

QUALITY CONTROL OF BOILED, ROASTED, AND SMOKED PRODUCTS: A CASE STUDY ON „SALAM ȚĂRĂNESC”

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Abstract

This paper provides a comprehensive evaluation of the physicochemical and organoleptic properties of „Salam Țărănesc,” produced at a local processing facility. The study was conducted over three sampling sessions, spaced six months apart, starting in June 2023, with each session involving the collection of two salami sticks. Physicochemical analyses demonstrated remarkable stability in the product composition, with lipid values ranging between 29.93% and 30.20%, proteins between 15.71% and 16.60%, water between 49.14% and 50.93%, and NaCl between 1.86% and 2.23%. These results align with current regulatory requirements, indicating rigorous quality control during the production process. Although variations in water content were observed, they remain within specified limits, confirming the stability of the product. Organoleptic evaluations confirmed the preservation of essential sensory qualities of the salami: a clean, non-sticky surface, a uniform reddish-brown color, a continuous casing, and a homogeneous filling. The aroma and taste met expectations for a well-cooked and smoked product, indicating a specific and pleasant consistency. The study highlights the high compliance of „Salam Țărănesc” with regulatory standards, ensuring consistent quality and food safety. The findings provide solid evidence of the effectiveness of quality control and the product’s conformity to consumer expectations, confirming that the production process is adequate for maintaining a high standard of the product.

Key words: chemical composition, organoleptic analysis, quality, „Salam Țărănesc”

INTRODUCTION

One of the major global concerns is ensuring food security through the development of sustainable and innovative strategies aimed at guaranteeing an efficient distribution of resources and addressing the increasing demand for food, particularly of animal origin [1]. In this context, meat production plays a crucial role in ensuring food security, being a fundamental component in providing a balanced diet.

In Romania, the average dietary requirement per capita is 2.700 kilocalories,

with a minimum of 55 grams of protein. Approximately 50% of this amount should come from animal sources, due to their high content of proteins with superior biological value [2]. Thus, meat, being the most protein-rich among animal-based foods, plays a significant role in maintaining a balanced diet. Meat consumption provides health benefits by enhancing the body’s resistance to infections, protecting against toxic substances, and stimulating the activity of the central nervous system [3]. Additionally, meat is an important source of iron, B

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vitamins, and vitamin PP. The fats contained in meat, when consumed in moderate amounts, play a crucial role in the transport of fat-soluble vitamins such as A, D, E, and K.

Thus, meat, as a zootechnical product, occupies a distinct position within the trophic-biological framework, significantly contributing to the diversity and stability of ecosystems as well as meeting the ever-growing demands of the market. Meat production represents a crucial element in achieving food security in Romania by meeting the goals of food independence [4].

Food security and ensuring the quality of consumed products are fundamental concerns in modern society, driving the food industry to continuously improve production and control procedures.

Within the agricultural structure of Romania, characterized by significant development potential, particularly in the animal sector, statistical data provide a detailed picture of meat production and consumption. With its impressive number of agricultural holdings, Romania stands out within the European Union, boasting a total of 2.88 million farms. Romania holds the top position in terms of livestock farms, accounting for 61% of all agricultural holdings, with animal husbandry accounting for 25% of these [5].

Pork plays a critical role in local nutrition, particularly in the processed meat industry, representing a product of significant importance in our country [6].

People value meat, an essential element of human nutrition, not only for its nutritional content but also for its role in diversifying the daily diet. In this context, the processes of boiling, baking, and smoking meat not only enhance the organoleptic attributes of the food but are also crucial for extending its shelf life, thereby contributing to meeting the demands of a continually growing market.

Although meat products are not the primary choice for Romanian consumers, they are increasingly gaining interest [7].

This paper aims to explore in detail the quality control processes for „Salam Țărănesc,” a pork product subjected to thermal treatments such as boiling, baking, and smoking. These treatments are essential not only for enhancing the flavor and texture but also for ensuring product safety by eliminating potential pathogens and extending its shelf life. The applied preparation methods significantly shape the distinctive characteristics of the salami, with each stage in the production process playing a crucial role in the final profile of the product.

The paper focuses on a detailed analysis of this product, with particular attention given to organoleptic and physicochemical evaluations. This endeavor includes a thorough investigation of each stage of the production process, from raw material selection to preservation procedures, with the aim of identifying correlations between the applied treatments and the final properties of the product. Through these evaluations, the paper aims to demonstrate how proper control of the production flow can directly influence the quality, safety, and acceptability of the products by consumers. Thus, continuous and effective monitoring of the production process is not only a legal requirement but also an essential practice for maintaining consumer trust and ensuring success in an increasingly competitive and regulated market. This underscores the importance of quality control as an integral component of the food industry, essential for producing high-quality products that meet consumer expectations and food safety standards.

MATERIAL AND METHOD

Organization of researchers

The research for this paper was conducted at a meat processing facility located in Țigănași commune, Iasi County, Romania. The study focused on boiled, baked, and smoked products, with particular

emphasis on the „Salam Țărănesc” product. We conducted three visits at six-month intervals, starting in June 2023, to ensure a thorough and detailed analysis of the production and quality control processes.

Each visit had specific objectives and included a series of essential activities for collecting the necessary data. In June 2023, the first visit involved an initial assessment of the production infrastructure and equipment, as well as an examination of standard operating procedures. We also collected preliminary samples for organoleptic and physicochemical analyses to establish a baseline.

The second visit, which took place in December 2023, aimed to monitor the implementation of the initial recommendations and operational changes. We carried out detailed analyses of physicochemical parameters to identify any variations or improvements in product quality. We paid special attention to assessing the consistency of the production process and verifying compliance with food safety standards.

The final visit, held in June 2024, aimed to complete the overall assessment of the production process and the quality of the „Salam Țărănesc” product. We conducted comparative analyses between the data collected during the three visits to emphasize the evolution and stability of the organoleptic and physicochemical characteristics of the product. We also focused on identifying best practices and areas that needed continuous improvement.

These visits provided a comprehensive perspective on how the applied thermal treatments influence the final product's quality. Continuous monitoring and rigorous evaluation were essential for drawing solid conclusions and ensuring adherence to excellence standards in the production of „Salam Țărănesc.” This effort underscored the importance of quality control at all stages of production, which is crucial for maintaining consumer trust and

achieving success in the competitive market.

Applied working methods

Evaluation of the organoleptic characteristics of „Salam Țărănesc”

The organoleptic analysis of "Salam Țărănesc" was conducted in accordance with the guidelines set out in Order ANSVSA No. 560/1271/339/210 of 2006, Annex 2. These evaluations focused on the essential aspects of the product, namely: external appearance, color, casing appearance, cross-sectional appearance, filling color, odor, taste, texture, and the presence or absence of impurities.

Starting in June 2023, we made three visits to the production facility, each at six-month intervals, to ensure a detailed and accurate analysis. We selected two salami sticks for evaluation during each visit, resulting in a total of six salami sticks analyzed throughout the study.

The analysis included a detailed examination of the salami's shapes, as well as its external and cross-sectional appearance. We visually assessed the cross-sectional appearance immediately after slicing. We evaluated the odor at the surface immediately after slicing and analyzed the taste by chewing the sample to ensure contact with the entire tongue surface. We determined the texture through palpation [8]. Additionally, to ensure precise results, we conducted an evaluation of the appearance and color of both the whole product and the cross section against a white background, under uniform white light, and without shadows. We assessed the odor and taste in a room free from foreign odors that could potentially affect the results.

This rigorous evaluation method provided relevant information regarding the quality of "Salam Țărănesc" taking into account the impact of thermal treatments on the product's organoleptic characteristics.

Physicochemical evaluation of „Salam Țărănesc”

In accordance with the regulations established by Order ANSVSA No. 13 of January 24, 2005, Chapter 5 – Norms for Sampling for Physicochemical Examination, two units of „Salam Țărănesc,” each weighing 1500 grams, were sampled. From these units, five samples, each weighing 300 grams, were obtained and appropriately labeled for subsequent analyses. The main objective of this stage was to obtain precise data regarding the nutritional content and sodium chloride quantity in the product.

Physicochemical analyses were conducted during three visits to the production facility, carried out at six-month intervals, starting from June 2023. Following the same sampling methodology throughout the study, a total of 15 samples of „Salam Țărănesc” were collected and analyzed. This approach allowed for a systematic and detailed assessment of the product’s physicochemical characteristics, contributing to a comprehensive and rigorous analysis.

This systematic approach enabled a detailed evaluation of the physicochemical characteristics of the product, ensuring compliance with established quality standards and labeling specifications.

To determine the water, fat, protein, and salt content in the salami samples, an automatic Food Check analyzer was used. This device is equipped with an infrared spectrophotometer designed for evaluating the chemical composition of meat products. The analyzer features a compact unit with a keyboard, screen, and sample tray.

The operating principle of the analyzer involves the use of a tungsten-halogen lamp that emits light, directed through an entrance slit of the monochromator. In the monochromator, the light is dispersed by an optical grating, with each angle of deviation corresponding to a specific wavelength. The

monochromatic light interacts with the meat sample, and the reflected light is captured by a silicon detector located beneath the sample plate, generating a specific photometric signal. The measurement takes approximately 50 seconds, with the working spectral range between 700 and 1100 nm.

The procedure involved finely chopping the salami samples and evenly distributing them on a glass tray. The samples were then introduced into the analyzer for evaluation.

Following the analysis, a thorough verification was conducted to ensure the chemical composition matched that stated on the product label, as well as to confirm compliance with the regulations outlined in Order ANSVSA No. 560/1.271/339/210:2006 – Annex 3, which specifies the physicochemical properties of smoked and cooked products. These details are presented in Table 1.

Table 1 Chemical Composition of „Salam Țărănesc” According to Product Label and Regulations of Order ANSVSA No. 560/1271/339/210:2006 (per 100 g product)

Compound	The value specified on the label	The value specified in the order
Water, % max.	-	50 %
Lipid, % max.	30.1 %	40 %
Carbohydrates, % max.	0.06 %	-
Protein, % min.	16.05 %	15 %
NaCl, % max.	2 %	3 %

RESULTS

Organoleptic characteristics of „Salam Țărănesc”

The exterior and sectional appearance of the salami samples indicated a high level of hygiene and quality, with a clean surface, uniform brownish-red color, and no fat accumulations. The filling was homogeneous and compact, with no air pockets or foreign bodies. The smell and taste were pleasant, reflecting proper

cooking, smoking, and seasoning. The texture was cohesive, and the consistency was uniform, indicating proper maturation. Overall, the salamis met all the quality standards, confirming their high quality.

Physicochemical Properties of "Salam Țărănesc"

In this study, a physicochemical analysis of "Salam Țărănesc" was conducted to assess the product's compliance with the quality standards outlined on the product label and in applicable national regulations. Key parameters such as water content, lipids, proteins, and salt (NaCl) were measured, as these are crucial in determining the overall quality of the final product.

The results from these analyses offer a clear understanding of the chemical composition of "Salam Țărănesc," enabling a detailed evaluation of its conformity with current standards. The measured values for the main physicochemical indicators are presented in Table 2.

The physico-chemical analysis of "Salam Țărănesc" was performed on samples collected at regular intervals of six months, covering the period from June 2023 to June 2024. The obtained results were compared with the limits specified on the product label and in the Order no. 560/1271/339/210:2006 (Table 2). Below is a detailed interpretation of the data concerning the content of lipids, proteins, water, and NaCl, considering these limits.

Table 2 Interpretation of physicochemical analysis results

Harvest period	No. collected samples (1500 g)	Samples of evidence (300 g)	Indicators			
			Lipid (%)	Proteins (%)	Water (%)	NaCl (%)
June 2023	2	1	29.95	15.71	49.14	2.20
		2	29.93	15.75	49.39	1.93
		3	30.00	16.00	48.90	2.10
		4	30.01	15.80	49.20	1.99
		5	29.98	15.98	49.20	2.23
December 2023	2	1	30.10	16.00	49.94	1.96
		2	30.20	16.20	49.80	1.89
		3	30.00	15.97	49.71	2.10
		4	29.98	16.53	50.93	2.00
		5	30.05	15.98	49.49	1.95
June 2024	2	1	29.98	16.60	50.02	1.86
		2	30.10	16.10	49.56	2.23
		3	29.97	15.98	49.57	2.11
		4	30.20	16.15	50.02	1.95
		5	29.93	15.85	49.90	2.10

DISCUSSIONS

According to the findings mentioned above, the evaluation of the exterior appearance of the salami samples was conducted through a detailed visual inspection of each whole salami, placed on a white surface. The salamis exhibited a clean, non-sticky surface, free from foreign bodies, reflecting a high standard of hygiene and stringent quality control during

production. The external color was uniform, a characteristic brownish-red typical of a well-smoked product, indicating proper curing. The film was well adhered and continuous, with slight, natural wrinkles that enhanced the authenticity of the traditional product. No fat accumulations were detected under the casing, signaling a uniform distribution of ingredients.

For the sectional analysis, each salami was sliced in half according to established methodology. The sections revealed a homogeneous, tightly compact, and visually appealing mosaic-like filling, free from fat lumps, air pockets, or any other irregularities. The filling adhered well to the casing, suggesting a properly cooked, boiled, and smoked product. The color of the filling was uniform throughout, with no signs of undercooking or uneven thermal processing, further confirming the high quality of the production process. No foreign materials, bone fragments, or clusters of spices and fat were observed, reflecting meticulous attention to detail in manufacturing.

The smell and taste were evaluated by inhaling the aromas emitted from a sliced piece and tasting the sample to assess its sensory attributes. The salamis emitted a pleasant, characteristic aroma of well-cooked and smoked meat, enriched by the used spices, with no off odors. The taste was similarly pleasant and typical of the product, free from any foreign or unpleasant flavors, underscoring the quality of the ingredients and the preparation methods used.

The consistency was assessed by slicing and palpation. Upon slicing, the filling remained compact and adhered to the casing, reflecting a consistent texture typical of high-quality traditional products. Palpation confirmed a cohesive, uniform consistency, indicating proper maturation and a balanced blend of components.

In conclusion, all the evaluated organoleptic characteristics of the „Salam Țărănesc” samples met the standards outlined in Order ANSVSA No. 560/1271/339/210 of 2006. The product was confirmed to be in full compliance with established quality requirements, validating the effectiveness of the production processes. This thorough evaluation demonstrates that the analyzed products

meet the criteria necessary to be regarded as high-quality items within their category.

Table 2 provides a detailed overview of the chemical composition of the „Salam Țărănesc” samples. This analysis includes essential parameters such as moisture content, protein levels, fat percentage, and salt concentration, which are crucial for evaluating the product’s nutritional value and quality. The chemical composition not only reflects the quality of the raw materials used but also indicates the effectiveness of the curing, smoking, and drying processes. By examining these components, we can assess the salami's adherence to industry standards and its overall suitability as a traditional product.

The maximum lipid content value, according to the label, is 30.1%, while the Order ANSVSA no. 560/1271/339/210:2006 allows a maximum content of 40%. The analysis results show that all obtained values fall below the 30.1% limit specified on the label and below the 40% limit set by the order. In June 2023, the lipid values ranged from 29.93% to 30.01%. In December 2023, values ranged from 29.98% to 30.20%, and in June 2024, they ranged from 29.93% to 30.20%. These data suggest that the product complies with the regulations concerning lipid content, thus ensuring adherence to quality standards.

According to the label, the minimum protein content is 16.05%, while the Order specifies a minimum of 15%. The analysis showed that all obtained values exceed this minimum, indicating an adequate protein content. In June 2023, the values ranged from 15.71% to 16.00%, and in December 2023, they ranged from 15.97% to 16.53%. In June 2024, the values varied between 15.85% and 16.60%. These results confirm that the product not only meets but also exceeds the standards, indicating good nutritional quality.

The maximum allowable water content, according to the Order, is 50%. The values

obtained in the study are mostly below this limit. In June 2023, the water content ranged from 48.90% to 49.39%. In December 2023, the values ranged from 49.49% to 50.93%, with a slight exceedance of the maximum limit in one sample (50.93%). In June 2024, the values ranged from 49.56% to 50.02%, with marginal exceedances of the maximum limit. These results suggest that, in general, the product complies with the regulations, but there are some fluctuations that might require adjustments to avoid exceeding the allowed limits.

According to the label, the maximum NaCl content is 2%, while the Order permits a maximum of 3%. All obtained values were below these limits, indicating good compliance. In June 2023, the values ranged from 1.93% to 2.23%. In December 2023, the values ranged from 1.89% to 2.10%, and in June 2024, they ranged from 1.86% to 2.23%. These data confirm that the product adheres to the established NaCl limits, contributing to the maintenance of an adequate nutritional profile.

Overall, the physico-chemical analysis of the "Salam Țărănesc" indicates that the product complies with most of the limits specified on the label and in official regulations, with the exception of some slight exceedances in water content in certain samples. The values for lipids, proteins, and NaCl meet the requirements, confirming good nutritional quality and regulatory compliance. However, to ensure continued compliance, it is recommended to closely monitor the water content and adjust production processes as necessary.

CONCLUSIONS

A detailed study of "Salam Țărănesc," based on regular physico-chemical and organoleptic analyses, has provided a comprehensive view of the product's quality and compliance. The physical and chemical test, which measured the amount of water, NaCl, lipids, and proteins in the product, showed that it mostly stays within the limits

listed on the label and in the rules of Ordinance ANSVSA nr. 560/1271/339/210:2006. However, we observed variations in water content, with some samples exceeding the maximum allowable limit at specific times. This suggests the need for adjustments in the production process to ensure consistent moisture levels in the product.

The organoleptic analysis confirmed the product's quality through visual, olfactory, and taste characteristics in line with standards. The sausages exhibited a clean, uniform surface, an appropriate reddish-brown color, a continuous membrane without cracks, and a homogeneous, compact filling without fat clumps or impurities. We rated the smell and taste as pleasant, noting well-cooked and smoked product notes.

In conclusion, the analyzed "Salam Țărănesc" generally meets the physical-chemical and organoleptic quality requirements. Continuous monitoring is essential to maintain uniformity and product compliance. We recommend adjustments in the production process, particularly in moisture control, to ensure optimal product consistency and consumer satisfaction.

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