EFFECT OF CATTLE GRAZING ON THE ARIDITY LEVEL OF HUMID HALOMORPHIC GRASS COMMUNITIES OF THE FLOODING PAMPA (ARGENTINA).

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ABSTRACT

The Argentine Flooding Pampa is a large humid rangeland, severely deteriorated by cattle grazing, to the point of causing the local extinction of many native grasses and important alterations in ecosystem function.

Among grassland communities exist those that vegetate halomorphic soils, highly degraded due continuous grazing by domestic herbivores causing soil denudation and increased aridity. An alternate grazing method, that controls the periodicity and moment of important rest periods followed by disturbance events, should increase cover and favor water availability. This succession process will determine more vigorous and abundant foraging species in the degraded communities.

After six years of controlled grazing implementation, grasses show a higher water potential recuperation capacity than those grazed continuously. These results are related to an increase in soil cover, a better water status which decreases the aridity level and allows seedling establishment.

KEYWORDS

Rangelands, grazing, plant cover, aridity, halomorphic communities, soil water potential

INTRODUCTION

The once lush rangelands of the Flooding Pampa are now continuously grazed and overstocked. This practice has increased communities' fragility, reduced plant growth, left bare soil, and lessened water infiltration, increasing the aridity of halomorphic soils (D'Angela et al., 1986; Deregibus, 1988).

We postulate that, through stock reduction and an alternate grazing method to control disturbance and rest events, which following vegetation grazing tolerance level, it is possible to halt deterioration and encourage a successional process to take place. This will occur through structural and functional modifications, such as species establishment, that will increase plant cover and favor water infiltration.

Our objectives were: 1) to evaluate variation in soil cover as a consequence of the imposed grazing situation, 2) to measure soil water status when covered or not by plants and 3) to determine the relationship between plant cover and soil water potential, as a way of predicting the aridity level.

MATERIAL AND METHODS

The humid grasslands communities we experimented with are Typic Natracualf soils and are dominated by *Sporobolus indicus* (L.), *S. pyramidatus* (Lam.), *Distichlis scoparia* (Kunth) and *D. spicata* (L.). Annual rainfall on the Flooding Pampa region averages 950 mm, often being scarce during summer and causing severe droughts (Ansín, 1995).

In a commercial ranch where controlled grazing was implemented, two paddocks vastly covered with halomorphic communities and stocked with 0.55 cow.ha^{-1}.year^{-1}, were compared with two areas continuously grazed, and stocked with 0.95 cow.ha^{-1}.year^{-1} and with two areas excluded to grazing.

Basal cover was measured for each treatment at every climatic station from 1986 through 1992, along four randomly placed 5 m interception lines (Facelli et al., 1988).

Soil water potential was determined between 1990 until 1992, using psychrometers PST 55-30-ST Wescor and HR-33T-R Dew Point Microvoltmeter Wescor, USA. Psychrometers were placed randomly at 5 cm under three *S. indicus* plants and in three bare soil positions between plants for each experimental plot.

Differences between treatments were analyzed using the ANOVA and Tukey test. Regression analyses were used to explain the relation between plant cover and soil water potential. Mean comparison were conducted using the Tukey test where $P<0.05$.

RESULTS AND DISCUSSION

Vegetation changes were noticeable. From an initial total basal cover of 42.5% in 1986, a different ($P<0.05$) 60% cover was measured six years later on the controlled grazed site. The 51.1% and 44.1% cover measured respectively when ungrazed or when continuous grazed, were not significantly different ($P>0.05$) to the original value.

The greatest floristic changes and cover variations caused by the treatments were observed at the end of the study. No change was observed in botanical composition for the continuously grazed treatment. The dominance of salt grass (*Distichlis spp)* was observed when grazing was excluded and, in the controlled grazed pastures, a significant cover increase occurred with *Botriochloa laguroides* (DC), *B. sacharoides* (Sw.), *Lolium multiflorum* (Lamarck) and *S. indicus* (from 1.3 to 10.8%) dominating.

During the critical summer time the soil water potential under the plant was higher ($P<0.05$) than that under bare soil: -5.5 vs -6.2 MPa in the Ungrazed treatment, -6.3 vs -9.6 MPa in the Continuous Grazing and -4.8 vs -7.1 MPa in the Controlled Grazing situations.

From these data it is interpreted that the reduction of the plant cover caused by continuous cattle grazing increases soil water stress, as infiltration rate of the bare Typic Natracualf soil is affected (Alconada, 1991). Controlled grazing encouraged a successional process that did not occur in the areas that were excluded to grazing.

A positive logarithmical correlation ($P<0.05$) was found relating plant cover and soil water potential under the plant for all treatments (Figure 1). Water status decreased steadily as basal plant cover decreased. Similar changes in structure and function to those found in this study, had been reported to occur in several grasslands around the world when management practices were modified (Miles, 1981).

CONCLUSIONS

It may be postulated that alternative time control grazing, in addition to a reduction of stocking rate, modifies the structural and functional aspects of humid and fragile rangelands. This occurs through an increase in plant cover and a reduction in the aridity level on humid halomorphic grass communities of the Flooding Pampa.

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Figure 1

Logarithmical correlation between Plant Cover (Xi= cover measured, Xn= maximum potential cover) and Water Potential under *Sporobolus indicus* ($P<0.05$).