INFLUENCE OF THE RICH *PUFA* CONCENTRATE FEEDS ON FATTENING LAMBS PERFORMANCE

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Abstract

The improvement of meat quality and of animal production is an objective necessity, given the global demand for food, as well as a priority for animal nutrition research.
The purpose of the present paper is to investigate the influence of sunflower meal replacement (20.4%) in the control group C, from the compound feeds for fattening lambs, by rapeseeds (15.4%) and camelina seeds (5%) in group E.
Our experiments used two groups (control, C and experimental, E) of Karabash lambs which were fattened in an intensive system, for 97 days, from the average weight of 17.4 kg to 40 kg, with an average daily weight gain of 233.6 g.
Fatty acids concentration was determined by transmethylation followed by separation in a capillary column by GC-Perkin Elmer.
The determination of meat composition revealed higher concentrations of linolenic fatty acid C18:3, 1.33 g% in group E compared to 0.52 g% in group C; PUFA/MUFA ratio was favourable to group E: 0.163 compared to 0.266 for group C.
The formation of a new fatty acid was observed docosahexaenoic acid, C22:6n3 in low amounts 0.24g but, important, nevertheless, due to its 6 degrees of unsaturation.
Te ratio of omega 6 to omega 3 fatty acids was 9.5:1, much closer to the ideal ratio (4:1) with favourable influences on human health, which allows us to support the use of PUFA rich dietary sources for the fattening lambs.

INTRODUCTION

Because the worldwide increasing demand for meat cannot be met entirely by cattle, pigs and poultry, the sheep fill in the demand of consumption and cover much of the current protein deficit. At the same time, sheep meat is a tradition in several economically developed countries [1]**.**
The improvement of meat production and meat quality is an objective necessity aiming to meet the requirements of the population while increasing the economic efficiency of sheep production.
The research of Bragagnolo (1997; 2001) show that some fatty acids from the sheep meat can have favourable effects on the human health and focused on the investigation of the possibilities to enhance these qualities, on the increase of the proportion of some acids at the expense of others, particularly by optimizing the dietary nutritional factors[4,5]**..**

MATERIAL AND METHOD

An experiment on two groups of Karabash growing lambs aimed to reveal the influence of the diet, of the compound feed particularly, on animal performance. The compound feed included rapeseeds and camelina seeds as protein sources, replacing completely the sunflower meal of the standard diets[6,7]**..** Each group consisted of 10 growing lambs kept in stalls fitted with feeders and drinkers with constant water level. The diets consisted of alfalfa hay as bulk feed (free access) and a compound feed given in two variants: CF_1 with sunflower meal and CF_2 with rapeseeds and camelina seeds. These latter ingredients are considered potential sources of protein and polyunsaturated fatty acids for the farm animals. The maintenance and fattening system was designed initially according to the semi-intensive arrangement starting immediately after weaning and continuing with the finishing of the animals during the microtest using the two groups. The

experiment started in early August and lasted 90 days until the end of October. It was preceded by a period of accommodation with the new maintenance and feeding conditions. The compound feed was given in a single meal, in the morning, and the hay was given in two meals, at 7 in the morning and at 4 in the afternoon. Table 1 shows the formulation of the two diets and Table 2 the fatty acids profile.

Table 1. Compound feeds structure

No.	Raw ingredients	CF_1 %(C)	CF_2 % (E)
1	Corn	10.7	10.7
2	Barley	20.4	20.4
3	Rice	18.9	18.9
4	Wheat	25.5	25.5
5	Sunflower meal	20.4	-
6	Rapeseeds	-	15.4
7	Camelina seeds	-	5
8	Calcium carbonate	2.1	2.1
9	Salt	1.0	1.0
10	Premix	1.0	1.0

Table 2 Fatty acids profile in the compound feed given to the control and experimental groups

	Control	Experimental
Fatty acids	CF1 Sheep	CF2 Sheep
Myristic C14:0	0.18	0.18
Palmitic C16:0	13.28	12.12
Palmitoleic C16:1	0.11	0.15
Stearic C18:0	2.79	1.68
Oleic C18:1n9	30.96	47.92
Linoleic C18:2n6	50.57	31.89
Linolenic C18(3n3)	1.17	4.93
CLA	0.34	0.44
Arahidonic C20(4n6)	0.41	0.69
Other fatty acids	0.20	0.00
Total	100.00	100.00

Four animals from each group were slaughtered at the end of the experiment, and samples of meat were collected from the deboned and homogenized carcass. The samples were conditioned, dried and prepared for the fatty acids analyzer using gas chromatography. The method is used to analyse meat samples and the fatty acids concentration is expressed in grams/100 g fat.

The equipment was a Perkin Elmer-Clarus 500 gas chromatograph fitted with a system for injection in the capillary column (splitting ratio about 1:100), with programmable oven for the chromatographic column, with flame ion detector (FID) and capillary separation column with high polarity stationary phase (60m X 0.25mm inner diameter, 0.25µm thick film).

The working method is according to ISO 5508:1990 and ISO 5509:2000 and it relies on the principle of transforming the fatty acids from the sample of fat into methyl esters, followed by the separation of the components in the capillary column. The components are identified by comparison with a standard chromatogram; their amount is determined from the peak area.

RESULTS AND DISCUSSION

The sheep meat composition determinations produced higher values for the linolenic fatty acid C18:3n3 in the experimental group (1.33 g%) compared to the control group (0.52 g%). SFA to unsaturated fatty acids ratio is similar in group E (1.18) than in group C (1.17). A new fatty acid was determined, the docosahexaenoic fatty acid, C22:6n3, in low amount, 0.24 g, but very important, nevertheless, due to its six degrees of unsaturation (Table 3).

Table 3 Average fatty acids concentration in the meat samples

	Meat. control group	Meat. experimental group
Fatty acids	Average	Average
Caprilic C8:0	0.00	0.45
Capric C10:0	0.00	0.62
Lauric C12:0	1.72	0.06
Myristic C14:0	10.07	5.61
Myristoleic C14:1	1.37	0.39
Pentadecanoic C15:0	0.00	0.77
Pentadecenoic C15:1	0.00	0.20
Palmitic C16:0	28.43	27.13
Palmitoleic C16:1	3.14	2.01
Heptadecanoic C17:0	1.05	1.47
Heptadecenoic C17:1	0.89	0.57
Stearic C18:0	11.80	16.64
Oleic trans C18:1n11t	1.46	1.76
Oleic cis C18:1n 9c	32.16	33.03
Linoleic C18:2n6c	4.06	4.50
Linolenic α C18:3n3	0.52	1.33
Linoleic conjugat CLA	0.26	0.39
Octadecatetraenoic C18:4n3	0.00	0.04
Eicosenoic C20:2n6	0.00	0.03
Arachidonic C20:4n6	1.02	0.67
Eicosapentaenoic C20:5n3	0.00	0.03
Docosahexaenoic C22:6n3	0.00	0.24
Other fatty acids	2.05	2.06
Total	100,00	100.00

The ratio of omega 6 to omega 3 fatty acids was 9.50:1 in group C compared to 3.20:1 in group E, which is much closer to the ideal ratio (4:1) [8] with beneficial effects on the human health. This supports our conclusion that the use of PUFA rich forages in fattening sheep diets is advisable (Table 4).

Table 4. SFA, MUFA, PUFA, TUFA content and their ratio in the meat samples

Control	SFA	MUFA	PUFA	SFA/TUFA	SFA/MUFA	SFA/PUFA	Ω6	Ω6/Ω3
1	55.08	38.09	6.40	1.18	1.36	9.06	5.08	9.50
2	54.55	36.26	6.25				Ω3	
3	53.24	39.89	4.92		TUFA		0.52	
4	49.40	41.86	5.86		44.88			
	Average	Average	Average					
	53.07	39.02	5.86					

Experimental	SFA	MUFA	PUFA	SFA/TUFA	SFA/MUFA	SFA/PUFA	Ω6	Ω6/Ω3
1	55.00	36.51	6.34	1.17	1.39	7.30	5.20	3.20
2	48.77	42.32	6.41				Ω3	
3	55.31	37.32	6.35		TUFA		1.64	
4	51.92	35.70	9.83		44.99			
	Average	Average	Average					
	52.75	37.96	7.23					

CONCLUSIONS

Although CF_1 with sunflower meal provided a higher concentration of linoleic acid (omega 6), 50.57% compared to just 31.89% in CF_2 with rapeseeds and camelina, with a ratio close to 1.6:1, when it was determined in the meat, this ratio changed and became almost 1:0.9 (4.06:4.5)
Higher values were also noticed for the most important unsaturated fatty acid, the omega 3 linolenic acid: 1.33% in group E compared to 0.52% in group C.
The total unsaturated fatty acids (TUFA) had similar levels in the meat samples from both groups: 44.48% and 44.99%, and SFA to TUFA ratio is also similar, being 1.18 for group C and 1.17 for group E.
Omega 6 to omega 3 fatty acids ratio, which influences the health state of the consumers, was 3.20:1 in group E, much closer to the ideal ratio (4:1) [8] than in group C (9.50:1).
It is thus advisable to adopt new feeding solutions using sources that were less used so far. Their use doesn't affect the quantitative side of the performance, while improving the qualitative side, thus increasing food safety.

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