STUDY ON THE CHEMICAL COMPOSITION OF GOAT MEAT SAMPLES CORRELATED WITH THEIR AGE

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Abstract

The research has been conducted in order to determine the values of main chemical components in goat meat and establish a link between animal age and the values of these parameters. Age groups considered in the study have been goatling and adult goats. Samples were collected in 2012 from an approved European slaughterhouse involved in intra-authorized veterinary trade, fulfilling all specific legal requirements. For determinations were used following methods: moisture content by drying in an oven, protein content by Kjeldahl method, total fat content used Soxhlet extraction unit and ash percentage was determined by using calcination method. The mean values for the results obtained from the measurements made were: 77,6% moisture for goatling to 73,5% for adults goats,14,8% protein for goatling to 19,8% for adults, 1,74% fat for goatling and 2,88% for adults, 1,14% ash for goatling to 1,52% for adults goats samples. As it can be seen, as age increases, the major components with important nutritional role occupy a higher share of the goat carcass, resulting in superior technological and organoleptic characteristics compared to the slaughtered youth.

Keywords: *goat meat, goat age, goat slaughter, meat composition, meat quality*

INTRODUCTION

Meat, regardless of the animal from which it comes (beef, mutton, pork, poultry), has a composition correlated with the age and nutritional status of the animal. Meat contains approximately 20% proteins. Fat meat content depends on species and nutritional status. According to some authors, the lowest fat content is founf in beef or veal meat (6-8%) and the richest in pork (30%). Meat (especially of young animals) contains a small amount of carbohydrates and a high amount of extractive substances (purine, creatine, creatinine) and minerals (phosphorus, iron). Viscera (liver, kidney, heart) contain copper and cobalt and increased amount of iron. The other minerals (calcium, sodium, chlorine, sulfur, magnesium) are found in meat in small concentrations. Chlorine, phosphorus and sulfur ions cause acid action in the body. Meat is rich in soluble vitamins - B complex. In addition, viscera are rich in fat-soluble vitamins (A, D). Given its large content of proteins, vitamins and minerals, meat nutritional value is high.

Goats are not as effective in terms of meat production as other slaughtered livestock. Their rearing is encouraged by the advantage of the efficiently use of poor quality fodder such certain plants or shrubs. Many studies have highlighted major differences between variants within the same breed, gender difference and even between individuals concerning the fodder use. Growth rate and meat chemical composition are influenced both by the animal physiological state and by microclimate and rearing conditions (Tăpăloagă Dana, 2008).

Goat meat has a fat content with 50-65% lower than beef, while similar proteins content. It also has 42-59% less fat than lamb meat and respectively 25% less fat than veal. Moreover, saturated fats in goat meat are lower than in chicken's (without skin) with 40%, with 850% than in beef's, with 1100% lower than in pork's and with 900% in lamb meat (U.S.D.A., 2000).

From the numerous studies on goat meat, it results that regardless of race, age or region, goat is an important source of high quality proteins, healthy fats (based on a proper unsaturated fats - saturated fats ratio), and with a low cholesterol intake. Goat meat is low cal and sodium, but the high levels of iron, potassium and essential amino acids should range it within the category of high quality meat (Argüello A., 2005; Lee H.J., 2008).

MATERIALS AND METHODS

The study has been conducted on two age groups: gloating and adult goats. There were collected and analyzed 30 samples, 15 for each group. Samples were taken during 2012 from an approved European slaughterhouse involved in intra-authorized veterinary trade, fulfilling all specific legal requirements. The analyzes were conducted in the Animal Source Food Quality Control Laboratory belonging to the Animal Productions and Public Health Department - Faculty of Veterinary Medicine Bucharest.

The samples' **moisture content** has been established by using the heating and water evaporation method from a certain amount of product at a temperature of 103±2°C until a constant mass was reached, which means that the results of two successive weights did not change by more than 0,0001g (AOAC, 2000). For the same sample processed for analysis, there were performed two parallel determinations; the final result was given by the arithmetic mean. The percentage of water was calculated using the formula:

$$\% \text{ moisture} = (W_1 - W_2) * 100 / W,$$

where:

W = weight of the analyzed product (in grams);

W_1 = weight of the capped vial + stick + sand + sample: before drying (in grams);
W_2 = weight of the capped vial + stick + sand + sample: after drying (in grams).

Determination of **total protein** was done by establishing the total nitrogen with the Kjeldahl method, which consists in extracting the total nitrogen from a mineralized sample [as ammonium sulphate - $SO_4(NH_4)_2$], then expressing it as ammonia (through distillation and caption on acid) and converting the total ammonia into protein with a correction factor. The percentage of total proteic substances was calculated using the formula:

$$\% \text{ total protein} = [(V - V_1) \times 0{,}0014 \times 6{,}25 \times 100] / W$$

where:
V = n/10 sulphuric (hydrochloric) acid volume in the capture cup (in milliliters);
V_1 = n/10 natrium hydroxide volume for titer acid excess (in milliliters);
0,0014 = nitrogen equivalent in grams for 1 milliliter of n/10 sulphuric (hydrochloric) acid;
6,25 = correction factor for converting total nitrogen into protein;
100 = for percentual representation of total protein;
W = weight of analyzed sample (in grams).

Determination of **total lipids** was done by using Soxhlet extraction method, which consists in the extraction of fat from analyzed meat samples with an organic solvent (by repeated siphoning in a closed system), its quantitative accumulation and percentual expression. The extraction is considered complete after approximately 6-8 hours of consecutive siphonings (10-12 siphonings/hour). Once the extraction complete, the ether from the flask is evaporated and the drying can be done at 95-100^{o}C. The difference between the initial flask weight and its weight after the ether evaporation represents the amount of fat in the sample (AOAC, 2000). Fat percentage was calculated using the formula:

$$\% \text{ fat} = W \times 100 / w$$

where:
W = weight of fat extracted from the analyzed sample (in grams);
w = weight of the analyzed sample (in grams);
100 = for percentual representation of the result.

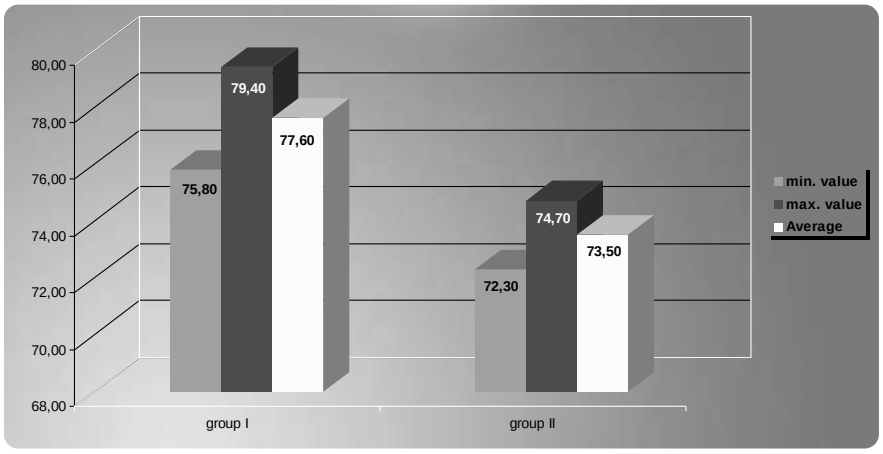
Ash percentage was determined by calcinating the sample. This consists in a complete transformation of organic substances in the sample, resulting in simple inorganic compounds which cannot be reduced, at a temperature of 525 ± 25°C, for 16-18 hours. Calculation was done using the formula:

$$\% \text{ ash} = W \times 100 / M$$

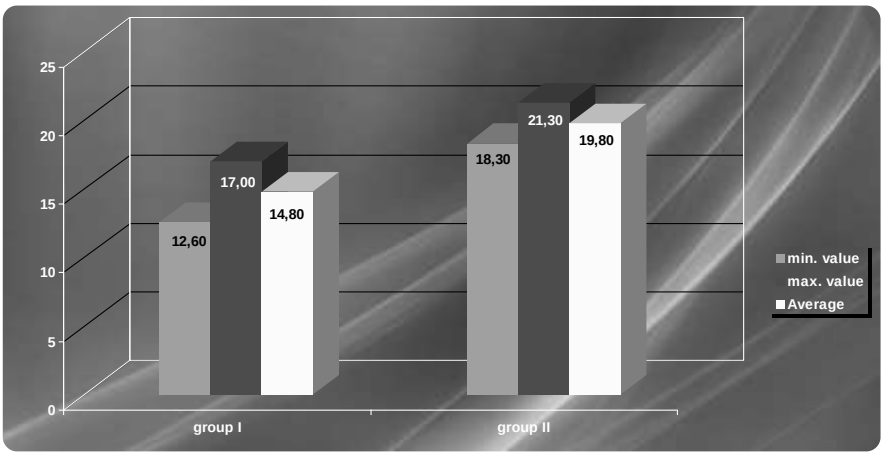
where:
W = weight of the ash after calcination (in grams);
M = weight of the analyzed sample (in grams);
100 = for percentual representation of the result.

RESULTS AND DISCUSSIONS

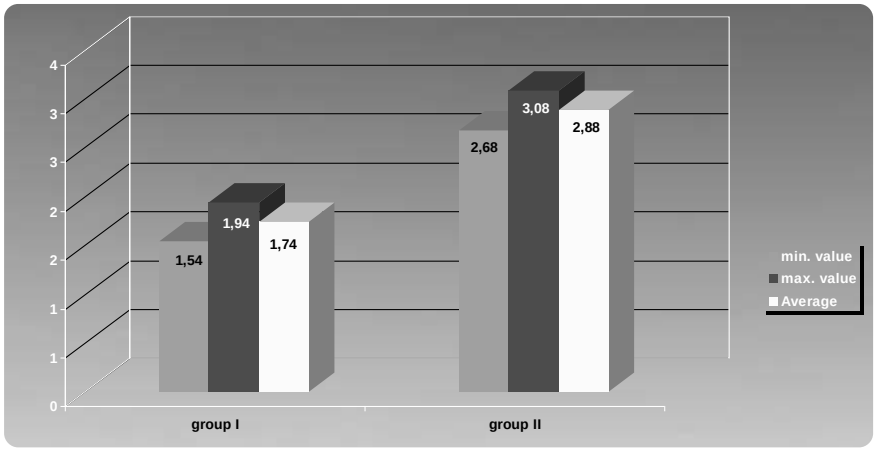
Regarding water content of the analyzed samples there were recorded average values of 77,6% in the samples collected from goatling, respectively of 73,5% in the samples from adult goats. The average values ranged within the following values: 75,8-79,4% for goatling, 72,3-74,7% for adult goats.



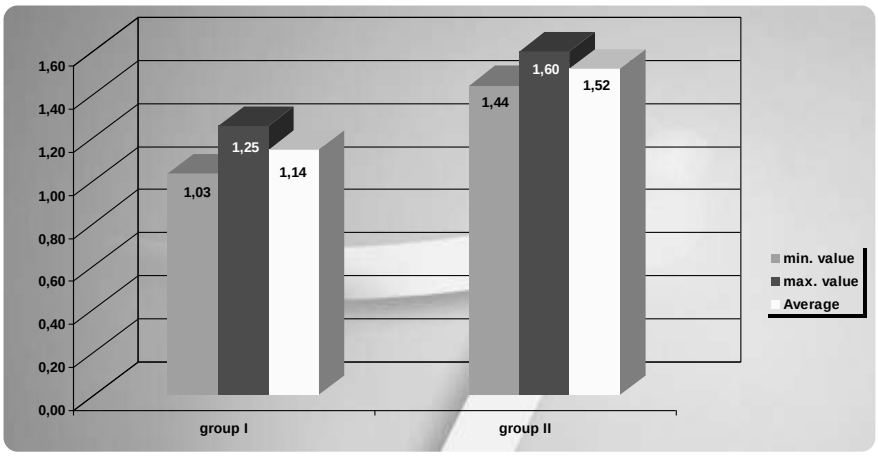
Average values for protein content were 14,8% (min. 12,6% and max. 17,0%) in goatling and 19,8% (min. 18,3% and max. 21,3%) for adult goats, which shows that age leads to a slightly increasing of protein content.



Fat percentage of the analyzed samples showed similar values for the two age groups, the difference being about 1%. Thus, the percentage of fat in goatling' meat samples was 1,74%, while in adult goats meat was 2,88%. These values were ranged between 1,54% and 1,94% in goatling, respectively between 2,68% and 3,08% in adult goats.



The difference between average values recorded for ash percentage was only 0,38%. The values obtained were 1,03 to 1,25% for goatlings (1,14% mean value) and 1,44 to 1,60% in adult goats (1,52% mean value).



CONCLUSIONS

As it can be seen, along with age the major components with nutritional role occupy a higher share in goat's carcass, leading to superior technological and sensory properties compared to the slaughtered goatling.
It is also noted that the values of these components are not close to the maximum ones recorded in other slaughtered livestock, which makes goat meat to be considered a healthy meat, regardless the age of animal's slaughter.
The only analyzed parameter which recorded decreased figures with increasing of age was water content, but the values were not as low as to describe a low digestibility or a decrease of pleasantness of the products.

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