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A STUDY OF THE QUALITY AND BIOLOGICAL VALUE OF MEAT OF DIFFERENT BREEDS OF RABBIT BRED IN GEORGIA

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ABSTRACT

The use of a rabbit meat is a perspective and accessible way of solving the problem of the shortage of domestic meat products in Georgia. Nowadays, there are sufficient on rabbit breeding in the country, but no data are available on the quality and technological properties of rabbit meat. Therefore, of scientific and practical interest is to study the quality indicators, safety, chemical composition and biological value of meat of different breeds of rabbits. The modern, standard, commonly accepted methods of the research have been used in performing this work, which are suitable for accomplishing the set tasks. Statistical processing of the results obtained and the evaluation of the reliability of the obtained data were carried out by the mathematical statistics methods using the Windows IBM SPSS Statistics software program. Based on the study of microbiological indicators of rabbit meat, it has been demonstrated that the number of mesophylic-aerobic and facultative anaerobic microorganisms does not exceed the values established by the sanitary standards and rules, no bacteria of intestinal bacillus and pathogenic microorganisms were detected, including salmonella, which is also is in compliance with the biological and hygienic safety requirements and standards. The safety of rabbit meat is also indicated by a study of its toxicity. It has been established that the breeds of rabbit bred in the country are distinguished by a high meat productivity, high protein and moderate fat contents and low caloric capacity. The biological value of rabbit meat has been determined: it is distinguished by the number of all essential amino acids and the protein-quality index, it does not have limited amino acids, and all essential amino acids scores, especially of lysine, tryptophan and leucine, exceed the "ideal protein" score. The level of satisfaction of human daily needs is also high with amino acids. The resulting data point to the high quality and biological value of the meat of rabbits bred in Georgia, and made it reasonable to use as raw material for domestic high-quality meat production.

Keywords: rabbit meat; safety; meat productivity; chemical composition; biological value

INTRODUCTION

Own natural resources and supplying the population with high quality foods is the most important strategic goal for all States, as shortages or inferiority of food cause serious economic and social consequences.

Recent years have seen deficiencies and imbalance of a number of nutrients – proteins, especially animal origin proteins, polyunsaturated fatty acids, vitamins and macro- and micronutrients.

An essential source of animal proteins and a number of biologically active substances is one of the mostly demanded food product – meat.

The population of Georgia traditionally consumes meat, pork, ovine and chicken meat.

At the same time, the real life of the country is the reduction in livestock numbers and an acute shortage of meat. The consumer market is saturated with meat and meat products imported from abroad.

Therefore, of high relevance is to search for the new, alternative sources for domestic production of meat products, which have a high biological and nutritional value.

Rabbit meat can be considered to be a prospective and affordable reserve of complete meat. In contrast to other agricultural animals, rabbit is distinguished by high reproduction capability, fast maturation and the feasibility of using its products in diet and preventive nutrition **(Aleksandrov and Kosova, 2006; Dalle Zotte, 2011; Hernández, 2008; Nikitin and Belchenko, 1994; Ulikhina, 2009; Zhitnikova, 2004)**.

The use of rabbit meat in food production is stemmed from the high content of easily digestible protein, the well-balanced aminoacid composition, the moderate fat content, and the substantial content of mineral substances and vitamins, low calorific capacity and high organoleptic indicators.

Compared to pork and poultry meat, the percentage of flesh in rabbit meat quite higher, but the percentage of connective tissue - significantly lower, and amount of sodium, purine compounds and the cholesterol content is smaller, the meat consistency itself is finefibered and delicate. Due to these properties, meat is considered to be a precious dietetic product that has no contraindications for arious diseases **(Tutelyan and Samsonov, 2002; Baranovsky, 2008; Hernández, 2008; Gerasimova and Golovaneva, 2013; Nistor, et al. 2013; Petracci and Cavani, 2013; Pla, Pascual and Ariño, 2004; Polak et al., 2006; Rafay and Prundeanu, 2013.; Mojto and Palanská, 1999; Vasilenko, 2004; Volkova, Inerbaeva and Motovilov, 2009)**.

It is noteworthy that rabbit production has been suspended for many years, but today, there has already been revealed the population's increased demand for rabbit meat, which was contributed considerably by information provided scientists, nutritionists and adherents of healthy eating about useful properties of rabbit meat. This is also demonstrated by our monitoring.

Rabbit meat is quite poorly represented on the Georgian consumer market, and besides products imported from abroad are dominating, while the country has all the necessary conditions for intensive development of rabbit breeding and rabbit meat production in large quantities. The implementation of this task corresponds to the important direction of of the country's economic policy – domestic safe food production.

In literature, there are sufficient data on rabbit breeding and nutritional value of rabbit meat, but there are no data on the quality of rabbit meat produced in Georgia.

Based on the above and taking into consideration that in consumption of food, the preference should be given to raw materials of local production, since people are genetically predisposed to their better digestion, and of scientific and practical importance is a comprehensive study of meat of different breeds of rabbits produced in Georgia.

The purpose of the work was to examine qualitative indicators of domestic rabbit meat production, as well as its safety, chemical composition and biological value.

Scientific hypothesis

(H1)There is a difference between the meat productivity of meat varieties and meat-skin varieties of rabbits.

(H2) Useful properties of rabbit meat is determined by the ratio of fat and protein, nutritional and biological value - by the content of amino acids and protein-quality index.

MATERIAL AND METHODOLOGY

Studies were conducted at the Akaki Tsereteli State University: in the laboratories of the Department of Food Technologies. The following breeds of rabbits bred in the cooperative "New Gurianta" were the subjects of these studies: meat varieties – Californian and New Zealand white rabbit, meat- skin varieties - White Giant and Gray Giant, their average age was 130 days.

We evaluated the quality of rabbit meat in a comprehensive manner – on the basis of organoleptic, microbiological, chemical indicators, aminoacid composition and biological value. To that end, we used the methods described in the appropriate standards, normative documents and special literature, which are widely accepted for analysis of meat products.

Organoleptic indicators were determined in accordance with the following characteristics: appearance and color, muscle condition on the section, consistency, smell, broth transparency and aroma.

During microbiological analysis, the quantities of mesophylic aerobic and facultative anaerobic microorganisms in rabbit meat were determined according to state standard "Food products. Methods for determining the quantities of mesophylic aerobic and facultative anaerobic microorganisms" – GOST 10444.15-94; number of bacteria of intestinal bacillus was determined according to State Standard "Food products. Methods for the detection and determination of the number of bacteria of the Escherichia coli group (coliform bacteria)" – GOST 30518-97; Salmonella was determined according to State standard "Food products. Methods for the detection of bacteria of the genus Salmonella " – GOST 30519-97.

To determine safety of rabbit meat, examination of samples on toxicity was carried out on the biological object *Tetraximena puriformis*, in compliance with "Methodological instructions on the accelerated determination of the toxicity of products and foods". The toxicity of test samples was determined by the presence of dead infusoria, altered forms, motion character and suppressed growth of *Tetraximena puriformi*. The absence of the death of infusoria or any other pathological change in *Tetraximena puriformi*, within 24 hours, indicates that meat is not toxic.

The meat productivity of rabbit was determined after slaughtering. We weighed and distributed the carcass, separated the meat from the bones and the cartilages from the flesh, then we determined the morphological composition of the rabbit carcass, based on the obtained data, and then we calculated the fleshing index.

The chemical composition was determined by determining the content of moisture, proteins, fats and ash in the mean sample of the flesh. Based on the obtained data, we calculated the energy value. The moisture content was determined at a temperature of 105 °C, by method of drying the weight up to the constant mass; the protein content was determined by Kjehldahl's method; the fat content was determined using Soxhlet method; the ash content was determined - by ashing method with preliminary drying **(Antipova, Glotova and Rogov, 2001)**.

The aminoacid composition of meat protein was determined by method of liquid chromatography on a chromatograph AGILENT 1200 according to the appliance instructions; the biological value of meat protein was determined according to the aminoacid composition wity further calculation of aminoacid scores, indexes E/N (the ratio of essential amino acids to the sum of nonessential amino acids) and E/T (the ratio of essential amino acids to the sum of all amino acids). In addition, we determined the protein-quality indicator – according to the ratio of triphophan/oxyproline.

Statisic analysis

To analyze the difference between the test parameters (meat productivity, chemical composition, biological and nutritional value) of meat of different varieties of rabbit, is conducted a statistical analysis of the obtained data, the

reliability of the obtained data was evaluated by the mathematical statistics methods using the Windows IBM SPSS Statistics software program (version 20.0). To describe the ordered sample, we used statistical functions of the average arithmetic value and average standard error. Graphical interpretation of the results was made by using Microsoft Excel.

In Tables and Figure, there are presented the data of typical tests, and each value is an average of at least three determinations.

RESULTS AND DISCUSSION

At the first stage of the work, we studied the organoleptic and microbiological indicators of the breeds bred in Georgia, such as Californian, New Zealand white, White Giant and Gray Giant.

By the organoleptic characteristics, the meat of individual breeds of rabbit did not differ from each other. On the surface of the carcasses of rabbits of all groups, there is formed a rose-pink dry crust of drying up. The serous membrane of the abdominal cavity is moist and shiny. Muscles are pink-rose, dense, elastic, the dimple formed when kneading with finger is quickly aligned. Meat has a specific peculiar smell characteristic of fresh rabbit meat, and when cooking, the broth is transparent and fragrant.

Microbiological analysis was carried out on the presence of mesophylic-aerobic and facultative anaerobic microorganisms, salmonellas and bacteria of intestinal bacillus. It has been established that in test samples, the quantities of mesophylic aerobic and facultative anaerobic microorganisms varied from 3.4·102 to 2.4·103 CFU.g-1 (colony forming unit/g) that does not exceed sanitary norms and rules. The established value of bacteria of intestinal bacillus (coliform) was not in 0.01 g sample, and met the hygienic requirements of microbiological safety, but pathogenic microorganisms including salmonella, have not been detected in 25 g samples, which also complied with microbiological safety norms and indicates safety of product.

The study of safety of test breeds of rabbit meat on the biological object *Tetraximena puriformis* showed that it is not toxic, because it does not have a negative impact on the survivorship rate infusoria, their motion and morphology of cells. The number of infusoria in the feeding area containing rabbit meat for each rabbit breed varied from 16.4 × 104 to 16.8 × 104 .

At the next stage, we studied the rabbit meat productivity and the morphological composition, as well as the content of individual tissues in the carcass. The results are presented in Table 1.

Analysis of data contained in the table reveals the high meat productivity of test breeds of rabbit.

Among individual tissues in the carcass, the highest percentage belongs to lean tissue, then followed by the contents of bone, fat and connective tissues, accordingly.

The New Zealand white and Californian breed of rabbit have the highest fleshing index (the ratio of the lean tissue content to the bone tissue content), and relatively lower – by 3.05% – White Giant and and by 2.5% – Gray Giant breeds (Figure 1). Thus, meat varieties of rabbit are characterized by higher meat productivity than meat – skin varieties.

The results of studying the chemical composition of different breeds of rabbit are presented in Table 2.

Analysis of data contained in the table reveals that all breeds of rabbit meat contain considerable amount of

Table 1 The yield of the rabbit meat carcass and individual tissues.

Indicator	Californian	New Zealand white	Gray Giant	White Giant
Live weight, g	3000 ±21.5	3260 ±21.5	3540 ±10.6	3420 ±8.6
Carcass body mass, g	1920 ±21.5	2119 ±14.83	2124 ±21.35	2018 ±17.85
Yield of the carcass, %	64	65	60	59
Lean tissue, g	1449 ±16.57	1626 ±16.57	1606 ±6.23	1542 ±19.29
Yield of lean tissue, %	75.45	76.75	75.60	76.40
Bone tissue, g	245 ±5.79	275 ±5.79	281 ±5.24	268 ±7.84
Yield of bone tissue, %	12.76	12.97	13.24	13.30
Connective tissue, g	76 ±4.32	83 ±4.32	86 ±2.62	86 ±5.6
Yield of connective tissue, %	3.98	3.95	4.05	
Fat tissue, g	143 ±10.2	133 ±10.2	150 ±4.78	121 ±5.73
Yield of fat tissue, %	7.45	6.30	7.05	6.01

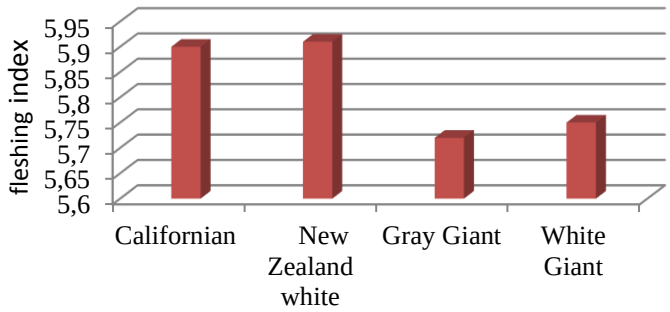

Figure 1 A fleshing index of different breeds of rabbit.

Table 2 Overall chemical composition and energy values of rabbit meat.

Substances	Rabbit breeds			
	Californian	New Zealand white	Gray Giant	White Giant
Moisture, %	71.20 ±0.42	69.2 ±0.36	70.3 ±0.61	70.2 ±0.58
Protein, %	21.1 ±0.08	20.4 ±0.10	19.1 ±0.12	19.6 ±0.19
Fat, %	7.1 ±0.14	7.4 ±0.23	8.3 ±0.18	8.7 ±0.15
Ash, %	1.22 ±0.18	1.2 ±0.22	1.0 ±0.16	1.0 ±0.14
Ratio of fat: protein	0.34	0.36	0.43	0.44
Energy value, kJ	538.4	673.8	629.3	656.6

proteins, and besides, the highest amount is observed in the meat of Californian breed of rabbit, but the same indicator for the New Zealand white rabbit breed is 3.3% lower, for the White Giant – 7.1% lower and for the Gray Giant breed – 8.5% lower.

The fat content in the meat of of the selected breeds is quite low. This indicates that it can be used as useful for health low-caloric raw material in diet and preventive nutrition.

The percentages of fat and protein in the meat of White and Gray Giant breeds are almost identical, but it is insignificantly lower in the meat of Californian and New Zealand white rabbit breeds.

The data obtained by us on the chemical composition of rabbit meat are confirmed by similar data existing in the literature. Thus, for example, in rabbit meat, the protein content is: 22.06% according to **Volkova (2009)**, 21.2%, according to **Nistor et al. (2013)**, 18.97% according to **Zhidik (2017)**, 22.3% – according to Sautkin's data **(Sautkin, 2010)**, According to these authors, the fat content is 1.29% 1.1%, 1.68% and 1.06%, respectively.

The above data indicate, in the same way that rabbit meat, compared to first-category beef and chicken meat and broiler chicken, is characterized by a higher protein and ash content (protein in beef 18.6, in chicken meat 18.2%, in chicken broiler – 19.7 %, ash – 0.9%, 0.8% and 1.1% respectively) and low fat content (fat – in beef 16.0%, in chicken meat – 18.4%, in chicken broiler – 13.8%) and low caloric content. A ratio of protein and fat in beef 0.9, in chicken meat – 1.0, in chicken broiler – 0.7 **(Vasilenko, 2004; Volkova, 2009)**.

To determine the biological value of rabbit meat, we studied its amino-acid composition (Table 3). There have been identified 19 amino acids in test breeds of rabbit meat, including all essential ones.

Analysis of the obtained data reveals that by the quantitative content of individual amino acids, the breeds did not exhibit many differences Of the concentrations of essential amino acids, the most are the amounts of lysine, in a sufficient amount contains tryptophan, which are almost fully absorbed and of nonessential amino acids – the amounts of glutamine, asparagine and alanine The amounts

Table 3 Amino-acid composition of rabbit meat, g.100 g^{-1} of protein.

Amino acid	Rabbit breeds			
	Californian	New Zealand white	Gray Giant	White Giant
Essential amino acids:				
Valine	5.02 ±0.20	5.04 ±0.22	5.05 ±0.23	5.03 ±0.24
Izoleitsin	4.01 ±0.19	4.02 ±0.18	4.03 ±0.17	4.10 ±0.20
Leitsin	8.05 ±0.22	8.02 ±0.20	8.04 ±0.25	8.08 ±0.26
Lysine	10.28 ±0.32	10.23 ±0.33	10.35 ±0.31	10.58 ±0.34
Methionine	2.61 ±0.15	2.58 ±0.12	2.65 ±0.16	2.69 ±0.14
Threonine	4.25 ±0.13	4.22 ±0.14	4.28 ±0.17	4.32 ±0.15
Tryptophan	1.51 ±0.04	1.48 ±0.06	1.54 ±0.07	1.59 ±0.08
Phenylalanine	3.90 ±0.13	3.89 ±0.12	3.93 ±0.14	3.97 ±0.13
Nonessential amino acids:				
Arginine	6.51 ±0.35	6.48 ±0.33	6.53 ±0.34	6.59 ±0.23
Asparagine	8.5 ±0.27	8.47 ±0.28	8.4 ±0.25	8.6 ±0.29
Histidine	2.3 ±0.05	2.29 ±0.07	2.6 ±0.09	2.9 ±0.30
Serine	3.62 ±0.19	3.60 ±0.21	3.68 ±0.23	3.73 ±0.08
Glutamine	14.44 ±0.32	14.42 ±0.38	14.49 ±0.39	14.55 ±0.28
Proline	3.72 ±0.04	3.70 ±0.03	3.78 ±0.04	3.82 ±0.22
Oxyproline	0.25 ±0.05	0.22 ±0.06	0.23 ±0.04	0.27 ±0.01
Alanine	7.72 ±0.31	7.71 ±0.33	7.78 ±0.34	7.89 ±0.34
Glycine	4.03 ±0.22	4.01 ±0.23	4.08 ±0.25	4.15 ±0.23
Cystine	0.92 ±0.18	0.90 ±0.15	0.96 ±0.16	0.99 ±0.05
Tyrosine	2.65 ±0.22	2.62 ±0.21	2.69 ±0.23	2.73 ±0.11
Total amino acid sum	94.29	93.9	95.05	96.58 ±2.16
Total amount of essential amino acids	39.63 ±1.27	39.48 ±1.25	39.83 ±1.32	40.35 ±1.34
Ratio of tryptophan / Oxyproline	6.04	6.73	6.70	5.90

Table 4 Aminoacid score of the rabbit meat proteins.

Amino acid	"Ideal protein" score	Rabbit breeds							
		Californian		New Zealand white		Gray Giant		White Giant	
Izoleitsin	4.0	4.01	100.3	4.02	100.5	4.03	100.8	4.10	102.5
Leitsin	7.0	8.05	115.0	8.02	114.6	8.04	119.1	8.08	115.4
Lysine	5.5	10.28	186.9	10.23	186.0	10.35	188.2	10.58	192.4
Methionine + cystine	3.5	3.53	100.9	3.48	116.0	3.61	103.1	3.68	105.1
Phenylalanine+ tyrosine	6.0	6.55	109.2	6.51	108.5	6.62	110.3	6.70	111.7
Threonine	4.0	4.25	106.3	4.22	105.5	4.28	107.0	4.32	108.0
Tryptophan	1.0	1.51	151.0	1.48	148.0	1.54	154.0	1.59	159.0
Valine	5.0	5.02	100.4	5.04	100.8	5.05	101.0	5.03	100.6

Table 5 Data on the biological value of the rabbit meat protein.

Rabbit breeds	Limited Amino acid	E/N,%	E/T,%	protein-quality index,%
Californian	does not have	0.72	0.42	5.90
New Zealand white	does not have	0.73	0.42	6.73
Gray Giant	does not have	0.72	0.42	6.70
White Giant	does not have	0.73	0.42	6.04

Table 6 Formula of balanced nutrition satisfaction level of rabbit meat by the content of amino acids.

Amino acids	Daily demand, g	Rabbit breeds			
		Californian	New Zealand white	Gray Giant	White Giant
Esencial aminoacids:					
Valine	3.5	30.3	29.4	27.4	28.0
Izoleitsin	3.5	24.9	23.4	21.7	22.6
Leitsin	5.0	34.0	32.6	30.6	31.6
Lysine	4.0	55.7	52.0	49.3	50.3
Methionine	3.0	19.0	17.3	16.6	17.0
Threonine	2.5	36.4	34.4	32.4	33.2
Tryptophan	1.0	34.0	30.0	29.0	30.0
Phenylalanine	3.0	28.0	26.3	25.0	25.3
Nonesencial aminoacids:					
Arginine	5.5	25.3	24.1	22.7	23.2
Asparagine	6.0	30.2	28.8	26.8	27.8
Histidine	1.5	40.8	31.1	33.1	30.1
Serine	3.0	26.2	24.5	23.4	23.7
Glutamine	16.0	19.2	18.4	17.3	17.6
Proline	5.0	16.1	15.1	14.4	14.6
Alanine	3.0	55.5	52.4	49.5	50.4
Glycine	3.0	29.2	27.3	26.0	26.3
Cystine	2.5	8.4	7.3	7.3	7.2
Tyrosine	3.5	16.5	3	14,7	14,8

of essential amino acids is 42%, the ratio of essential and nonessential amino acids for the Grey Giant and Californian breeds is 0.72, and for White Giant and New Zealand White breeds – 0.73. The obtained data do not contradict the literary data. For example, according to Volkova **(2009)**, the E / N value is 0.72, according to **Vasilenko (2004.)** – within 0.71 – 0.76, according to **Zhidik (2017)** – 0.72.

The results of calculation of amino acids (Table 4) and the data on the biological value of rabbit protein (Table 5) indicate that the rabbit meat does not have limited amino acids, the scores of all essential amino acids are higher than the "ideal protein" score.

One of the significant characteristics of meat protein quality is the protein-quality indicator – the ratio of trifluorane and oxyproline. In this ratio, triflufan characterizes the content of high-grade proteins, and oxyproline – deficient. It should be noted in the sample samples that the protein content oxyproline of the connective tissue is 0.22 – 0.27%, which determines the stiffness of the meat when its content in the beef is 1.56% and in the chicken meat is 0.83% **(Antipova and Zherebtsov-Voronezh, 1991; Tutelyan and Samsonov, 2002; Volkova, 2009)**.

There have been calculated the formula of balanced nutrition satisfaction level of rabbit meat by the content of amino acids (Table 6).

Table data indicate that amino acids have the highest satisfaction level of human daily demand for lysine, which,

along with other useful properties, contributes to the complete absorption of calcium by the organism and the growth of bone tissue, and for the selected breeds of rabbit it varies from 49.3% to 55.7%.

Of high importance are also the balanced nutrition formula's satisfaction levels for threonine and tryptophan, which cover the human daily demand, accordingly, from 33.2% to 36.4% and 29% to 34%.

The level of satisfaction of the daily demand is also quite high for both all essential and almost all nonessential amino acids.

Thus, the resulting data point to the high quality and biological value of the meat of rabbits bred in Georgia.

CONCLUSION

1. There have been established the quality indicators, safety, chemical composition and biological value of the meat of the relatively under-investigated and non-traditional for the population rabbit breeds bred in Georgia.
2. Study of the microbiological characteristics and toxicity of rabbit meat points to its safety.
3. The yield of the rabbit carcass and the content of individual tissues in the carcass point to a high meat productivity of rabbit. At the same time, was revealed the difference between meat and meat- skins breeds – the meat productivity of California and New Zealand white breeds was 2.7 – 3% higher than for gray giant and white giant breeds. These results confirmed our first hypothesis (H1) and showed higher meat productivity in meat varieties of rabbits.
4. Study of the chemical composition showed that rabbit meat is distinguished by a high protein content (19.1 – 21.1%), a moderate fat content (7.1 – 8.7%) and a relatively low energy value (538.4 – 673.8 kJ); contains a complete set of essential amino acids, does not have limited amino acids.
5. An advantageous ratio of fat and protein in rabbit meat, a significant content of protein and essential amino acids, including lysine, indicates the beneficial properties of rabbit meat, its high nutritional and biological value. This confirms our second research hypothesis (H2).
6. The chemical composition of rabbit meat, low caloric capacity and high amounts of essential amino acids, especially of lysine, have made it reasonable to use as raw material for domestic high-quality meat production, and as a protein enricher in the production of dietary and medicinal-prophylactic culinary foodstuffs.

REFERENCES

Aleksandrov, S. N., Kosova, T. I. 2004. *Rabbits: Breeding, rearing, feeding*. Moscow, Russia : AST, Stalker. 120 p. ISBN 966-696-643-3.

Antipova, L. V., Glotova, I. A., Rogov, I. A. 2001. *Methods for studying meat and meat products*. Moscow, Russia : Kolos. 376 p. ISBN: 5-9532-0187-7.

Antipova, L. V., Zherebtsov-Voronezh, N. A. 1991. *Biochemistry of meat and meat products*. Estonia : Voronezh Publishing House, 184 p.

Baranovsky, A. Yu. 2008. *Dietology*. St. Petersburg, Russia : Peter. 893 p. ISBN: 9785469016816.

Dalle Zotte, A., Szendrő, Z., 2011. The role of rabbit meat as functional food. *Meat Science*, vol. 88, no. 3, p. 319-331. https://doi.org/10.1016/j.meatsci.2011.02.017 PMid:21392894

Gerasimova, N. Y., Golovaneva T. V. 2013. Optimization of rabbit meat functional and technological properties by means of whey and apple acid treatment. *Scientific Journal of KubSAU*, vol. 85, no. 1, p. 337-346.

Hernández, P. 2008. Enhancement of nutritional quality and safety in rabbit meat. In *9th World Rabbit Congress*. Verona, Italy, p. 1287-1299.

Methodical instructions for the accelerated determination of the toxicity of livestock products and feed. Approved by the Veterinary Department of the Ministry of Agriculture of the Russian Federation, 16.10.2000. no. 13-7-2156.

Nikitin, B. I., Belchenko, N. B. 1994. *Processing of poultry, rabbits and production of poultry products*. Moscow, Russia: Kolos. 320 p.

Nistor, E., Bampidis, V. A., Păcală, N., Pentea, M., Tozer, J., Prundeanu H. 2013. Nutrient Content of Rabbit Meat as Compared to Chicken, Beef and Pork Meat. *Journal of Animal Production Advances*, vol. 3, no.4, p. 172-176. https://doi.org/10.5455/japa.20130411110313

Petracci, M., Cavani, C. 2013. Rabbit meat processing: historical perspective to future directions1. *World Rabbit Science*. vol. 21, no. 4, p. 217-226. https://doi.org/10.4995/wrs.2013.1329

Pla, M., Pascual, M., Ariño, B. 2004. Protein, fat and moisture content of retail cuts of rabbit meat evaluated with the NIRS methodology. *World Rabbit Science*, vol. 12, no. 3, p.149-158.

Polak, T., Gašperlin, L., Rajar, A., Žlender, B. 2006. Influence of genotype lines, age at slaughter and sexes on the composition of rabbit meat. *Food Technology and Biotechnolology*, vol. 44, no. 1, p. 65-73.

Sautkin, A. V. 2010. *Veterinary and sanitary assessment of rabbit meat when using "Emil" in their diet* : theses. Moscow, Russia. 137 p.

State Standard GOST 10444.15-94: 2010. *Food products. Methods for determining the amount of mesophilic aerobic and facultative-anaerobic microorganisms*.

State Standard GOST 30518-97: 2009. *Food products. Methods for the detection and determination of the number of bacteria of the Escherichia coli group (coliform bacteria)*.

State standard GOST 30519-97: 2005. *Food products. Methods for the detection of bacteria of the genus Salmonella*.

Tutelyan, V. A., Samsonov, M. A. 2002. *Guide to Dietology*. 3rd ed. Russia : Clinical Medicine, 544p. .ISBN 5-225-04723-8.

Ulikhina, L. I. 2009. *Handbook of rabbit breeder from A to Z*. Moscow, Russia : Aquarium-Print, 256 p. ISBN: 978-5-9934-0221-5.

Vasilenko, O. A. 2004. Development of meat products production technologies on the basis of the rational cuttingof rabbit towels : abstract of theses. Russia, 22 p.

Volkova, O. V., Inerbaeva, A. T., Motovilov, K. Y. 2009. Morphological composition and biological value of rabbit meat. *Siberian Herald of Agricultural Science*, vol. 8, p. 97.

Zhidik, I. Yu. 2017. *Veterinary-sanitary evaluation of rabbit meat by the use of mineral additive "Zeolite Natural" of Kholinsky deposit* : abstract of theses. Russia : UFA. 21p.

Zhitnikova, I. 2004. *Rabbits: breeds, breeding, maintenance, care. Rostov-on-Don*. Russia : Phoenix. 256 p. ISBN 5-222-05603-1.

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