

COMPARATIVE STUDY OF THE MEAT PRODUCTIVITY OF YOUNG LAMBS AND KIDS, THE CHEMICAL COMPOSITION OF THEIR MEAT AND THE MORPHOLOGICAL COMPOSITION OF THEIR CARCASSES

Bursa Jafarli

Azerbaijan State Agricultural University, Ganja, Azerbaijan

Abstract. The paper studies the meat productivity of lambs and kids fed under the same conditions, the chemical composition of their meat and the morphological parameters of their carcasses. The main differences in the chemical composition of the meat of lambs and kids were observed in terms of the amount of fat contained in it. Thus, it was found that the amount of fat in lamb meat exceeded its amount in kid meat by almost 2 times ($P < 0.05$). The amount of internal fat in lambs with a high coefficient of reliability ($P < 0.001$) was also approximately 2 times higher than in kids. The slaughter yield in carcasses of lambs (51.67%) also turned out to be higher than that of lambs (42.79%). The weight of chilled carcasses of lambs exceeds by 18.4% the same weight of kid carcasses. However, when it came to boneless meat and bones, there was no significant difference between lambs and kids. The reason for this is that goat carcasses do not contain fat-tail fat, while lamb carcasses contain approximately 10% fat-tail fat. Thus, our experiments have shown that the meat productivity of lambs, the amount of fat in their meat and the morphological composition of their carcasses are relatively higher than these indicators in kids.

Keywords: *lamb, kid, carcass, chemical composition of meat, fat, protein, meat, internal fat, fat-tail fat.*

Corresponding Author: Bursa Jafarli, Azerbaijan State Agrarian University, 450, Ataturk avenue, AZ 2000, Ganja, Azerbaijan, e-mail: bursa_96@mail.ru

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1. Introduction

Meat is an integral part of the human diet. This is based on the fact that this product is a source of dietary protein, fat, vitamins and minerals for the population. From 1961 to 2011, the consumption of meat by the world population per year per person increased from 23.1 kg to 42.2 kg (Sans & Combris, 2015). In addition, meat and meat products, along with the fact that they are a powerful source of energy and are also of great importance for meeting the need for fat-soluble vitamins. Along with these positive qualities of meat and meat products, they also have their negative sides. So, in the composition of red meat there are a large number of saturated fatty acids and cholesterol. And these substances, when regularly consumed by people in large quantities, cause many metabolic disorders, obesity, diabetes, hypertension, atherosclerosis, and even cancer (Klurfeld, 2015; Wang *et al.*, 2016)). Therefore, in recent years, people, trying to pay more attention to caring for their health, began to refuse meat and meat products containing heavy fats and cholesterol. From this point of view, the amount of saturated fatty acids and cholesterol in the meat of lambs and kids is relatively lower than in beef and pork (Ivanovic *et al.*, 2016; Madruga & Bressan, 2011). Conversely, many researchers (Aghwan *et al.*, 2014; Anaeto *et al.*, 2010; Chaiyawan, 2018; Lopes *et al.*, 2014; Niedziółka & Pieniak, 2006) note that the amount of unsaturated and

polyunsaturated fatty acids in the meat of lambs and kids is much higher than in other types of meat.

According to forecasts, by 2050 the world population will reach 9 billion people (Bruce, 2016; United Nations). Such population growth rates will dictate an increase in demand for meat and meat products by several times (Henchion *et al.*, 2007; 2014; Weber & Windisch, 2017). Taking into account all of the above, we can expect an increase in demand for lamb and kid meat.

2. Materials and methodology

The main goal of the paper is to study the meat productivity of lambs and kids fed under the same conditions, the chemical composition of their meat and the morphological parameters of their carcasses. Lambs of the Bozakh breed and local kids grown on natural pastures in the western region of the Republic of Azerbaijan, in the city of Ganja and its environs, were involved in the research. In order to study the chemical composition and calorie content of meat, samples were taken from the carcasses of 15 heads of lambs of the Bozakh breed and 15 heads of local kids. We determined the amount of fat in the meat using a Soxhlet extractor, the protein content by the Kjeldahl method, and the calorie content by burning in calorimetric bombs. At one of the slaughter points in the city of Ganja, 3 heads of lambs and kids of average fatness with the same live weight (about 17 kg) were selected. We should also note that lambs of the Bozakh breed reach the indicated live weight in 2-3 months, and local kids in 3-5 months. Then all the animals (3 heads of lambs and 3 heads of kids) were euthanized by halal slaughter. After the slaughter, a veterinary and sanitary examination was carried out by the veterinary expert of the Azerbaijan Food Safety Agency and we were issued certificates that all six carcasses are suitable for human consumption. After that, the animal carcasses were weighed and as a result, the weight of hot carcasses was determined. Then the carcasses were divided by us into two parts and placed in refrigerators at a temperature of +5°C for 36 hours. After weighing the chilled carcasses, we proceeded to cut them into pieces. In other words, having separated the boneless meat from the bones, we weighed them separately. In addition, the internal fat of the lambs and their fat-tail fat were also weighed and taken into account. The received data were processed from the standpoint of statistics.

3. Results and discussion

First of all, we should note that during a visual inspection of the carcasses of lamb and kid, there was no difference in color (Fig. 1.) and the smell of their meat. Thus, both lamb meat and kid meat have the same specific smell inherent in each of them. This is noted in their studies by Keskin *et al* (2012) as well as Dehouegnon *et al* (2018). By determining the organoleptic indicators (color, smell, taste, etc.) of sheep and goats meat grown under different conditions, it was found that sheep and goat meat do not differ in these indicators. It became obvious that the organoleptic indicators of sheep and goats fed on natural pastures are better in comparison with the meat of animals grown on the basis of intensive technologies.

The meat productivity of animals is characterized by the quantity and quality of meat obtained during slaughter. Here, the main indicators are the live weight of slaughter animals, carcass yield and morphological parameters of the carcass.

Table 1 reflects the indicators of meat productivity of lambs and kids used in the experiment.

Table 1. Meat productivity of lambs and kids

Indicators, kg	Lambs	Kids
Weight before slaughter	17,05±1,15	17,20±1,49
Hot carcass weight	8,66±0,56	7,74±0,78
Chilled carcass weight	8,49±0,64	7,17±0,78
Internal fat	0,32±0,03	0,19±0,04*
Fat-tail fat	0,87±51	
Slaughter yield in %	51,67	42,79

Note : *P<0,001

As can be seen from the table, the pre-slaughter live weight of animals sent for slaughter was approximately at the same level. When it came to the ratio of the weight of a hot and chilled carcass, the predominance of this indicator was observed in lambs. These indicators for carcasses of lambs were 11.9% and 18.4%, respectively, while for kid carcasses they were relatively higher. However, the difference between these scores was not statistically significant. The amount of internal fat in lambs with a high coefficient of reliability ($P<0.001$) turned out to be approximately 2 times higher than in kids. The slaughter yield in carcasses of lambs (51.67%) also turned out to be higher than that of lambs (42.79%). José et al (2019) conducted a study on 12 male kids and 12 female kids and studied the morphological characteristics of their carcasses and the chemical composition of the meat. It became obvious that the yield of boneless meat was higher in carcasses of kids fed in natural (organic) conditions. However, the fat content of the meat of kids kept in farm conditions was higher than that of animals kept in natural conditions. Miok et al (2013), after conducting research on 92 lambs and 90 kids, studied the morphological parameters of their carcasses. The live weight of lambs intended for slaughter was higher than the weight of a hot carcass and the weight of internal organs (except for the spleen). The live weight of females and their slaughter rates were lower compared to males. In these experiments, it was noted that the color of lamb meat is slightly lighter than that of kid meat. If we take into account that the animals that were used in our experiments were grown in natural conditions, then we can say that the results obtained are in good agreement with these data.

The quality of meat is mainly determined by its chemical composition (amount of fat, protein, crude ash and moisture) and calorie content. Our studies show that there are significant differences in the meat of lamb and kid, fed under the same conditions. Information on the chemical composition and calorie content of lamb and kid meat is shown in Table 2.

Table 2. Chemical composition and calorie content of lamb and kid meat.

Indicators	In kid meat	In lamb meat
Humidity, as %	74,19±0,72	71,69±0,48
Dry matter as %	25,81±0,55	28,31±0,37
Fat, as %	4,02±0,23	8,27±0,22*
Protein, as %	20,95±1,17	18,78±0,88
Ash, as %	1,03±0,04	1,04±0,06
Calorie content, kcal	1589,73	1893,57

Note: * - $P < 0.05$

As can be seen from Table. 2, the moisture index of kid meat is slightly higher than that of lamb meat, and the dry matter value is slightly lower. However, these differences are not statistically significant. The main differences in the chemical composition of lamb and kid meat were noted in terms of the amount of fat. Thus, the amount of fat in lamb meat is almost 2 times higher ($P < 0.05$) than in kid meat. Other researchers (Aghwan et al., 2014; Lopes et al., 2014; Niedziółka & Pieniak, 2006) have also reported that the amount of fat in lamb meat is higher relative to goat meat. In similar studies, it was noted that the amount of fat in kid meat does not exceed 5% and this is in good agreement with our results. In addition, in the above studies, it was determined that the amount of fatty acids in the meat of lamb and kid. A significantly higher content of palmitic, stearic and oleic acids was found in lamb meat in relation to kid meat. And this suggests that lamb meat contains more saturated fatty acids relative to kid meat. If it comes to the amount of protein, then, on the contrary, kid meat had an advantage. From this it follows that, taking into account the lower amount of fat in lamb meat, its higher protein content and its lower calorie content, kid meat can be considered dietary meat.

Table 3. Morphological composition of carcasses of lambs and kids

Indicators	Lambs	Kids
Chilled carcass in kg	8,49±0,64	7,17±0,7
Boneless meat in kg	5,57±0,34	5,08±0,82
Bones in kg	2,05±0,22	2,09±0,27
Boneless meat as %	65,60	70,85
Bones as %	24,15	29,15
Fat-tail fat as %	10,25	-
Fleshiness ratio	2,72	2,43

One of the main indicators reflecting the commercial quality of animals intended for slaughter is the study of the morphological composition of the carcass. The morphological composition of the carcass refers to the ratio of boneless meat and bones. To determine the morphological composition of the animal carcasses used in the experiments, we separated the boneless meat from the bones of the chilled carcasses after the control slaughter, weighed them separately, and determined the meatiness coefficient. Table 3 shows the morphological composition of carcasses of lambs and kids used in the experiment.

As can be seen from the table, the weight of chilled carcasses in lambs is 18.4% more than in kids. However, when it came to boneless meat and bones, there was no significant difference between lambs and kids. Therefore, the yield of boneless meat in kids was slightly higher than in lambs. The reason for this is that kid carcasses do not contain fat-tail fat, while lamb carcasses contain approximately 10% fat-tail fat. In terms of fleshiness, also between the carcasses of lambs and kids no significant difference was found. From the reports of other researchers (Abner *et al.*, 2014; Italo *et al.*, 2015) it also follows that the live weight of lambs and the weight of their carcasses, fed under the same conditions, were higher than that of kids.

4. Conclusion

Thus, our experiments show that lambs fed under the same conditions, that is, on natural pastures, have higher meat productivity, a higher fat content in their meat and a higher morphological composition of the carcass. However, it should be noted that, without taking into account fat-tail fat, the yield of kid boneless meat is not inferior to this indicator in lambs.

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