



INFLUENCE OF SEX AND AGE AT SLAUGHTER ON PROFILE OF FATTY ACIDS IN MEAT OF KIDS

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ABSTRACT

The study group consisted of male and female kids of the Refined White Breed. The animals were divided into three groups:

a – consisted of male kids slaughtered at the age of 90 days

b – included male kids slaughtered at the age of 160 days

c – covered female kids slaughtered at the age of 180 days.

The content of fatty acids in the intramuscular fat of the animals was determined with use of the gas chromatography method. It was also presented on the Chrom-5 apparatus. The analysis of chemical composition and the fatty acids profile proved that the muscle tissue of the kids from the second group contained less fat and had a larger proportion of unsaturated fatty acids.

Key words: male kids, female kids, fatty acids

INTRODUCTION

Meat, which is a natural foodstuff rich in nourishing substances, is an important part of human diet. Due to the risk of civilization diseases, more and more attention is focused on detailed research over the value of animal food products (Nurnberg et al., 2001; Stankov et al., 2002). According to the medical examinations on humans, it is stated that the incidence of vascular and coronary diseases is connected with the high consumption of fat rich in saturated fatty acids. Therefore, it is suggested that sheep and goat meat should be more widely consumed, as they have the desired dietetic and taste properties (Bodkowski et al., 1999; Patkovska-Sokoła et al., 1995).

The main objective of this study was to analyze the content of fatty acids in kid's intramuscular fat depending on the sex and age of the slaughtered animals.

MATERIAL AND METHODS

The study group consisted of twenty-four kids (sixteen males and eight females) of the Refined White

breed. Half of them were born single, whereas the other half came from twin pregnancies.

Until the age of 45 days the animals were not separated from their mothers. Then, the sixteen male kids were divided into two random groups a and b (eight each). The female kids made the third studied group c. Having been separated from their mothers, the kids were intensely fattened without any limitation with all-mash (produced by firm Cargill, Poland) containing 5.6 MJ metabolizable energy and 18 g crude protein per kilogram. Meadow hay of average quality was also used as roughage.

The first group a was slaughtered at the age of 90 days and average live weight of 28 kg, the second group b at the age of 150 days and weight of 35 kg and the female kids (group c) were slaughtered at the age of 180 days and average weight of 28 kg.

The obtained carcasses were cooled for 24 hours at 4°C. After that, the samples of intermuscular thigh muscle (m. adductor) were taken. The content of dry matter, crude protein, fat and ash in meat was determined with standard method (Ringdorfer et al., 2003), crude

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protein by Kjeldahl's method (Słowiński et al., 1996), whereas the intramuscular fat was determined by the Soxhlet's apparatus (Sheridan et al., 2003). The content of fatty acids in the intramuscular fat was determined using the gas chromatography in Chrom-5 apparatus as follows: fire-ionisation detector, glass column, spiral phase 10%Silar5-CP, internal diameter 4 mm and length 2.5 m. Carrier gas was nitrogen 30 ml.min⁻¹, temperatures in columns 200°C, in batcher 250°C and in detector 250°C.

The obtained results were statistically worked out with the mean values of the parameters and the standard deviation presented in tables. Significance of the differences between the mean values of parameters was assessed by means of Tukey test.

RESULTS AND DISCUSSION

Chemical composition is one of the factors, which determines the quality of meat. The results of the chemical analysis (tab. 1) proved that the meat from b group of male kids contained the least fat (1.57 %) as compared to the other groups. That group also had the lowest amount of crude protein (19.12 %). The highest amount of fat was found in meat of female kids group (2.25 %). Those are statistically significant differences.

Similar results were also obtained by Mioc (2001), when the content of dry matter was 23.74 %, protein 19.94 % and ash 1.16 %. According to results of Krupa (1995) the muscle tissue of 150-day-old kids contained 23.89 % dry matter, 20.57 % protein, 1.57 % fat and 1.24 % ash. Another studies, carried out by Słowiński (1996) showed, that meat of male kids contained about 1–3 % more water and protein and less fat than the meat of female kids.

Chemical composition analysis of the three studied groups showed the presence of twelve acids containing from 14 to 20 atoms of carbon (tab. 2). The amount of saturated acids was bigger in group a (40.68 %) than

in b (37.72 %). These differences appeared statistically significant. As far as the saturated fatty acids are concerned, the highest values were detected with the palmitic and stearic acids. In a group of male kids the value of palmitic acid was 18.94 % and stearic 19.38 %, in group b the content of palmitic acid was 22.12 % and stearic 12.75 %. While analyzing the content of the mono-unsaturated fatty acids it was found that there was a higher proportion (53.48 %) of oleic acid in the group slaughtered at the age of 180 days as compared to the group of kids slaughtered at 90 days (49.98 %). The difference appeared statistically significant. The proportion of poly-unsaturated acids was in a group 6.01 %, in b group 5.22 %. That difference was also found significant.

One of the important factors of intramuscular fat quality is the mutual relation between unsaturated and saturated fatty acids. According to Nestel (1997) relation in the human diet should equal about 2. In our study the relations were 1.45 in group a and 1.65 in b. While comparing the content of fatty acids in the intramuscular fat in b and c groups, it was noted that the proportion of stearic acid was higher in female kids group slaughtered at the age of 180 days (20.30 %) than in b group of male kids (12.75 %). The difference was statistically significant.

The proportion of saturated acids ranged between 37.72 and 46.66 %, which was also found statistically significant. While analyzing the content of the mono-unsaturated fatty acids it was found that there was a higher proportion (53.48 %) of oleic acid in group b than in c (44.14 %). The difference was statistically significant. As far as other mono-unsaturated acids are concerned, there were no statistically significant differences. The proportion of unsaturated acids in group b (the second group of male kids) was higher than in female group c (62.46 % to 53.34 %). That was a statistically significant difference.

The amount of fatty acids in the intramuscular fat in our study was lower by 3 % than found by Johnson et al. (1995). In study carried out by Kalinowska and Pustowiak (2000) the content of palmitic and stearic

Table 1: Chemical composition of meat

Parameter (%)	Group						S (t-test)
	a (n = 8)		b (n = 8)		c (n = 8)		
	\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	
dry matter	21.97	0.02	22.91	0.03	23.49	0.08	
crude protein	20.80	0.37	19.12	0.33	20.16	0.79	a:b+ b:c+
fat	1.97	0.29	1.57	0.22	2.25	0.35	a:b+ b:c+
ash	1.10	0.05	1.05	0.01	1.15	0.03	

+P≤0.05

n – number of animals in a group; \bar{x} – arithmetical average; SD – standard deviation; S – difference between groups significant at the level $\alpha = 0.05$; a – male kids at age of 90 days; b – male kid at age of 150 days; c – female kid at age of 180 days

acids was lower (15.86 % and 17.70 %) than in ours. Also, the proportion of saturated fatty acids was lower than that of our study (36.35 % in group c). The mean value of unsaturated acids was 52.55 %, which is 9.91 % lower than in our study (group b).

Another study, carried out by Sheridan et al. (2003) with kids slaughtered at similar ages obtained the following results: saturated fatty acids 45.59 %, mono-unsaturated 51.06 %, poly-unsaturated 3.35 % and unsaturated acids 54.41 %.

Pieniak-Lendzion (2001) determined 33.63 % saturated and 66.37 % unsaturated fatty acids. The results were similar to those in our study. The result of Ringdorfer's et al. (2002) experiment brought higher amount of saturated acids (62.8 %) in comparison with our studies. According to Banskalieva et al. (2000), the content of fatty acids in intramuscular fat was as follows: saturated acids 43.88 %, mono-unsaturated 42.30 % and poly-unsaturated acids 16.47 %.

CONCLUSION

The results of this study prove that the composition of meat coming from the group of female kids (group c) was richer in dry matter, protein, fat and ash than of male group b. The b group had significantly lower amount of saturated fatty acids as well as better proportion of unsaturated to saturated acids than the other two groups.

It is, therefore, evident that the best quality of meat had the kids slaughtered at the age of 150 days.

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Table 2: Fatty acids composition of intramuscular lipids (%)

Fatty acid		Group						S (t-test)
		a (n = 8)		b (n = 8)		c (n = 8)		
		\bar{x}	SD	\bar{x}	SD	\bar{x}	SD	
myristic	C14:0	1.45	0.30	1.78	0.14	2.43	0.21	
myristoleic	C14:1	0.16	0.05	0.19	0.06	0.39	0.16	
palmitic	C16:0	18.94	1.11	22.12	0.90	22.89	0.68	a:b++
palmitoleic	C16:1	2.08	0.40	2.42	0.36	3.32	0.11	
margaric	C17:0	0.90	0.12	0.87	0.10	1.06	0.17	
margaroleic	C17:1	0.68	0.17	0.83	0.20	0.79	0.10	
stearic	C18:0	19.38	1.50	12.75	1.55	20.30	1.31	a:b++ b:c++
oleic	C18:1	49.98	1.83	53.48	1.97	44.14	0.72	b:c++
linoleic	C18:2	4.61	0.61	3.84	0.92	3.57	0.92	
linolenic	C18:3	0.77	0.39	0.41	0.28	0.33	0.79	
eicosenoic	C20:1	0.80	1.03	0.27	0.10	0.42	0.11	
arachidoleic	C20:4	0.62	0.21	0.99	0.49	0.26	0.04	
SFA		40.68	1.45	37.72	2.45	46.66	1.42	a:b++ b:c++
UFA		59.31	1.45	62.46	2.39	53.34	1.42	a:b++ b:c++
MUFA		53.30	1.83	57.22	2.01	49.11	0.93	b:c++
PUFA		6.01	0.68	5.22	1.38	4.23	0.78	a:b+

+S≤0.05 ++S≤0.01

SFA – saturated fatty acids (f.a.); UFA – unsaturated f.a.; MUFA – mono-unsaturated f.a.; PUFA – poly-unsaturated f.a.

Other symbols are identical with those of the table 1.

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