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Improving the technology of producing dietary pâtés

Iryna Taraimovych*

PhD, Associate Professor

Lutsk National Technical University

43018, 75 Lvivska Str., Lutsk, Ukraine

<https://orcid.org/0000-0003-4129-2671>

Tamara Sydoruk

Assistant

Lutsk National Technical University

43018, 75 Lvivska Str., Lutsk, Ukraine

<https://orcid.org/0009-0006-9008-9556>

Abstract. The aim of the study was to improve the technology for the production of dietary pâtés by applying Sous vide technology, which will preserve the maximum amount of nutrients, improve the organoleptic properties of the product, increase its safety and shelf life. The paper investigated the possibility of using Sous vide technology for the preliminary thermal processing of the prescription components of liver pâté and the use of ricotta cheese and cashew nuts as enriching additives. Replacing 15.0% of chicken liver in the liver pâté with a similar amount of ricotta cheese and using Sous vide technology for preliminary heat treatment contributed to the formation of a slightly sweet taste, more delicate texture and lighter colour of the finished product; reducing the fat content of the finished product by 15% and increasing the ash content (by 6.3%). The practical feasibility of applying the Sous vide technology and using ricotta cheese in the amount of 10.0% and cashew nuts in the amount of 2.5% in the production of dietary liver pâté was established. The use of gentle heat treatment modes and control of the heating rate preserve the nutritional value of the product and its digestibility, reduce moisture loss and improve the organoleptic characteristics of the finished product. The elimination of added frying oil in the recipe of the finished product made it possible to reduce the proportion of fat by 15% and to classify the resulting pâté as a dietary product. A recipe for a liver pâté of increased biological value for dietary use had been developed. All this allowed to create original natural products of high quality and with high consumer properties. Practical recommendations on the production technology of pâtés of increased biological value based on chicken liver are given

Keywords: pâté products; chicken liver; Sous vide technology; quality; dietary product

Introduction

The production of functional foods is an urgent task for the modern food industry. The growing interest of consumers in maintaining and improving their health through the use of healthy foods has led to the development of many new functional foods. Most of them are dairy products, plant-based products, specific fats, and combined meat, vegetable and offal products. Meat and by-products can be modified by adding ingredients

that are beneficial to health while eliminating or reducing components that are considered harmful. The use of these ingredients in meat products provides an opportunity to improve the nutritional and health benefits of their products. Some success has been achieved by being able to balance the composition of ingredients, which enhances the absorption of nutrients. In the production of meat products, innovative thermal

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*Corresponding author

processing methods are hardly ever used to preserve the biologically active substances of raw materials, eliminate the effects of added fat and ensure the functional properties of the resulting products.

Ukrainian food industry was going through an intensive stage of development, introducing innovative technologies and modern equipment. According to A. Antoniv *et al.* (2023), the goal of improving existing processing methods was to ensure the rational use of food resources and reduce raw material losses at all stages of the technological cycle. As noted by E. Choi & W.S. Shin (2020), the use of traditional technologies and equipment for heat treating of raw materials led not only to a loss of weight, aroma and taste of the product, but also to the loss of biologically active components (vitamins, minerals).

Scientists T. Semko *et al.* (2024) noted that the use of Sous vide technology was of interest. Liver pâté was a popular product in the culinary and meat processing industry, characterised by its delicate texture, high nutritional value and rich flavour. Chicken liver was a valuable by-product that contained a large amount of protein (approximately 18-20 g per 100 g of product), fat (4-6 g per 100 g of product, including healthy unsaturated fatty acids), carbohydrates (up to 1-2 g), minerals (Fe, Zn, Cu, Se) and vitamins (A, B, D), and was used to make this dish. In addition to its high nutritional value, the liver is easily absorbed by the body and was also the best source of iron and folic acid, which were necessary for pregnant women, children and people with iron deficiency anaemia. There were also some contraindications, namely high cholesterol, liver or kidney disease, or individual intolerance.

Sous vide technology can be used to make dishes from any product type. As noted by D. Kathuria *et al.* (2022), any raw meat will benefit from this culinary treatment, while vegetables also retained their bright fresh colour and delicate, elastic texture. The standard process for cooking meat products using Sous vide technology was to immerse and hold raw, chilled, vacuum-packed raw meat in water heated to 55-70°C for several hours. According to A. Antoniv (2024), adding marinade to meat in vacuum bags allowed to get a product that was balanced in all its organoleptic properties. The marinade penetrated deep into the fibres of the meat under vacuum during cooking, which enhanced the flavour. This also created the conditions for better absorption of flavours and ingredients from the marinade by the product, resulting in an intense and uniform taste. At the same time, all useful microelements were retained in the product to the maximum extent possible, as during traditional cooking (boiling, stewing, frying), many nutrients are destroyed by high temperatures, oxygen or dissolve in water.

Another important advantage of Sous vide technology was a 15-35% reduction in weight loss of the finished product, as this processing method ensured

even heat distribution over the entire mass of the product, cell membranes were preserved, and, according to S. Zavadlav *et al.* (2020), the juice was retained inside the product. In the process of cooking meat raw materials, volatile flavour compounds were retained in their own juice and minimal nutrient loss was ensured.

Among the disadvantages of this processing method was the possible increase in bacterial contamination, if the cooking temperature and time are not carefully observed, or if the required storage temperature was not ensured after cooking. H. Onyeaka *et al.* (2022b) recommend that, when using Sous vide technology, it was necessary to combine the technological process of product production with additional technological processes to ensure maximum product safety and the destruction of microorganisms in the process of food preparation. The authors argued that the use of Sous vide technology improved both the quality and nutritional value of the product and the shelf life of food products. Researchers H. Onyeaka *et al.* (2022a) indicated the superiority of products in terms of flavour profile compared to products prepared in the traditional way, as the use of Sous vide technology involves the presence of airtight packaging that retained volatile aromatic compounds. Z. Cui *et al.* (2021) cited the following advantages of using Sous vide technology in food preparation: precise temperature control and a significant improvement in quality characteristics such as colour, taste and nutritional value of the finished product.

Given the relevance and benefits of Sous vide technology in food production, this study aimed to integrate vacuum cooking into liver pâté preparation.

Materials and Methods

The object of study in this article was the effect of two heat treatment methods on chicken liver and, in general, on the process of making chicken liver pâté. The following ingredients were used to prepare chicken liver pâté based on a traditional recipe: chicken liver, onions, carrots, sunflower oil, butter, and salt. In addition to studying the effect of heat treatment, the chicken liver pâté was based on ricotta cheese, which is used as an additional ingredient to improve the texture and taste of the pâté, and cashew nuts were added to increase the nutritional value.

The model compositions (MC) contained an almost identical ratio of recipe components (differing only in the presence of olive oil used for frying the ingredients) (Table 1): chicken liver, onion, carrot, ricotta cheese, butter, garlic, cashew nuts, olive oil, ground nutmeg, salt, ground black pepper. All ingredients were purchased at a local supermarket (Luts'k, Ukraine). The preparation of chicken liver pâtés began with the weighing and preparation of the recipe components. The liver was cleaned of bile ducts, veins, and, if necessary, films. Some cooking techniques included soaking the liver in milk or water with salt to eliminate possible

bitterness. This was not necessary for chicken liver, as it was tender, unlike beef or pork liver. It was cut the peeled chicken liver into 2-3 cm pieces, rinsed it under cold water and dried with a paper towel. It was peeled the onions and garlic, rinsed under cold water, cut the onions into strips and the garlic into slices. Also, it was peeled the carrots, rinsed them under cold

running water and grated some of them on a coarse grater for frying, and cut the rest into small pieces for Sous vide. The butter was left at room temperature to soften. The ricotta cheese was drained of excess moisture, cashew nuts were fried in a dry frying pan and chopped with a knife. Once prepared, the recipe ingredients can be used directly in the cooking process.

Table 1. Mass fraction of recipe components in model pâté compositions

Formulation component	Mass fraction of formulation components in MC, wt. %	
	MC1	MC2
Chicken liver	62.0	64.5
Onion	6.0	6.4
Carrot	6.0	6.4
Butter	6.0	6.4
Ricotta cheese	12.0	12.8
Cashew nuts	2.0	2.5
Garlic	0.4	0.4
Ground nutmeg	0.1	0.1
Salt	0.4	0.4
Ground black pepper	0.1	0.1
Olive oil (for frying)	5.0	–

Note: MC1 – cooked by frying; MC2 – cooked using Sous vide technology

Source: developed by the authors

Two heat treatment methods were used for comparison: frying and Sous vide technology:

1. Using the frying method (MC1): first, fry the onions and garlic until transparent in a preheated frying pan (200°C) with olive oil, then add the prepared carrots and sauté until tender. The vegetables were placed on a plate to cool. Next, the prepared chicken liver was fried until cooked for 8-10 min. The frying was done using a ProfiCook PC-DKI 1067 (Germany) tabletop induction cooker. At the end, salt, ground nutmeg and ground black pepper were added. The fried liver was covered with a lid to prevent the surface from getting weathered and allowed to cool. The cooled vegetables and chicken liver, ricotta cheese, and softened butter were placed in a bowl and ground using a Liberton LHB-0312 (China)

immersion blender until a uniform consistency was obtained without lumps of individual recipe ingredients. Cashew nuts were added to the pâté and mixed with a spoon. The finished pâté was spread on a shallow dinner plate using a moulding ring.

2. Using Sous vide technology (MC2): the prepared vegetables (onions, carrots, garlic) and chicken were placed separately in special plastic bags and vacuumed in a ProfiCook PC-VK 1134 (Germany) vacuum packer, which extracted excess air and sealed the open edges. For this method of heat treatment, a Sous vide Sirman Softcooker S GN1/1 (Italy) was used and two programmes were set up to cook vegetables and chicken liver separately, as they had different temperature conditions and cooking times, as shown in Table 2.

Table 2. Temperature conditions for different products

Product	Temperature, °C	Cooking time
Beef	54...56	1...2 hours
Chicken breast	60...65	1...2 hours
Chicken liver	65	45 min
Pork	58...70	1...4 hours
Fish (salmon, tuna)	50...52	30...60 min
Vegetables (carrots, potatoes)	85...90	1...2 hours

Source: based on D. Kathuria et al. (2022)

After cooking in the Sous vide apparatus, the bags of vegetables and chicken liver were cooled to room temperature. After cooling, the contents of the bags were opened, placed in a bowl, and soft butter, ricotta

cheese, salt, ground nutmeg, and ground black pepper were added. Then the ingredients were ground using a Liberton LHB-0312 (China) immersion blender until a uniform consistency was obtained without lumps of

individual recipe ingredients. Cashew nuts were added to the pâté and mixed with a spoon. The finished pâté was spread on a shallow dinner plate using a moulding ring.

The finished chicken liver pâté samples were examined for physicochemical parameters, in particular, the moisture content was determined according to DSTU ISO 1442:2005 (2007), namely, the samples were dried to a constant weight at a temperature of $103^{\circ}\text{C} \pm 2^{\circ}\text{C}$; the mass fraction of fat according to DSTU ISO 1443:2005 (2007), according to the Soxhlet method, which used the extraction of fat from a dried product sample with a solvent and then removing the solvent.

A comparative determination of losses during heat treatment in samples of fried liver and liver cooked using the Sous vide technology was performed as the ratio of the mass of a piece of liver before and after heat treatment, expressed as a percentage, as well as the total losses of the finished pâté in relation to the mass of raw materials. For organoleptic evaluation, a standard method was applied using the method of quantitative descriptive analysis (QDA). The expert evaluation of QDA was carried out using a point scale, according to which the organoleptic characteristics of the finished products were evaluated by the tasting commission of the Department of Food Technology and Chemistry of LNTU, which consisted of 10 people. To ensure the objectivity and reliability of the results, the experts, who tasted the product were informed about the evaluation methodology in advance. The evaluation was based on the following parameters: appearance, colour, consistency, taste and smell. Each indicator was evaluated on a scale to obtain generalised data on the quality of the samples.

Statistical processing of the experimental data and the calculation part were performed using the built-in functions of Microsoft Excel 365. The study was conducted in accordance with the requirements of The Declaration of Helsinki (2013).

Results and Discussion

During the study, a comprehensive analysis of pâté samples was carried out, evaluating their physicochemical parameters and organoleptic properties. The methods used allowed to determine the impact of Sous vide technology on the quality and nutritional value of the product. The results obtained became the basis for the development of optimal production modes that

ensure high nutritional value and safety of the finished product. For all cooking methods, the same set of products and spices were used: chicken liver, onions, carrots, butter, ricotta cheese, cashew nuts, garlic, ground nutmeg, salt, ground black pepper and extra virgin olive oil (only for the frying method) (Fig. 1).



Figure 1. Prepared ingredients for the preparation of pâté samples

Note: a – frying (MC1); b – cooking using Sous vide technology (MC2)
Source: developed by the authors

Table 3 contained a scoring system for assessing the organoleptic characteristics of ready-made chicken liver pâté samples. It consisted of five main columns: group descriptor (general evaluation category), single descriptor (specific parameter), verbal description (qualitative characteristic of the attribute's intensity), and point scale (numerical rating system). Several key evaluation categories were presented in this table. The "Appearance" parameter included only one descriptor – "Colour" – which was rated on a scale from 1 (dark brown) to 5 (light cream). The "Smell" parameter determined the degree of preservation of the liver's characteristic aroma, ranging from 1 (none) to 5 (significantly pronounced). Similarly, the "Taste" parameter was assessed based on the intensity of the liver's flavour retention, from 1 (none) to 5 (significantly pronounced). The "Consistency" category included two parameters: "Density" and "Tenderness". Density was rated from "very soft" (1 point) to "dense" (5 points), while tenderness was assessed from "rigid" (1 point) to "delicate" (5 points). Also, the Table 3 provided a standardised evaluation system that allowed for an objective analysis of the organoleptic characteristics of chicken liver pâté. The use of numerical scores alongside verbal descriptions helped to unify the assessment process and ensured the comparability of expert tasting results.

Table 3. Scoring scale for determining the organoleptic characteristics of samples of ready-made chicken liver pâté

Group descriptor	Single descriptor	Verbal description	Points
Appearance	Colour	Dark brown	1.0
		Dark orange with a reddish tint	2.0
		Light brown with a reddish tint	3.0
		Light brown	4.0
		Light cream	5.0

Table 3. Continued

Group descriptor	Single descriptor	Verbal description	Points
Smell	The degree of preservation of the smell inherent in the product (liver)	None	1.0
		Barely perceptible	2.0
		Slightly pronounced	3.0
		Moderately pronounced	4.0
		Significantly pronounced	5.0
Taste	The degree of preservation of the taste inherent in the product (liver)	None	1.0
		Barely perceptible	2.0
		Slightly pronounced	3.0
		Moderately pronounced	4.0
		Significantly pronounced	5.0
Consistency	Density	Very soft	1.0
		Soft	2.0
		Mild	3.0
		Sealed	4.0
		Dense	5.0
	Tenderness	Rigid	1.0
		Slightly rigid	2.0
		Very delicate, close to smeary	3.0
		Tenderness is not expressed intensely enough	4.0
		Delicate	5.0

Source: developed by the authors

In Figure 2 samples of chicken liver were shown after the application of two heat treatment methods. Sample in Figure 2, a was liver pan-fried, which provided intense thermal action and the formation of a crust. Sample in Figure 2, b was liver cooked using the Sous vide technique, which helped preserve a more delicate structure and the natural colour of the product. The analysis of visual characteristics allowed for the evaluation of changes in colour, structure, and the degree of thermal processing, which affected the further organoleptic properties of the finished pâté. Figure 3 displayed finished pâté samples made from previously heat-treated chicken liver using the two methods. Sample Figure 3, a was pâté made from pan-fried liver (method MC1), which had a darker shade and a denser texture. Sample Figure 3, b was pâté made from liver cooked using the Sous vide technique (method MC2), which had a lighter colour and a more delicate consistency. Special attention was given to the consistency uniformity during the analysis, as it was an important indicator of quality and consumer properties of the pâté.

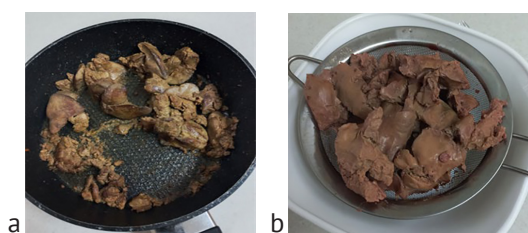


Figure 2. The appearance of the prepared chicken liver samples after heat treatment

Note: a – frying; b – cooking by Sous vide technology

Source: developed by the authors



Figure 3. The appearance of the finished samples of chicken liver pâtés

Note: a – frying (MC1); b – cooking using Sous vide technology (MC2)

Source: developed by the authors

The results of the organoleptic study of chicken liver pâtés made by frying and using Sous vide technology were presented in the form of organoleptic profiles in Figure 4. The analysis of the profiles allowed to visualise differences in the perception of key quality indicators such as texture, aroma, taste, and appearance. The pâté prepared using Sous vide technology, presented in Figure 4, b demonstrated a more uniform texture, enhanced flavour retention, and a more delicate aroma, which was often preferred in dietary products. On the other hand, the pâté made by frying, presented in Figure 4, a tended to have a more pronounced and slightly more intense flavour due to the Maillard reaction, but the texture was less consistent, and there was a noticeable difference in moistness. The data obtained allowed to determine the advantages of each cooking method, with Sous vide technology providing a more controlled and gentle cooking environment that enhanced the preservation of the nutritional and sensory qualities of the pâté. This justified the feasibility of using Sous vide technology

to improve the production of dietary pâtés, offering a healthier and more refined product for consumers.

As can be seen from Figure 4, during the tasting, the highest number of points was given to the sample of chicken liver pâté made using the Sous vide technology, which was assessed by experts as the sample with the most acceptable organoleptic characteristics,

which was consistent by J. Ruiz-Carrascal *et al.* (2019). The main changes occur with the organoleptic indicator “Consistency”, which is consistent with the results of physicochemical studies. The individual descriptors “Density” and “Tenderness”, which are part of the group descriptor “Consistency”, directly depend on the water content of the product samples after heat treatment.

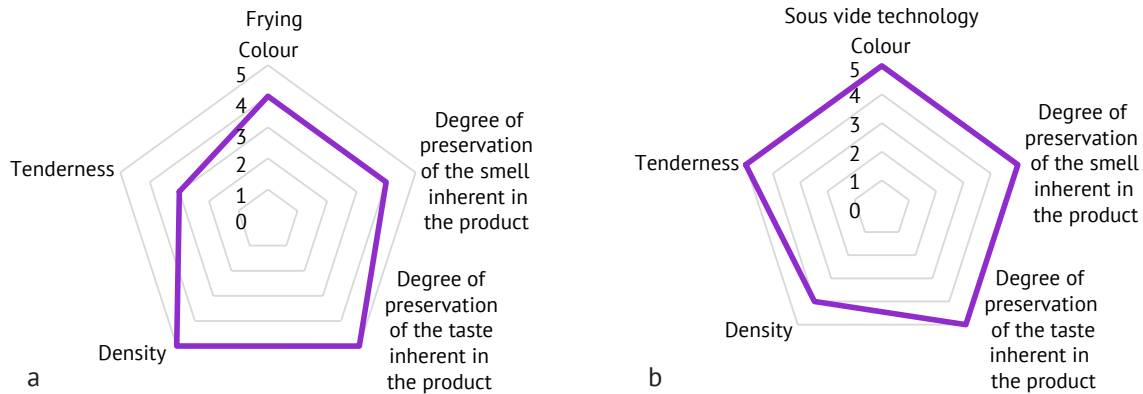


Figure 4. Organoleptic profiles of finished samples of chicken liver pâtés using different heat treatment methods

Note: a – frying (MC1); b – cooking using Sous vide technology (MC2)

Source: developed by the authors

The colour of the finished product is shaped by the presence of natural pigments in the liver muscle tissue, which include carotenoids, melanin's, haemoglobin and some other chemical compounds. Scientists I. Djekic *et al.* (2021) noted in their works that products cooked at 60°C have the most pronounced reddening, and an increase in temperature and cooking time leads to yellowing of the product. During traditional heat treatment, a significant portion of the pigments sensitive to light, heat and oxygen is destroyed, and a small portion of them is converted to oil during frying, which is why experts described the colour of such liver as dark.

Using the Sous vide technology, it is possible to avoid a significant change in the finished colour of the product, thus creating a positive consumer assessment. In addition, vacuum-packed products can be stored after heat treatment until further processing, which helps to preserve the properties of semi-finished products with minimal microbiological contamination. S. Yıkmiş *et al.* (2018) noted in their work that if the temperature is maintained at 1-4°C after cooking, the product can be

stored for a long period of time, ensuring rapid cooling after thermal processing. The authors H.C.J. Godfray *et al.* (2018) and E. Pogorzelska-Nowicka *et al.* (2018) had shown that processing and storage in vacuum packaging with low oxygen permeability eliminates the influence of air on the product, which in turn provides much better texture, colour, taste and microbiological stability for a much longer time than a product that is not packaged under vacuum.

Sous vide cooking ensures precise temperature control, which guarantees even cooking of the raw material. The semi-finished product is tender, juicy, and has a homogeneous texture without overdried or undercooked areas. Also, cooking at low temperatures reduces the loss of important nutrients, vitamins and trace elements in the finished product, which often occurs during traditional heat treatment methods, such as frying. The liver pâtés made using different types of heat treatment were investigated for physicochemical parameters: moisture, fat and ash content. The results of physicochemical studies of model pâté samples in a comparative aspect were grouped in Table 4.

Table 4. Results of physicochemical tests of model pâté samples

Indicator	Research results	
	MC1	MC2
Freshly prepared samples		
Mass fraction of moisture, %	42.7 ± 0.6	46.8 ± 0.5
Mass fraction of fat, %	32.7 ± 0.9	23.7 ± 0.3
Mass fraction of ash, %	1.45 ± 0.1	1.63 ± 0.2
Samples after 24 hours of storage		
Mass fraction of moisture, %	41.7 ± 0.7	44.0 ± 0.7

Source: developed by the authors

Tests of the analysed liver pâté samples showed that the mass fractions of ash were in the same quantitative range, and the mass fractions of moisture in the MK2 samples were 11.6% higher than in the MK1 samples. According to N.T. Elsharawy *et al.* (2018), liver pâtés usually contained about 25% animal fats, which were mainly saturated fatty acids. Consumption of animal fats can be a risk factor for diabetes, obesity, cardiovascular and other diseases, as well as provoke an increase in cholesterol. The data on the fat content of the finished

product allowed to control the information on the shelf life. Researchers Y. Zhu *et al.* (2022) emphasised that the lower the fat content in the finished product, the slower the oxidation processes and, consequently, the spoilage. Also, one of the positive effects of the Sous vide technology was a higher moisture content in the finished product and a reduction in tissue juice losses compared to the product obtained by traditional heat treatment. The results of studies of the amount of tissue juice loss during heat treatment were presented in Table 5.

Table 5. Weight loss during different methods of liver heat treatment

Heat treatment method	Weight of pieces before heat treatment, g	Weight of pieces after heat treatment, g	Losses during heat treatment, %
Frying	34.55-52.27	24.31-41.15	29.6
Sous vide	40.56-55.20	35.07-51.37	13.5

Source: developed by the authors

Thus, the use of Sous vide allowed maintaining such product quality indicators as juiciness, taste and aroma, nutritional value at the highest possible level compared to traditional heat treatment; increasing the bioavailability of various nutrients to the body; increasing the shelf life of products by reducing the fat

content of the finished product; reducing weight loss during the technological process; and reducing lipid oxidation. Therefore, for the technological process of production of liver pâté with cashew nuts, a technological flow chart was developed, which was shown in Figure 5.

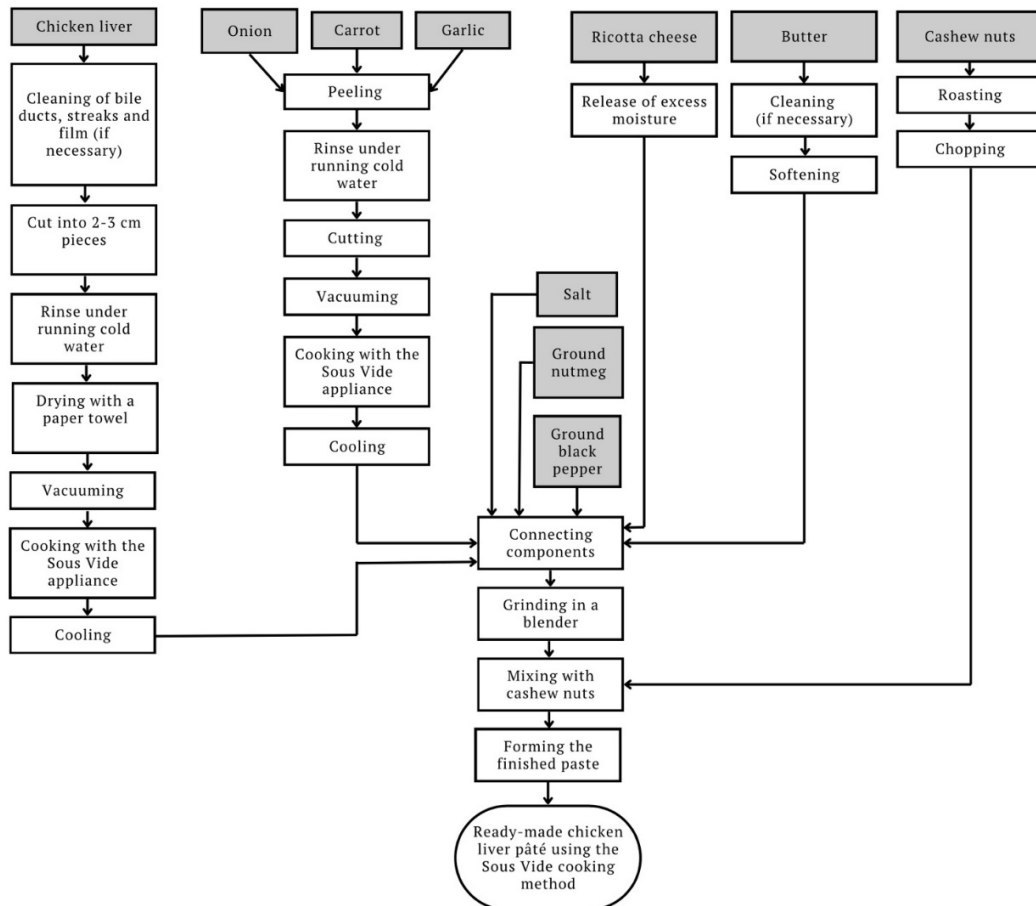


Figure 5. Technological scheme of cooking chicken liver pâté using the Sous vide cooking method

Source: developed by the authors

So, the technological process of preparing chicken liver pâté using the Sous vide method consisted of several key stages. First, the ingredients were prepared: the chicken liver was cleaned of bile ducts, veins, and membranes, then cut into pieces, rinsed in cold water, and dried. The vegetables were cleaned separately, washed, and chopped. Next, the prepared products were vacuum sealed into bags: the liver separately, and the vegetables separately. The vacuum-sealed ingredients were placed in the Sous vide machine, where they undergo heat treatment at a temperature of 65°C for 1-1.5 hours. After cooking, the products were cooled. At the stage of forming the pâté, all components were combined, and spices such as salt, black pepper, and nutmeg were added. The mixture was blended into a smooth, creamy consistency, after which chopped roasted cashews were added. The resulting mass was shaped into the desired structure and cooled.

A significant number of authors noted that one of the most important qualities of the finished product, when using the Sous vide technology was its appearance, which, in turn, was a consumer preference. In particular, the results of the assessment of the colour characteristics of meat raw materials were noted in the works of many scientists. A. Kicińska *et al.* (2019) focused on the impact of Sous vide cooking on the colour retention of different types of meat, emphasising that the controlled environment of this technology helped preserve the natural colour of the meat. The author noted that Sous vide cooking, when applied to poultry and red meat, prevented the typical colour loss seen with traditional cooking methods. Similarly, K. Jeong *et al.* (2018) investigated the effects of Sous vide technology on the appearance of various meat products, particularly pork and beef. They concluded that the low-temperature cooking environment of Sous vide helped preserve the myoglobin content in the meat, which was responsible for its red colour. B. Uttaro *et al.* (2019) also conducted research examining, how Sous vide technology affected the colour and texture of different types of meat. The author found that the improvement in colour quality was related to the precise control of temperature and cooking time, which prevented the formation of undesirable colour changes typically seen in overcooked products or heat-induced browning. Additionally, Y. Ding *et al.* (2018) conducted research to determine the effect of temperature and the duration of Sous vide processing on the profile of volatile compounds in pork ham. Their study showed that the colour of the meat depended not only on the temperature and cooking time, but also on the retention of specific volatile compounds that affected the aroma and overall sensory experience. The use of equipment for the production of liver pâté using the

Sous vide technology does not require significant skills, or constant monitoring, and was easy to operate and, as noted by A. Głuchowski *et al.* (2020), was a common way of producing products in craft production.

So, these studies underlined the importance of Sous vide technology in improving the visual and sensory characteristics of meat products, with particular emphasis on colour preservation, which directly influenced consumer preferences.

Conclusions

As a result of the conducted research, the advantages of using Sous vide technology for the production of liver pâté with the addition of cashew nuts were established, namely the improvement of organoleptic indicators, which was ensured by the maximum disclosure of the true flavours of the product, preservation of its consistency, uniformity and nutrients. And since the products were made without preservatives, stabilisers, or thickeners, the result is dietary nutrition by reducing the amount of salt and saturated fats, reduced weight losses (increased yield) and increase in the nutritional and biological value of dishes. Microbiological contamination was prevented, as the manufacturing process ensured enhanced control of production, losses and quality of the finished product. Also, it was determined data about extended shelf life of semi-finished products, as products made using Sous vide technology were protected by vacuum packaging from external contaminants and pathogenic microorganisms and can be stored for a long time at a temperature of 0 to +3°C. In this study was noted that reduced cooking time for semi-finished products, which, in turn, led to increased efficiency and optimisation of production in the conditions of a craft enterprise. Such an organisation of the technological process allowed for a rational distribution of personnel employment during the working day.

The priority direction for further development of technological processes in the production of pâté products is the search for technologies for the production of products of increased nutritional and biological value using non-traditional additives, which will allow expanding the overall range of functional food.

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None.

Conflict of Interest

None.

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Удосконалення технології виробництва дієтичних паштетів

Ірина Тараймович

Доктор філософії, доцент
Луцький національний технічний університет
43018, вул. Львівська, 75, м. Луцьк, Україна
<https://orcid.org/0000-0003-4129-2671>

Тамара Сидорук

Асистент
Луцький національний технічний університет
43018, вул. Львівська, 75, м. Луцьк, Україна
<https://orcid.org/0009-0006-9008-9556>

Анотація. Метою дослідження було удосконалення технології виробництва дієтичних паштетів шляхом застосування технології *Sous vide*, що дозволяє зберегти максимальну кількість поживних речовин, покращити органолептичні властивості продукту, підвищити його безпечність та збільшити термін зберігання. У роботі було досліджено можливість використання технології *Sous vide* для попередньої термічної обробки рецептурних компонентів печінкового паштету, а також застосування сиру рікота та кеш'ю як збагачувальних добавок. Заміна 15,0 % курячої печінки в складі паштету на таку ж кількість сиру рікота та використання технології *Sous vide* для попередньої теплової обробки сприяли формуванню дещо солодкуватого смаку, більш ніжної текстури та світлішого кольору готового продукту; зниженню вмісту жиру в готовому продукті на 15 % та підвищенню зольності (на 6,3 %). Встановлено практичну доцільність застосування технології *Sous vide* і використання сиру рікота в кількості 10,0 % та горіхів кеш'ю в кількості 2,5 % у виробництві дієтичного печінкового паштету. Використання щадних режимів теплової обробки та контроль швидкості нагрівання дозволяють зберігати поживну цінність продукту та його засвоюваність, зменшувати втрати вологи та покращувати органолептичні характеристики готового продукту. Виключення доданої олії для смаження з рецептури дозволило знизити вміст жиру на 15 % та класифікувати одержаний паштет як дієтичний продукт. Розроблено рецептуру печінкового паштету підвищеної біологічної цінності для дієтичного використання. Усе це дозволило створити оригінальні натуральні продукти високої якості та з високими споживчими властивостями. Надано практичні рекомендації щодо технології виробництва паштетів підвищеної біологічної цінності на основі курячої печінки

Ключові слова: паштетна продукція; куряча печінка; технологія *Sous vide*; якість; дієтичний продукт