COMPOSITION OF DOMESTIC RABBIT CARCASSES AND MEAT

T. Mardari*

Technical University of Moldova, Republic of Moldova

Abstract

The major morphological components of the domestic rabbit carcass are muscle tissue (muscle, tendons, ligaments, fascia, and aponeuroses) and bones. The research was aimed at assessing the morphological parts of the carcasses and the chemical composition of domestic rabbit meat. The analysis of meat samples was carried out on the laboratory apparatus "Cagle Labs" of German production for each separate meat sample, making three measurements for each sample. The weight of the studied rabbit carcasses ranged from 1.77 to 3.46 kg/carcass, the muscle weight was between 49.7-73.81% of the carcass weight, the bones - 17.5-29.29%, the meat/bone ratio, for small carcasses - 2.71/1, for medium carcasses - 3.41/1, for large carcasses - 3.94/1, in the meat of the domestic rabbits taken into the study an average protein content of 20.14%, fat 3.11%, moisture 78.96%.

Key words: *Chemical Composition, Domestic Rabbits, Muscle Tissue*

INTRODUCTION

Raising rabbits for meat production is an important branch of the livestock sector, which is developing in many countries with tradition, both in large farms, in industrial flow, and in small farms.

In Europe, raising domestic rabbits is well-developed and represents 80% of world production. The most important producers of rabbit meat are: Russia, France, Spain, Ukraine and Hungary, and the most important importers of rabbit meat are: Italy, France, England and Germany.

In Moldova, there is no tradition in the consumption of domestic rabbit meat and the extensive breeding system is practiced. A number of countries such as France, Belgium, the Netherlands, Germany, Switzerland require rabbits of heavier breeds, while in England rabbits weighing between 1 and 1.6 kg (skinned, eviscerated and frozen) are preferred.

Rabbit meat production is obtained mainly from large breeds, whose slaughter yield is, on average, 70%, and from medium breeds whose yield is 60% [12].

Raising domestic rabbits can be practiced by any natural or legal person, who complies with the requirements related to raising and maintaining animals, in accordance with the sanitary and veterinary requirements and hygiene for obtaining production of animal origin, stipulated in the State Program in the field of zootechnics and regulated by the Zootechnics Law [13].

The traceability of rabbit meat must be ensured from the breeder to the final consumer, being an extremely important aspect, strictly regulated by the European legislation in force [9].

Rabbits at slaughter must have a weight of at least two kg, well-developed muscles to the touch, rounded and well-filled thighs and hips, the fat under the skin is easily felt [7].

Rabbits of all breeds and crosses are used to obtain meat, but a mandatory condition is that they do not come from

*Corresponding author: tatiana.mardari@mpasa.utm.md
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places where infectious diseases have been recorded [1].

It is considered optimal that rabbits be slaughtered when they reach 50-60% of the weight of adult animals. To make the meat tasty, rabbits will be fattened before slaughter, which can last 20-60 days.

The slaughter yield is 55-68% and depends on the breed, age, and body weight. It is most advisable that rabbits be slaughtered at adult age, when the fur is larger and has maximum density; it is not recommended to slaughter rabbits younger than 4 months for fur [2].

The share of cut portions in the composition of the carcass is of particular interest. Thus, in the case of carcasses weighing 1400-1600 grams, the proportion of muscle represents approx. 63%, that of the skeleton 13-14%, and that of fat 6-7% of the carcass weight. The meat-bone ratio varies in the same direction as the fattening state, being therefore a quality factor of the carcass. This ratio depends on the breed of rabbits, body weight, fattening state, etc.

From a nutritional point of view, rabbit meat is an important source of energy and nutrients for humans. Due to its balanced chemical composition in trophins with high biological value (proteins, fats, minerals and vitamins), superior digestibility and dietary and culinary potential, it represents an indispensable food in human nutrition.

Rabbit meat is a light, tasty and different meat from other types of meat that we currently consume. It is dietary, healthy, with a very low cholesterol content and a high degree of digestibility due to the rich content of essential amino acids, being recommended by many nutritionists and is highly sought after on the foreign market [10].

In units specialized in the production of meat rabbits, live meat production appreciation indices are monitored, and after slaughter, qualitative and quantitative carcass indices. Selection for meat production in domestic rabbits is based on the following criteria: degree of development and type of body conformation, slaughter yield, meat/bone ratio, weight of valuable parts in the carcass, measurements on the carcass, meat quality [4].

In accordance with the provisions of Article 1(3)(D) of Regulation (EC) No 853/2004 of the European Parliament and of the Council of 11 December 2004 laying down specific hygiene rules for food of animal origin, the slaughter of rabbits at farm level and the sale of the meat directly to the final consumer or its supply to local retailers is permitted, as this activity is associated with primary production.

The slaughter of rabbits at farm level must be carried out in units such as slaughterhouses registered with the veterinary authorities in accordance with the provisions of the order of the President of the National Veterinary and Animal Health Agency No 111/2008 (Regulation (EC) No 853/2004) on the procedure for the veterinary registration of direct sales of final products and the retail sale of products of animal origin.

The normative acts establishing the sanitary and veterinary conditions under which the activity of slaughtering rabbits at the level of holdings and meat marketing can be carried out are the following: Regulation of the European Parliament no. 852/2004 on general hygiene rules applicable to food; Regulation of the European Parliament no. 853/2004 on specific rules applicable to food of animal origin; Regulation of the European Parliament no. 10/2010 on plastic materials and objects intended to come into contact with food (Regulation of the European Parliament no. 10/2010).; ANSA Order on the marking and health certification of fresh meat and the marking of other products of animal origin (GOST 20235.0-74 Rabbit meat).

Rabbit meat has a pale pink color, and when boiled it becomes white, just like

poultry meat. The fat is white, very rarely yellow. Fresh meat has a specific aroma, tenderness and juiciness characteristic of rabbit meat [5].

Meat represents a series of organoleptic characteristics, the most important of which are: color, consistency, smell, taste, tenderness, juiciness, fat deposits, appearance of bone marrow and broth after boiling and sedimentation, aroma (or flavor) and palatability. Some organoleptic properties (color, juiciness, tenderness, etc.) can be determined with the help of special devices or methods, which is why they can be considered as physical characteristics [3].

Rabbit meat meets the current requirements of consumers, being rich in proteins with a high biological role, it also contains a reduced amount of lipids, and its quality is superior compared to other species.

In terms of taste and appearance, rabbit meat resembles poultry meat, has a high degree of digestibility, is juicy and has a pleasant taste, being considered a dietary meat [8].

Due to its taste, but also nutritional qualities, we recommend the consumption of rabbit meat for a healthy diet or the replacement of meat from other species with rabbit meat in the diet.

The purpose of the research is to assess the morphological parts and chemical composition of domestic rabbit meat.

MATERIAL AND METHOD

Refrigerated domestic rabbit carcasses with heads, each with an intact paw covered with fur, served as the biological material.

To achieve the purpose of this study, the morphological structure of 18 refrigerated, eviscerated carcasses purchased from the commercial network during 9 months of the year was analyzed (Figure 1).

In the study, the mass of the component parts of the carcasses and edible internal organs was determined. All parts of the carcass were separated and weighed (Figure 2).

Some indices of the chemical composition of the meat from the studied carcasses were also taken into study.

Fig. 1. Appearance of refrigerated carcasses subjected to the study

Fig. 2. Deboning of carcasses and homogenization of meat

For this, muscle mass was collected from the carcass, which was homogenized, and then a 200 g meat sample was taken according to GOST 20235.0-74 Rabbit meat, Sampling methods (Figure 3). Organoleptic methods for determining freshness. The samples were sent for analysis to the laboratory.

Chemical analysis of meat samples was performed on the "Cagle labs" device of German production for each meat sample

separately. 3 measurements were performed for each sample.

Of the indices characterizing the chemical composition of meat, the following were studied: water content, dry matter, protein, fat and collagen. All results obtained from the study were processed biometrically.

RESULTS AND DISCUSSIONS

Meat production in rabbits can be evaluated on the carcass after slaughter, freed from skin, head, extremities and internal organs, but with internal fat. The ratio of meat, fat, connective tissue, bones depends on many factors: the age of the animals, the time of slaughter, the state of fattening, the type and level of feeding, etc.

The high dietary characteristics of rabbit meat are due to an almost equal ratio of internal, subcutaneous and intramuscular fats. Only overfed adult rabbits have excess perineal fat that is easily removed. Rabbit fat is fusible, does not have an unpleasant odor.

The age and live weight of rabbits at slaughter are closely related to the qualities of meat. Carcass fat begins to increase after reaching a live weight of 1.2-1.5 kg. This improves the quality of meat, its caloric value and up to a live weight of 2.3-2.5 kg does not negatively affect feed payments.

The major morphological components of the domestic rabbit carcass are muscle tissue (muscle, tendons, ligaments, fascia, and aponeuroses) and bones. The data obtained due to the separation of the components of the studied carcasses are presented in Table 1.

The average weight of the 18 pcs. of rabbit carcasses studied was 2.406 kg with a variation from 1.77 to 3.46 kg/carcass.

The muscles in the carcasses varied between 0.93 kg and 2.42 kg, on average constituting 1.53 kg, the bones had an average weight of 0.492 kg, the head weight representing 0.238 kg, and the internal organs 0.144 kg.

Table 1. Morphological structure of domestic rabbit carcasses, kg, n=18

Studied Indices	Mean±SEM	V %	Limits, min...max.
Carcasses weight	2.40±0.14	24.61	1.77...3.46
Muscles weight in the carcasses	1.53±0.11	31.66	0.93...2.42
Bones weight	0.49±0.01	16.04	0.37...0.61
Head weight	0.23±0.01	22.85	0.17...0.35
Internal organs weight	0.14±0.00	15.09	0.09...0.18
Meat/bone ratio	3.08±0.15	21.45	1.71...4.08

SEM=Standard error of mean

In the carcasses of domestic rabbits, a fairly favorable meat/bone ratio is recorded, thus in the examined carcasses 3.08/1 was obtained in favor of meat.

Table 2 presents the data on the yield of the component parts of domestic rabbit carcasses.

Table 2. Yield of component parts of domestic rabbit carcasses, n=18

Studied Indices	Mean ±SEM	V %	Limits, min...max.
Average weight of carcasses, kg	2.40±0.14	24.61	1.77...3.46
Meat yield in rabbit carcasses, %	62.65±1.42	9.64	49.7...73.81
Bones yield in rabbit carcasses, %	21.04±0.81	16.50	17.25...29.29
Head yield in rabbit carcasses, %	10.00±0.28	11.97	7.74...11.84
Internal organs yield in rabbit carcasses, %	6.23±0.35	24.16	3.77...8.16

Thus, from the data obtained, we observe that muscle tissue has the largest share of the carcass weight. Thus, on average in the examined rabbit carcasses, muscle tissue represents 62.5% with

variations between 49.7-73.81% of the carcass weight, bone tissue has a significant share in the structure of the rabbit carcass, varying within very wide limits (17.5-29.29%), depending on the influencing factors, on average constituting - 21.04%, the head and internal organs having an insignificant share, respectively 10.0% head and 6.23% internal organs.

According to the normative acts in force, in terms of weight, domestic rabbit carcasses are classified into 4 groups (also called "calibrations"), namely:

- large carcasses (A) = 3,300 – 4,300 grams/piece;
- medium carcasses (B) = 2,300 – 3,300 grams/piece;
- small carcasses (C) = 1,300 – 2,300 grams/piece;
- very small carcasses (D) = 900 – 1,300 grams/piece.

Following the classification of the rabbit carcasses studied, we obtained small carcasses – 10 pcs., medium carcasses – 6 pcs., and large carcasses – 2 pcs. The morphological structure of the studied rabbit carcasses is presented in Figure 3.

The average weight of small rabbit carcasses was 1.98 kg, of medium-sized carcasses – 2.78 kg, and of large ones – 3.60 kg.

The main components of the rabbit carcasses studied varied depending on the weight of the carcass, so the meat in small carcasses constituted 1.17 kg, in medium carcasses - 1.84 kg, in large carcasses - 2.37 kg. A variation is also observed in the ratio between meat/bones, in small carcasses - 2.71/1, in medium carcasses - 3.41/1, in large carcasses - 3.94/1, which is also the highest compared to the other groups.

The average weight of the bones in the carcasses was 0.44 kg in small carcasses, 0.53 kg in medium carcasses and 0.60 kg in large carcasses. The head mass had an insignificant variation between groups, as did the mass of the internal organs.

The ratio of meat, fat, connective tissue, bones depends on many factors: the age of the animals, the time of slaughter, the state of fat, the type and level of feeding, and pedigree characteristics.

In the carcass of the studied rabbits, the share of the component parts varied depending on the weight of the carcass. The data are presented in Figure 4.

However, the highest yield of meat was recorded in medium carcasses - 66.07% and the lowest in small carcasses - 58.88%, which is a fairly high yield compared to other animals.

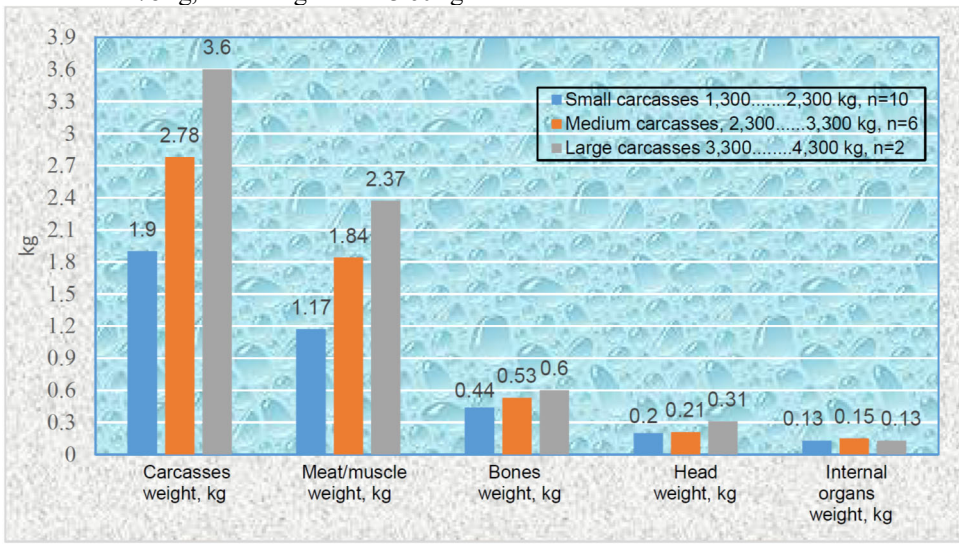

Fig. 3. Morphological structure of domestic rabbit carcasses according to weight, kg

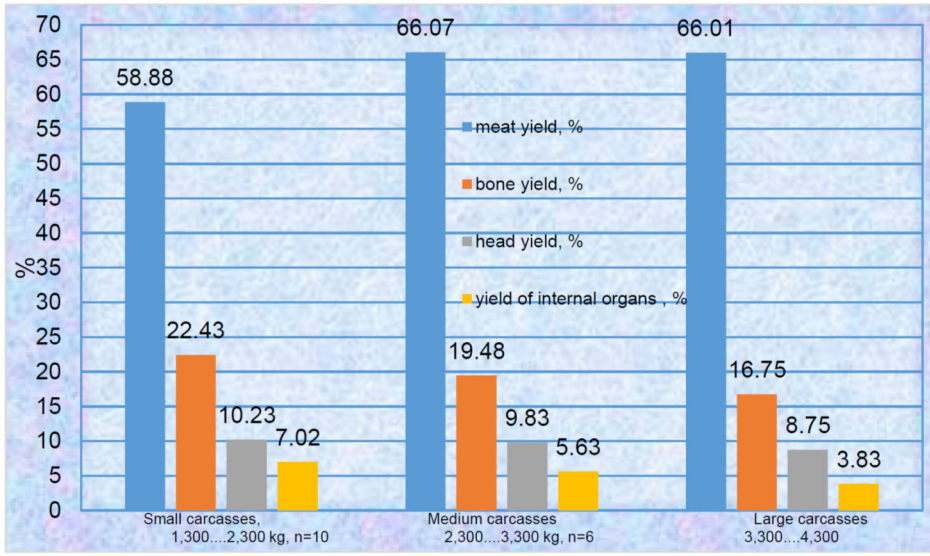

Fig. 4. Yield of component parts of domestic rabbit carcasses by weight, %

In small carcasses, the highest yield of bones, head and internal organs was observed, respectively 22.43%, 10.23%, and 7.02%, compared to the other groups.

Rabbit meat is characterized by current consumer requirements, being rich in proteins with a high biological role; it also contains a reduced amount of lipids (especially cholesterol). Proteins have a significant weight in meat, in assessing the quality of meat proteins, digestibility and high biological value are considered, meat proteins being part of the I-st quality class.

Literature data indicate the following chemical composition of domestic rabbit meat: water-65.3 g, protein-20.7 g, fat-12.9 g. The water content is higher the lower the fat content. Lipids determine the energy value of meat. The main components of the domestic rabbit meat studied are moisture, dry matter, proteins, fat and collagen. The average moisture content of rabbit meat was 78.21%, with a variation between 73.72-81.34%. The average amount of dry matter was 21.78%, Table 3.

Due to the fact that proteins are the basic components that provide food products with nutritional value, the quality of food products is assessed, firstly, by their protein content.

Rabbit meat is characterized by the highest percentage of protein, compared to the meat of other domestic animal species, and at the same time with a low percentage of fat, this fact presents the meat as being of great nutritional value. This is also the reason rabbit meat is so sought after.

Table 3. Average composition of domestic rabbit meat, %, n=18

Studied Indices	Mean ±SEM	V %	Limits, min...max.
Moisture	78.21±0.43	2.35	73.72...81.34
Dry matter	21.78±0.43	8.45	18.66...26.28
Proteins	20.14±0.09	1.97	18.97...20.65
Fat	3.11±0.27	37.30	1.2...5.47
Collagen	1.49±0.04	12.01	1.25...1.87
Moisture	78.21±0.43	2.35	73.72...81.34

Regarding the protein content in the meat of domestic rabbits studied, an average of 20.14% is observed, varying between 18.97-20.65%.

Fat is the most variable composition of meat, the proportion of which is directly influenced by species, age, breed, gender and particularly, by the state of maintenance of the animals.

At the level of fat content, an average value of 3.11% was observed, with variations ranging from 1.2-5.47%. Figure 6 presents the chemical composition data of rabbit meat depending on carcass weight. The water content in rabbit meat varied depending on the weight of the carcass, so the meat of small carcasses had a high average moisture content of 78.96%, and that of large carcasses -74.48%, so the dry matter in the meat varied.

Proteins are a fairly important component of meat, and in the meat of the examined rabbits it varied depending on the weight of the carcasses. Small carcasses recorded the highest protein content - 20.51%, and in large carcasses - 19.28%.

However, excessive fat content reduces the nutritional quality of meat because it leads to a decrease in the percentage of protein. Fat in carcasses varied depending on weight, so in small carcasses it was recorded on average at 2.88%, and in large carcasses - 4.45%.

Collagen is an insoluble and indigestible protein substance, through thermal processing up to 1000 C, in the presence of water, it hydrolyzes, transforming into gelatin which is soluble and digestible. Collagen is responsible for the basic hardness of meat; it varies quantitatively depending on a number of factors. Qualitatively, collagen is dependent on the age of the animal.

In the examined meat, practically the same amount of collagen was detected on average 1.49%, with a variation from 1.3% in large carcasses and 1.55% in small and medium carcasses.

Based on the data obtained, the ratio between water/protein, water/lipids, protein/fats was calculated, Table 4.

The water: dry matter ratio in the meat of the studied rabbits was 3.59:1, varying from 3.75:1 in small carcasses to 2.91:1 in large carcasses.

In the studied rabbit meat, the water/protein ratio is 3.88/1, the water/lipid ratio is 25.14/1, and the protein/lipid ratio is 6.47/1. The weight of the carcass has a greater influence on the water/fat ratio, which on average was 25.14/1, so that in large carcasses this ratio is 16.73/1.

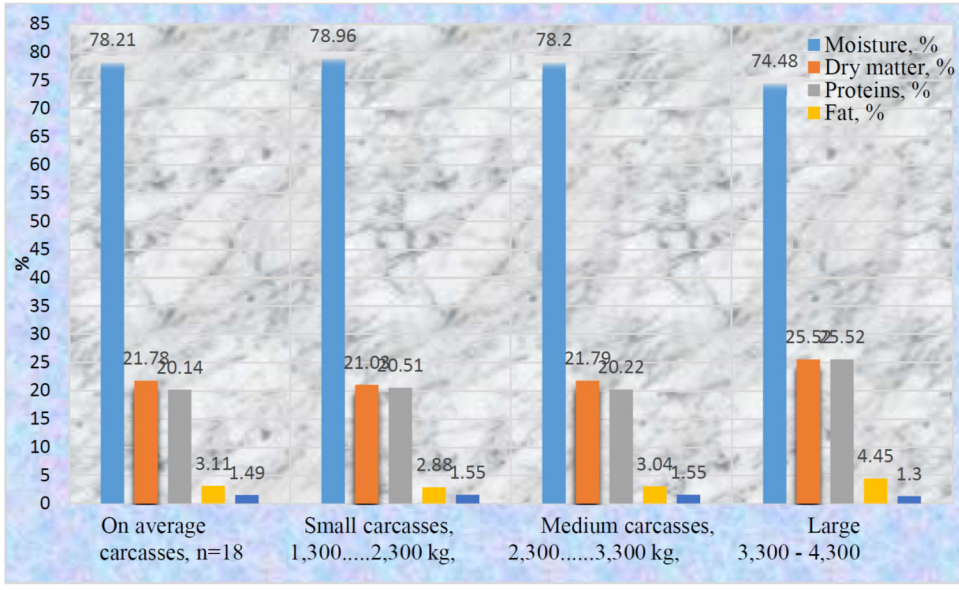

Fig. 6. Variation in the composition of domestic rabbit meat depending on the weight of the carcasses

Table 4. The ratio of chemical indicators of meat and bones: meat in the carcass of the studied rabbits

Specifications	On average, n=18	In small carcasses, n=10	In medium carcasses, n=6	In large carcasses, n=2
Water: dry matter ratio	3,59:1	3,75:1	3,58:1	2,91:1
Water: protein ratio	3,88:1	3,84:1	3,86:1	3,86:1
Water: fat ratio	25,14:1	27,15:1	25,72:1	16,73:1
Meat: bone ratio in carcass	3,08:1	2,71:1	3,41:1	3,94:1
Protein: fat ratio	6,47:1	7,12:1	6,65:1	4,33:1

Therefore, it can be concluded that domestic rabbit meat is very juicy and has a high protein content, which makes it fall into the category of superior meats.

As a result, we confidently recommend the consumption of domestic rabbit meat by evaluating its qualitative characteristics described in this study.

CONCLUSIONS

The major morphological components of the domestic rabbit carcass are muscle tissue (muscle, tendons, ligaments, fascia, and aponeuroses) and bones. The muscles in the studied rabbit carcasses ranged from 0.93 kg to 2.42 kg, on average constituting 1.53 kg, (62.5%), the average share of bones - 0.492 kg, (21.04%), the head and internal organs have an insignificant share 10.0% head and 6.23% internal organs;

2. The highest meat yield was recorded in medium-sized carcasses - 66.07% and the lowest in small carcasses - 58.88%, which is a fairly high yield compared to other animals;

3. In domestic rabbit carcasses, a fairly favorable meat/bone ratio is recorded, in the examined carcasses it was 3.08/1 in favor of meat, so in small carcasses - 2.71/1, in medium carcasses - 3.41/1, in large carcasses - 3.94/1;

4. The main studied components of rabbit meat are: moisture, dry matter, proteins, lipids and collagen. The average moisture was 78.21%, dry matter - 21.78%;

5. Domestic rabbit meat is very juicy and has a high protein content, which makes it fall into the category of superior meats, so the average protein content was 20.14%, fat - 3.11%, collagen - 1.49%;

6. The water: dry matter ratio in the meat of the studied rabbits was 3.59:1, water/protein - 3.88/1, water/lipids - 25.14/1, protein/lipids - 6.47/1;

7. As a result, we confidently recommend the consumption of domestic rabbit meat, evaluating its qualitative characteristics described in this study.

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