REGULATION CHALLENGES ON NUTRITION VALUES DECLARED IN MEAT PROCESSED PRODUCTS

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Abstract

The meat processing industry confronts regulatory challenges relating to food additives use, hygienic rules, non-conventional ingredients replacing traditional ones. Nutrition values labeling and its conformity with the declaration is another concern for meat processing producers considering the complex matrix of meat, variation in raw material, storage time, packaging mode etc. This has caused problems with official authorities who find some variation between lab analysis results and nutrition values declaration in the label. This paper aims at assessing factors such as storage time until last date for consumption, packaging mode for two types of meat products. Samples stored under three conditions unpackaged, packaged in modified atmosphere, and vacuum packaged were monitored throughout their shelf life to evaluate variations in nutritional values. The results confirmed that vacuum packages show the least variation in composition compared to modified atmosphere packaging. The most stable component has been protein content, while fat resulted as most varied component. Though considering all the nutritional components variability, the energy content proved to be the most robust indicator, cancelling all the fluctuation between the components. In any case all the results were between tolerance limits by ±20% showing conformity with Regulation (EC) No. 1162/2012 and the Albanian Regulation VKM Nr.434/2018 "Për etiketimin e ushqimeve dhe informimin e konsumatorit".

Keywords: *Dry cooked salami, sausage, unpackaged, modified atmosphere packaging, vacuum packaging, nutritional value, label.*

Përmbledhje

Industria e përpunimit të mishit përballet me sfida rregullatore në lidhje me përdorimin e aditivëve ushqimorë, rregullat higjienike, përbërësit jo-konvencionalë që zëvendësojnë ato tradicionalë. Etiketimi i vlerave ushqyese dhe përputhshmëria e tij me deklaratën është një shqetësim tjetër për prodhuesit e përpunimit të mishit duke pasur parasysh matricën komplekse të mishit, ndryshimin në lëndën e parë, kohën e ruajtjes, mënyrën e paketimit etj. Kjo ka shkaktuar probleme me autoritetet zyrtare të cilat gjejnë disa ndryshime midis rezultateve të analizave laboratorike dhe deklaratës së vlerave ushqyese në etiketë. Ky punim synon të vlerësojë faktorë të tillë si koha e ruajtjes deri në datën e fundit për konsum dhe mënyren e paketimit për dy lloje produktesh mishi. Mostrat në tre gjendje: të papaketuara, në paketim në atmosferë të modifikuar dhe në paketim në vakum për të tre llojet e mostrave janë monitoruar gjatë afatit të tyre të ruajtjes për të vlerësuar ndryshimin midis vlerave ushqyese. Rezultatet konfirmuan se paketimet në vakum tregojnë ndryshimin më të vogël në përbërje krahasuar me paketimin në atmosferë të modifikuar. Komponenti më i qëndrueshëm ka qenë përmbajtja e proteinave, ndërsa yndyra rezultoi si përbërësi më i larmishëm. Megjithëse duke marrë parasysh të gjitha ndryshueshmëritë e përbërësve ushqyes, përmbajtja e energjisë doli të jetë treguesi më i fuqishëm, duke anuluar të gjitha luhatjet midis përbërësve. Sidoqoftë, të gjitha rezultatet ishin midis kufijve të tolerancës me + 20%, duke treguar konformitet me Rregulloren (KE) 1162/2012 dhe VKM Nr.434/2018 "Për etiketimin e ushqimeve dhe informimin e konsumatorit".

Fjalë kyçe: *Sallam i pjekur i staxhionuar, salçiçe, i paamballazhuar, amballazhuar në atmosferë të modifikuar, amballazhim në vakum, vlerë ushqyese, etiketë.*

Introduction

Consumption and production of meat products are increasing worldwide due to globalization, so consumer demands. Though they have similarities, some relevant differences can be found between countries (Flores& Todra, 2021). The diet in Balkan countries has traditionally been based on fresh meat products, though recent social economic development has shifted to consumer society, changing the preferences to meat processed products. However, the demand for healthy food, based on meat and its products, remains the same as everywhere. All countries without exception require that energy, as well as proteins, total fats and carbohydrates (either total or available) must be declared where a nutrition label is required (Hawkes, 2010). Consumers, especially in well developed countries, are informed to make smart and science-based choices by the regulatory and official authorities' information.

However regulatory authorities around the globe face challenges of keeping pace with innovation in food industry sector, in meat processing, in particular. The wide variety of new foods, new food ingredients, variability in raw material, innovative technologies and packaging mode present challenges to food producers and consequently official authorities (Van der Meulen & Szajkowska, 2012). Maintaining human health requires eating whole, nutrient-dense and fresh foods. The term "balanced diet" has gained popularity ensuring the body consumes all essential nutrients. Thus, informing and understanding the nutritional composition of food is crucial for a well-balanced diet (Shehzadi, 2025). Initially, nutrition labeling was not given very much consideration. This is indicated by the fact that legislation on nutrition labeling has evolved later than the one that applies to general labeling, and that the provision of nutrition facts has been optional in many countries (Buzgeia *et al.*, 2023).

Nowadays, food labeling policy, as part of the regulatory system, has become increasingly important in public health. It helps consumers understand the nutritional profile and quality of food products and supports informed dietary decisions in response to the rising burden of diet-related diseases (Albuquerque *et al.*, 2020), (Iheme *et al.*, 2025), (Panzcyk *et al.*, 2023). This issue has become a concern for policymakers, because scientific evidence indicates that healthy diets and lifestyles are important not only for individuals but impacts public healthcare expenses and productivity putting a heavy burden on the economic system (Albuquerque *et al.*, 2020). These necessitate laws and regulations and accurate labeling of nutritional values which describe the nutrient content of food and encompasses information used to educate consumers about a product's nutritional qualities and guide them in making the right food choice (Food Safety Authority, Ireland, 2010), (Iheme *et al.*, 2025), (Fabiansson, 2006), (Euroepan Parliament and Council, 2002) establishing a higher standard across food systems from production to distribution (Albuquerque *et al.*, 2020) in the article 8 specifically states "Food Law shall aim at the protection of the interests of consumers and shall provide a basis for consumers to make informed choices in relation to the foods they consume.

It shall aim at the prevention of: (a) fraudulent or deceptive practices; (b) the adulteration of food; and (c) any other practices which may mislead the consumer”. To fulfill this objective and to avoid any irregularities found in the presentation of food information a new regulation was published to ensure the use of an accurate, clear and informative label to help consumers make smart, healthy and economic choices. A clear definition of the food label is specifically defined in Article 2 of Regulation (EU) No1169/2011 (European Parliament and Council of the European Union, 2011) on the provision of food information to consumers, the EU definition of a label is “any tag, brand, mark, pictorial or other descriptive matter, written, printed, stenciled, marked, embossed or impressed on, or attached to the packaging or container of food” (European Court of Editors EN 2024). Nutrient profiling is defined as “the science of categorizing foods according to their nutritional composition” (Raseta *et al.*, 2019). Though defined as “science”, the declaration of nutritional values poses a particular challenge for the producer who must carefully monitor his production so that problems do not arise from the inconsistency of the declared values with those obtained from the chemical analysis carried out by the official food safety and quality controls. Producers are also challenged to develop and/or reformulate products to achieve the highest food quality and in their exchange, providing that industry ensures accuracy in nutrition labeling, they will be more competitive in market (Albuquerque *et al.*, 2020). Accurate nutrition labeling is also important for the food inspectors who carry out official controls who have the task of comparing the values declared on the label with the chemical analysis in real time (Raseta *et al.*, 2019) and making decisions based on science which dictates regulations, guidelines and guides to facilitate decision-making and manage subjectivity and avoid disproportionate administrative measures for the manufacturing business.

This challenge becomes particularly complex when faced with specific products, which are subject to continuous compositional changes because of moisture loss, enzymatic activity, variability of raw materials, method of product packaging, or simply storage time until the product's expiration date. Different processing techniques will result in different food structures, affecting bioavailability and overall nutritional value (Orlien & Bolumar, 2019). Meat products are an example of this concern. Food like meat products is a crucial nutrient-dense dietary product, rich in macronutrients like proteins, lipids and carbohydrates which are essential for growth and life maintenance (Shehzadi, 2025). Nutrition quality is concurrent with food safety and sensory perception is becoming an increasingly important factor in food choices (Orlien & Bolumar, 2019). Food authorities worldwide have established their own nutrition labeling rules as a public health tool introducing more variability in Calorie counts (Albuquerque *et al.*, 2020), (Peele & Nuckols, 2025).

A "nutrition label" is a panel on which nutritional information about a food product is displayed (Hawkes, 2010). Recognizing the importance of nutrition labeling as a public health tool, since 1985 the Codex Alimentarius Commission (Codex), have adopted and established Guidelines on Nutrition Labeling (Codex Alimentarius, Amended 2024). This Guideline has been continuously amended for providing consumers with reliable information about nutritional profile of products on the market (Albuquerque *et al.*, 2020), (Fabiansson, 2006). Tolerance limits set in this Guide in relation to many factors such as shelf life, accuracy of analysis, processing variability and variability of the nutrients in the product and whether the nutrient has been added or is naturally present in the product serve both food producers and competent authorities during official food control (Fabiansson, 2006), (Raseta *et al.*, 2019).

EU has also drafted specific harmonized regulations and guidelines for the labeling of food products, mandatory ingredients for declaration, and optional ones that help consumers make their choices (Panzcyk *et. al.*, 2023). At the same time, these guidelines also help manufacturers to comply with legislation for the correct declaration of the nutritional values of products. But legislation in this regard is sometimes challenging to implement and leaves room for misinterpretations. The Food Labeling Regulation in Albania (VKM Nr. 434, "Per etiketimin e ushqimeve dhe informimin e konsumatorit", 2018) is in conjunction with the EU regulation but some discrepancies found between the nutrition facts labeled and those found by chemical analysis have caused misunderstandings in how to apply correctly this regulation in practice. According to the Article 31 of VKM No. 434/2018 (VKM Nr. 434, 2018) specifically is cited that the declared values are the average values based on the average quantities resulting from one of the below options:

- The manufacturer's analysis of the food
- Calculation from the actual or average quantity of nutrients used
- Calculation from generally accepted data

Different regions have slightly different tolerances but still allow for some degree of error (Peele & Nuckols, 2025). However, it's important to recognize that labeling regulations are another source of discrepancy when estimating energy intake based on Atwater system (Peele & Nuckols, 2025). Label accuracy can vary from chemical analysis results because of many more important factors being variability of raw materials, production batch, packaging mode, storage time and condition, inaccuracy in chemical analysis, different testing methods (Food Safety Authority, Ireland, 2010). The scientific understanding of calories and nutrition availability is still evolving for example physical structure and complexity of food is another cause of discrepancies between label data and chemical analysis, for example in higher fiber products (Peele & Nuckols, 2025). For people concerned about every calorie taken during meals, they should be aware of the fact that cooking from the other side, though not adding calories in food, it helps making the energy more available and readily adsorbed (Peele & Nuckols, 2025). This could be particularly serious because of the current obesity debate where consumers now deliberately try to avoid energy-dense food. The wrong label information could mislead consumers (Fabiansson, 2006). From the study of the literature regarding this discrepancy between the declared values and the real ones resulting from chemical analysis, it has been noted that the problem is well known and widely treated. The nutrient values are either based on chemical analyses performed in analytical laboratories or calculated from the nutrient contents of recipe ingredients using retention and/or yield factors. They are also borrowed values from other tables and databases or presumed values (Almaamari *et al.*, 2024).

Moreover, this problem is more acute in processed meat products. Meat processing is a critical component of the food industry (Shehzadi, 2025) leading to a complex meat batter system, a complicated matrix determining the texture, the physical condition of the meat emulsion which is the continuous phase of the system (Kawecki *et al.*, 2021). This complexity impacts on chemical analysis and changes in time of the nutritional values declared on the label because of enzymatic, microbiological actions or even from the considerable moisture content in them or the variability of the raw material. Packaging also has its impact as a preservation technique while helping maintain nutrition, texture, quality and more important safety of meat products (Shehzadi, 2025). The purpose of this article is precisely to study the impact of storage and packaging mode of two processed meat products to see the variability of the nutritional values presented on the label with the values derived from laboratory chemical analyses. Main nutritional compounds of meat products were assessed to determine how they changed during their storage in the market shelves until ultimate consumption.

Materials and methods

The analysis of nutritional values content (energy value, protein, total fat, salt, carbohydrates) was carried out in the production plant laboratory starting from the first day of production until the expiry date of the respective product. We analyzed samples covering the entire time span while they remain on the retail food market shelves and are subject to official controls for the accurate assessment of the declared nutritional values on the label. The nutritional values analysis plan was compiled and extended for each sample type according to their last date for consumption. As the food packaging function has evolved from simple passive preservation methods to active and intelligent ones, it is important to use appropriate packaging to preserve nutritional values except for the quality and safety of meat products (Kawecki *et al.*, 2021). Depending on the food nature, interaction of food with packaging is greatly affected by the food composition by interacting and posing effects, which may affect the quality, integrity and shelf life of the food and nutritional content as well (Garba, 2023).

Hence the research was conducted on two different meat products in three different storage and packaging conditions: unpackaged products (UP), vacuum packed products (VAP), and modified atmosphere packed products (MAP) to study nutritional values variation depending on products specific and technology used, packaging mode and storage time until their best before date of consumption. Three types of samples have been selected: unpackaged (UP), vacuum packing (VAP) and low oxygen modified atmosphere packing (MAP) which are widely used in the meat industry. Vacuum packing, which eliminates air without replacing it with another gas, prevents product contamination and loss of water (Kawecki *et al*., 2021). The MAP method consists of replacing air with a mixture of gases. Different proportions of N_2 (approx. 70%) and CO_2 (approx. 30%), O_2 (<0.8%) are used for our tested meat products samples. Six units of different batches from each of the six sample types (two different products, each unpackaged, UP and in two different packaging, MAP, VAP) have been taken for analysis to consider any variability of raw materials.

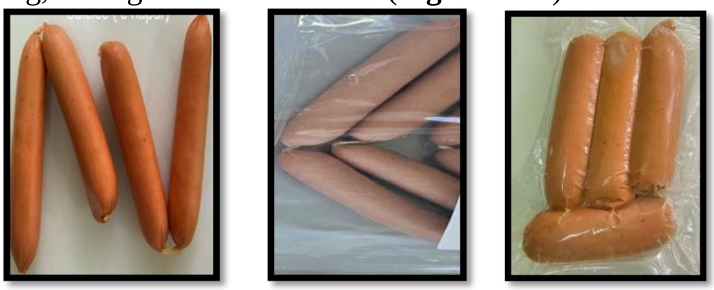
Samples

Two different meat products were selected to be tested for nutritional values content.

1. Sausages unpackaged (1 week storage), in modified atmosphere packaging (shelf life 1month) and in vacuum packaging (shelf life 3 months)
2. Dried cured meat unpackaged, in modified atmosphere packaging (shelf life1 month) and in vacuum packaging (shelf life 3 months)

These two types of meat products have been selected because of their specifics in production, storage time before putting them in the market, casing and dimensions.

1. Sausages, a massive product with diameter 26.5 mm, natural edible casing, average moisture content (**Figure1.a-c**)



a) b) c)

Figure 1. a) Unpackaged sausage, b) In modified atmosphere packaged, c) In vacuum packaged

2. Dry cured meat product (inedible casing, D = 42 mm), cooked, seasoned dried product with a relatively low moisture content (**Figure 2. a-c)**

a) b) c)

Figure 2. a) Unpackaged dry cooked salami, b) In modified atmosphere c) In vacuum packaged

All the samples were analyzed first in their production day and then subsequently analyzed according to their sampling plan, following their storage in refrigerator as in normal marketing or home storage condition at +4 °C until their expiry date.

Analytical parameters

Proximate analysis of all selected samples was carried out in the accredited laboratory of a meat processing plant in Tirana, Albania. All the samples have been analyzed for moisture and nutritional content: nitrogen content (conversion factor to total protein = 6.25), total fat, ash, salt and total carbohydrates. Based on the results, the energy content for each product was calculated according to the conversion factors listed in ((European Parliament and Council of the European Union, 2011) adopted and presented in the Appendix XIV of VKM No. 434 (VKM Nr. 434 "Per etiketimin e ushqimeve dhe informimin e konsumatorit", 2018) **(Table 1).**

Table 1. Conversion factors for the calculation of energy content of food products

Nutrient / Component	Energy value (kJ/g)	Energy value (kcal/g)
Carbohydrates (except polyols)	17	4
Polyols	10	2.4
Protein	17	4
Fat	37	9
Salatrims	25	6
Alcohol (ethanol)	29	7
Organic acids	13	3
Fibre	8	2
Erythritol	0	0

(Codex Alimentarius, Amended 2024)

Methods of analysis

Official methods of analysis have been used:

- SSH ISO 1442:2023Meat and meat products-Determination of moisture content- Reference method- based on measuring the weight loss of the sample after drying in the oven.
- SSH ISO 1443:1973 Meat and meat products-Determination of total fat contentby Soxhlet extraction after acid hydrolysis of the sample
- SSH ISO 1841-1:1996 Meat and meat products-Determination of chloride- Volhard titrimetric method

- SSH ISO 937:2023 Meat and meat products-Determination of nitrogen content (Kjeldahl method)-Reference method
- SSH ISO 936:1998 Meat and meat products-Determination of total ash based on weight remained after incineration the sample in 540°C in muffle furnace
- Luff Schoorl titrimetric method for total sugar content.
- Total carbohydrates content is calculated by subtracting from 100 the sum of the percentage of total fat, protein, ashes, sugar and moisture content.

Results

The nutritional values given in the respective labels for each product type are shown in **Table2**.They are the same despite the packaging mode.

Table 2. Nutrition values declared in label for both products

Product	Energy content KJ/100 g	Protein %	Fat %	Carbs %	Sugar %	Salt % / Ash %
Sausage	1040	14.45	20.20	4	0.5	1.9/3.6
Dry cooked salami	1228	18.1	23.15	3.5	0.25	2.22/4.3

Tables 3 and 4 show the average results (n=6) and deviations in each nutritional component for the two product types in three marketing conditions (unpackaged, modified atmosphere and vacuum packaged) during their shelf-life period until the last date of consumption. The results are shown not rounded to the nearest as recommended (Food Supplements Europe, 2014). This is only to better interpret the variation and draw the conclusions for this study.

Table 3. The average nutritional values for dry cooked salami, (unpackaged n=6, in modified atmosphere n=6, in vacuum n=6)

Product/ dry cooked	Protein %	Total fat %	Carbs % (without sugar)	Energy KJ/100g	Salt % / Ash %	Moisture %
UP (3 weeks)	16.86 16.24-17.44	20.5 18.68-22.86	5.02 3.95-6.40	1130 1062-1191	1.98/2.58	55.04 54.04-56.10
MAP (1 month storage)	18.1 17.45-18.95	20.7 19.5-22.05	5.40 4.58-6.53	1163 1114-1220	2.23/3.83	53.53 52.83-54.29

VAP (3 months storage)	18.6 17.95-19.45	20.22 18.85-21.75	5.52 4.35-6.6	1158 1099-1227	2.25/3.25	54.41 53.76-55.75

Table 4. The average nutritional values for sausages, (unpackaged n=6, in modified atmosphere n=6, in vacuum n=6)

Product/ Sausage	**Protein %**	**Total fat %**	**Carbs % (without sugar)**	**Energy KJ/100g**	**Salt % / Ash %**	**Moisture %**
UP (1 week storage)	12.98 12.3-13.68	20.91 18.68-24.03	5.02 6.4-3.95	1079 1001–1188	2.08/3.15	54.18 50.6-58.64
MA (1 month storage)	12.76 12.3-13.18	19.97 18.86-21.68	5.19 4.58-5.86	1044 997-1115	1.92/2.64	58.25 57.25-58.65
VAP (3 months storage)	13.11 12.6-13.55	20.46 19.6-21.75	5.39 4.35-6.36	1072 999-1143	1.95/2.89	57.75 55.56-60.05

Note: According to Rounding guidelines for the nutrient declaration in nutrition labeling of foods and food supplements, protein and fat as higher than 10% should be rounded to nearest 1g, carbs as lower than 10% should be rounded to nearest 0.1g, salt as higher than 1% should be rounded to nearest 0.1g (Food Supplements Europe, 2014)

Discussion

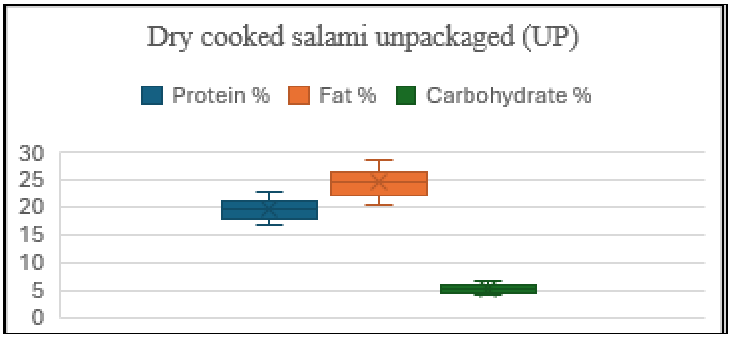
Meat processing is a critical component of the food industry. To enhance the safety and nutritional quality of meat, a variety of techniques are used, each with its unique advantages and disadvantages. Packaging also plays an important role as a preservation technique while helping maintain nutritional quality, texture, quality and more importantly, safety of meat products. Referring to the tolerance levels set (**Table 5**) (European Commission, Health and Consumer Directorate, 2012), (Food Supplements Europe, 2014), all the nutritional values obtained from laboratory testing were found to be in compliance with the tolerances set despite of the packaging mode and storage time.

Table 5. Nutritional tolerances limits for food other than food supplements including measurement uncertainty

	Tolerances for foods (includes uncertainty of measurement)	
Nutrient / Component	**Declared amount**	**Permitted tolerance**
Vitamins	—	+50%** / −35%
Minerals	—	+45% / −35%
Carbohydrates, Sugars, Protein, Fiber	< 10 g per 100 g 10–40 g per 100 g > 40 g per 100 g	±2 g ±20% ±8 g
Fat	< 10 g per 100 g 10–40 g per 100 g > 40 g per 100 g	±1.5 g ±20% ±8 g
Saturates, Mono-unsaturates, Polyunsaturates	< 4 g per 100 g ≥ 4 g per 100 g	±0.8 g ±20%
Sodium	< 0.5 g per 100 g ≥ 0.5 g per 100 g	±0.15 g ±20%
Salt	< 1.25 g per 100 g ≥ 1.25 g per 100 g	±0.375 g ±20%

**for vitamin C in liquids, higher upper tolerance values could be accepted

Boxplot analysis was used to illustrate more clearly the variation between nutritional components for each product type in different packaging modes (**Figure 3a-c, Figure 4a-c**).



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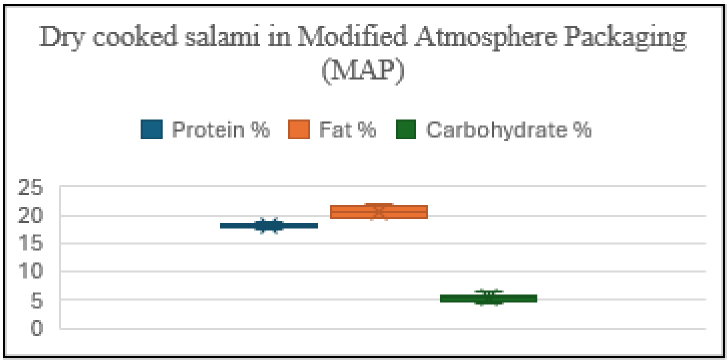

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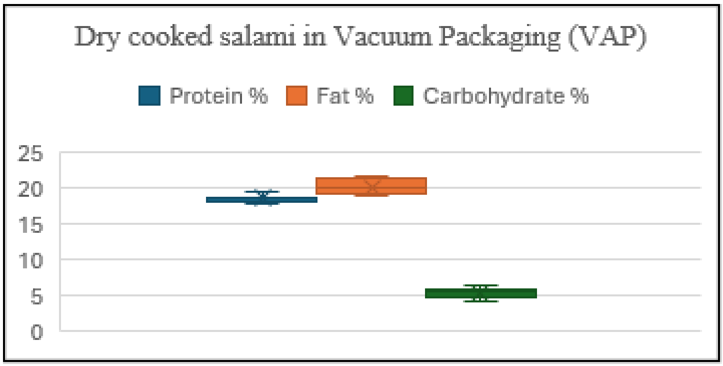
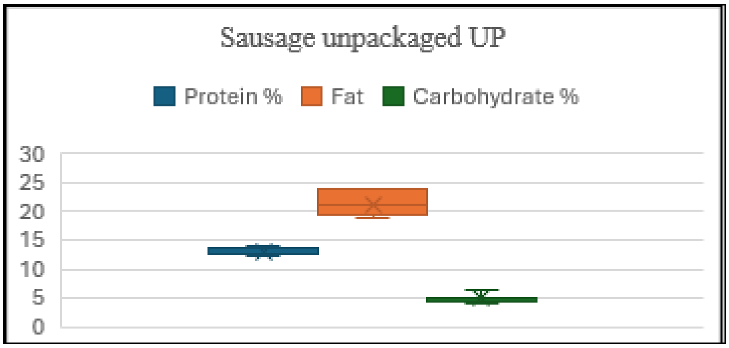


c)

Figure 3. Boxplot diagram of nutrition values variation for dry cooked salami a) unpackaged UP b) in MAP c) in VAP



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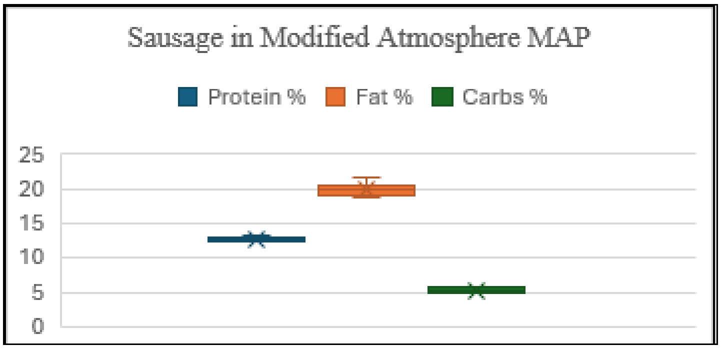

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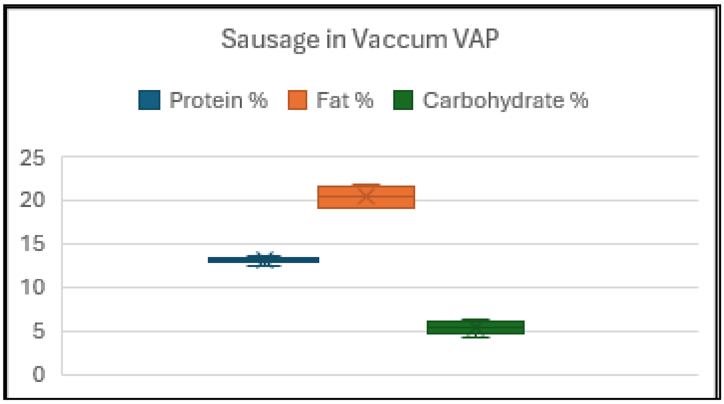
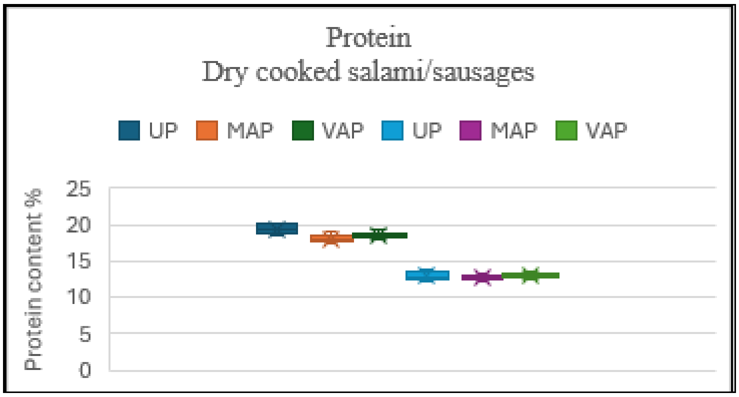


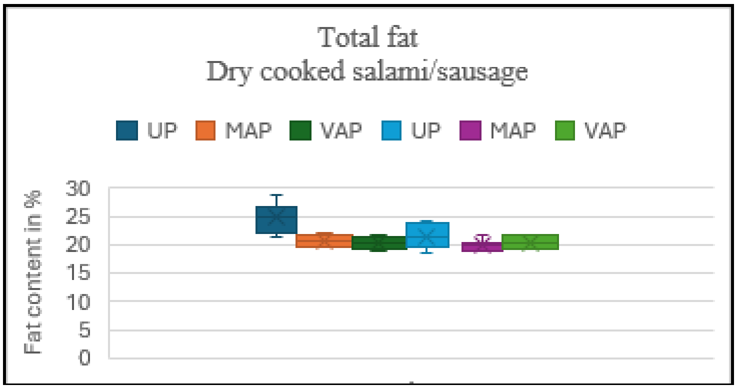
c)

Figure 4. Boxplot diagram of nutrition values for sausages a) unpackaged UP b) in MAP c) in VAP

Observing the results obtained, it is clearly noticed that the unpackaged sausages showed the most variable product regarding the nutritional values content. Though this product has a limited storage time (1 week), the high moisture content, the dimensions and natural casing have stimulated the water loss impacting this way the fluctuations in other nutritional contents values. As this product has short shelf life, no problem will result in authentication and quality indicators from official controls. This fact is not noticed in the unpackaged dry cooked salami, which undergoes seasoning storage time in the storehouse before going to the market, showing a robust stability compared to sausages. The comparison between the same nutritional parameters for two products in three different packaging modes is shown in **Figure 5a-c**.



a)



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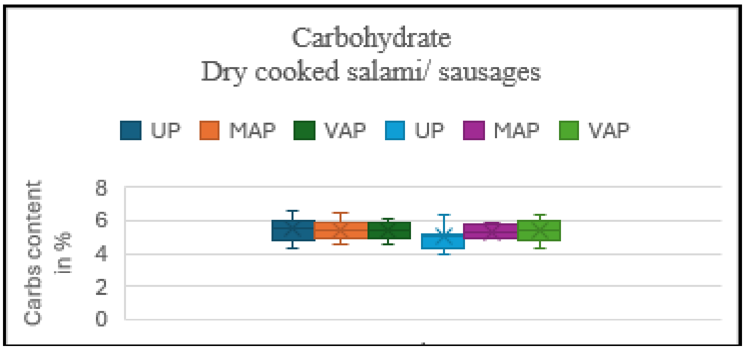

c)

Figure 5. Boxplot diagram for three main nutritional components for both products a) protein, b) total fat, c) carbohydrate

Protein content was the most stable component, exhibiting the lowest variability. This result is in conformity with findings in other studies. Total fat content shows the most variable component. This fact is noticed even from various studies (Fabiansson, 2006). Carbohydrates ranked second in terms of variability. This can be explained not only by the microorganism and degradation rate of carbohydrates to elementary sugars but even from the method of calculation. In this study the total carbohydrate is calculated by the arithmetical difference between 100% and the sum of other components. So, each slight variability in other components is reflected in the carbohydrate content.

his overall variability is not reflected in calories content. Putting in other words, as Peele and Nuckols (Peele & Nuckols, 2025) have specifically argued we don't need perfect calorie counts for tracking to be helpful as errors and fluctuations in nutritional values tend to cancel out and even if there are consistent tracking errors in one direction, the precision should still be sufficient for the data to be useful. This fact is noticed in the energy content for both unpackaged products, in modified atmosphere packaging and in vacuum packaging. Except for the unpackaged products where moisture loss impacts the energy contents as dry solids increase, the other packaged products show less variability for energy content compared to each nutritional value (**Figure 6).**

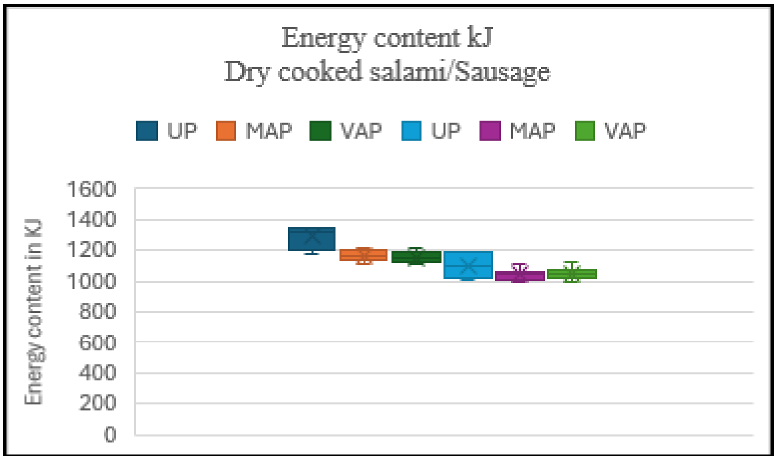

Figure 6. Boxplot diagram for energy content for both products

Another fact is that the tolerance limits should be analyzed from a critical point of view. It has no sense to exclude as unacceptable the beneficial components in food such as protein or fiber content if they result higher than the limit set ±20%. This issue has been discussed by Fabiansson (Fabiansson, 2006). It enforces the controversial discussion often occurred during routine official control, when protein content happens higher than the declared value. Though often within the established limit ± 20%, it is nonsense to consider the product irregular considering this valuable nutritional component. Fabiansson has applied a leeway of -20% limits for nutritional compounds: protein, fiber, carbohydrates (lower limit compounds) and +20% limits for nutritional compounds such as sugars, energy, total fat, saturated fats, cholesterol (upper limits compounds).

This way of considering the information given in label allows more flexibility by preventing any disagreement between producers and authorities. It's true that nutrition data isn't perfectly accurate, what is more there is no need to be so. Trying to be as accurate as possible with the values declared in label, especially for beneficial nutritional components, only creates confusion and misunderstanding to the consumers. To avoid these, researchers are refining methods for estimating food energy and absorption (Peele & Nuckols, 2025).

Conclusion

Tolerances for nutrition labeling purposes are important as it is not possible for foods to always contain the exact nutrient levels labeled, due to natural variations and variations from production and during storage. However, the nutrient content of foods should not deviate substantially from labeled values to the extent that such deviations could lead to consumers being misled (European Commission, Health and Consumer Directorate, 2012). The current Directive on Nutrition Labeling indicates that average values are the values which best represent respective amounts of the nutrition parameters which a food product contains (Food Safety Authority, Ireland, 2010).

Though not always perfectly accurate the nutritional information dictated by the Nutrition Labeling Guidelines, should be carefully and wisely used. The tolerance limits set by ± 20% are wide enough not to cause any concern for the meat producers, though orientate consumers towards smart and healthy choices. Though not yet legally established in Albania, this tolerance should be positively taken into consideration by the local authorities while performing official control for nutritional components that are considered positive to health. Other components declared that have a negative impact on health (saturated fat, sugar or sodium) or claimed (dietary fiber in the food label should be scrutinized for any irregular, misleading or false declaration.

The results of this paper did not show any significant discrepancy between the nutritional values declared and the laboratory results for both products as unpackaged (1 week shelf life for sausages) (three weeks for dry cooked salami) storing at normal condition at +4°C.

Even for the MAP and VAP no significant change in nutritional components was observed. All the parameters were within the tolerance limits set at ± 20% according to the regulation. Between two packaging types, MAP showed the greatest variation though within the tolerance limits compared to vacuum packaging, probably because this last one ensures more water binding parameters as explained by Stangierski *et al*, (Stangierski et al., 2022). The total fat content showed the greatest variation for both products in the three-trading forms. The nutritional variability did not affect significantly the total calories count.

The study should be further extended to other food components and food products, especially relating to nutritional or health claims under the Regulation No1924/2006 (European Parliament and Council, 2006). Though these studies are time consuming to cover all the prepackaged food products, these studies should be continuously performed to keep the food market under control and help consumers make healthy choices.

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