Rational use of turkey meat in the production of healthy food products

Liliya A. Zubairova[1*], *Liliya I.* Samigullina[1], *Khamit Kh.* Tagirov[1], *Natalya V.* Gizatova[1], and *Albert Y.* Gizatov[1]

[1]Bashkir State Agrarian University, Ufa, Russia

Abstract. This article presents the meat characteristics of Canadian White Broad-Breasted turkeys. The morphological composition of individual parts of eviscerated carcasses was determined, and the muscle-bone and meat-bone indices of the main anatomical parts were calculated. Detailed studies of the chemical composition of hand- and mechanically deboned turkey meat were conducted. The amino acid and fatty acid content of the meat was analyzed, and biological value indicators were calculated. Mechanically deboned meat was found to have high nutritional value, expanding the potential for its use alongside hand-deboned meat in meat product production. When developing healthy turkey sausages, the use of a sprouted grain product, "Talkan", in the recipe was proposed. Research has shown that the use of the developed recipe compositions contributes to the production of products with excellent consumer properties. An increase in the total amount of essential amino acids in the test samples, approaching the physiological norm (standard) for valine, phenylalanine and tyrosine, indicates a more balanced composition and an increase in the biological value of sausage products.

1 Introduction

Despite rising costs of basic production resources, including breeding stock, technological equipment, and logistics support, the global turkey farming industry is demonstrating steady production growth. Key drivers of this growth include not only capacity expansion but also a structural shift in consumer preferences: turkey is becoming an integral part of a healthy diet. Emerging, sustainable demand creates a solid foundation for further industry expansion [1].

Increased productivity and efficiency in turkey farming operations in a number of countries is paving the way for turkey to expand its presence in both domestic and foreign markets. Turkey outperforms other bird species in terms of live weight gain, body weight, yield of edible parts, and muscle mass. Turkey meat is distinguished by its high nutritional and biological value, as well as its taste characteristics [2-4]. In all countries, this dietary bird is particularly popular among young people and those pursuing a healthy lifestyle, who value its low calorie content and low fat content [5, 6].

* Corresponding author: yla2003@yandex.ru

Currently, large turkey breeds and crosses are used in industrial processing in our country, producing a variety of products, from whole carcasses and semi-finished products to highly processed products such as sausages and whole-muscle products. It should be noted that the domestic turkey market is characterized by excess demand over supply, indicating significant potential for production expansion. Given the steady trend toward a healthy lifestyle, it is safe to predict that turkey's position on Russian tables will continue to strengthen. The targeted use of turkey by-products and the production of high-quality meat products must be based on a thorough and comprehensive study of raw material quality. The meat industry is also interested in maintaining high product quality standards to meet the needs of increasingly sophisticated consumers.

One of the important qualities of meat is its nutritional and biological value. Turkey meat is one of the most high-fat and dietary meats. The nutritional value of meat is determined primarily by its content of biologically complete and easily digestible proteins and saturated fatty acids. The biological value of meat is largely determined by its amino acid composition. Turkey meat is an excellent source of several important vitamins and nutrients, such as iron, zinc, potassium, and B vitamins [7-9].

In recent decades, the global market has seen a clear trend toward growth in healthy food products, functional foods, and specialty foods with a purposefully balanced nutrient composition. More and more people are recognizing that a balanced diet can benefit their health and are increasingly concerned about the chemical composition of the food they consume [9]. The growing popularity of sports and a healthy lifestyle has led to a significant increase in consumer attention to healthy food products and fitness products that have a balanced composition and provide the body with essential macro- and micronutrients.

In today's world, fitness has become popular among the population. Fitness is a specific cultural and lifestyle approach that involves maintaining physical fitness and health, achieved through exercise, a balanced diet, and adherence to a set of recommendations for organizing daily activities. It is also important to note that the effectiveness of exercise is directly related to nutrition. The growing sports nutrition market offers consumers a wide range of specialized products, classified by composition and mode of action. These include protein blends for building muscle tissue, energy boosters for increasing endurance, creatine for explosive power, amino acids for protecting muscles from breakdown, as well as weight gainers, cardio supplements, and vitamin and mineral complexes. Anyone who is professionally involved in sports or fitness selects these products according to their individual goals - whether it's weight loss, weight gain, or improving body tone. However, sports supplements are ineffective without proper training and proper nutrition. [10] Therefore, the development of healthy nutrition products, including high-protein fitness products, including meat-based ones, is relevant.

At the same time, numerous studies have proven the use of plant-based raw materials in the development of meat products as a source of dietary fiber, vitamins, minerals, and other vital components. Combining plant and animal-based raw materials allows for the production of high-nutrition products while reducing production costs and preserving the consumer properties of the finished product. For example, incorporating sprouted grain products into the diet offers a unique opportunity to consume a whole, living organism, possessing all its natural biological properties and at its peak vitality. Sprouted grain is rich in enzymes necessary for digestion and assimilation. During germination, the amount of vitamins increases, while the rich mineral composition is preserved. Consuming sprouted grain products is recommended for the prevention of cardiovascular diseases, gastrointestinal tract diseases, and atherosclerosis, and has a beneficial effect on the vitality of people leading an active lifestyle. The peoples of Bashkortostan have long consumed crushed sprouted grains of wheat, oats, and other crops, intuitively understanding their

nutritional value. This cereal product was called "Talkan". Currently, when a significant portion of the population adheres to the concept of functional nutrition, a wide range of cereal products can be found on the market, including sprouted grain "Talkan". "Talkan" offers a wide range of vitamins and minerals. It serves as a source of fat-soluble vitamins A, D_2, D_3, and E, and minerals Mn, Fe, Cu, and Zn [11].

Therefore, the aim of this study was to study the meat qualities of White Broad-Breasted turkeys, determine the morphological composition of individual parts of eviscerated carcasses, evaluate meat quality based on key functional and technological properties, nutritional and biological value, and develop healthy sausage products.

2 Materials and methods

The experimental portion of the study was conducted at the M. Gafuri Bashkir Poultry Complex LLC using carcasses of Canadian White Broad-Breasted turkeys. The objects of the study were turkeys (males) and turkey hens (females) arriving at the slaughter and processing shop at the age of 105 and 145 days, respectively.

Cutting, deboning, and deep processing of the eviscerated carcasses were performed after slaughter, water cooling, and air cooling when the carcass temperature reached 2°C. The carcasses were manually cut into individual parts: breast (fillet and tenderloin), legs (thighs and drumsticks), wings, and other components.

The study subjects included hand- and mechanically deboned meat, as well as turkey-based sausage products. To impart functionality to the meat product during the development of sausages, a cereal product made from sprouted grain - finely ground "Talkan" oatmeal, produced at the Aktirman Mill Complex in the Republic of Bashkortostan - was used.

Moisture-binding capacity was determined using the method of P. Grau and R. Hamm, as modified by V.P. Volovinskaya and B.I. Kelman; water-holding capacity was determined according to the recommendations of R.M. Salavatulina. Standard methods used in the meat industry were used to determine the organoleptic and physicochemical properties and to assess the nutritional and biological value of raw materials and finished products [12].

3 Results and discussion

In poultry processing, the mass yield of useful products and waste is of great importance. Therefore, studies were conducted on the mass characteristics of primary and secondary products and technical waste generated during the primary processing of turkeys (Table 1).

It has been established that in terms of live weight of the bird and the mass yield of the eviscerated carcass, male turkeys are superior to female turkeys. This is consistent with previous studies showing that poultry growth rates vary significantly by sex. Males are known to be heavier than females from an early age, and this difference increases with maturity. Females mature faster than males due to their smaller size in adulthood, reaching the age when their growth rate peaks earlier than males [1].

Research has shown that the eviscerated carcass mass yield of male turkeys is 79.83% of the live bird's weight, and the meat yield of female turkeys is 77.58%. The share of edible by-products in turkey’s accounts for 1.49%, in turkeys - 1.90%; technical waste: turkeys - 10.75%, turkeys - 12.72%.

Table 1. Yield of products from slaughter of turkeys and turkey hens.

Name of raw materials	Yield of poultry slaughter products			
	Turkeys (Male)		Turkeys (Female)	
	weight, g	useful product, %	weight, g	useful product, %
Live bird weight	17979.39	100.00	8865.90	100.00
Gutted carcass weight	14344.48	79.83	6877.40	77.58
Organ meats: Heart Gizzard Liver	 63.56 73.49 131.06	 0.35 0.41 0.73	 27.26 48.50 92.32	 0.31 0.55 1.04
Head	114.83	0.64	55.85	0.63
Legs	249.14	1.39	112.75	1.27
Feather and down raw materials	1060.78	5.90	523.09	5.90
Technical waste (including: blood, intestines with contents, cloaca, spleen) and process losses	1942.05	10.75	1128.73	12.72

To determine the morphological composition of meat, turkey carcasses were cut up (Table 2).

Table 2. Cutting up turkey carcasses.

Gutted Carcass Parts	Turkeys (Male)	Turkeys (Female)
	useful product, %	useful product, %
Breast:		
Large Fillet	20.86	20.03
Small Fillet	4.65	4.97
Thigh part of the carcass :		
Thigh	16.61	15.58
Drumstick	12.07	12.04
Neck	4.16	3.64
Medallions	0.94	0.87
Whole Wing	10.87	12.07
Tail	1.62	2.01
Trimming	2.76	3.38
Skin	4.57	5.43
Fat	0.40	0.55
Carcasses	19.64	18.58
Industrial Waste	0.85	0.85
Total:	100.00	100.00

Results of studies of turkey carcass cutting by sex show that male turkeys yield the highest thigh and carcass yield, while female turkeys yield the highest wing and soft tissue yield (skin and fat). Male turkeys yield the highest breast fillet yield compared to female turkeys by 0.83% and slightly lower breast fillet yield by 0.32%.

Analysis of the morphological composition of individual parts of gutted turkeys shows that the greatest amount of muscle tissue is concentrated in the breast and drumsticks (Figs.

1, 2). It is also important to note the influence of gender on the quantity and quality of meat products.

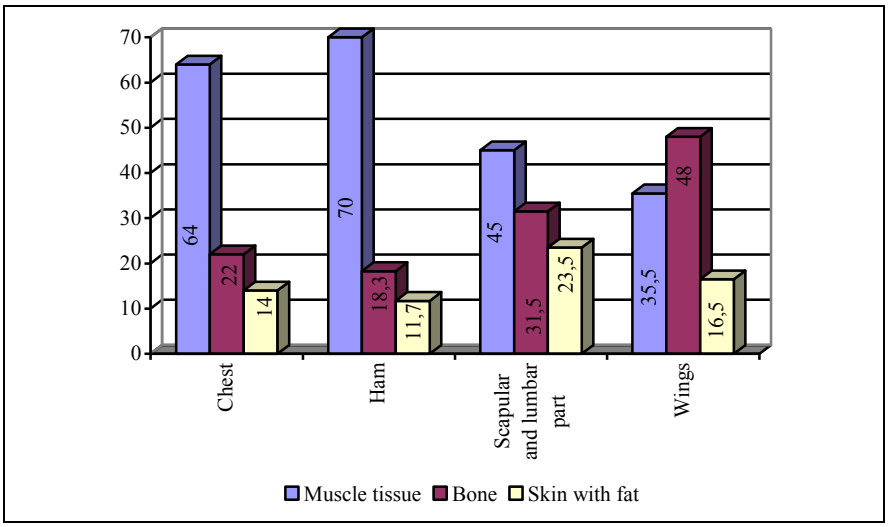

Figure 1. Morphological composition and yield of individual parts of gutted turkey (male) carcasses.

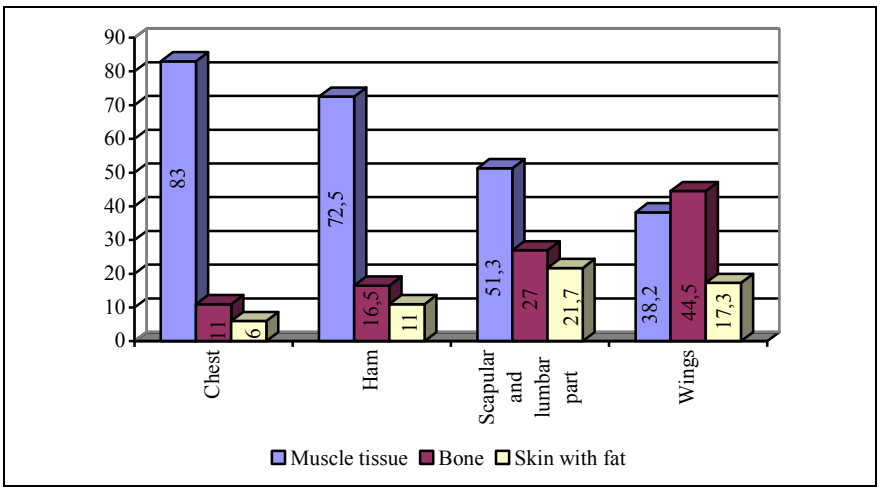

Figure 2. Morphological composition and yield of individual parts of gutted turkey (female) carcasses

To objectively assess the quality of meat from individual parts of carcasses, quality indices were calculated [13].

Table 3. Quality indices of individual parts of carcasses.

Indicator	Turkeys (Male)				Turkeys (Female)			
	Chest	Ham	Scapular and lumbar part	Wings	Chest	Ham	Scapular and lumbar part	Wings
Muscle-bone index (muscle tissue/bone)	2.91	3.83	1.43	0.74	7.55	4.39	1.90	0.86
Meat-bone index (meat tissue/bone)	3.55	4.46	2.17	1.08	8.09	5.06	2.70	1.25

The results of the study showed that the muscle-bone index and meat-to-bone index of the breast of female turkeys are 4.64 and 5.54 higher, respectively, compared to the same indices for the breast of male turkeys (Table 3). For other parts, quality indicators differ slightly, but they are also higher for female turkey meat. The data in Table 3 indicate that the quality of muscle and meat tissue is higher in the breast of female turkeys, and in the thigh of male turkeys. Moreover, the greatest increase in muscle mass is observed in female turkeys. This is consistent with previous studies by V.V. Gushchin et al. (2011), E. Tumova et al. (2020) [1, 13].

To assess the nutritional value of the test samples, the chemical composition of the meat was analyzed. A comparative analysis of the chemical composition of poultry meat is presented in Table 4.

Table 4. Chemical composition of poultry meat.

Raw materials	Mass fraction, %				Energy value of 100 g of product, kJ
	moisture	squirrel	fat	ash	
Hand-Deboned Turkey Meat	75.0	23.0	1.0	1.0	421.80
Mechanically-Deboned Turkey Meat	70.4	19.2	9.5	0.9	678.79
Mechanically-Deboned Chicken Meat [14]	72.2	15.2	17.3	2.1	909.38

A comparative analysis of the chemical composition of hand- and mechanically separated turkey meat with mechanically separated chicken meat revealed some differences in protein, fat, and ash content. Mechanically separated turkey meat has relatively high protein content (19.2%).

A comparative analysis of the amino acid composition, determined using high-performance liquid chromatography, showed that turkey meat, in terms of essential amino acid content, matches the reference protein according to the established amino acid scale proposed by the international organization FAO/WHO (Food and Agriculture Organization of the United Nations/World Health Organization). Mechanically separated turkey meat also has a relatively high content of essential amino acids, surpassing hand-detached turkey meat in valine, lysine, and threonine (Fig. 3).

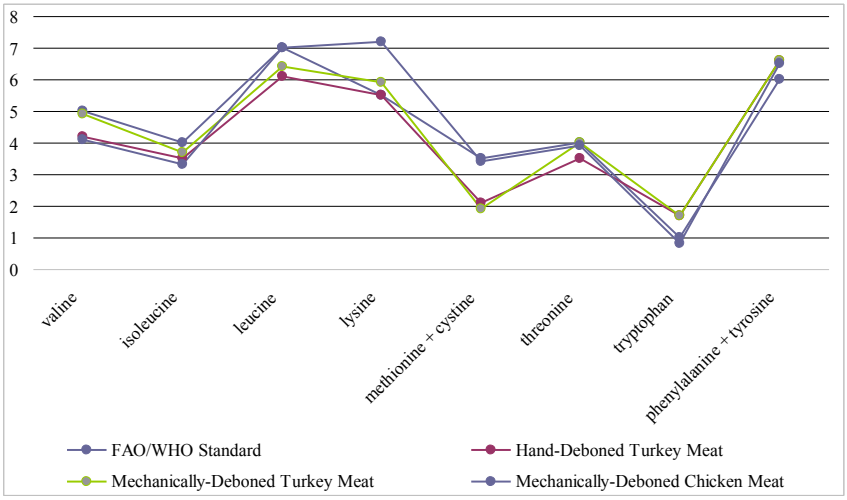

Figure 3. Content of essential amino acids in poultry meat.

To more fully characterize the biological value of poultry proteins, amino acid scores (the ratio of the actual amino acid content to the standard) were calculated.

For turkey meat, the limiting amino acids are sulfur-containing amino acids – methionine and cystine, with amino acid scores of 60% and 54% for hand- and mechanically deboned meat, respectively (Figure 4).

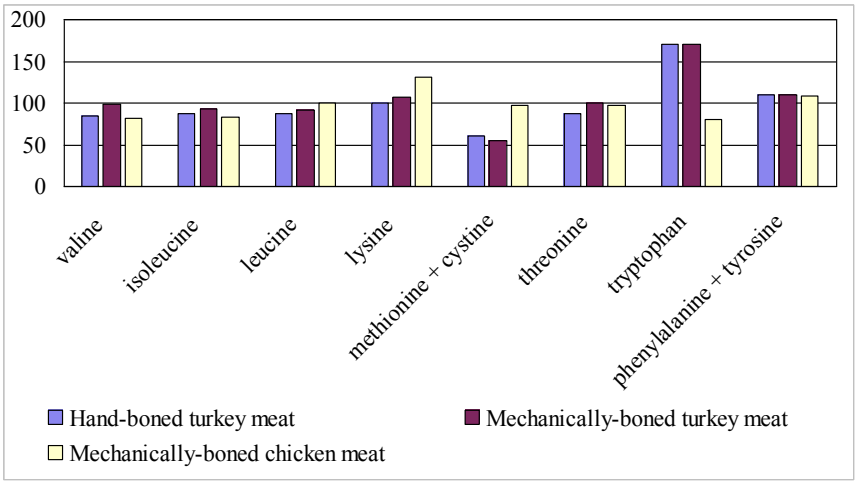

Figure 4. Amino acid score of poultry meat.

Turkey meat is known to be a dietary raw material due to its low fat content. However, the fatty acid composition of its fats is highly valuable from a nutritional perspective. This is particularly true for polyunsaturated fatty acids, which are essential and cannot be synthesized in the human body. It is also known that the higher the unsaturated fatty acid content and the lower the melting point, the higher the value of the fat.

The fatty acid composition of hand- and mechanically separated turkey meat was determined using gas chromatography. A comparative analysis of the fatty acid composition of lipids in hand- and mechanically separated turkey meat with chicken meat revealed some differences in the content of unsaturated and saturated fatty acids (Fig. 5). It

is worth noting the relatively high content of linoleic and linolenic acids in hand-deboned turkey meat (approximately 30%), which are essential for normal functioning of the body, as well as for the prevention and treatment of a number of human diseases. For many years, high-fat diets have been considered the primary cause of atherosclerosis and cardiovascular disease. To reduce the risk of cardiovascular disease, cardiologists and nutritionists advise consumers to reduce their overall intake of saturated fatty acids, which are believed to stimulate the production of low-density lipoproteins (also known as "bad cholesterol"). Furthermore, consumers are advised to increase their overall intake of monounsaturated and polyunsaturated fats, which help lower cholesterol [9].

The polyunsaturated fatty acid content of the compared meat samples can be arranged in ascending order: chicken meat, mechanically deboned turkey meat, and hand-deboned turkey meat. Oleic acid accounts for the majority of the monounsaturated fatty acids in the compared samples.

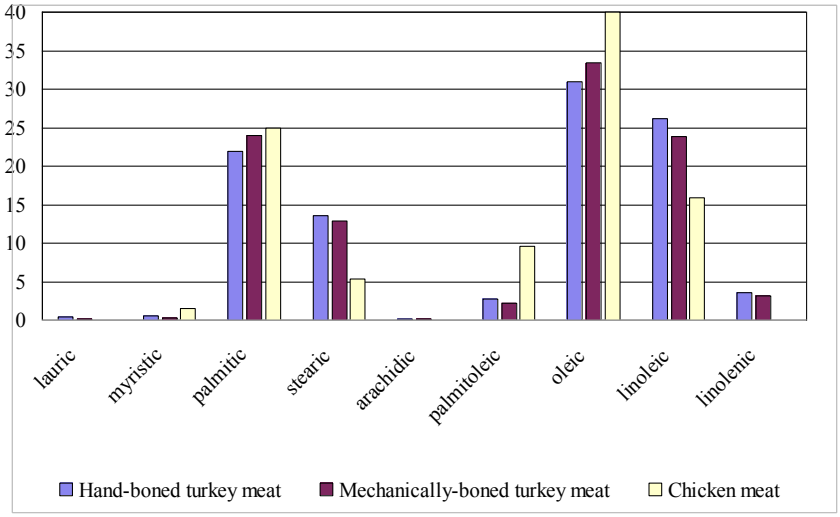

Figure 5. Fatty acid composition of lipids in poultry meat.

Functional and technological properties - water-binding capacity (WBC) and water-holding capacity (WHC) - are of primary importance when determining the acceptability of meat for food production. These properties influence the final consumer properties and overall product quality [12].

The results of the functional and technological properties of poultry meat are presented in Table 5.

Table 5. Functional and technological properties of poultry meat.

Type of raw material	Water-binding capacity, %	Water-holding capacity, %	Losses during heat treatment, %
Hand-Deboned Turkey Meat	73.0	75.3	24.7
Mechanically Deboned Turkey Meat	61.0	67.7	32.3
Mechanically Deboned Chicken Meat [15]	45.2	43.0	57.0

The study showed that mechanically separated turkey meat is inferior to hand-deboned turkey meat in terms of water-binding capacity and water-holding capacity, but superior to mechanically separated chicken meat, which is consistent with the high protein content of processed turkey products.

Taking into account the specificity of turkey as a raw material for the production of healthy food products, a recipe for a turkey sausage product was developed. Hand- and mechanically separated turkey meat was used as the main meat raw material, with the cereal product "Talkan" oatmeal added to the test sample at a 5% dosage instead of the meat raw material. All sausage production processes were carried out in accordance with the traditional technology for the production of cooked sausages.

To confirm that the composition of the developed products complies with physiological norms for nutrients, which are most important for people with increased physical activity, physicochemical tests, including amino acid composition, were conducted. A comparative assessment of the biological value of sausages showed that the experimental samples were superior to the control ones in terms of the content of essential amino acids (Fig. 6).

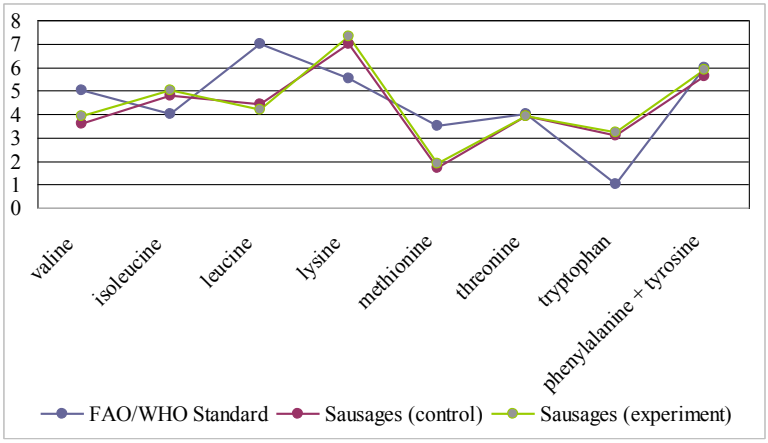

Figure 6. Content of essential amino acids in sausages.

An analysis of the study results revealed that the content of individual essential amino acids in the sausages increased. For example, in the sausages, compared to the control, the amino acid content of valine increased by 8.7%, lysine by 4.6%, and phenylalanine and tyrosine by 6.5%. A comparative analysis of the total amount of essential amino acids revealed a 4.7% increase in the test samples, indicating an increase in the biological value of this product.

It was found that the content of the replaceable amino acid glycine in the sausages increased by 7.0% compared to the control sample and the content of the essential amino acid methionine by 11.1%. Glycine is known to be part of the cytochromes responsible for energy production, and it is involved in the synthesis of collagen, hemoglobin, and glutathione [15]. Furthermore, the important substance creatine can be synthesized by the body itself from amino acids such as glycine, arginine, and methionine.

4 Conclusion

Thus, the results of the conducted research on the meat quality of turkeys, as well as the nutritional and biological value of meat, will help address issues of rational raw material use, as well as the planning and expansion of product lines. Our research confirms the high nutritional and biological value of hand- and mechanically deboned turkey meat and expands the possibilities of its use in meat product production. To enhance the functionality of sausage products, it is recommended to include the finely ground oatmeal product "Talkan" in the recipe. Based on the obtained research results, the component composition

and dosages of the proposed components were determined, and a turkey sausage recipe was developed that ensures a product with good consumer properties and high biological value.

References

1. E. Tůmová, R. Mervyn Gous, D. Chodová, M. Ketta, Differences in growth and carcass composition of growing male and female turkeys, Czech J. Anim. Sci. 65, 330–336 (2020)
2. E. Brown, Meat production in Russia in 2025: EMEAT expert assessment, Meat Technol. 1, 13–15 (2026)
3. A. Davleev, Russian turkey farming: steady growth continues, Anim. Husb. Russ. 3, 2–5 (2025)
4. E.V. Litvinova, S.N. Kidyaev, V.L. Lanshina, Turkey meat - an effective alternative to traditional raw materials in meat processing, Meat Technol. 8, 40–43 (2025)
5. O. Zurashvili, Current features of consumer behaviour in the meat category, Meat Technol. 4, 44–46 (2025)
6. M. Anna Anandh, R. Annal Villi, Quality and acceptability of emulsion and restructured meat rolls from turkey (Meleagris gallopavo) meat, J. Entomol. Zool. Stud. 8(5), 432–435 (2020)
7. S. Kumar, A.S.R. Anjaneyulu, S. Majumdar, Y.P. Gadekar, A. Patel, R.P. Singh, Physico-chemical and functional parameters of Black turkey, Beltsville white turkey and Broiler spent hen meat, Indian J. Poult. Sci. 46(3), 365–369 (2011)
8. M.N.K. Reddy, M.S. Kumar, G.V.B. Reddy, N. Krishnaiah, N.A. Reddy, K. Rao, Quality evaluation of turkey meat sausages incorporated with ground carrot, Pharma Innov. J. 7(4), 773–777 (2018)
9. M.M. Castro Ferreira, M.A. Morgano, S.C. Nascimento de Queiroza, D.M.B. Mantovani, Relationships of the minerals and fatty acid contents in processed turkey meat products, J. Food Chem. 69, 259–265 (2000)
10. N.Sh. Mukhametov, Sports nutrition in sports and fitness, Interexpo Geo-Siberia 6(2), 153–155 (2014)
11. O.F. Nuretdinova, S.A. Leonova, Sprouted oat grain as one of the priority types of raw materials for the development of functional food products, Russ. Electron. Sci. J. 7, 36–41 (2014)
12. L.V. Antipova, I.A. Glotova, I.A. Rogov, Methods for the Study of Meat and Meat Products (Kolos, Moscow, 2001), 376 pp.
13. V.V. Gushchin, V.N. Mahonina, V.A. Kanivets, L.A. Shinkarenko, Quality indices of meat in eviscerated turkey carcasses, Meat Ind. 3, 12–15 (2011)
14. L.V. Antipova, S.V. Polyanskikh, D.Yu. Kovalev, Nutritional value and properties of mechanically deboned guinea fowl meat, Meat Ind. 5, 24–28 (2011)
15. A.P. Nechaev, S.E. Traubenberg, A.A. Kochetkova et al., Food Chemistry, 5th ed., revised and expanded, ed. A.P. Nechaev (GIORD, St. Petersburg, 2012), 672 pp.