

PHYSICO-CHEMICAL AND SENSORY CHARACTERISTICS OF QUAIL MEAT, MEAT LINE

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Abstract

At this stage the emphasis of all species are bred for meat is not only the quantity but also the qualitative aspect. In the consumer preferences, the data on the quality of quail meat is low, and many of them refer to the quantitative aspect.

Physico-chemical and sensory properties influence the consumption of the meat product. The sensory analysis performed by the points method noted the succulence and fleshiness of the females from the females compared to that resulting from males with significant differences.

The taste of the meat is specific, refined and unique, a mixture of chicken and game. Frashiness was also determined by shear forces with the Warner-Bratzler apparatus, which showed that it was 13.76 ± 1.58 N/cm² for chest muscles, and in males 17.85 ± 1.39 N/cm².

For pulp muscles the values were higher, ie in chickens 35.11 ± 1.39 N/cm² and in the cock of 38.38 ± 2.68 N/cm². The pH value determined 30 minutes after sacrifice showed minor changes in the two sexes. Changes were higher 24 hours after sacrificing to pulp muscles due to their different morphological structure.

The chemical composition determined in youth in the two sexes did not show any difference, but in adults, the amount of fat is predominant due to existing deposits both in the anterior chest area and in the limbs.

Key words: quails, sensory qualities, chemical properties, pH

INTRODUCTION

Quail meat has evolved in consumer preferences, primarily driven by increased consumption of this product. Meat in general and poultry in particular are an important source of animal protein, used in human food and present in the menu of Romanians 3-4 times a week.

Its importance is due to its outstanding nutritional qualities and its low cost compared to other animal protein sources.

Compared to other species of domestic animals that provide meat for consumption, the bird has the advantage of having a relatively small body mass offering fresh meat on a permanent basis, satisfying relatively easily this consumption requirement. Another important feature is that it is prepared relatively easily, has good organoleptic qualities, is low in calories, and

contains all the amino acids necessary for human nutrition.

The domestic snail is the species that completes the poultry meat offered for consumption, being known from antiquity. It is not possible to specify the moment when it was domesticated, but it is well known that Japanese quail is the origin of domestic quails that grow to obtain eggs and meat.

The qualities of the meat and eggs produced by them, which are distinguished by special nutritional qualities and easy preparation, have long been known.

The purpose of the paper

It was to determine the chemical composition of quail meat from the Faraon line to youth, adults, and both sexes.

Another attribute of the analyzed meat was its pH determined at 30 minutes and 24 hours after sacrifice. The sensory qualities of the meat largely determine the consumption of this.

For this purpose, based on a score, the taste, the smell, the sweetness, the succulence

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and the global appreciation were determined on samples of meat from the youth of the two sexes.

Biological material

Work has been done on meat samples from 45-day-old quail youths and adults who have completed the exploitation cycle. The meat used was chest and pulp chopped next to the skin and fat. For sensory analysis, the same meat was used which, after being visually analyzed, was baked for 20 minutes at 180°.

Working method

The pH values were determined with a pH meter in the third center of the medial center of the pectoral muscle, and the femoral biceps in both sexes and age categories. The apparatus was calibrated in standard slurries for pH 4.01 and 7.01. Before and after each determination, the electrode was immersed in a special cleaning solution.

The chemical composition was determined on samples of boned meat that has been chopped, and the measurement was carried out with apparatus FOOD CHEK (Figure 1). The principle of the method was infrared spectrophotometry.



Fig. 1 Aparatul Food Check

The method uses the infrared absorption characteristics of the sample spectra to be analyzed. The method is based on the light of a tungsten halogen lamp illuminating the input slot of a monochromator. Within the monochrome, light is diffracted by an optical barrier. For each deviation angle, a wavelength specific to the output slot is obtained.

The monochromatic light penetrates the meat sample compartment, after interacting with it, a portion of the light is collected on a silicon detector under the sample plate to generate a corresponding photometric signal (Prevolnic, 2004).

From the ratio of reading values, analyzers, and reference values the reflection values were calculated, the limits of the spectral range being 730 ÷ 1100nm. With this apparatus the percentage of water, protein, fat, collagen and salt was determined.

Sensory analysis was performed on the basis of an evaluation sheet, on points on a scale of 1-5. The following attributes were analyzed: color, taste, smell, flavor, taste and succulence for the determination of mildew, the meat was visually analyzed and then prepared by baking for 20 minutes at 180°C. On raw meat, shear force was determined with a device called Warner-Bratzler (Figure 2).

The meat samples were derived from pectoral muscles and semi-membranous and lateral and median gastrocnemian muscles harvested from the young (male and female).

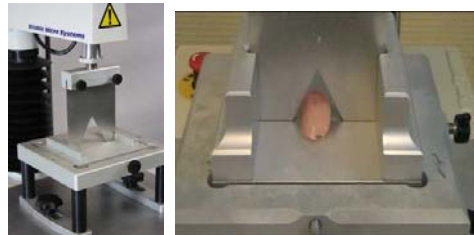


Fig. 2 The device for determining the softness

RESULTS OBTAINED AND THEIR DISCUSSION

The sensory qualities of quail meat

Sensory attributes give palatability, flavor and attractiveness of different kinds of meat, which is also an important decision to acquire them.

Quail meat was evaluated by the points method on a scale of 1-5 and targeted the following attributes: color, taste, flavor, tenderness, Succulency and a global appreciation. These attributes were evaluated on the basis of a table, with the following content (table 1):

Table 1 Scoring for sensory evaluation of meat

The sensory traits	Score awarded				
	1	2	3	4	5
Color	very open	open	red	close	Very close
Flavor	undetectable	perceivable	slightly distinct	distinct	very distinct
Taste	unpleasant	tasteless	tasty enough	tasty	very tasty
Tenderness	very rigid	slightly stiff	sufficiently rigid	early	very tender
Succulence	very dry	slightly dry	sufficiently succulent	succulence	very juicy
Overall appreciation	incompatible	acceptable	good enough	very good	exceptional

Following the centralization and processing of the data from the evaluation sheets, the following table has been compiled (tab. 2):

Table 2 Main statistical estimators for quail meat sensory analysis

Nr crt	Specification	Sex	No samples	$\bar{X} \pm s_{\bar{x}}$	V%	Meaning of difference between environments
1	Color	M	25	2.74±0.041	5.17	Ns
		F		2.63±0.09	6.45	
2	Flavor	M		2.43±0.08	9.05	Ns
		F		2.55±0.06	9.18	
3	Taste	M		4.41±0.08	7.67	Ns
		F		4.35±0.05	6.56	
4	Tenderness	M		4.46±0.07	8.25	*
		F		4.62±0.11	10.13	
5	Succulence	M		4.74±0.04	5.05	*
		F		4.51±0.03	7.17	
6	Overall appreciation	M		3.56±0.05	6.46	Ns
		F		3.78±0.04	7.82	

Analyzing the presented table we can make the following points:

- the color of the quail meat was evaluated with a score of $2.63 \div 2.74$ which characterizes a light meat characteristic of the pectoral muscles;

- the flavor of the meat is easily perceptible because it is less noticeable for fresh meat, being assimilated to game meat.

- the taste was rated with a score of $4.35 \div 4.410$ which can be described as specific, refined and unique, a mixture of chicken and game;

- the most appreciated of the sensory attributes, were the bluntness and succulence, obtaining the highest scores;

- by gender, meat from males was better appreciated by the evaluators, than that of the females, except for bliss and succulence;

- the overall appreciation of quail meat was in favor of females, which shows that from a sensory point of view. It offers more valuable meat, due to the higher amounts of fat found subcutaneously.

We mention those who have evaluated the sensory quality of quail meat, they are not loyal consumers of the range of meat, so some lower scores are explained, obtained at the important qualities of this meat product.

Determining the fleshiness of the flesh through Warner-Bratzler forces

The sensory appreciation of the meat is based on the sensations received through the senses of the evaluators prepared for this purpose. It is true no tool how effective it is, it can not properly appreciate these attributes of food in our case of meat.

There is an apparatus-based analysis of sensory qualities that only give guidance on a

particular feature. This instrumental analysis must complete the sensory analysis based on analyzers to provide a realistic and authentic picture of the quality of the analyzed products.

For shear testing, shear-operated machines are used. Such a device was used to determine the quails of quail meat, and the data obtained are shown in Table 3.

It is noted that there are differences in the tenderness, both according to the analyzed muscles and by gender.

- the chest muscles are milder than the pulp, as shown by the values obtained from the determinations;

- by sex the values obtained are in females of 13.76 ± 1.58 (N / cm²) and in males of 17.85 ± 1.39 (N / cm²);

- for pulp muscles, the values obtained oscillate between 35.11 ± 1.39 (N / cm²) in females and 38.38 ± 2.68 (N / cm²) in males.

Table 3 Sweetheart of quail meat determined by Warner-Bratzler shear forces

Specification		Sex	N	$\bar{X} \pm s_{\bar{x}}$	V%
Shear force N / cm ²	Chest muscles	M	7	17.85±1.39	17.40
		F	9	13.76±1.58	25.61
	Pulp muscles	M	7	38.38±2.68	16.86
		F	9	35.11±1.39	8.87

From the determinations made, it results that pectoral tumors are the smallest, followed by those of the pulp. Fleasiness is a consequence of how the proteolytic calpain system degrades proteins that are responsible for the integrity of muscle fibers (Goll et al., 2003, Le Fauchery, 2010).

Physico-chemical characteristics of meat

The most important changes occur in the stiffness stage, when the glycogen degradation and its transformation into lactic acid occurs in the muscle. By printing the most important sensory properties to the flesh. Since these changes result in a change in the pH of the meat, this physical parameter was determined 30 minutes and 24 hours after sacrifice, the results being shown in the table. 4.

Table 4 The pH of the chest and the thighs in young quail

Nr crt	Specification		Female	Males	Differences
1	pH piept	30 '	6.32±0.06	6.35±0.07	1.1%
		24 h	6.13±0.07	6.22±0.06	1.7%
2	pH pulpe	30 '	6.44±0.07	6.42±0.07	1.7%
		24 h	6.21±0.05	6.31±0.02	1.2%

The analysis of the presented table shows relatively small changes of the pH in the studied time intervals, but also by gender. The largest changes were made 24 hours after sacrifice, both sexes. Thus, in males at the chest level, the pH was 6.13 versus 6.32 in females. Ph pulp was 6.21 in males and 6.44 in females. In females, at 24 hours the pH dropped to 6.22 from 6.35 as it was at the chest level. And in males the pH values at the two control points were different, so the pH at the chest was 6.31 and at the pulp level of 6.42.

Compared to lowering of pH in mammals. quails are lower. Regarding the pH of the meat it is observed that it was higher in the flesh than in the chest. Differences of 1.2-1.4% are not high and are due to the different morphological structure that determines the functional affiliation of the studied muscles.

Unlike other avian species (turkey chicken), the pectoral muscles are entirely of the glycolic type. The quails take the dark muscle fibers of the oxidative type (10-12). This may be one of the reasons for increasing

the pH of quail meat compared to the data recorded in broiler chickens (11).

The chemical composition of the meat was then analyzed in the two age groups and by sex. The results obtained are presented in the following tables.

We mention that there are a number of factors that influence the chemical composition of the meat. Of these we have watched bird age and sex. The chemical composition of the meat obtained from the quail youth aged 45 days is shown in Table 5.

Table 5 The chemical composition of the meat quail derived from the youth

Nr. crt	Specification (%)	Female		Males		Differences		
		$\bar{X} \pm s_{\bar{x}}$	V %	$\bar{X} \pm s_{\bar{x}}$	V%	+/-	%	semnif
1	Water	62.2±0.47	1.53	62.8±1.64	16.2	0.6	9.5	*
2	S.U	37.8±0.62	6.17	37.2±0.52	9.12	0.6	9.5	*
3	Protein	18.0±0.19	2.16	18.1±0.47	6.32	0.1	5.5	ns
4	Fat	18.2±0.86	9.22	18.3±1.33	17.73	0.1	5.4	ns
5	Collagen	16.2±0.13	11.63	16.3±0.5	11.51	0.1	6.1	ns
6	Salt	2.6±0.11	7.03	1.9±0.05	10.17	0.7	5.1	ns

The analysis of the table shows the following:

- the amount of water and dry matter recorded relatively small differences between the two sexes

- The dietary value of the meat is different depending on its composition and the ratio of the nutrient groups. The amount of protein oscillates in both sexes between 18.0% in females and 18.1% in males, and the fat was 18.2% in females and 18.3% in males. Gender differences are not statistically assured at any given nutrient

Analyzing the data in the table below, we notice that there are differences between males and females in fat. In females, their value was 19.07% and in males 17.8% with a difference of 1.27%.

The amount of lipids is different and depending on the fat content, in adults there was a higher fat content in the carcass at both sexes. What also caused the greater amount of fat in the meat.

Collagen was higher in males of 16.4% and in females of 16.05%.

The chemical composition of adult quail was analyzed in Table 6 below.

Table 6 The chemical composition of quail meat derived from adult

Nr. crt	Specification (%)	Female		Males		Differences	
		$\bar{X} \pm s_{\bar{x}}$	V %	$\bar{X} \pm s_{\bar{x}}$	V%	+/-	semnif
1	Water	62.12±4.73	15.24	62.98±1.53	5.93	0.86	ns
2	S.U	37.88±0.93	9.72	37.02±1.01	8.13	0.83	ns
3	Protein	18.0±1.38	15.33	18.23±0.43	5.86	0.23	ns
4	Fat	19.07±5.97	22.25	17.8±1.88	25.89	1.27	*
5	Collagen	16.05±1.43	17.81	16.4±0.47	7.01	0.35	ns
6	Salt	1.6±0.05	6.25	1.8±0.23	22.22	0.2	ns

Analyzing the table above, we make the following references:

- at first analysis, the results obtained had small differences between the two age groups.

- The amount of fat obtained in adult quail was higher, namely 19.07%, compared to 18.23% in males. This is explained by the fact that as they age, they increase fat deposits to the detriment of muscle mass, especially in females.

CONCLUSIONS

1. The chemical composition of the meat recorded small differences between the sexes in the youth, but more obvious by age categories.

2. The percentage of meat protein was 18.0-18.1% in the youth, and in adults it oscillated between 17.8% in males and 19.7% in females.

3. The high percentage of fat of over 17% is due to the fact that leather was used, but it is a quality fat in which unsaturated fatty acids predominate

4. The sensory analysis performed by the points method revealed that the chest muscles are light in color, with a slightly recognizable flavor, a refined and unique taste with little difference between the two sexes.

5. The overall meat assessment achieved a score of 3.56 for males and 3.78 for females, indicating that from a sensory point of view, females meat is more valuable than males.

6. Determination of mildew, through Warner-Bratzler shear forces, showed differences in both sexes and muscle groups analyzed.

7. The pectoral muscles are superior to the pulp muscle, the values obtained are 13.76 N / cm² in females and 17.85 N / cm² in males. The pulp fat was 38.38 N / cm² in the cock and 35.11 N / cm² in the chickens.

8. Flegm is dependent on many factors including the type of muscles in the analyzed pectoral muscles, these being fast, white, glycololytic muscle mucus, have a greater tenderness than red, slow, and oxidative metabolism, such as muscles legs.

9. The fringing is also influenced by the thickness of the muscle fibers and their density, also revealed by the histometric determinations performed on the chest muscles

[8] Mustafa Karakaya, Cemalettin Saricoban, Mustafa T. Yilmaz 2004: The effect of various types of poultry pre- and post-rigor meats on emulsification capacity, water-holding capacity and cooking loss

[9] Offer G, Knight P., 1988: The structural basis of water-holding in meat. In: Lawrie R (ed) Developments in meat science, vol 4. Elsevier Applied Science, London

[10] A. Genchev, S. Ribarski, G. Zhelyazkov, 2010: Physicochemical and technological properties of japanese quail meat, Trakia Journal of Sciences, Vol. 8, No 4, pp 86-94

[11] Cíntia Amaral Moraessi col, 2015: Performance and meat chemical composition of quails fed with different sorghum levels instead of corn, Ciência Rural, Santa Maria, ISSN 1678-4596

[12] A. Genchev, G. Mihaylova, S. Ribarski, A. Pavlov, M. Kabakchiev, 2008 - Meat quality and composition in japanese quails, Trakia Journal of Sciences, Vol.6, No. 4 , pp 72-82, ISSN 1312-1723

[13] Y. M. Choi, S. Shin, M. P. Wick, J. H. Choe and K. Lee, 2013: Muscle fiber characteristics of pectoralis major muscle as related to muscle mass in different Japanese quail lines

REFERENCES

- [1] Rogério G. T. da Cunha, 2009: Quail meat - an undiscovered alternative, Brazil (<http://www.poultryworld.net/Other-Poultry-Species/Other-Poultry-Species/2009/2/Quail-meat---an-undiscovered-alternative-WP006930W/>)
- [2] Ioan Văcaru Opriș (coordonator), 2004: Tratat de avicultură ***, Edit. Ceres, București
- [3] Margareta Confederat, 2000: Biologie celulară, Histology, Embriologie Generală, Edit. Ion Ionescu de la Brad, Iași
- [4] Marius Giorgi Usturoi, 2008: Creșterea păsărilor, Edit. Ion Ionescu de la Brad, Iași
- [5] Octavian Baston, 2010: Evaluarea prospețimii cărnii de pasăre, Editura Ștef
- [6] Constantin Banu și col, 2007: Calitatea și analiza senzorială a produselor alimentare, Seria "Inginerie Alimentară", Edit. Agir, București
- [7] Paul Corneliu Boișteanu și col 2015 : Bazele morfologice ale producției de carne, Edit Ion Ionescu de la Brad, Iași