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Presenter Information

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Fatty acid profile of elephant grass pastures with different grazing heights

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Introduction

Ruminant milk and meat are a source of CLA and omega-3 in the human diet and these fatty acids (FAs) have a beneficial effect on human health (Mcguire and Mcguire 2000). The increase in CLA and omega-3 in ruminant products is mainly related to proportion of C18:2 and C18:3 in the animal feed, like forage and to incomplete ruminal biohydrogenation (Bauman *et al.* 2000). Evaluation of FAs have been performed in temperate forage pastures, without the interaction of animal grazing, and presenting samples collected at ground level and at fixed re-growth intervals or seasons as the main sampling criteria. Therefore, the objective of this study was to evaluate the proportion of fatty acid in strata of elephant grass cv. Pioneiro with different grazing heights.

Material and methods

The experiment was conducted in Lages (Santa Catarina State), Brazil, between February and June 2011. The climate is subtropical humid without a dry season and a cool summer (Cfb), with a mean annual temperature and precipitation of 15.8° C and 1550 mm, respectively. The experimental design was a 2 x 2 factorial complete random-ized block design, with three replications, corresponding to combinations of two pre-grazing heights (90 or 120 cm) and two defoliation severities (grazing down of 50 or 70% of the pre-grazing sward height) of elephant grass cv. Pioneiro swards (*Pennisetum purpureum* Schum.), result-ing in four treatments: 90/50, 90/70, 120/50 and 120/70. A variable stocking rate was used to ensure that the occupation period of paddocks did not exceed two days.

The average pre and post-grazing heights were estimated at sixty points per experimental unit using a "sward stick" (Barthram 1985). The collection of forage samples was performed at pre-grazing in three points per paddock using a rectangular frame of 1 m^2 and was stratified into 3 parts: stratum 1 (upper half above stubble height), stratum 2 (bottom half above stubble height) and residues (stubble). Subsamples of strata 1 and 2 were collected for analysis of the fatty acid profile and morphological composition (stem plus pseudo stem, leaves and dead material). Samples of expanding leaves, fully expanded leaves and stems were also collected to assess the lipid profile in these structures individually. Fatty acid analysis was performed using gas chromatography after extraction of fat (AOAC 2000; method 925.38) and derivation. The data were analyzed using MIXED procedure (grazing cycles were used as repeated measure-ments) with the SAS statistical program. A *Tukey's* test with a significance level of 5% was used for comparison of means.

Results

The most common FAs present in elephant grass swards were C18:3, C18:2 and C16:0, together comprising approximately 94% of the total FAs observed (Table 1). The highest proportion of FA in pasture was C18:3 (approximately 58%). There was no interaction between pre and post-grazing heights (P>0.05), and there was no difference between grazing severities and lipid profile of the pastures.

Table 1. Fatty acid proportion and crude fat (CF) in elephant grass swards subjected to grazing heights.

Treatment	Stratum	CF (%)	C16:0	C16:1	C18:1n9	C18:2n6	C18:3n3
			% Total Identified Fatty Acids				
90/50	1	3.64	15.48	4.20	1.66	15.12	63.52
	2	2.47	19.08	3.58	3.08	20.07	53.86
90/70	1	3.08	15.40	4.17	1.74	14.10	64.67
	2	2.39	19.99	3.85	2.97	21.37	51.73
120/50	1	3.12	20.09	4.11	1.54	15.38	61.51
	2	2.50	17.32	4.40	2.80	20.03	52.61
120/70	1	2.66	17.07	4.01	0.92	15.96	62.02
	2	1.94	21.64	3.99	2.68	22.97	48.70
				P-values			
Height (90 and 120 cm)		0.113	0.0036	0.328	0.146	0.138	0.051
Strata (1 and 2)		<0.001	<0.001	0.370	<0.001	<0.001	<0.001

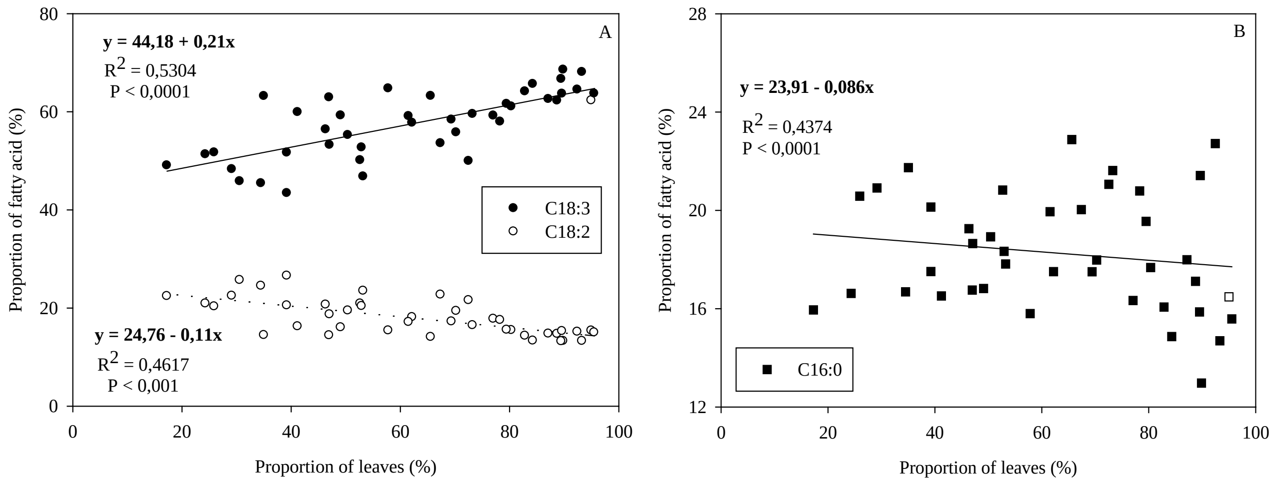

Figure 1. Relationship between the proportion of leaves and the proportion of (A) linolenic (C18:3), linoleic (C18:2) and (B) palmitic (C16:0) acids in elephant grass swards subjected to grazings heights.

However, pre-grazing heights modified the proportion of some FAs observed, with the highest proportions of C16:0 (19%) being found in the 120 cm treatments and the highest proportions of C18:3 (58%) being found in the 90 cm treatments (Table 1). Higher percentages of C18:3 (63%) and crude fat (3%) were found in stratum 1 of the pasture, whereas higher proportions of C16:0 (20%), C18:1 (2.8%) and C18:2 (21%) were found in the stratum 2. There was no relationship between the mass of leaves and the proportion of C18:2 (R^2 = 0.0228; P = 0.3398) and C18:3 (R^2 = 0.0132; P = 0.4695), however, the highest proportions of C18:3 were related to the highest proportion of leaves (Fig. 1). Thus, the grazing stratum of the 90/50 treatment is the most appropriate when the goal is to provide forage with a higher proportion of C18:3.

In this study, the presence of the highest proportions of C18:3 in the pasture with the highest proportion of leaves can be explained by a greater proportion of these FAs in the leaves (61%) when compared with stems (18%). In contrast, the highest proportions of C18:2 and C16:0 in pastures with the lowest proportions of leaves, can be explained by a greater proportions of these same FAs in the stems (30 and 53%) when compared with leaves (14 and 20%). Moreover, no difference in the proportions of FAs was found between expanding leaves and fully expanded leaves. However, these preliminary results should be discussed with caution, since it is not presented here the concentration of FA (g of FA/kg of DM) and might have differences among treatments since there was a trend that pastures grazed with 90 cm had higher crude fat content when compared with those grazed at 120 cm, especially when associated with a level of severity of 70%.

Conclusion

A higher proportion of linolenic acid in elephant grass can be obtained with a pre-grazing height of 90 cm and in the upper stratum or by employing management strategies that result in a greater proportion of leaves.

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