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HERBACEOUS VEGETATION DYNAMIC AFTER CUT AND BURN SHRUB PLANTS IN SOUTHERN BRAZIL.

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Abstract

A savanna area at "Serra do Sudeste" in southern Brazil, was studied during four years to evaluate the influence of cutting and burning shrub plants on dynamic of herbaceous vegetation. The cover of each species in 44 permanent quadrats (0,25 m^2) and in each area (cut and burned) was evaluated. The results suggested that grasses and legumes were favored by cutting shrub plants. Burning favored forbs in the first years after disturbance and retarded the development of native forage species desirable for grazing.

Keywords: savanna, native forage species, grasses, legumes, forbs, management, "Serra do Sudeste".

Introduction

The vegetation of "Serra do Sudeste" in Rio Grande do Sul, southern Brazil, is formed by shrubs species associated to grassland. Cutting and burning shrub plants are commonly used by farmers at this region as an intentional management aiming to increase and maintain the available grazing areas for animal production. The improvement of pasture yield using cut of shrub plants was refered by many authors (Morton and Melgoza, 1991; Schacht et al.,

1989, 1992). Fire is also used as a management tool to control woody plants aiming to increase the availability and utilization of pasture (Mayeux and Hamilton, 1988; Damé et al., 1997). At the same site of this work Girardi-Deiro et al. (1994) verified an improvement on herbaceous vegetation yield and botanical composition on cutting area. However, the influence of cutting and burning shrub plants on herbaceous vegetation dynamic is not sufficiently studied yet. The objective of this work was to evaluate the influence of cutting and burning shrub plants on forbs and forage species dynamic.

Material and Methods

The study area is situated at northern Bagé (53° 38´ 44´´W and 30° 54´02´´ S), Rio Grande do Sul, Brazil. It is under a Cfa subtropical climate with average annual precipitation of 1350 mm and average annual temperature of 17° C. The study area size is 1920 m^2 situated over litolic and shallow soils with declivity average of 16%. The soil type is classified as Lithosols (Camargo et al. 1987). The vegetation was evaluated through 11 permanent quadrats measuring 1 m^2 each, divided in quaters of 0.25 m^2 (sample units) for each area: sites where the shrub plants were only cut (cut areas) and sites (patches about 3 m diameter) where leaves and fine stems of shrubs not used for wood were piled and burned (burned areas) in jan./1991. The cover of each species and the percentual of bare soil were evaluated in the 44 sample units during 4 years (1992-1995). The herbaceous vegetation dynamic was analysed with a view at changes in the species composition and cover. The data were arranged in groups: grasses, legumes, forbs and bare soil. Variance analysis and LSD (Least-significance-difference) test were used in data analysis.

Results and Discussion

Cover (Table 1)

Grasses: The mean cover of grasses was significantly greater ($P < 0.05$) on cut areas along the four years. The decline in cover of grasses from 1992 to 1993 on cut areas was specially due to the increase on forbs cover during this period. The grasses cover reduction verified from 1994 to 1995 in both situations (cut and burned) was mainly due to the progressive sample units occupation by shrub species of carqueja (*Baccharis trimera*).

Legumes: An increasing of legumes along the observation period on both areas was verified, but mainly on burned areas. However, legumes cover was significantly greater ($P < 0.05$) on cut areas, except in 1995.

Forbs: On both areas forbs showed a similar trend along the four years. However, the mean cover of forbs was significantly greater ($P < 0.05$) on burned areas, except in 1993. These results agree with Cesar and Gifford (1982), who verified an increasing of little woody plants and a decreasing of grasses using clipping and burning.

Bare soil: The mean percentage of bare soil was greater ($P < 0.05$) on burned areas. This was expected due to the kind of fire that burned all plants under the soil surface. Nevertheless, two years after burning, about 67% of bare soil was replaced by plants; after five years the vegetation covered about 90% of the soil surface. This occupation was slower than observed by Godron et al. (1981) in a *garrigue* community, France: two years after fire the vegetation cover exceeded 80% of the area and after three years it covered an area with the same size of the control area.

Species number (Table 2)

Grasses: The number of Gramineae gradually increased through the years on both sites. Despite the greater number on burned areas (except in 1992) grasses have occupied a smaller soil surface than on the cut area, as shown in Table 1. Grama-forquilha (*Paspalum notatum*) and grama-tapete (*Axonopus affinis*) prevailed on cutting sites during the four years,

whereas on burned areas *Eragrostis lugens* occurred mainly in the first two years and *Axonopus affinis* and *Paspalum paniculatum* in 1995.

Legumes: The number of legumes was greater on cutting areas where pega-pega (*Desmodium incanum* and *D. affine*) was the main species. On burning areas *D. incanum* prevailed only in 1995.

Forbs: In general, the number of forbs increased from 1992 to 1995, especially in 1993.

Finally, on cutting areas, the occurrency of better forage species like *Paspalum notatum*, *Desmodium incanum* and *D. affine* have prevailed, while on burning areas, in the first two years, those of medium quality like *Eragrostis lugens* prevailed (Barreto and Kappel, 1967). However, in 1995, on burning areas, forage species like *A. affinis, D. incanum, P. paniculatum* and *P. notatum* have improved in cover and species number. Therefore, the results suggested that grasses and legumes were favored by cutting shrub plants. Burning favored forbs in the first years after disturbance and retarded the development of native forage species desirable for animal production.

References

Barreto, I. L. and Kappel A. (1967). Principais gramíneas e leguminosas das pastagens naturais do Rio Grande do Sul. Proc. 15 th. Congresso Nacional de Botânica, Porto Alegre, 1964, pp. 281-194.

Camargo, M. N., Klamp E. and Kauffman J. H. (1987). Classificação de solos usadas em levantamentos pedológicos no Brasil. Boletim informativo da Sociedade Brasileira da Ciência do Solo, Campinas, **12** : 11-33.

Cesar, H. L. and Gifford D. R. (1982). Flora indicadora de fogo e corte em um campo do Distrito Federal. Proc. 32 th. Congresso Nacional de Botânica, Teresina, 1981, pp. 201-206.

Damé, P. R. V., Quadros F. L. F., Kersting C. E. B., Trindade J. P. P and Londero F. A .A . (1997). Efeito da queima seguida de pastejo ou diferimento sobre a produção, qualidade, cobertura do solo e sistema radicular de uma pastagem natural. Ciência Rural, Santa Maria, **27** : 133-137.

Girardi-Deiro, A. M., Mota A. F. da and Gonçalves J. O. N. (1994). Efeito do corte de plantas lenhosas sobre o estrato herbáceo da vegetação da Serra do Sudeste, RS, Brasil. Pesquisa agropecuária brasileira, **29** : 1823-1832.

Godron, M.; Guillerm J. L., Poissonet, J., Poissonet P, Thiault M. and Trabaud L. (1981). Dynamics and management of vegetation. In: Di Castri, F., Goodall, D. W. and Specht, R. L. Mediterranean-type shrublands**.** (Ecosystems of the world , 11), pp. 317-344.

Mayeux, H. S. Jr. and Hamilton W. T. (1988). Response of false broomweed and associated herbaceous species to fire. Journal of Range Management, **42**: 2-6.

Morton, H. L. and Melgoza A. (1991). Vegetation changes following bush control in creosotebush communities. Journal of Range Management, **44**: 133-139.

Schacht, W. H., Mesquita R. C. M., Malechek J. C. and Kirmse R. D. (1989). Response of Caatinga vegetation to decreasing levels of canopy cover. Pesquisa agropecuária brasileira, **24** : 1421-1426.

Schacht, W. H., Long J. N. and Gobena A. (1992). Aboveground biomass acumulation in coppicing woodland, northeast Brasil. Forest Ecology and Management, **55**: 201-208.

Table 1 - Mean cover of grasses, legumes, forbs and bare soil in cut (C) and burned (B) areas. "Serra do Sudeste"/Bagé, RS, Brazil.

	1992		1993		1994		1995	
	C	B	C	B	C	B	C	B
	---------- % ----------							
Grasses	57.80^{Aa}	23.43^{Db}	48.25^{Ba}	34.59^{Cb}	57.93^{Aa}	46.78^{Ab}	51.12^{Ba}	40.39^{Bb}
Legumes	5.91^{Ba}	0.89^{Cb}	5.09^{Ba}	2.48^{Cb}	11.11^{Aa}	5.05^{Bb}	11.55^{Aa}	9.98^{Aa}
Forbs	17.66^{Bb}	27.55^{Ba}	36.91^{Aa}	37.39^{Aa}	21.75^{Bb}	30.15^{Ba}	21.04^{Bb}	25.60^{Ba}
Bare soil	2.27^{Ab}	33.05^{Aa}	3.25^{Ab}	19.36^{Ba}	0.50^{Ab}	9.52^{Ca}	0.57^{Ab}	10.36^{Ca}

Capital letters shows significant deference ($P < 0.05$) between years within treatments (cut and burned) and small letters shows significant deference ($P < 0.05$) between treatments (cut and burned) within years. LSD test.

Table 2 - Number of grasses, legumes and forbs in cut (C) and burned (B) areas. "Serra do Sudeste"/Bagé, RS, Brazil.

	1992		1993		1994		1995	
	C	B	C	B	C	B	C	B
Grasses	26	20	27	30	28	30	30	33
Legumes	9	5	10	5	9	6	9	6
Forbs	54	56	76	65	58	61	64	58
Total	89	81	113	100	95	97	103	97