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CHEMICAL CHARASTERISTIC OF RABBIT HIBRIDS

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Abstract

The aim and purpose of the analysis was to evaluate the influence of the gender male/female on the chemical, microbiological and sensory composition. Flemish giant rabbit and New Zealand white rabbits (group ON), were used as a material for the study. Rabbits were fed *ad libitum* with commercial pelleted feed, with the addition of small amounts of green feed and hay. The experiment included 6 rabbits, 3 males and 3 females. Previously defined live weight of 1800 to 2500 g was achieved within 77 days and after that they were slaughtered. This paper provides the conducted results of the research in regard of the chemical, microbiological and sensory composition of the rabbit meat.

The average composition (n-6) of the inclusion of the water in the thigh, shoulder blade and the back are 71.89% / 74.51% / 72.61%, the inclusion of proteins is 19.46% / 18.62% / 21.28%, the inclusion of fats is 3.34% / 4.36% / 2.46%, the inclusion of minerals is 1.16% / 1.10% / 1.19%. In meat parts, are not found bacteria of the following types: *Clostridium*, *Staphylococcus*, *Proteus*, *Escherichia*. The average microbiological content (24 hours *post mortem*) of total bacteria (*bacillus*) number varies from 2.44 to 2. 58 (log CFU/g). Male rabbits are tougher, with more intensive color, taste and smell.

Keywords: *rabbits, hybrids, chemical, microbiological and sensory composition*

INTRODUCTION

Meat represents concentrated source of nutritive composition (Higgs, 2000). Meat used to be declared as product which is optimally crucial for healthy growth of the humans. That knowledge is not respected that well lately, especially in regard to the reduction of the composition of fats. The overuse of meat products with high composition of fats, may lead towards many diseases (hypertension, cancer, diabetes). In regard to this matter it is very important to choose meat without fats i.e. meat with proper composition (Perc, 2001).

Rabbit meat is a reliable source of essential fats and amino acids, protein with high biological value, vitamins from B group (B_{12}) and many other minerals (especially the composition of calcium, copper and iron) (Koch & Pavčič, 2000; Para et al. 2015). The meat also contains very little composition of sodium, fats and cholesterol, very little composition of connective tissue, very easy decomposable in the organism, with sweet taste and it has less energetic value than other types of meat. Regarding all these characteristics and small energetic values, rabbit meat is declared to be protective food for the human heart (Grün, 2002; Lah, 2006).

The chemical content of different parts of

the meat depends on the gender, age, genotype and the type of the meat. This is the reason why there are many deviations between the data from different authors for the chemical content of different types of meat. One of the factors that influence the content and deposition of the fats is the gender. Males grow more intensively and gain more weight in opposition to the females (Andronikov et al. 2019). Due to this fact the meat from the females contains more fat than the male meat (Suchý, 2002). As a result of rabbits being slaughtered very young, before they reach puberty, there are not many significant statistical differences between the genders. For differences to be determined, 15 chemical, microbiological and sensory features of different parts of the rabbit`s body.

weeks of age have to pass (105 days) (Hernández & Lozano, 2001).

Because of the vast necessity of rabbit`s meat in the world, we can expect more expansion of the production of this meat (Skandro et al. 2008). Unfortunately, in Republic of North Macedonia the breeding of rabbits is not developed yet and they are bred on more intensive way and there is no tradition of the consummation of the meat as it is the case in Western Europe where there are immense farms for breeding rabbits and there is a tradition of the meat consuming.

However, the aim of this research is to point out how the gender influences the

MATERIAL AND METHODS

Six rabbit's hybrids (3 male and 3 female), that is, crossed units from the so-called Belgium oriash and New Zealand's white rabbits (ON) fed ad libitum with industrially pelleted food (containing alfalfa, barley, corn, wheat, soy, granules sunflower premixes, salt, vitamins and minerals) were the research material for our study (Andronikov et al. 2019).

The rabbits reached the defined weight from 1800 to 2500 g in 77 days kept in separate wire cages. 24 hours before slaughter, their feeding was stopped. Slaughtering and primary processing of rabbits was performed in the usual way. The slaughter was done after the veterinary examination and looting. 24 post mortem cool carcasses were cut in basic pieces and measured on an electronic scale, there in each organ individually, and then cut to the front, the middle and the back part (Bivolarski et al. 2011).

Chemical analyses

Total nitrogen (TN) was determined according to the Kjeldahl method. Moisture content was determined by drying at 103 ± 2°C to constant mass. The intramuscular fat content was determined according to AOAC International method, with petroleum ether as solvent. Ash was determined by burning and combustion (4 – 5 h) at 525 – 550°C [Ash of Meat, 1997]. Content of sodium chloride was determined by ISO 1841-1/1999. Content of nitrite were determined by ISO 2918- 1/1999.

Microbiological analysis

Following bacteria were determined: Total bacteria (bacillus) number – ISO 4833/2003. Sown on nutrient agar to 37°C during 24 hours. Staphylococcus ISO 6888-1/1999. Sown on ETGP agar (barit parker agar) after termostating on 37°C during 24 hours. Enterobacteriaceae ISO 21528- 1/2004; ISO 21528-2/2009. Escherichia coli are sown on lactose bujon and brilliant green, thermostated on 37°C during 24–48 hours. Clostridium sown on sulfite agar, thermostated on 37°C during 24–48 hours. Data were transformed into log10 CFU/g before comparison of means. The results were statistically processed using mathematical program Microsoft EXEL ANOVA (single factor) 2009/2013.

Sensory examination

The sensory analysis was done by five experienced specialists. The meat of the thigh of a rabbit was previously cut into cubes. Thus, prepared meat was placed separately in pots and thermally treated at a temperature of 72 to 85° C (cooking) without the addition of salt and spices. The analyzed sensory characteristics of the meat were the following: color, after-taste of rabbit flavor, smell, mouth feeling, softness, juiciness. The sensory analysis was done by using a 9-level scale approved by VNIMP Moscow.

Statistical analyses were made by using the statistical software SPSS ver. 21 (SPSS Inc, Chicago, IL, 2012).

RESULTS AND DISCUSSION

From table 1 we can notice that the average composition of water on the back of male rabbits is 73.06% and of females is 72.17%. The average content of water on the back with all rabbits is 72.61%.

The composition of the water on the shoulder of the male rabbits is 75.83% and of the female is 73.20%. The average content of water on the shoulder with all co rabbits is 74.51%.

The composition of the water in the thighs of the males is 71.92% and in females is 71.87%. The average content of water in the thighs with all rabbits is 71.89%.

Table 1. Chemical composition (%) in three parts (back, shoulder and thigh) of male and female rabbits

Chemical composition (%)					
		Back			
	Group	Water	Fat	Proteins	Minerals
BS (n-6)	ON	72.61±0.77	3.34±0.52	19.46±0.90	1.19±0.05
Male (n-3)	ON	73.06±0.54	3.04±0.18	20.25±0.46	1.20±0.03
Female (n-3)	ON	72.17±0.75	3.64±0.59	18.68±0.21	1.17±0.07
		Shoulder			
	Group	Water	Fat	Proteins	Minerals
BS (n-6)	ON	74.51±1.51	4.36±0.25	18.62±0.33	1.10±0.05
Male (n-3)	ON	75.83±0.40	4.24±0.08	18.55±0.43	1.11±0.06
Female (n-3)	ON	73.20±0.73	4.49±0.31	18.70±0.23	1.10±0.04
		Thigh			
	Group	Water	Fat	Proteins	Minerals
BS (n-6)	ON	71.89±0.60	2.46±0.25	21.28±0.61	1.16±0.04
Male (n-3)	ON	71.92±0.79	2.42±0.15	21.72±0.58	1.19±0.03
Female (n-3)	ON	71.87±0.46	2.50±0.35	20.84±0.15	1.14±0.03

$\dot{x}$ – mean, Sd – standard deviation; number of pieces = 3

The fats contents on the back of the males are 3.04 % and in females 3.64%. The average content of fats on the back with all rabbits is 3.34%. The content of fats on the shoulder of males is 4.24% and in females 4.49%. The average content of fats on the back with all rabbits is 4.36%. The fats contents in the thigh of males are 2.42% and in females 2.50%. The average content of fats in the thighs with all rabbits is 2.46%.

The content of proteins on the back of the males is 20.25% and in females is 18.68%. The average content of proteins on the back with all rabbits is 19.46%. The composition of proteins on the shoulder part of the males is 18.55% and in females 18.70%. The average content of proteins on the shoulder with all rabbits is 18.62%. The composition of proteins on the thighs of the males is 21.72% and in females 20.84%. The average content of proteins in the thighs with all rabbits is 21.28%.

The minerals on the back of the males are 1.20% and in females is 1.17%. The average content of minerals on the back with all rabbits is 1.19%. The minerals on the shoulder of the males are 1.11% and in females is 1.10%. The average content of minerals on the shoulder with all rabbits is 1.10%. The minerals on the thighs of the males are 1.19% and in females is 1.14%. The average content of minerals on the thighs with all rabbits is 1.16%.

In our research the composition of the proteins is the highest on the thighs of the males 21.72% and the least is on the shoulder

part of the males 18.55%. The composition of the water is the highest on the rib part of the males 75.83% and the least is on the thighs of the males 71.87%. The content of the fats is the highest on the rib part of the females 4.49% and the least is on the back of the females 2.42%. The composition of the minerals is the highest on the back of the females 1.20% and the least on the rib part of the females 1.10%.

Baiomy & Hassanien (2011) did a research of the chemical content on the meat of New Zealand white rabbits, in which they have conducted the average content of proteins 20.35% (male / female – 20.06% / 20.01%), water (male / female – 69.9% / 70.03%), minerals 0.99 % (male / female – 1.01% / 0.96%), fats 7.87% (male / female – 7.99% / 7.75%).

The results that we have conducted regarding the chemical contents are corresponding with the results that have been conducted by the rest of the authors (Dalle Zotte et al. 1996; Hernández et al. 1998; Gondret et al. 1998; Nizza & Moniello 2000; Metzger et al. 2003; Wood et al. 2003; Pascual et al. 2004; Polak et al. 2006, Ali 2007; Chrenek et al. 2012; Nistor et al. 2013; Belichovska et al. 2017). The mentioned authors determined average composition of water between 60 and 76%, proteins between 18 and 25.0%.

In addition to this, regarding the gender, males have more composition of water, proteins and minerals than females but the composition of fats is bigger in females. Our provided fact corresponds with the results conducted by the other authors (Dalle Zotte et al. 1996; Polak et al. 2006, Ali 2007).

In opposition to this, Baiomy, A.A. & Hassanien H.H.M. (2011) claim that the composition of proteins, fats and minerals in male New Zeland rabbits is bigger than the ones in females.

Table 2. Microbiology (24 h post mortem) (Total bacteria (Bacillus) number) in three parts (back, shoulder and thigh) of male and female rabbits

Microbiology (24 h *post mortem*) (Total bacteria (*Bacillus*) number)				
	Group	Shoulder (log CFU/g)	Back (log CFU/g)	Thigh (log CFU/g)
BS (n-6)	ON	2.44±0.12	2.47±0.17	2.58±0.08
Male (n-3)	ON	2.44±0.06	2.39±0.06	2.56±0.03
Female (n-3)	ON	2.44±0.19	2.55±0.24	2.59±0.13

ẋ – mean, Sd – standard deviation; number of pieces = 3

In meat parts, not found bacteria of the following types: Clostridium, Staphylococcus, Proteus, Escherichia.

Table 2 shows that the back part, the shoulder part and the thighs of the examined rabbits are not contaminated with microorganisms, which leads to the fact that the slaughter and the primary processing of the rabbits is done in strictly prescribed hygienic conditions.

Table 3. Sensory analysis of male and female rabbits.

		Sensory analysis					
	Group	Colour	After-taste of rabbit flavor	Smell	Mouth feeling	Softness	Juiciness
BS	ON	7.90±0.85	7.95±0.89	7.75±0.97	8.40±0.99	7.60±0.75	6.75±0.72
Male	ON	8.30±0.95	8.40±0.97	8.10±1.10	8.30±1.34	7.33±0.88	6.67±0.88
Female	ON	7.56±0.53	7.44±0.53	7.44±0.70	8.44±0.53	7.90±0.48	6.90±0.52

ẋ – mean, Sd – standard deviation; number of pieces = 3

The average sensory values of rabbits are between 6.75 (juiciness) to 8.40 (mouth feeling). The sensory analysis determines that the males have more intensive color, taste and smell in opposition to the females with are softer and juicier.

CONCLUSIONS

Based on results of investigation of chemical, microbiological and sensory characteristics in different parts of meat of Flemish giant rabbit and New Zealand white rabbit, it may be concluded as follows:

Male rabbits in opposition to female rabbits have bigger composition of water, proteins and minerals, meanwhile females have bigger content of fats.

Male rabbits have more intensive color, taste and smell in opposition to the females with are softer and juicier.

No bacteria are found from the following types of Clostridium, Staphylococcus, Proteus, Escherichia. The total number of bacteria (bacillus) showed very low values.

The hygiene conditions in which the course of this experiment was flawless.

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ХЕМИСКИ КАРАКТЕРИСТИКИ НА ЗАЈАЦИ ХИБРИДИ

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Резиме

Влијанието на полот машки/женски на хемискиот, микробиолошкиот и сензорниот состав беа цел на анализа. Како материјал за ова истражување ни послужија хибриди на вкрстени единки од т.н. белгиски оријаши и новозеландски бели зајаци (ОН), кои беа хранети ад либитум со индустриски пелетирана храна. Во истражувањето беа опфатени шест зајаци и тоа три машки и 3 три женски. Дефинираната жива маса од 1800 до 2500 g зајаците ја постигнаа за 77 дена, по што се изврши колењето. Во трудот се изнесени резултатите од истражувањето на хемискиот, микробиолошкиот и сензорниот состав на месото од зајаци. Просечниот удел (n-6) на содржината на вода во бутот, плешката и грбот 71,89% / 74,51% / 72,61%, содржината на протеини 19,46% / 18,62% / 21,28%, содржината на масти 3,34% / 4,36% / 2,46%, содржината на минералните материи 1,16% / 1,10% / 1,19%. Во деловите од месо од зајаци не се пронајдени бактерии од следните родови: *Clostridium*, *Staphylococcus*, *Proteus*, *Escherichia*. Просечниот микробиолошки состав (24 часа post mortem) на вкупниот број на бактерии (*bacillus*) се движи од 2,44 до 2,58 (log CFU/g). Машките зајаци се потврди, со поинтензивна боја, вкус и мирис.

Клучни зборови: *зајаци, хибриди, хемиски, микробиолошки, сензорен состав.*