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FATTY-ACID COMPOSITION OF MEAT OF CASTRATED AND NON-CASTRATED GOATS AMONG UKRAINIAN POPULATION IN THE PROCESS OF THEIR BREEDING FOR MEAT

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Abstract: The results of studies of fatty acid composition of lipids longest dorsi muscle (Longissimus dorsi muscle), the index of softness and dietary indicators of meat according to the content of fatty acids in goat castrated and not castrated by varying of the intensity of their growth. Found that, balanced feeding of not castrated goats saturated with fatty acids in the lipid longissimus dorsi muscle is reduced; monounsaturated is increased and polyunsaturated does not change.

Key words: lipids, fatty acids, cooking meat, customs and non-cutting bags, meat quality index

Introduction. Goat meat has been recognized worldwide in recent years, especially in developed countries with a high level of cardiovascular disease, mainly due to its low fat content. At the same time, the study of lipid content in goat's meat is paid insufficient attention in comparison with the definition in the meat of other animals. For example, there are results of studies that evaluated the lipid composition of goat's meat in one form of muscle or from different parts of the carcass, without differentiating the structure of tissues. The purpose of some experiments was to use the lipid composition of goat's meat as a determinant of its quality. The following factors, such as breed, age, sex and feeding conditions have been investigated, which influenced the deposition of fat in goats. There is more internal fat deposits and less subcutaneous and intramuscular in goats compared to sheep [13].

The fatty acid composition usually has little effect on the market value of carcasses, although the fat content is significant. Nevertheless, the physical and chemical properties of lipids affect the nutritional value of food and the taste of meat. The taste of meat depends on the composition of fatty acids [9]. Saturated fatty acids increase the hardness of fats, which affects the taste quality when meat is being cooled. On the other hand, unsaturated fatty acids increase the oxidation potential, which affects the duration of its storage.

Significant interest in increasing the nutritional value of meat stimulated its study of the composition of fatty acids. However, little is known about the composition of fatty acids of goat's meat. There is a limited number of publications devoted to the composition of fatty acids in certain fatty deposits of goats [1,3,15]. In addition, the available database is relatively fragmentary. For example, experimental studies were conducted on different breeds, age groups, sex, weight categories, types of muscles and fatty deposits. Attention should be paidto

considerations of such differences in scientific work. Therefore, there is always a significant need for individual experiments.

Goal of the work. Taking it into account, the purpose of this work was to study the composition and content of fatty acids in goat's meat under different conditions of breeding and castration of animals.

Materials and methods. In the experiment, domestic goats of Saanen and local breeds of goats were used, which were kept in the Sumy National Agrarian University. Three groups of goats of 3 months old were formed, with 10 animals in each. The two groups were experimental and one was control. Animals were kept on the main diet, which contained a daily set of bulk feed (hay, green fodder), respectively, according to age and body weight with free access to water. Goats of experimental groups received starter feed, balanced in terms of energy, protein, minerals and vitamins. The goats of the control group received 20-25% of the nutrient content of concentrated feeds from the total number of the basic diet, which simulated the feeding conditions in a typical economy and provided a moderate level of growth.

Before slaughter, the animals were kept for 12 hours on a hungry diet with free access to water. All procedures were carried out in accordance with the instructions [5] on the protection of animals used for experimental and other scientific purposes. The breeches of goats were carried out on the Vorozhbyan meat plant by the method [4]. The carcasses were stored at 12 °C (± 2 °C) for 6 hours after slaughter to avoid cold sealing and cooled to 2°C (± 2°C) for 24 hours [11]. After cooling, samples of meat were taken from the longest muscle of the back (*Longissimusdorsi muscle*), Which were individually packed in vacuum, and frozen at -20 °C. Samples of meat were stored for the first week. For 1 day before the analysis, the samples were defrosted at 4°C (± 1°C) [10].

Chemical-analytical studies were conducted in the Ukrainian laboratory of quality and safety of agricultural products of the National University of Biological resources and Nature Management of Ukraine. For the determination of fatty acids, the intramuscular fat was extracted from 15 g of meat by the method [7]. The fatty acid methyl esters were analyzed on a Trace GC Ultra (Thermo Electron Corporation, USA) gas chromatograph with a flame-ionization detector on a capillary column SP-2560 (100 m x 0.25 mm ID, 0.2 μm film, Supelco). Individual fatty acids were determined by comparing the retention time to the Supelco 37 Component FAME Mix, C_4-C_{24} fatty acid mixture with a detection limit of 0.01%. Statistical analysis of data was carried out using StatSoft Statistica 6.1.478 Russian, Enterprise Single User [16].

Results and discussion. As a result of chromatographic analysis in the lipids of the longest muscle of the goats' back, one short chain fatty acid (C_6), three with medium chain (C_8-C_{12}) and twenty six - with a long chain (C_{14}-C_{24})) were detected. 28 fetal acids were detected in the meat

of animals in the control group, in the experimental non-castrated goats - 30, and in the castrated - 26 fatty acids (Table 1). The middle chain of fatty acids were represented in the goat's meat of all experimental groups, while long-chain - had differences in the animals of individual groups. C17: 1 and C23: 0 were not detected in the control and experimental (castrated) goat's meat, and the latter also did not contain C14: 1 and C 20: 2 fatty acids.

Table 1.

Composition and content of fatty acids (in% to the total content of fatty acids) in the lipid fraction of the longest muscle of the goat's back, M ± m.

Fatty acids	non-castrated goats	group №1	group №2
C 6:0	0,21±0,03	0,71±0,02[a]	0,51±0,01[ab]
C 8:0	0,20±0,06	0,28±0,05	0,29±0,04
C 10:0	0,41±0,11	0,78±0,15	0,33±0,07[b]
C 12:0	0,31±0,03	0,13±0,02[a]	0,60±0,08[ab]
C 14:0	2,47±0,13	1,62±0,21[a]	3,46±0,43[b]
C 14:1	0,27±0,05	0,11±0,02[a]	absent
C 15:0	1,09±0,15	0,78±0,04	0,85±0,08
C 15:1	0,36±0,06	0,19±0,09	0,22±0,02
C 16:0	15,84±0,89	11,71±0,37[a]	17,15±0,71[b]
C 17:0	1,23±0,03	1,23±0,12	1,22±0,12
C 18:0	15,94±1,13	13,95±0,40	14,50±0,66
C 18:1n9t	0,46±0,07	0,99±0,09[a]	0,66±0,06[b]
C 18:1n9c	26,85±1,01	35,29±0,72[a]	30,14±0,66[ab]
C 18:2n6t	1,07±0,20	1,97±0,37	0,79±0,06[b]
C 20:0	0,38±0,06	0,32±0,04	0,53±0,02[b]
C 18:3n3	1,30±0,06	0,86±0,11[a]	1,20±0,02[b]
C 20:1	0,39±0,10	0,16±0,02[a]	0,25±0,05
C 20:3n3	0,42±0,03	0,70±0,12	0,35±0,03[b]
C 20:4n6	6,46±0,39	4,99±0,46	4,59±0,42[a]
C 23:0	absent	0,34±0,07[a]	absent
C 22:2	0,25±0,04	0,40±0,02[a]	0,33±0,04
C 20:5n3	0,51±0,13	0,57±0,14	0,53±0,04
C 24:0	0,32±0,03	0,34±0,09	0,33±0,02
C 22:6n3	1,21±0,10	1,75±0,27	1,38±0,05
SFA	38,72±0,51	35,58±1,03 [a]	40,26±0,31[b]
MSFA	31,20±1,07	40,92±0,81 [a]	33,28±0,36[b]
PSFA	30,05±0,58	26,75±1,35	26,67±0,65[a]
USFA/SFA	1,58±0,04	1,90±0,09[a]	1,49±0,03[b]
n-6	26,16±1,18	22,12±2,23	22,88±0,75
n-3	3,43±0,32	3,89±0,65	3,45±0,15
n-6 / n-3	7,62±0,20	5,73±0,54[a]	6,63±0,25[a]
18:0+18:1/16:0	2,74±0,16	4,29±0,12[a]	2,65±0,15[b]

a - p≤0.05 compared with the experimental group, b - p≤0,05 compared with experimental group № 1

The fodder diet, as it is known [2], seriously affects the composition and content of fatty acids in the lipids of the muscles. The goats of the experimental non-skilled group feeding the starter feed had differences both in composition and in the fatty acid content of the lipids of the longest back muscle. The content of fatty acids such as C6: 0, C18: 1n9t, C18:1n9c, C20: 3n6 and C22: 2 is believed to be elevated and C12:0, C14:0, C14:1, C16:0, C 18:2n6c, C18: 3n3, and

C 20:1 was significantly lowered compared to the goats of the control group. In addition, fatty acids of C17:1 and C 23:0 were detected in experimental goats' meat (non-castrated).

Castration of animals leads to a change in the hormonal status, which in turn leads to changes in other biochemical parameters. Fatty acid composition and content of lipids of muscles also undergoes changes [14]. We found that the quantitative content and composition of fatty acids of the lipids of the longest muscle of the back of the castrated and non-castrated goats had differences. In the meat of castrated goats, the quantitative content of fatty acids such as C 12:0, C14:0, C16:0, C18:2 n 6c, C20:0, C18:3 n 3, C22:0 is believed to be elevated, and C 10:0, C16:1, C18:1n9t, C20:3n6, C20:3n3, C20:3n3 is likely to decrease compared to non-castrated goats. In addition, fatty acids C17:1, C14:1, C20:2 and C23:0 were not detected in the meat of castrated goats. It should be noted that fatty acids of the longest muscle of the lipids of the 8:0, C15:0, C15:1, C17:0, C18:0, C20:5n3, C24:0 and C22:6 n 3 Back in animals of all groups of variability were not exposed. The content of saturated fatty acids (SFA) in non-castrated goat meat compared to goats in the control group decreased by 8%. The probable reduction occurred in the fractions C12:0, C14:0 and C16:0 fatty acids. In the meat of castrated goats, the level of NLC increased by almost 12% compared to uncorrected goats. Probably the content of fractions C12:0, C14:0, C16:0, C20:0 and C22:0 fatty acids isincreased. The content of monounsaturated fatty acids (MSFA) in non-castrated goat meat increased by almost 24% in comparison with goats in the control group. The probable increase occurred in the fractions C18: 1n9t, C18: 1n9c fatty acids and C17: 1 fatty acid appeared. In the meat of castrated goats, the level of MSFA decreased by almost 19% compared to the experimental uncapped group of goats. The content of fractions C16: 1, C18: 1n9t, C18: 1n9c fatty acids and the C14: 1 fatty acid was not detected.

It is known that a high level of SFA with a long chain increases the cholesterol content in blood plasma, while MSFA and PSFAdecreases it [8]. Thus, the ratio of unsaturated to saturated fatty acids (USFA) / SFA and n-6 / n-3 defines dietary indicators of meat quality [6]. On the other hand, the high ratio of USFA / SFA in meat causes its rapid deterioration due to the oxidation of unsaturated fatty acids. Information on quantitative content of n-6 and n-3 fatty acids in goat muscles is limited. Experiments have shown that the ratio (C18:0+C18:1)/C16:0 can be used to compare the potential effects of various types of lipids on human health [1]. This ratio should be from 2 to 3. Thus, analyzing our data we see that in the control group goat and castrated goat ratio (C18:0 +C18: 1)/C16:0 is less than 3, while non-castrated goat research group this figure is more than 4.The index of softness of meat is considered as the ratio (C16:1+C18:1)/(C16:0+C18:0), [12]. In our experiment data were obtained that characterize the animals of each group separately. In the goats of control and castrated animal groups, this rate

was at level 1, while in the non-castrated goats of the experimental group the coefficient reached 1.5.

Conclusions:

It is established that in the balanced feeding of non-castrated goats, the content of saturated fatty acids in the lipids of the longest muscle of the spine decreases, the monounsaturated - increases, and polyunsaturated - does not change. The ratio of unsaturated to saturated fatty acids increases by 17%. For the balanced feeding of castrated goats, the content of saturated fatty acids in the lipids of the longest muscle of the spine increases in comparison with the same diet unreported goats, monounsaturated - decreases, and polyunsaturated - does not change. Indices of softness index and dietary indices of meat on the fatty acid content in the lipids of the longest muscle of the back of uncorrected goats in the experimental group are better compared to the goats of the control group and castrated animals.

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