Nutritional Groups of Herbaceous Species from the Pampas Grasslands

Jusiane Rossetto [1,], Teresa C. M. Genro [2], Bruna M. de Faria [2], Ênio R. Prates [1], Amanda de S. Santos [3], João P. Velho [4], José P. P. Trindade [2], Luis G. R. Pereira [5], Ángel Sánchez Zubieta [1], Emilio A. Laca [6]*

[1] Federal University of Rio Grande do Sul, Brazil
[2] Embrapa South Livestock, Brazil ;
[3] Sul-Rio-Grandense Federal Institute, Brazil;
[4] Federal University of Santa Maria, Brazil;
[5] Embrapa Dairy Cattle, Brazil;
[6] University of California, Davis, USA
* Corresponding author email: jusiane.rossetto@colaborador.embrapa.br;

Key words: Crude protein, digestibility, grassland, neutral detergent fiber

Introduction

The Pampa is a major biogeographic unit in South America and one of the world's grasslands richest sources of endemic herbage species, including more than 400 *Poacea* and 150 *Fabeacea* (Boldrini et al., 2010). In Brazil, the Pampa biome represents roughly 2% of national territory and it is the basis for livestock production in the State of Rio Grande do Sul. Because of geographical location and climatic conditions, the Pampa contains a rare combination of C3 and C4 plant species, which makes this biome unique in the world (Boldrini et al., 2010). This study aims at characterizing the nutritional properties of the most important species of the region to help improved nutritional management of herds and to understand the basis for the high meat quality.

Materials and Methods

The experiment was conducted in a native Pampa pasture located near of Bagé, State of Rio Grande do Sul, Brazil, over a three year period (2009, 2011 and 2012). The species evaluated were twenty-one *Poacea: Andropogon selloanus* (Anse), *Axonopus affinis* (Axaf), *Cynodon dactylon* (Cyda), *Dichanthelium sabulorum* (Disa), *Eragrostis cataclasta* (Erca), *Eragrostis plana* (Erpl), *Holcus lanatus* (Hola), *Lolium multiflorum* (Lomu), *Luziola peruviana* (Lupe), *Melica rigida* (Meri), *Mnesithea selloana* (Mnse), *Paspalum nicorae* (Pani), *Paspalum notatum* (Pano), *Paspalum pauciciliatum* (Papa), *Paspalum pumilum* (Papu), *Paspalum urvillei* (Paur), *Piptochaetium montevidense* (Pimo), *Saccharum angustifolium* (Saan), *Schizachyrium tenerum* (Scte), *Setaria parviflora* (Sepa), *Sporobolus indicus* (Spin), and five *Fabeacea: .*: *Desmodium incanum* (Dein), *Lotus corniculatus* (Loco), *Trifolium polymorphum* (Trpo), *Trifolium pretense* (Trpr), and *Trifolium repens* (Trre). Plants were collected at two phenological stages: bloom (F) and vegetative (V). Plants and seeds from each collection were transported to a greenhouse. The plants were analyzed for dry matter (DM), organic matter (OM), crude protein (PC), ash free neutral detergent fiber (aNDF), acid detergent fiber (ADF) and *in vitro* OM digestibility (OMD). Gas production kinetics of each species were estimated at 2, 4, 6, 9, 12, 15, 18, 24, 30, 36, 42, 48, 72 and 96 h (Mould et al., 2005). Data adjustment made by the Gompertz equation (Lavrencic, 1997) generated the variables: coefficients "A" (Acoef, microbial efficiency rate), ""C" (Ccoef; gas production rate), total gas production (TGP). Variables evaluated were: Acoef, Ccoef, TGP, NDF digestibility (NDFdeg), and DM digestibility (DMD). Clusters of species, phenological stages and plant parts were created by K-means clustering with number of cluster ranging from 4 to 8. Clusters were then related to original variables by plotting against the principal components analysis (JMP Pro 12, version 12.0.1).

Results and Discussion

Best clustering results were obtained with 6 groups (Figure 1). The groups were separated mostly by differences in Groups 4 and 6, integrated by species with divergent characteristics represent extreme nutritional sides. Group 4 is composed of species with more structural carbohydrates; *Saccharum angustifolium*, followed by *Paspalum nicorae* scored the highest levels at F and V stage. In group 6 are those species with better chemical composition at both stages of maturation, such as *Lotus corniculatus*, *Trifolium pretense* and *T. repens*, with average CP, NDFdeg and DMdeg of 243, 303 and 748g kg^{-1} of dry matter, respectively. Despite having lower values than group 6, species from group 2 also have high protein and NDF and DM digestibility, with mean values of 181, 630 and 748g kg^{-1} of dry matter, respectively. In this group, C_3 species are predominant.

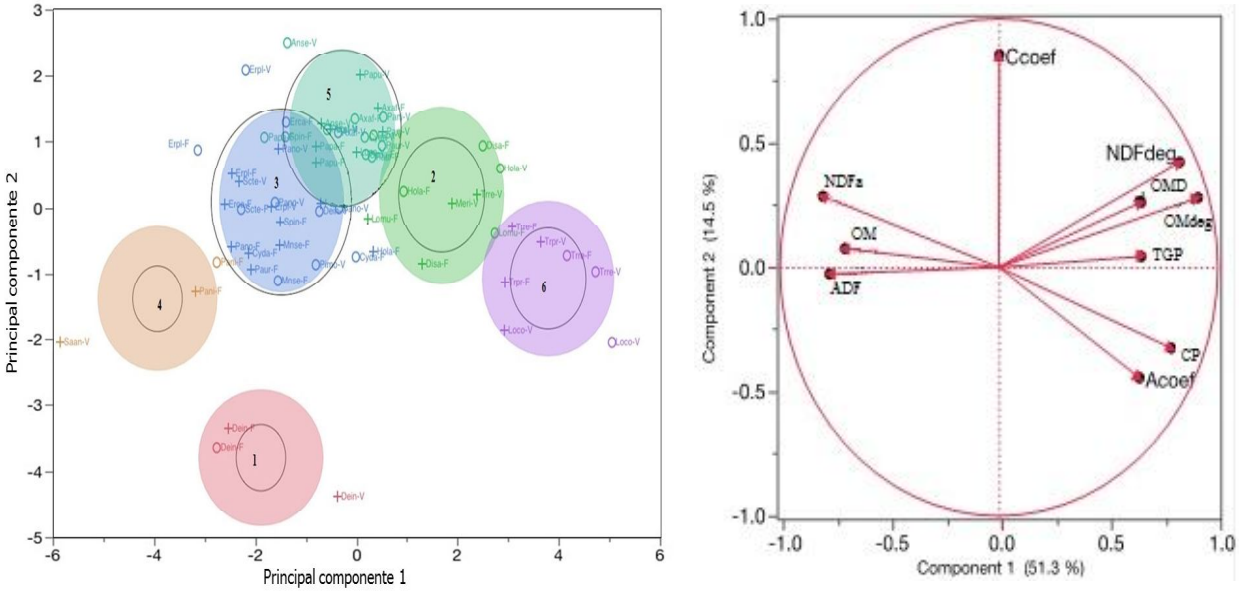

Figure 1. Cluster of Pampa species based on nutritional characteristics. The separation of clusters is explained by a cluster of horizontal variables related to fiber contend and a vertical variable dominated by the Ccoef and Acoef.

In groups 3 and 5 are located species with high content of NDF, but with higher digestibility than those from group 4. Group 1 is integrated only by *Desmodium incanum*, which had different characteristics than others. It is high in CP, low in NDF and ADF, and thus in dry matter and NDF digestibility, suggesting the presence of any plant secondary compound, which in turn could impair degradation by ruminal microbes.

Conclusions and Implications

Chemical composition and digestibility of grass species by multivariate analysis allowed their classification in different nutritional groups, which may be used to improve nutritional management of herds grazing grasslands.

References

Boldrini, I. I., Ferreira, P. M. A., Andrade, B. O., Schneider, A. A., Setubal, R. B., Trevisan, R., Freitas, E. M., 2010. Bioma Pampa: Diversidade florística e fisionômica. Porto Alegre, Pallotti. 64p. (Portuguese)

Mould, F.L., Kliem, K.E., Morgan, R. Mauricio, R.M., 2005. In vitro microbial inoculum: A review of its function and properties. Anim. Feed Sci. Technol. 123–124, 31–50.

Lavrencic, A., Stefanon, B. Susmel, P., 1997. An evaluation of the Gompertz model in degradability studies of forage chemical components. Ani. Sci. 64, 423-431.