

Influence of part-time grazing management on lipid fractions (fatty acids and triglycerides) of sheep's milk

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INTRODUCTION

Part-time grazing is a traditional flock management system used in the Basque country (Northern Spain) in which pasture feeding is supplemented indoor with forage (alfalfa and pasture hay) and concentrate to meet milk production requirements. Pastures are available from early spring (March) to early summer (June). Most of milk produced in this period is used to produce PDO Idiazabal cheese. Previous studies have reported changes in the technological and compositional quality of milk and cheese from commercial flocks under part-time grazing [1-2]. This study evaluated the effect of part-time grazing management on fatty acid and triglyceride composition of raw ewe's milk.

MATERIAL AND METHODS

Experimental design

Experiment monitored over 5 weeks (in May):

- 1 conditioning week + 4 experimental weeks
- 48 *Latxa* dairy ewes
- 4 experimental groups
- 12 animals in each group were blocked on the basis of: (a) lactation day and milk yield, (b) milk protein and fat, and (c) body weight

Milk samples (evening and morning combining) were taken once a week.

Milk analyses

Fatty acids from milk fat were methylated with sodium methoxide and analysed in duplicate by GLC in a CP-Sil (60 m x 0.25 mm - 0.25 µm film thickness) column (Agilent Technologies) using oven temperature gradient and FID detection.

Triglycerides from milk fat were analysed by RP-HPLC in a Nucleosil 100 C-18 (25 cm x 4 mm - 3 µm) column (Teknokroma) using an acetonitrile:acetone gradient elution and ELS detection. Analyses were made in duplicate. Peak identification was done according to the methodology proposed by Nájera et al. [3].

Data analysis

ANOVA (GLM) using feeding regime and time (week) as factors and Stepwise Discriminant Analysis were performed using SPSS 17.0 Statistic Package.

Feeding regime of the 4 groups of animals

All groups received 500 g/ewe/day of concentrate..



Group	Alfalfa (g/ewe/d)	Grazing time ¹ (min/ewe/d)	Grass hay (g/ewe/d)
0	600	0	1000
1	300	228±8 ^a	0
2	600	224±6 ^a	0
3	900	209±1 ^b	0

¹visually measured; ^{a,b}significantly different at P≤0.05

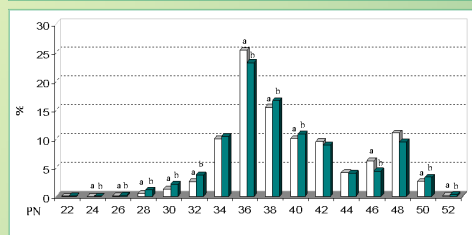
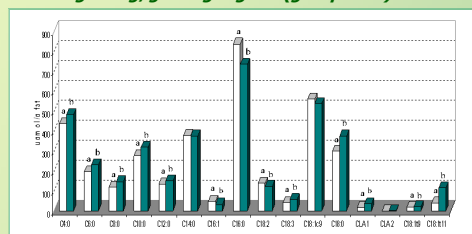
Nutritional characteristics of the feeds

Feed	Crude Protein (%)	Neutral-Detergent Fibre (%)
Concentrate	22.0 ± 1.0	-
Alfalfa hay	19.6 ± 3.2	36.4 ± 6.5
Grass hay	9.3 ± 3.1	56.1 ± 5.3
Pasture ²	23.4 ± 2.0	40.0 ± 3.3

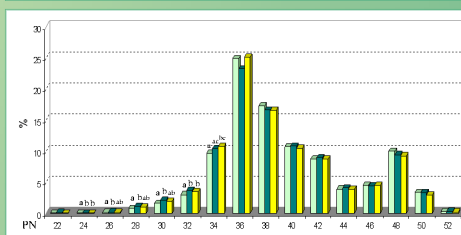
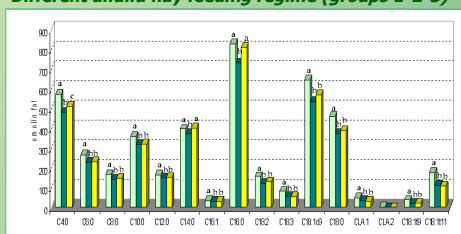
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RESULTS AND DISCUSSION

No grazing/grazing regime (groups 0-2)



Different alfalfa hay feeding regime (groups 1-2-3)

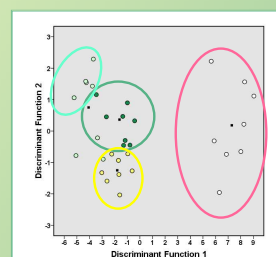


PN	Main Triglycerides*
22	Not identified
24	Not identified
26	Not identified
28	C6:0-C8:0-C16:0
30	C10:0-C10:0-C10:0
32	C4:0-C14:0-C14:0
34	C4:0-C14:0-C16:0
36	C4:0-C16:0-C16:0
38	C4:0-C16:0-C18:0
40	C6:0-C16:0-C18:1c9
42	C10:0-C14:0-C16:0
44	C10:0-C16:0-C16:0
46	C10:0-C16:0-C18:1c9
48	C16:0-C16:0-C18:1c9
50	Not identified
52	Not identified

* Triglyceride molecular species identified in sheep's milk according to Nájera et al. [3].

Abbreviations

PN: partition number
PN = CN - 2ND
CN: total number of carbons
ND: number of double bonds
CLA1 = C18:2c9t11
CLA2 = C18:2t10c12



Stepwise Discriminant Analysis

The 93.8% of the total number of cases were correctly classified. Discriminant variables were butanoic, palmitic and palmitoleic acids. Discriminant function 1 classified the samples according to the grazing regime (groups 0 and 1-2-3) whereas discriminant function 2 classified samples according to the different alfalfa hay doses under part-time grazing management (groups 1-2-3).

Conclusions

- The composition of sheep's milk lipid fractions (fatty acids and triglycerides) was significantly affected by the feeding regime under part-time grazing management.
- Part-time grazing management increased the content of short-chain (<C14) and some of the unsaturated fatty acids as C18:3, C18:2c9t11 and C18:1t11. The grazing effect on triglyceride content was variable and triglycerides with low and high PN values were affected.
- Under part-time grazing management, the lower alfalfa hay dose, the higher content of short-chain (<C14) and some unsaturated fatty acids as C18:2, C18:3, C18:1c9, C18:2c9t11 and C18:1t11. Lower percentages in triglycerides with PN lower than 36 were reported with lower alfalfa hay dose.

References

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- [3] Nájera AI, Perea S, Barcina Y, de Renobales M & Barron LJR (1999). *Journal of the American Oil Chemists Society* 76, 399-407.

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