

MODERN CATTLE SLAUGHTERING TECHNOLOGY AND ITS MEAT QUALITY

Vlora Rama

PhD candidate at University “St. Kliment Ohridski”, Faculty of Biotechnical Science, Bitola,
R.N.Macedonia

Engineer of Food Technology at “Stone Cattle-Vineyards and Winery”, 21000 Rahovec, Kosovo

vlora_rama@hotmail.com

Elena Josevska

University “St. Kliment Ohridski”, Faculty of Biotechnical Science, Bitola, R.N.Macedonia
elena.josevska@uklo.edu.mk

Vesna Karapetkovska Hristova

University “St. Kliment Ohridski”, Faculty of Biotechnical Science, Bitola, R.N.Macedonia
v.primavera79@gmail.com

Abstract: Slaughter technology has changed dramatically over the past 30 years. Methods of handling the alive animal immediately prior to slaughter, methods of stunning, killing, early postmortem handling, and carcass treatment have all seen technological advancement. The primary factors driving changes in these technical aspects of cattle slaughter have been to increase efficiency of commercial operations and the improvement of carcass and meat quality. This research has been done with the aim of identifying the quality of meat, chemical composition and nutritional value of meat from animals slaughtered with modern technology. During this research we took three samples, at different points of the cattle carcass. Sample points are: 1. Spine; 2. Chest and 3. Thigh. The samples were taken fresh immediately after slaughter, while the distance from industry to laboratory was about 1 hour. The amount for a sample was about 300 gr. The samples were packaged with vacuum to avoid the contamination or any damage. The samples were analyzed in the chemistry laboratory at the Kosovo Food and Veterinary Agency. Samples analysis was made by Food Scan with these parameters: protein, fat, moisture and collagen. Based on the above results, we see that the sample of spine is richer in protein and fat and the sample of chest is richer in moisture. In the sample of thigh, all parameters are lower than in two other samples. Since the Kosovo state doesn't have yet any official regulations for the limits of these parameters, based on the literature we have used, we see that the first sample exceeded the value of the fat because by 5.2 it should have up to 4.8 based on the reference values, while the second and third samples exceeded the value of moisture because by 74-76 it should have up to 70-73. However, exceeded values are minimal and we can't say that the meat is of poor quality. At the end of the analysis, we have come to the conclusion that meat samples that we analyzed, although in some cases they had exceeded the limits, but were minimal. This makes us realize that the quality of the meat is good. If, at the end of the analysis, we would result in a concentration of moisture beyond the limits, or any other parameters, in that case we can say that is not good quality of meat. The reason why these three samples were taken for analysis is that we wanted to do the research of the quality of the meat at different points of the cattle carcass because as we know that is difficult to determine the quality of the whole carcass taking just one sample. Many factors may affect the nutritional content of the meat; one of many factors is animal welfare and stress before slaughter. The results obtained give us a conclusion that the animal had no stress before slaughter, animal welfare was respected and the meat is of good quality and has nutritional value.

Keywords: quality, production technology, meat samples, carcass

1. INTRODUCTION

Meat consumption in developing countries has been continuously increasing from a modest average annual per capita consumption of 10 kg in the 1960s to 26 kg in 2000 and will reach 37 kg around the year 2030 according to FAO projections. This forecast suggests that in a few decades, developing countries' consumption of meat will move towards that of developed countries where meat consumption remains stagnant at a high level, (Gunter, H., & Hautzinger P., 2007).

Slaughter technology has changed dramatically over the past 30 yr. Methods of handling the live animal immediately prior to slaughter, methods of stunning, killing, early postmortem handling, and carcass treatment have all seen technological advancement. The primary factors driving changes in these technical aspects have been to increase efficiency of commercial operations and the improvement of carcass and meat quality, (Fletcher DL., 1999). The manner in which livestock are mustered, yarded, handled, transported, restrained, slaughtered, and

exsanguinated can affect their welfare and final meat quality. Welfare requirements dictate that animals should be insensible to noxious, potentially painful, stimuli during slaughter. In abattoirs, pre-slaughter stunning is usually applied to induce rapid desensitization of animals to the pain of slaughtering, and to minimize bodily injury risks to abattoir personnel. After stunning process, there are some other steps of slaughtering, which are: bleeding, removal of the skin from the head, cutting the front legs, cutting the back legs and hang, removal of the skin from the thigh, rectum processing, removal of external genitalia and breast removal, skin removal, separation of the head from the body, chest bone cutting, removal of internal organs (evisceration), carcass separation and processing of organs, (Danev *et al.*, 2009).

2. MATERIAL AND METHODS

The slaughterhouse that was taken for research is slaughterhouse "**Malësia**", which is located in Kosovo. It is one of the meat factories in Kosovo and the region that works with modern technology. The factory in general, include the slaughterhouse and the processing part, it has 3700m², which has a slaughter capacity of up to 250 cattle, and about 40 slaughter per day. It is one of the most completed slaughterhouses with European standards. It has implemented the HACCP system, is certified with the ISO 22000 standard, is certified by Canada for HALAL slaughter and has US certificate for export in all over the world. The age of cattle for slaughter is 3-13 months, while the cattle race that is most often slaughtered is: Simmental, Limousine and Belgian Blue. As one of the largest factories in the country that meets all the conditions, works with the latest technology equipment and produce high quality meats and meat products.

2.1 Slaughtering Technology

Slaughtering technology with the application of modern equipment, hygienic condition and monitoring is shown in the figures (1-6).

The HALAL certification that this slaughterhouse has does not mean that it fulfills the conditions of slaughter but, they should also take care of the welfare of the animal. Before they come to the factory, the animals are subjected to many veterinary checks. When a cattle arrive to the factory, it rest for 24 hour before slaughter to avoid stress of transport. Place for rest before slaughter is separate from the slaughterhouse so, cattle should go to the slaughterhouse, or enter the box, passing through a stainless steel plateau, in this way the animal is not in direct contact with the floor. After passing this plateau, the cattle enter the box where it is subjected to HALAL slaughter. As the animal enters the box, the box rotates, returns to the right of the animal. In this way is done the HALAL slaughter of the cattle.



Fig. 1 Cattle depot



Fig.2Stainless steel plate



Fig.3 Modern Cattle Box

After the cattle is slaughtered and the bleeding is finished, should be tied a back leg of cattle and to pass on the process of removing the skin. After removal of the skin, from the carcasses are removed the internal organs which are stored at a temperature of 0-2°C. After removal of the internal organs, the carcass is separated into two parts and stored at a temperature 0-4°C.



Fig. 5 Skin removal



Fig. 6 Separation of the carcass into two parts

2.2 Sampling

After slaughtering process samples have been taken in order to analyse meat quality according the chemical composition. Meat samples have been taken from Limousine breed with average 12 months originated from Croatia. The average weight after slaughtering was 292.00 kg. Samples were taken in three different points of carcasses: 1. Spine; 2. Chest; 3. Thigh, (Figure 7, a, b, c).

The amount for a sample was about 300 gr. The samples were packaged with vacuum to avoid the contamination or any damage.



(a)



(b)



(c)

Fig.7 Meat samples taken on this point of carcass: a) Spine, b) Chest c) Thigh

2.3 Analyse of chemical composition

The samples were analysed in the chemistry laboratory at the Kosovo, Food and Veterinary Agency by Food Scan analyzers with these parameters: water, protein, fat and collagen. 300gr sample is homogenized in the blender, 150gr of the homogenized mass placed on the plate of instrument for analysis, while the rest of the sample is stored in case of the first sample will be damaged.

Food Scan™ Meat Analyzer is an easy-to-use routine analysis instrument for 669 analysing all stages of meat production-from checking incoming raw material to final product control. It delivers accurate results in just 50 seconds and technology is based on Near Infrared Transmittance, NIT.

3. RESULTS AND DISCUSSION

As of the results (Table 1, 2, 3) it can be concluded that the water content of all three samples ranges in the permitted range such as from 73.21% in spine to 76.24% in the chest. The water content varies depending on the

anatomical region of the body and the muscle fibres in that anatomical region and the water retained under pressure. The water content is also affected by the manner how the body is treated and the time when the samples are taken.

Table 1. Chemical composition of Spine

Point of sampling-Spine			
Parameters	First measurement	Second measurement	Average values
Water	73.14	73.29	73.21
Protein	20.80	20.92	20.86
Fat	5.19	5.22	5.20
Collagen	2.04	1.98	2.01

Table 2. Chemical composition of Chest

Point of sampling-Chest			
Parameters	First measurement	Second measurement	Average values
Water	76.21	76.28	76.24
Protein	19.63	19.73	19.68
Fat	2.75	2.78	2.76
Collagen	1.66	1.73	1.69

Table 3. Chemical composition of Thigh

Point of sampling-Thigh			
Parameters	First measurement	Second measurement	Average values
Water	74.71	74.58	74.64
Protein	20.13	20.13	20.13
Fat	3.89	4.03	3.96
Collagen	1.40	1.37	1.38

The percentage of water in the meat is closely and inversely related to the fat percentage, (Mestani, M., 2017). Thighs and breasts show a lower fat content of 3.96% and 2.76%, which is justified according to the presence of greater amounts of protein in them. It is common for the samples to be taken from the MLD muscle located between 12-13 ribs. The highest collagen content is in the spine in 2.01% as a result of the higher amount of connective tissue proteins.

Proteins in pulp of meat are in the amount of 18-23%. The main and complete proteins are myosin, myogene, globulin and myoglobulin, (Mestani, M., 2017). The chemical composition of meat is influenced by a number of genetic and parametric factors.

Results of our research show that proteins are ranging in the permitted values.

Our results are similar with the results of (Lawrie, R. A., & Ledward D., 2006) who reported that meat composition consists of approximately 75% of water, 19% of protein, 2.5% of fat, 1.2% of carbohydrates and 1.65% of nitrogen compounds. It also contains a great amount of several minerals (calcium, phosphorus, sodium, potassium, chlorine, magnesium) and trace elements such as iron, copper, zinc and many other. These values were similar to the ones found by (French *et al.*, 2001) for crossbred Limousin x Charolais animals, maintained in pasture: 73% of moisture, 1.3% of ash, 22.6% of crude protein and 2.5% of fat.

Ahmad *et al.*, (2018) reported that quality traits of meat along with its nutritional composition become dependent upon animal breed type, feeding source, genetics of animal and post mortem techniques.

The slaughterhouse is an important step in the production of meat as it presents some of the preferable opportunities for contamination. Biological, physical and chemical hazards may be encountered at an abattoir, (Zailani *et al.*, 2016). The same recommendation for production of good quality meat give us, (Elsharawy N.T., Ahmand M.A., & Abdelrahman A.H., 2018).

The proximate chemical composition of the control sample of this investigation is similar to that reported for beef (Lijalem *et al.*, 2015; Shenzad *et al.*, 2014).

4. CONCLUSIONS

The obtained results give us a conclusion that the animal had no stress before slaughter, welfare was respected ie. the whole process of slaughter ends in a short time, with complete bleeding of the animals. This modern technological

slaughter method has also shown satisfactory chemical composition of the meat from all three different anatomical regions. The results are in accordance with Rulebook and Regulation of the meat and meat products in Kosovo.

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