., Gomide, J. A., Queiroz, D. S. & Silva, E. (2001). Composição química e digestibilidade in vitro de lâminas foliares e colmos de gramíneas forrageiras, em função do nível de inserção no perfilho, da idade e da estação de crescimento. *Revista Brasileira de Zootecnia, 30*(3), 964-974.

Paris, W., Cecato, U., Martins, E. N., Limão, V. A., Galbeiro, S. & Oliveira, E. (2009). Estrutura e valor nutritivo da pastagem de Coastcross-1 consorciada com *Arachis pintoi*, com e sem adubação nitrogenada. *Revista Brasileira de Saúde e Produção Animal, 10*(3), 513-524.

Quaresma, J. P. S., Almeida, R. G., Abreu, J. G., Oliveira, M. A. & Carvalho, D. M. G. (2011). Produção e composição bromatológica do capim-tifton 85 (Cynodon spp.) submetido a doses de nitrogênio. *Acta Scienciarum. Animal Sciences, 33*(2), 145-150.

Ribeiro, K. G. & Pereira, O. G. (2010). Valor nutritivo do capim-tifton 85 sob doses de nitrogênio e idades de rebrotação. *Veterinária e Zootecnia, 17*(12), 560-567.

Ribeiro, O. L., Cecato, U., Rodrigues, A. M., Faveri, J. C., Santos, G. T., Lugão, S. M. B., & Beloni, T. (2012). Composição botânica e química da coastcross consorciada ou não com arachis pintoi, com e sem nitrogênio. *Revista Brasileira de Saúde e Produção Animal, 13*(1), 47-61.

Steinwandter, E., Olivo, C. J., Santos, J. C., Araújo, T. L. R., Aguirre, P. F. & Diehl, M. S. (2009). Produção de forragem em pastagens consorciadas com diferentes leguminosas sob pastejo rotacionado. *Acta Scientiarum. Animal Sciences, 31*(2), 131-137.

Van Soest, P. J., Robertson, J. B. & Lewis, B. A. (1991). Methods for dietary fiber, neutral detergent fiber, and nonstarch polysaccharides in relation to animal nutrition. *Journal of Dairy Science, 74*(10), 3583-3597.

Received on March 2, 2015.
Accepted on May 4, 2015.