Multidisciplinary Conference on Sustainable Development
15-16 May 2025

Partial meat replacement with lentils: effects on nutritional and sensory quality of chicken pâté

Ileana Cocan, Monica Negrea, Ersilia Alexa, Calin Jianu, Daniela Stoin
University of Life Sciences "King Mihai I" from Timisoara, Faculty of Food Engineering, Calea Aradului 119, Timisoara 300645, Romania
**e-mail: ileanacocan@usvt.ro*

Abstract: *This paper aims to valorize lentil (Lens culinaris) as a vegetable source of protein in chicken pâté technology. In the current context of the orientation of the food industry towards products with high nutritional value and low costs, the integration of vegetable proteins represents a sustainable and efficient solution. The study is based on the hypothesis that partial substitution of meat with lentils can lead to an organoleptically and qualitatively acceptable end product without compromising food safety or sensory characteristics of the product. Linseed is compositionally characterized as a rich source of protein, fibre, minerals and starch, low in lipids and anti-nutritional factors. The study followed the development and testing of four types of pate: a control (no added lentils) and three variants with 10%, 20% and 30% added lentils. For each variant, physico-chemical (water, protein, fat, fat, salt, carbohydrate, energy content) and sensory analyses were carried out according to standardized methodologies. The results showed that the addition of lentils positively influenced the water and protein content, slightly reducing the lipid content, without negatively affecting the organoleptic characteristics. All samples were within the limits allowed by the legislation in force. The main conclusion is that linseed can be successfully used in the formulation of meat products, contributing to their nutritional and functional diversification*

• Introduction

The composition of meat significantly affects the quality of the final product, especially depending on the fat content or the presence of lean meat. Proteins, essential components of muscle tissue, are complete in animal meat and play a vital role in human nutrition. However, in the meat industry, plant-based proteins are increasingly used as substitutes for animal proteins to improve texture, enhance nutritional value, and reduce costs. Commonly used sources include soy, wheat, corn, peas, and other legumes. These proteins are available as powders or dry textured forms and provide functional benefits such as emulsification, water-binding, and structural properties, while also contributing to health by reducing cholesterol levels. Although soy isoflavones may have adverse effects, plant proteins remain a promising alternative for processed meat products.

• Material and method

In the second part of the project, several specific objectives were pursued, including the development of recipes for lentil-based pâté, the production of the final product with varying percentages of lentils, and the evaluation of these samples from organoleptic and sensory perspectives. Additionally, a physico-chemical characterization of the obtained products was conducted by determining their moisture, ash, protein, fat, NaCl content, and energy value. Four pâté samples were analyzed in this study: the control pâté (PM), pâté with 10% lentils (P10), pâté with 20% lentils (P20), and pâté with 30% lentils (P30).
The organoleptic examination involves the evaluation of external and cross-sectional appearance, consistency, color, smell, and taste, with these characteristics varying depending on the product category (such as boiled, smoked, or dry-cured products).The physico-chemical examination aims to assess the integrity of meat products by determining their main components, using standardized methods. Water content was determined according to SR ISO 17025/2005 and ISO 1442/1997, fat content according to SR ISO 1444/2008, and protein content according to SR ISO 937:2007. Sodium chloride content was analyzed using the Mohr method, according to STAS 9065/5-1973, and product freshness was evaluated using the Griess method, in accordance with STAS 9065/7-1974. Carbohydrate content was determined by difference, subtracting the sum of lipid, protein, ash, water, and NaCl fractions from 100%, in line with Regulation (EU) No. 1169/2011. The energy value of the product was calculated based on its chemical composition, considering that 1 g of fat provides 9 kcal, and 1 g of protein or carbohydrate provides 4 kcal each, also in accordance with the same regulation.

• Results and discussions

Organoleptic Characterization

The sensory evaluation focused on the appearance, consistency, and taste of the samples. All variants complied with the legally accepted standards. At temperatures up to 10°C, the products maintained their packaging shape, with a clear, well-gelled aspic, displaying a color range from pale yellow to pink-orange, depending on the variety. The cross-section was uniform, smooth in texture, pinkish-yellow in color, without air pockets, water, or fat accumulations. Taste and smell were pleasant, characteristic of liver, with slightly bitter-sweet notes and no foreign odors (such as rancid, musty, or burnt). The consistency was soft, as expected for this type of product.

Acknowledgement: The publication of this paper was supported by the Faculty of Food Engineering from the University of Life Sciences "King Michael I" of Timisoara, Romania.

Physico-chemical characterisation

Table 1 Physico-chemical characterisation of pâté samples

Parameter	PM (martor)	P10 (10% lentil)	P20 (20% lentil)	P30 (30% lentil)	Legal limits (according to Ord 210/2006)
Humidity (%)	59.12	60.00	60.60	61.12	max. 74
Protein (%)	16.52	17.30	18.40	19.46	min. 9
Fat (%)	24.24	21.00	18.00	15.11	max. 30
NaCl (%)	1.69	1.65	1.60	1.56	max. 2
Ash (%)	0.65	0.75	0.85	0.99	-
Glucides (%)	0.91	1.30	1.70	2.10	-
Energy value (kcal/100g)	278.88	260.00	240.00	222.23	-
Kreiss reaction	negative	negative	negative	negative	negative

Physicochemical analyses were conducted on a control sample (PM) and experimental variants containing 10% (P10), 20% (P20), and 30% (P30) lentil. All results complied with the legal standards established by Order 210/2006. Moisture content increased slightly with higher lentil addition (59.12% to 61.12%), remaining well below the maximum permitted limit. Protein content improved significantly (from 16.52% to 19.46%), enhancing the nutritional quality. Conversely, fat content decreased markedly (24.24% to 15.11%), resulting in a product with lower energy density (278.88 to 222.23 kcal/100g). Sodium chloride levels slightly declined across samples, while ash and carbohydrate contents increased proportionally with the amount of lentil added. All samples exhibited a negative Kreiss reaction, indicating the absence of lipid oxidation and ensuring oxidative stability. In conclusion, lentil incorporation improved the nutritional profile of the products by increasing protein content and reducing fat and caloric value, without compromising food safety or exceeding legal compositional limits.

Sensory analysis

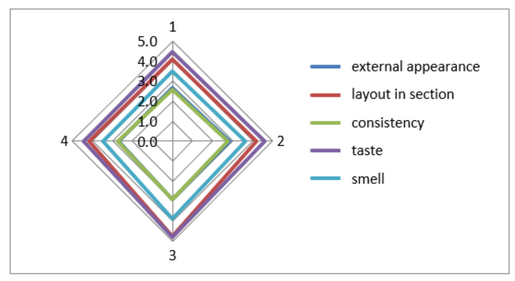

Figure 1 Sensory analysis of pate sample

Following the sensory evaluation of the four pâté samples, the best results were recorded for the pâté with 20% lentil addition, achieving the highest scores both overall (19.30) and individually for external appearance, cross-sectional appearance, consistency, taste, and aroma. The pâté with 10% lentil ranked second, followed by the one with 30% lentil, while the plain pâté received the lowest scores. The results indicate that the moderate addition of lentils significantly improves the sensory qualities of the pâté.

• Conclusions

All pâté samples met the legal requirements for physicochemical parameters. Lentil addition increased protein content while reducing fat content and energy value.Moisture, NaCl, and ash contents remained within acceptable limits. The Kreiss reaction was negative for all samples, indicating oxidative stability.Sensory analysis showed that the pâté with 20% lentil achieved the best scores, demonstrating that moderate lentil incorporation improves product quality.