FATTY ACID COMPOSITION AND THERMAL PROFILES OF SUBCUTANEOUS FAT FROM STEERS UNDER DIFFERENT DIETAR REGIMEN

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Introduction

The quality of the subcutaneous fat in steers is important not only from the nutritional point of view but also for beef quality. The fatty ac composition of adipose tissue in ruminants it is not easily altered by dietary means (Smith, 1991). Breed differences in adipose tissue fatty ac composition are many times hiding for confounding factors as age, plane of nutrition, etc. (Eichorn et al., 1986).

Objective

The aim of this research was to determine the effects of 4 different dietary regimens on the fatty acid composition and thermal profiles of ste subcutaneous fat.

Materials and methods

Samples of subcutaneous fat at Longissimus dorsi 10-13a ribs were taken from 40 Angus steers under 4 different dietary regimen grass alone, cor "ad libitum" or grass supplemented with corn (1.0 or 1.5 % of liveweight) (Table 1). The average slaughter weight was 380 kg.

Table 1. Experimental treatment

	n	Fall-Winter	Spring	Summer
T1	10	Corn ad lib	Corn ad lib	Corn ad lib
T2	10	Corn 1%	Grass	Corn 1.5%
T3	10	Corn 1%	Grass	Grass
T4	10	Grass	Grass	Grass

Fat samples were extracted with hexane and the fatty acid composition determined by GLC of corresponding methyl esters (García el al., 1976) Melted samples were used for Differential Scanning Calorimetry (DSC) analysis. The calorimetric curves were registered between -35 and 65°C wit a heating rate of 5°C/min. Aliquot samples (5-6 mg) were under the following procedure. Melted samples were kept 2 days at room temperature cooling at -35°C at 5°C/min and heating up to 65°C at 5°C/min. Two areas were clearly detected in the thermograms. Area 1: -35°C to 30°C wit an average maximum at 6°C, and Area 2: 30°C to 65°C with an average maximum at 42°C. The areas were weighted and the ratio Area 1/Area 2 were calculated. Statistical analyses were performed using the INRA STATITCF Programme (1989). Multivariate analysis of variance was performe using a least square model. Discriminant factor analysis (DFA) was performed to classify the subcutaneous fat into groups according to its fatty acid composition.

Results and Discussion

The fatty acid composition of subcutaneous fats is shown in Table 2.

Table 2. Fatty acid composition of subcutaneous fat (%) (Mean±SD).

Fatty acid	T1	T2	T3	T4
14:0	3.8±0.53a	3.4±0.34ab	3.3±0.70ab	3.2±0.42b
15:0	2.0±0.37a	2.0±0.39a	2.1±0.36a	2.1±0.33a
16:0	26.8±2.23ab	25.4±2.41a	29.3±2.50b	27.1±1.49ab
16:1	4.7±0.66a	5.0±0.59a	4.3±1.74a	4.9±0.73a
17:0	1.6±0.35a	1.3±0.26bc	1.5±0.18ac	1.7±0.13a
17:1	1.0±0.18b	0.9±0.18ab	0.8±0.08a	0.8±0.26a
18:0	13.7±2.31a	15.6±1.83ab	15.8±2.01ab	16.9±2.21b
18:1	43.4±1.93a	42.0±3.25a	38.5±2.65b	38.5±1.12b
18:2	2.4±0.66a	1.9±0.40b	1.9±0.25b	1.9±0.32b
18:3	0.7±0.19a	1.0±0.28ab	1.0±0.26ab	1.3±0.43a
MUFA/SFA	1.0±0.13a	1.0±0.10a	0.9±0.08b	0.9±0.02b

a, b, c Values with different letters in the same row are different ($p<0.05$).

Fatty acid percentage showed significant differences ($p<0.05$) due to dietary regimens. The MUFA/SFA ratio (16:1+18:1)/(14:0+16:0+18:1) also differed ($p<0.05$) among dietary regimens. The discriminant factor analysis (DFA) allows the correct classification of 90% of the steers using the subcutaneous fatty acid composition (Fig. 1).

The effect of dietary regimens on the thermal behaviour of subcutaneous fat is presented in Table 3. The two relative areas (A1 and A2) of the thermograms between -35 and 65 were correlated with the total saturated fat (mg) in the sample. SFA mg=0.78 mg sample-0.0035 A1 mg-0.0022 A2 mg. R2=0.84.

The fatty acid composition corresponding to A2 was (14:0 6%; 16:0 48 % and 18:0 31%)

Table 3. Ratio of thermogram areas 1 and 2.

Treatment	A1/A2 ratio
T1	3.2±0.40 a
T2	2.0±0.68 b
T3	1.7±0.44 b
T4	1.7±0.31 b

a, b Values with different letters in the same row are different ($p<0.05$).

Conclusions

Fatty acid composition of subcutaneous fat from steers was affected significantly ($p<0.05$) by differences in the diet. The MUFA/SFA ratio was affected significantly ($P<0.05$). The DFA detected differences among the four diets and the thermal profiles also were different.

References

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Fig. 1. Diet Effects. DFA performed to classify in groups according to the subcutaneous fatty acid composition