RESEARCH ON CHARACTERIZATION OF PHYSICO-CHEMICAL PARAMETERS OF NUTRIA MEAT

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Abstract

The purpose of this paper was to determine and characterize the physico-chemical parameters of nutria meat. The animals were grouped in experimental groups (n = 4 males and n = 4 females), aged 8 months, raised in individual cages with dimensions of 0.80m2 with permanent access to food and water. The stunning of the nutria was performed electrically, with an intensity of 230 V, followed by bleeding, skinning and evisceration. For carrying out the research, the following parameters were followed: meat acidity; crude chemical composition (protein, fat) and the profile of fatty acids. The determination of the acidity of the nutria meat was performed using the pH meter Hanna HI 8424, by inserting the electrode in the muscle tissue sample at a depth of 1 cm. Determinations were performed at 3 hours, 12 hours, and 24 hours. The raw chemical composition was performed using the Food Check analyzer, the working method corresponding to the standard user manual of the spectrophotometer, compatible with SR ISO 937: 2007. The determination of the fatty acid profile was performed using a gas chromatograph Agilant technologies 5977E. after performing the analyzes it was concluded that the nutritional value of nutria meat is adequate for human nutrition, also the type of fatty acids is in accordance with human nutritional requirements.

Key words: fatty acids, protein, fat, meet, nutria

INTRODUCTION

Meat represents the striated muscles, which make up the structure of the half-carcases and carcasses resulting from the slaughter of animals, along with all the tissues with which they come into natural contact, namely: nerves and blood vessels found in striated muscles, fatty tissue, tissue connective tissue and bone tissue [2].

These tissues are found in different proportions in the structure of the meat, a proportion that is influenced by their quality, a quality which in turn is determined by a multitude of factors, such as: species, breed, sex, fattening status, and of the anatomical region examined, etc. Muscle tissue is the main group of meat, which is about 40% of the total weight of the animal's body [4]. Regardless of the species from which it comes, muscle tissue, in addition to water, also includes significant amounts of: proteins, lipids, minerals, trace elements and macroelements. In addition to these, meat also contains biologically active substances, namely: hormones, vitamins, ferments, as well as substances that are not used by the body in the process of vital activity, these being called inedible substances.

Water in muscle mass is found in a proportion of 75%, being found in different amounts in each species [3]. Thus, the amount of water being influenced by the following factors: race, sex, age, fattening status, etc.

Proteins from a biological point of view are considered the most valuable substances, and from the point of view of chemical composition they are considered the most complex, being found in a percentage of about 18% of muscle tissue mass and about 75% of dry matter. total. Lipids are part of the muscle fibers, but also of the adherent connective tissues. Muscles have in their composition about 3% lipids, but this content can fluctuate depending on many factors, among them we can list: species, race, sex, age, fattening capacity, etc. Depending on their chemical structure, Muscle lipids can be classified as

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follows: neutral lipids - cerebrosides, cholesterol, phospholipids, triglycerides and in lipid-accompanying substances [1]. The mineral substances are found especially in the extracellular environment (this category includes: chlorides, bicarbonates, sodium) and to a small extent in the intracellular one - potassium, magnesium, phosphates, sulphates, etc. Moreover, the mineral substances are grouped into two major groups, as follows: trace elements and macroelements. Vitamins are considered to be organic substances with a low molecular weight, which are usually not produced by the body or which are not produced in sufficient quantities [6] For this reason, most of the category of vitamins must be administered through food intake.

MATERIAL AND METHOD

The animals under analysis were subjected, before slaughter, to a diet and watering consisted of a fasting food of 12 hours and 2 hours without water. The animals were grouped in experimental groups (n = 4 males and n = 4 females), aged 8 months, raised in individual cages with dimensions of 0.80m2 with permanent access to food and water.

The determination of the acidity of the nutria meat was performed using the pH meter Hanna HI 8424, by inserting the electrode in the muscle tissue sample at a depth of 1 cm. The determinations were performed at 3 hours, 12 hours and 24 hours.

Fig. 1 Determination of acidity in nutria meat

The chemical composition was performed using the Food Check analyzer, the working method corresponding to the standard user manual of the spectrophotometer (Anderson, 2007; Prevolnik, 2004), compatible with SR ISO 937: 2007.

Determination of fatty acids in nutritious meat was performed using Agilant technologies 5977E gas chromatograph. The injected sample volume was 1 µL, for reading an Omegawax 320 capillary column (Supelcco) with a length of 30 m, an internal diameter of 0.32 mm and a thickness of 0.25 µm was used. The running software of the chromatographic analysis series included a thermal operation program between 160 ÷ 260°C, with a gradual increase of 4° C / min at a 1: 100 division ratio. The temperature of the flame ionization detector and injector was kept constant at 150 ° C.

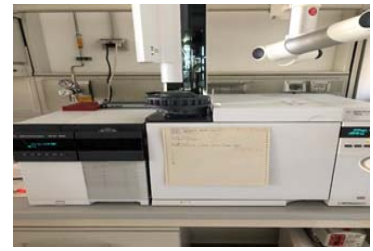

Fig. 2 Determination of fatty acids

The time required to detect all peaks in a sample was 30 min., The identification of fatty acids in the resulting chromatograms was performed by comparing the retention times of each fatty acid with the retention times of external standards (37 methyl ester compounds of fatty acids, two polyunsaturated fatty acid compounds and Supelcco). Quantification of the fatty acids in the resulting chromatogram was possible by adding an internal standard at the beginning of the extraction of total lipids from the muscle samples [5] (C19: 0).

RESULTS AND DISCUSSIONS

The acidity of muscle tissue has a strong influence on the qualitative parameters of the meat such as water retention capacity, tenderness, flavor and color [8,10].

The acidity of qualitative meats, after slaughter, is characterized by a pH of 6.1-6.8.

In the research performed, the evolution of acidity was followed at 3 hours after slaughter, 6 hours and 24 hours respectively (final pH) on the three categories of flies, both in males (Table 1) and in females.

Table 1 Results regarding the evolution of the pH of nutria meat in males

Anatomical region	3 hours	6 hours	24 hours
Back muscles	5,7	5,7	5,9
Thigh muscles	5,9	5,9	5,8
M.*Longissimus dorsi*	5,8	5,8	5,9

Analyzing the obtained results, we observe that the pH values at 24 hours after slaughter vary between 5.8 and 5.9 in males, reaching a maximum of 6 in females.

Analyzing the data from the literature we find in a study conducted by Migdal et al in 2013 on nutria meat from animals slaughtered at the age of 6 months showed that the pH 15 minutes after slaughter varies between 6.81- 6.78 in the semimembranosus and longissimus dorsi muscles and the ultimate pH varies between 6.13-6.26 [7].

Table 2 Results regarding the evolution of the pH of nutria meat in females

Anatomical region	3 hours	6 hours	24 hours
Back muscles	6,1	5,8	5,9
Thigh muscles	5,9	6.0	6,0
M.*Longissimus dorsi*	5,9	5,8	5,8

Tumova in another study in 2017 found values between 5.5-5.6.

The different results described in the literature can be explained in terms of the different management of animal husbandry and slaughter.

Results on the chemical composition of nutria meat - Determinations on the raw chemical composition of nutria carcases were performed in accordance with the interpretation of nut slaughter. Thus, the weight of the live animal, the carcass, the total amount of meat that resulted as well as the percentage of protein and fat were followed. Thus, the weight of live animals in males varied between 4635g and 5650g and in females (table 2) between 4614g and 5092g. In the study published by Cabrera et al. in 2007 it states that the weight of males at the age of 8 months varies between 5380–6100 g in males and 4490–5200 g in females. Except for the M4 male, all individuals are within the maximum and minimum weight limits.

Table 3 Interpretation of slaughter in males

Specification	Animal weight (g)	Meat carcass weight (g)	Total meet (g)	% Protein	% Fat
M1	5590	2990	1590	22,3	2,2
M2	5650	3080	1800	22,7	2,1
M3	5382	3040	1740	21,4	1,8
M4	4635	2287	987	20,8	2,3

Regarding the weight of the carcass, in males a minimum weight of 2287g was recorded in males and the maximum was 3080g. The females had a minimum carcass weight of 2458g and a maximum of 2798g.

Table 4 Interpretation of slaughter in females

Specification	Animal weight (g)	Meat carcass weight (g)	Total meet (g)	% Protein	% Fat
F1	4855	2685	1442	21,3	2,6
F2	4614	2458	1258	20,9	2,3
F3	4823	2673	1447	21,9	1,9
F4	5092	2798	1482	23,6	1,9

Regarding the percentage of protein in nutria meat, there were variations between 21.3 and 23.6. Comparing the results obtained with those cited in the literature (Cobrera et al. 2007), which has a limit of the percentage of protein in nutria meat between 19.2-25.5, we see that it falls within this range. We can also say that the percentage of protein in nutria meat is close to that found in beef, lamb, pork.

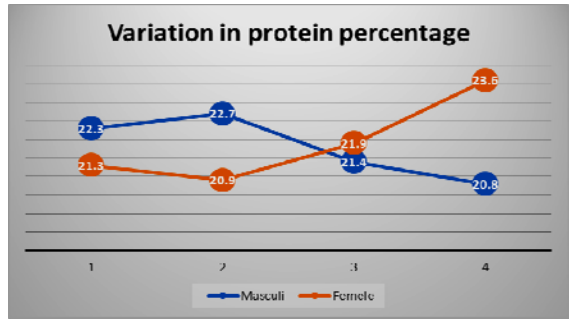

Fig. 3 Variation in protein percentage

Unlike protein, the percentage of lipids is more sensitive, being slightly influenced by a number of factors such as muscle type, feeding regime and age of the animal this is also underlined by Hoffman & Cawthorn, 2013, which justified the large range of reference for lipid percentage 1.40% to 8.80%.

In our research, the percentage of lipids ranged from 1.9 to 2.6%.

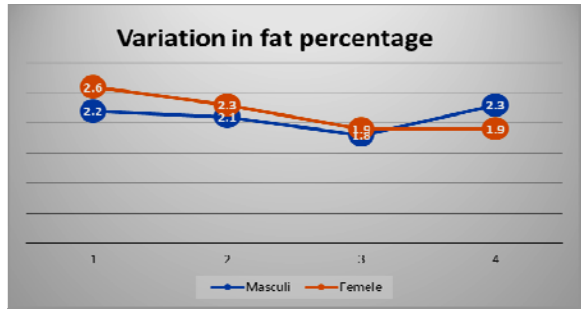

Fig. 4 Variation in fat percentage

Table 5 Fatty acids determined in nutria meat from males

The type of fatty acid studied		Back muscles	Thigh muscles	M. Longissimus dorsi
		%	%	%
Methyl tetradecanoate	C14:0	4,21	3,00	4,95
Methyl 13-methyltetradecanoate	C15:1	0,37	0,46	0,34
Hexadecanoic acid, methyl ester	C16:0	35,98	44,78	35,99
7-Hexadecenoic acid, methyl ester, (Z)-	C16:1	0,60	0,58	0,63
9-Hexadecenoic acid, methyl ester, (Z)-	C16:1w9	7,56	5,58	9,03
Methyl isoheptadecanoate	C17:0 iso	0,36	0,88	0,29
Octadecanoic acid, methyl ester	C18:0	9,08	14,84	8,01
9-Octadecenoic acid, methyl ester, (E)-	C18:1w9	17,98	10,95	16,62
11-Octadecenoic acid, methyl ester	C18:1w7	1,87	1,81	2,14
9,12-Octadecadienoic acid (Z,Z)-, methyl ester	C18:2w6	20,46	14,39	19,35
9,12,15-Octadecatrienoic acid, methyl ester, (Z,Z,Z)-	C18:3w3	0,64	0,23	0,46
5,8,11,14-Eicosatetraenoic acid, methyl ester, (all-Z)-	C20:4w6	0,88	2,50	2,18

Analyzing the data obtained by us on the amount of fatty acids present in the meat of nutrients, we note that in muscles, saturated fatty needles are the most representative with the highest amount of c16: 0, maximum 44.78% being obtained in the muscles of the thigh.

Monounsaturated fatty acids in nutria meat provide some stability in the oxidation process that affects all foods, especially meat [12]. The advantage of the needle content. Monounsaturated fats can be transferred to consumers by increasing their plasma LDL resistance by limiting the formation of oxidized LDL by decreasing the atherogenicity of these lipoproteins.

In nutria meat monounsaturated fatty acids are most often represented by the needle. palmitoleic (C16: 1) and ac. oleic (C18: 1). In our study the highest amount of C16: 1 was determined in the back muscles in females. C16: 1 omega9 acid was the most representative, recording a maximum percentage of 9.03 in L. dorssi muscles in males. C18: 1omega7 needle with maximum values in L. dorssi muscles in males was also identified in significant quantities, 2.14%.

Table 6 Fatty acids determined in nutria meat from females

The type of fatty acid studied		Back muscles	Thigh muscles	M. Longissimus dorsi
		%	%	%
Methyl tetradecanoate	C14:0	4,21	2,87	3,00
Methyl 13-methyltetradecanoate	C15:1	0,37	0,64	0,46
Hexadecanoic acid, methyl ester	C16:0	35,98	42,68	44,78
7-Hexadecenoic acid, methyl ester, (Z)-	C16:1	0,60	0,65	0,58
9-Hexadecenoic acid, methyl ester, (Z)-	C16:1w9	7,56	4,23	5,58
Methyl isoheptadecanoate	C17:0 iso	0,36	0,70	0,88
Octadecanoic acid, methyl ester	C18:0	9,08	16,60	14,84
9-Octadecenoic acid, methyl ester, (E)-	C18:1w9	17,98	12,49	10,95
11-Octadecenoic acid, methyl ester	C18:1w7	1,87	2,11	1,81
9,12-Octadecadienoic acid (Z,Z)-, methyl ester	C18:2w6	20,46	15,28	14,39
9,12,15-Octadecatrienoic acid, methyl ester, (Z,Z,Z)-	C18:3w3	0,64	0,24	0,23
5,8,11,14-Eicosatetraenoic acid, methyl ester, (all-Z)-	C20:4w6	0,88	1,50	2,50

Polyunsaturated fatty acids comprise two categories known as n-6 and n-3. N-6 fatty acids are produced by synthesis from the needle precursor. linoleic (C18: 2n6) while ac. fatty from the n-3 family come from their own precursor, alpha-linoleic acid (C18.3n3). These two fatty needles cannot be synthesized by the animal body and must be provided by the diet. Needle. linoleic is responsible for the synthesis of arachidonic needle (C20: 4n6) and alpha-linoleic acid for the synthesis of EPA (C20: 5n3) and DHA (C22: 6n3). All of these acids are precursors to a cascade of various products such as prostaglandins and leukotrienes that regulate metabolism [11].

Saadoum and Cabrera in 2008, in the study, obtained values of polyunsaturated fatty acids between 20.5-32.2% in males and 20.2-30% in females, a level that is much higher than beef, lamb or pork and similar to the percentage found in chicken.

In our research the highest percentage was recorded by C18: 2w6 acid in the back muscles in females followed by C20: 4w6 acid with a value of 3.35% in Longissimus dorsi muscle in females.

CONCLUSIONS

The chemical composition of nutria meat and the increased interest of consumers in different parts of the world, for this new and exotic meat, can frame nutria meat as a good candidate being considered an attractive delicacy.

The nutritional value of nutria meat is adequate for human consumption if we take into account the protein content.

The type of fatty acids present in nutria meat is in accordance with human nutritional requirements.

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