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STRUCTURE AND FUNCTION VEGETATION CONDITIONS BY GRAZING PROCESSES IN A HUMID PAMPEAN GRASSLAND (ARGENTINA)

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Abstract

Expressed changes were evaluated as consequence of the cattle grazing, or their exclusion, in the structure of plant communities of the Flooding Pampa. We center our interest in the species numbers, plant cover, species diversity and forage availability. The treatments were: a) continuous grazing, b) enclosure grazing and c) controlled grazing. The enclosure grazing area was installed two years before starting the measurements. In the continuous grazing St. Augustine grass (*Stenotaphrum secundatum* Walt.) holds its initial cover of 64 % and dallis grass (*Paspalum dilatatum* Poir.) the 15 %. In the enclosure grazing *S. secundatum* decreased its cover up to 15 % and in the meanwhile *P. dilatatum* increased its cover up to 47 %. In controlled grazing *S. secundatum* decreased its cover up to 30 % while *P. dilatatum* increased its cover up to 47 %. The great availability of the forages established was concentrated in the compartment of the gramineous (continuos grazing: 1,576 $kg.ha^{-1}$; controlled grazing: 1,852 $kg.ha^{-1}$ and enclosure grazing: 4,785 $kg.ha^{-1}$) and the biggest contribution was given by *P. dilatatum*. In the condition of this trial, with a prolonged enclosure grazing, the erect gramineous like *P. dilatatum* increased their plant cover displacing from the grassland those ones of creeping stoloniferous habits like *S. secundatum*. In the meanwhile the controlled grazing started to show legumes such as birdsfoot trefoil (*Lotus tenuis* Waldst. et Kit) which are lost with the continuous grazing.

Keywords: Grassland, species diversity, forage availability, dallis grass (*Paspalum dilatatum* Poir.)

Introduction

The cattle raising are the main use of the native grasslands in Argentina Republic. A common practice of the usage of these grasslands is the continuous grazing; whose consequence is the damage of the forage resource (Ansín, 1995; Ansín and Deregibus, 1997). The great variability of the ecological environment where the grassland is developed does not allow the existence of a grazing "system" (Danckwerts et al., 1993). The emphasis in the grazing system design has focused on the variation of the rest and grazing intensity for maximum livestock production per unit of land area. However, the success in grazing manipulating depends fundamentally on the ability to recognize those grassland conditions where grazing processes can produce desirable changes in the structure and functioning of this ecosystem (Stuth et al., 1997). Thus, the objective of our work is to evaluate the changes which take effect in the native grassland, as a result of the continuous grazing made by the cattle, the controlled grazing and its exclusion as well. Our interest was focused on establishing the botanical composition, plant cover, species diversity and forage availability.

Material and Methods

The trail was sited on a cattle breeding ranch belongs to National University of La Plata located in the Flooding Pampa (35º 01' S, 57º 07' W). The native grassland, whose dominant species are *Stipa charruana* (Arech.), *Danthonia montevidensis* (Hack *et* Arech.) and *Eryngium ebracteatum* (Lam.) is located on an albic Natracualf soils. The dallis grass (*Paspalum dilatatum* Poir.) presence is highlighted by its forage value.

Three treatments were evaluated: a) continuous grazing. Since summer 1997 stocked with 0.8 cow.ha^{-1}.year^{-1}, b) enclosure grazing. Since summer 1997 and, c) controlled grazing. Since spring 1999 and stocked with 1.1 cow.ha^{-1}.year^{-1}. Grazing was carried out with Aberdeen Angus cows.

In autumn 2000, the numbers species and the plant cover using the visual method were determined in each treatment on surfaces of 25 m^2 with five repetitions. The species diversity was calculated using the Shanon-Weaver index, making use of the data from the botanical censuses (Margalef, 1977). Forage availabilities were evaluated simultaneously in the three treatments. Plants were cut down to ground level in 10 rectangles of 0.5 m^2 located at random. Electrical scissors GARDENA Accu 6 Lwa 79 were used. Cut plants were separated into four compartments: gramineous, legumes, wide leaf herbs and ground litter. Separate plant material was dried to a constant weight, getting the total dry matter (DM) with them. Differences between treatments were analyzed using the ANOVA and Tukey test when $P<0.05$.

Results and Discussion

When the experience was to start, the native grassland had a plant cover of 91% the species number was 25, giving as a result a species diversity of 2.3.

In Table 1 it can be observed that after two-year enclosure grazing, the grassland showed neither significant variation in the species numbers censured nor its total plant cover. In spite of the fact that a great ($P<0.05$) species diversity was observed in the controlled grazing as well as in the enclosure grazing. These results are concordant with. Sala *et al.* (1986) and Ansín (1995), who observed that the native grassland in the Flooding Pampa the enclosure grazing turns out to be in small changes in the vegetal plant cover but with significant changes in its distribution.

Even though the total plant cover did not have significant variations among the treatments, the species diversity difference displayed among them was directly related to the changes taken in the cover of the censured species. The main difference observed was that, while in the continuous grazing *Stenotaphrum secundatum* (Walt.) set up in the specie which presented the greatest cover, in the controlled grazing and in enclosure grazing the dominant specie turned to be *P. dilatatum*. Thus, while in the continuous grazing *S. secundatum* held its initial cover of 64 % and *P. dilatatum* the 15 %, in controlled grazing and enclosure grazing *S. secundatum* decreased its cover to 30 % and 15% respectively meanwhile in both treatments *P. dilatatum* increased its cover up to 47 %.

From the forage point of view, the importance of the variations settles down not only in the reached cover by *P. dilatatum*, but also in the contribution that the grassland forage availability brought about such gramineous. In Table 2 it is possible to appreciate the great availability of the forage established, in enclosure grazing as well as in the another two grazing treatments, it is the established concentrated in the compartment of the gramineous and the biggest contribution was given by *P. dilatatum*. On the other hand, the great quantity of DM registered in the enclosure grazing, in regard to the continuous grazing, it is coincident with the determinations done by Rusch and Oesterheld (1997) in native grasslands of the Flooding Pampa.

In the conditions of this trial, with a prolonged enclosure grazing, the erect gramineous like *P. dilatatum* they increased their cover displacing those ones of creeping habits like *S. secundatum*. In the meanwhile in the controlled grazing began to express legumes, such as the birdsfoot trefoil which are lost by the continuous grazing. Therefore, the alteration of species diversity may represent a major change in ecosystem functioning and open an interesting question for our experiment. Does grazing change the relative plants cover and DM availability relationship?

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Table 1 - Vegetation structure: species number, plant cover and species diversity. Summer 2000

	Species number	Plant cover (%)	Species diversity
Continuous grazing	25.0 ± 3.0 a	93.0 ± 6.0 a	2.2 ± 0.2 a
Controlled grazing	24.0 ± 3.0 a	94.0 ± 6.0 a	2.5 ± 0.1 b
Enclosure grazing	24.0 ± 3.0 a	87.0 ± 4.0 a	2.5 ± 0.2 b

Means within a column followed by a different letter are significantly different ($P<0.05$)

Table 2 - Compartments total DM availability (kg.ha^{-1}). Summer 2000

	Gramineous	Legumes	Wide leafs herbs	Ground litter	Total DM
Continuous grazing	1576 ± 298 a	6.0 ± 0.5 a	14 ± 4 a	0 a	1596 ± 301 a
Controlled grazing	1852 ± 246 b	6.0 ± 0.5 a	116 ± 11 b	0 a	1974 ± 252 b
Enclosure grazing	4785 ± 424 c	8.0 ± 0.5 a	385 ± 40 c	424 ± 40 b	5602 ± 598 c

Means within a column followed by a different letter are significantly different ($P<0.05$)