https://www.sworldjournal.com/index.php/swj/article/view/swj33-01-019
DOI: 10.30888/2663-5712.2025-33-01-019

UDC 637.5.05/07

JUSTIFICATION OF THE FEASIBILITY OF PRODUCING MINCED QUAIL MEAT

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Анотація. *Quail meat is a dietary product, rich in useful substances, in particular proteins, vitamins, minerals, and essential amino acids. It can become part of a balanced diet. Despite this, quail meat is not so common in the food industry. The smaller size of the carcass and the higher cost compared to other types of meat make it less profitable for commercial production. The purpose of the work is to substantiate the feasibility of producing quail mince for use in the food industry. It has been established that adding a small portion of skin with subcutaneous fat (40%) has a positive effect on the moisture-holding capacity of minced meat and allows the creation of a stable emulsion, which can become a good raw material for the production of meat products.*

Key words*: quail meat, minced meat, physical and chemical indicators, functional and technological properties, emulsifying capacity, emulsion stability.*

Introduction.

Quail meat has good nutritional qualities and adds variety to the human diet, and is highly valued by consumers. From the point of view of producers, commercial quail breeding is a profitable direction, and their production volumes are growing significantly. The production of quail meat with added value is an important way to improve the marketing opportunities of the industry [1].

In the consumer market, quail meat accounts for a small percentage of poultry sales compared to broilers. However, there is growing consumer interest in quail meat as an alternative to chicken and turkey, and new food products using quail meat may have nutritional advantages over other types of poultry meat [2].

Quail meat is a dietary product rich in nutrients, in particular proteins, vitamins (A, B, D, K), minerals (potassium, calcium, iron, magnesium, phosphorus, copper), and essential amino acids such as arginine and histidine. It can be part of a balanced diet. However, quail meat has not found widespread use in the food industry due to

several factors: the smaller size of the carcass makes it less profitable for commercial processing; higher cost compared to other types of meat; certain taste preferences of consumers who are not always ready for the delicacy of quail meat. In order to increase the level of practical application of quail meat for industrial processing, it is advisable to conduct a study of the rational use of carcasses in the complex processing of all components.

Quail production is a new branch of poultry farming, which allows to expand the range of poultry meat in the food industry [3]. Quail is an attractive species, which has some advantages over other types of poultry, namely: fast growth; high productivity; early onset of egg production; high reproduction rates; low feed consumption; low investment and resistance to diseases [4]. The brisket is the main meat part. The meat yield from the quail brisket is about 50-60% [5].

Quail meat is considered healthy due to its high protein content, low fat and cholesterol levels, fatty acid profile, and vitamin (pyridoxine, niacin, thiamine, pantothenic acid, and riboflavin) and mineral (copper, iron, manganese, and zinc) content [6]. Compared to broiler chicken breast, quail breast contains [7] only slightly less protein (22.6% versus 23.2%) and water (71.7% versus 74.9%), but more ash (1.27% versus 0.98%) and fat (2.99% versus 1.65%).

It was found that the chemical composition of products made from quail meat had the highest protein and ash content, and conversely, the lowest fat content compared to products made from chicken meat as a control or commercial group. All products made from quail meat had high content of K, Ca, Mg, P, Fe, Zn, Se and vitamin A [8]. Quail meat is considered an alternative source of protein for human consumption, especially in developing countries [9]. In addition to its economic benefits, quail meat products are gaining popularity as delicacies [10].

Although quails have been extensively studied for their growth and reproduction characteristics, to our knowledge there is little research on the further processing of quail meat for the production of meat products. The aim of this paper is to substantiate the feasibility of producing quail mince for use in the food industry.

Standard methods were used for the studies. The moisture content in the minced

meat samples was determined by drying. For this purpose, 5 g of the sample was placed in a weighing bottle and dried for 1 hour at 150°C. The moisture-binding capacity of the minced meat (*CBM*) was determined by pressing. The sample was covered with a glass plate, a 1 kg weight was placed on it and kept for 10 minutes. The filter with the sample, freed from the weight and the bottom plate, and a pencil outlined the contour around the spot of pressed minced meat. When the filter paper dried in the air, the outer contour was drawn. The area of the spots was measured using a planimeter. The difference between the area of the filter paper and the total area of the spot formed by the minced meat was determined. Considering that 1 cm^2 of the area of the wet spot and filter corresponds to 8.4 mg of moisture. The content of bound moisture, % of the total moisture, was determined by the formula:

$$CBM = \frac{a - 8,4 \cdot b}{a} \cdot 100\%, \quad (1)$$

CBM – is the content of bound moisture, to total moisture, %;

$$a = \frac{a \cdot w}{100}, \quad (2)$$

b – difference in spot areas, cm^2;

w – moisture content in minced meat, %;

m – mass of sample taken to determine SZ, mg.

The moisture-holding capacity (MHC) of the mince was calculated as the difference between the mass fraction of moisture in the mince and the amount of moisture separated during heat treatment.

The stability of the emulsion was determined by heating the emulsion at 80 ºC for 30 min and cooling with water for 15 min. This indicator shows how well the emulsion holds fat and water together, preventing their separation.

To determine the emulsifying capacity (EC, %), 7 g of minced meat was mixed with 100 cm3 of water in a homogenizer for 60 s at a speed of 66.6 s^{-1}. 100 cm^3 of refined sunflower oil were added and the mixture was emulsified in a homogenizer at a speed of 1500 rpm for 5 min. The emulsion was poured into 4 calibrated centrifuge tubes and centrifuged in an MPW-340 laboratory centrifuge at a speed of 500 rpm for

10 min. The volume of emulsified oil was determined and the EC was calculated using the formula:

$$EC = \frac{V_1}{V} \cdot 100\%, \quad (3)$$

V_1 – the volume of emulsified oil, cm^3;

V – the total volume of oil, cm^3.

pH was determined using a digital pH meter using the generally accepted method.

Main part. Quail carcasses purchased at the Sumy market were used for the research. The characteristics of the raw materials are presented in Table 1.

Table 1 - Characteristics of meat raw materials

Indicators	Meaning	
	g	%
Average carcass weight	228	100
Average weight of the fillet part of the carcass	83	36
Average skin and fat mass	39	17
Average weight of bone tissue from one carcass	106	47

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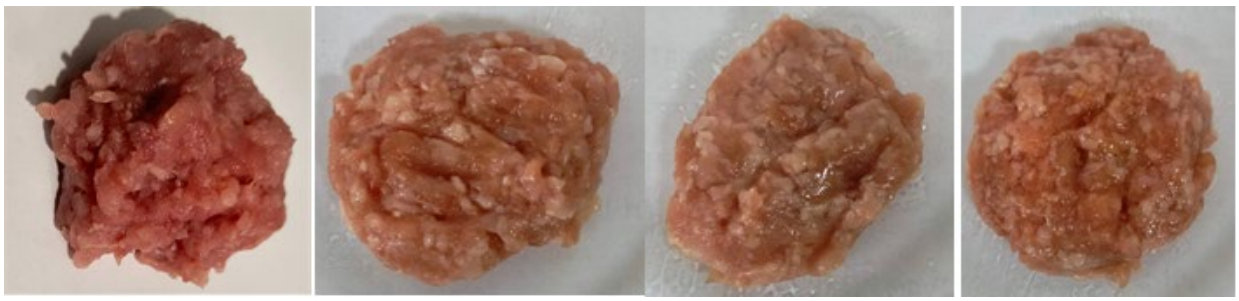
The study found that when manually deboned, the pulp (fillet) makes up only 36% of the carcass weight, the skin with subcutaneous fat - 17%, and bone tissue - 47%. Adding quail skin to minced meat usually does not increase the protein content, but rather increases the amount of fat and calories. quail contains fats and collagen, also protein, but is not as valuable in terms of nutritional value as muscle protein. The collagen contained in the skin is not a complete protein, since it has fewer essential amino acids than muscle protein. Excess skin in minced meat can lead to a deterioration in its texture and taste, as well as a decrease in nutritional value.

Considering that the carcass contains a significant portion of skin and subcutaneous fat, it is advisable to use them for making mince.

Four types of mince compositions were made (Fig. 1): Sample 1 (Fig. 1, b) - contains 30% skin with subcutaneous fat; Sample 2 (Fig. 1, c) - contains 40% skin with subcutaneous fat; Sample 3 (Fig. 1, d) - contains 50% skin with subcutaneous fat. Chopped fillet without added fat and skin was used as a control sample (Fig. 1, a).



a *b* *c* *d*

Figure 1 – Experimental samples of minced meat: *a* – without skin and fat; *b* – contains 30% skin with subcutaneous fat; *c* – contains 40% skin with subcutaneous fat; *d* – contains 50% skin with subcutaneous fat

Author's development

The physicochemical and functional-technological properties of the minced meat samples were determined. The results are presented in Table 2.

Table 2 – Physicochemical and functional-technological properties of minced meat

Indicator	Control	Sample 1	Sample 2	Sample 3
Moisture content, %	66,41±0,64	67,57±0,62	67,98±0,04	72,7±1,85
CBM, %	52,07±0,72	52,78±0,43	54,97±0,25	52,48±0,1
*MHC*a, %	56,14±0,08	56,16±0,05	57,08±0,21	57,11±0,25
*MHC*m, %	78,97±0,3	77,29±0,013	75,14±0,31	72,3±2,06
pH	6,81±0,01	6,81±0,01	6,03±0,04	5,65±0,04
EC,%	48,00±0,03	48,00±0,01	47,00±1,41	47,00±1,41
Emulsion stability (*ES*), %	38,04±1,01	38,33±0,15	39,55±1,53	33,77±0,15

Author's development

Water is a native component of minced meat along with other food substances. It is both a medium and a direct participant in most physicochemical and biochemical reactions. The results showed that adding skin with subcutaneous fat to the minced meat system helps to increase the moisture in it.

Adding 30% skin with fat leads to an increase in the moisture content by 1.16%. 40% of the additive (Sample 2) contributed to an increase in the moisture content by 1.57%, and 50% - by 6.29%. The moisture content in minced meat is a very important indicator, since the juiciness, splendor and texture of finished meat products depend on it. Fat helps to retain moisture, preventing the minced meat from drying out during heat treatment, and also contributes to the formation of a homogeneous structure and

binding of ingredients.

Changes in the moisture-holding capacity of minced meat (*MHC*, %) were studied when adding skin and fat. It has been established that such additives have a positive effect on the ability of meat mass to retain moisture, which affects the juiciness and structure of finished products.

With the addition of 30% *MBC* increases by 0.71%. The introduction of 40% skin with fat allows increasing the moisture-retaining capacity by 2.9%, but with an increase in the proportion of fat and skin to 50%, a significant decrease in the moisture-retaining capacity is observed, probably due to a significant increase in the proportion of fat in the system.

When skin with fat is added to the minced meat system, its moisture-binding capacity (*MHC*a,%) increases slightly. The moisture-binding capacity is the most important functional property of raw minced meat. It shows the degree of protein binding with bound and free water. This indicator characterizes the yield of the finished product. The addition of 30% of the additive allows increasing the yield of finished products by 0.02%, 40% - by 0.94%, 50% - by 0.97%. Minced meat with the maximum amount of muscle proteins and the minimum amount of fat has the highest moisture-binding capacity.

The content of muscle tissue in minced meat (MCM m, %) is also an important indicator. The higher the percentage of muscle tissue, the better the quality of the minced meat, as a rule. An increase in the proportion of skin in the minced meat system leads to a decrease in this indicator. The introduction of 30% skins reduces MCM m by 1.68%, 40% - by 3.83%. However, regardless of the amount of the additive, the minced meat belongs to category B.

The emulsifying capacity (*EC*) was also determined in the test samples. Emulsifying capacity is the property of muscle proteins to bind and retain fat. To obtain a stable emulsion, it is necessary to disperse the fat. When dispersed, fat particles are surrounded by dissolved myosin, part of the undestroyed muscle fibers and edematous collagen fibers. Protein and moisture will form a spatial matrix that retains fat in the form of small droplets. When adding 30% of skin, the EC does not change, and

increasing their share to 40-50% leads to a decrease in this indicator by 1%.

Meat proteins such as myosin and actin play a key role in emulsion stabilization. They envelop fat droplets, preventing them from merging and leaving the emulsion. Insufficient emulsifying capacity can lead to the separation of fat and water during heat treatment, deteriorating the texture and taste of the product.

The stability of minced meat emulsion (*SE*, %) shows how well the emulsion holds fat and water together, preventing their separation. The optimal amount of fat, as well as its ratio with proteins and water, is necessary to form a stable structure, where fat particles are evenly distributed in an aqueous medium associated with proteins. A lack of fat can lead to the fact that proteins cannot completely surround the fat globules, which will reduce the stability of the emulsion. When adding 30-40% of skins with fat to the minced meat system, this indicator increases by 0.29-1.51%, respectively. But when the proportion of additives increases to 50%, the SE decreases by 4.27%. Fat, in particular its fat globules, act as an emulsifier in the meat emulsion, i.e. they help stabilize the mixture of water and fat.

An unstable emulsion can lead to the release of fat and water during heat treatment, which worsens the quality and appearance of meat products.

Fat not only adds juiciness and taste to minced meat, but also plays a key role in the formation of its structure. Collagen contained in the skins improves its texture, VUZ and VUZ, which makes the minced meat more juicy, elastic and prevents it from crumbling. In addition, collagen is a source of amino acids that are important for strengthening the connective tissue of the body. Therefore, it is advisable to limit the proportion of skins in the minced system to 40%.

It should be noted that an increase in the proportion of peel and fat in the minced system leads to a decrease in pH. However, its quality does not decrease, since the pH level of fresh minced meat is usually between 5.5 and 6.5.

Conclusions.

It has been established that with manual boning of quail carcasses, the yield of meat raw materials is only 36%. Considering that the share of skin and subcutaneous fat is 17%, it is proposed to use them for making minced meat.

Experimental studies have shown that it is rational to use 30% of skin and fat. Adding 40% of skin with fat leads to an increase in moisture content by 1.57%, the VUZ increases by 2.9%. The introduction of 40% of skin with fat contributes to the growth of KE by 0.29-1.51%. At the same time, the yield of meat products increases by 0.94%.

The prospect of further research in this direction is the development of a technology for semi-finished products using quail mince.

References:

1. Santhi D., Kalaikannan A. Japanese quail (Coturnix coturnix japonica) meat: characteristics and value addition. World's Poultry Science Journal. 2017, 73(2), 337-344. doi:10.1017/S004393391700006X

2. Purohit A.S., Reed C., Mohan A. Development and Evaluation of Quail Breakfast Sausage. *LWT—Food Science and Technology*, 2016, 69, 447-453. https://doi.org/10.1016/j.lwt.2016.01.058

3. Sabow A.B. Carcass characteristics, physicochemical attributes, and fatty acid and amino acid compositions of meat obtained from different Japanese quail strains. *Trop. Anim. Health Prod*. 2020. 52. 131–140. doi: 10.1007/s11250-019-01991-2.

4. Quaresma M.A.G., Antunes I.C., Ferreira B.G., Parada A., Elias A., Barros M., Santos C., Partidário A., Mourato M., Roseiro L.C. The composition of the lipid, protein and mineral fractions of quail breast meat obtained from wild and farmed specimens of Common quail (Coturnix coturnix) and farmed Japanese quail (Coturnix japonica domestica). *Poult Sci*. 2022. 101(1). 101505. doi: 10.1016/j.psj.2021.101505.

5. Bueno L.O., Dinali D.L., Ramos Ad.L.S., Ramos E.M. Development of Poultry Sausages Utilizing Manually and Mechanically Deboned Meat from Spent Laying Quails. *Poultry*. 2025. 4(1). 5. https://doi.org/10.3390/poultry4010005.

6. Quaresma M.A.G., Antunes I.C. Ferreira B.G., Parada A., Elias A., Barros M., Santos C., Partidário A., Mourato M., Roseiro L.C. The composition of the lipid, protein and mineral fractions of quail breast meat obtained from wild and farmed specimens of Common quail (Coturnix coturnix) and farmed Japanese quail (Coturnix

japonica domestica). *Poult. Sci*. 2022, 101, 101505.

7. Kokoszyński D., Żochowska-Kujawska J., Kotowicz M., Wegner M., Arpášová H., Włodarczyk K., Saleh M., Cebulska A. Carcass characteristics, physicochemical traits, texture and microstructure of young and spent quails meat. *Poult Sci*. 2024. 103(7). 103763. doi: 10.1016/j.psj.2024.103763.

8. Farag M. , Abd-El-Aziz N., Ali, A. Preparing and Evaluation of New Nutritious Products from Quail Meat. *Food and Nutrition Sciences*. 2021. 12. 889-898. doi: 10.4236/fns.2021.129066.

9. Rincon A., Kumar S., Ritz C.W., Jackson J.S., Jackson C.R., Frye J.G., Hinton A., Singh M., Cosby D.E., Cox N.A. et al. Antimicrobial interventions to reduce Salmonella and Campylobacter populations and improve shelf life of quail carcasses. *Poult. Sci*. 2020, 99, 5977–5982.

10. Martinez-Laorden A, Arraiz-Fernandez C, Gonzalez-Fandos E. Microbiological Quality and Safety of Fresh Quail Meat at the Retail Level. *Microorganisms*. 2023, 11(9), 2213. https://doi.org/10.3390/microorganisms11092213.

The article has been sent: 05.09.2025 г.