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Assessment of the quality and nutritional value of organic dried sausages

Maryna Khomenko
PhD in Agricultural Sciences
National University of Life and Environmental Sciences of Ukraine
03041, 15 Heroiv Oborony Str., Kyiv, Ukraine
https://orcid.org/0000-0001-7023-3676

Nataliia Slobodianiuk
PhD in Agricultural Sciences, Associate Professor
National University of Life and Environmental Sciences of Ukraine
03041, 15 Heroiv Oborony Str., Kyiv, Ukraine
https://orcid.org/0000-0002-7724-2919

Alina Omelian*
National University of Life and Environmental Sciences of Ukraine
03041, 15 Heroiv Oborony Str., Kyiv, Ukraine
https://orcid.org/0000-0001-9004-5250

Mykola Seba
PhD in Agricultural Sciences, Associate Professor
National University of Life and Environmental Sciences of Ukraine
03041, 15 Heroiv Oborony Str., Kyiv, Ukraine
https://orcid.org/0000-0001-9696-934X

Inna Briukhachova
PhD in of Agricultural Sciences
Separate Department of National University of Bioresources and Natural Use of Ukraine
"Nizhyn Agrotechnical Institute"
16600, 10 Shevchenko Str, Nizhyn, Chernihiv region, Ukraine
https://orcid.org/0000-0003-3098-8200

Abstract. Organic production, which is focused on the production of high-quality, high-nutritional and environmentally friendly food products, is becoming increasingly relevant in developed countries, in particular, Ukraine. The purpose of the study is to determine the quality and nutritional value of organic dried sausages. For its implementation, physico-chemical, microbiological, organoleptic, and statistical research methods and approaches to abstraction, synthesis, analysis, systematisation, and generalisation of data are used. Three types of sausages are selected for the study: Sample 1, Sample 2, and Sample 3. As a result of the study, it is identified that all indicators of the investigated samples are controlled and meet the requirements of regulatory documents. During the organoleptic assessment, it is identified that all the investigated samples had a dry surface without damage, an elastic consistency, and a pleasant smell with the aroma of

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*Corresponding author

spices. The difference was observed only in colour, it was from dark pink to dark red, which is due to different recipes of sausages. Microbiological analysis of the products shows that there was no pathogenic microflora in all samples. According to the results of the physico-chemical analysis, it is identified that the content of moisture, salt, and sodium nitrite was within the normal range. The difference was observed in protein and fat content. The first sample of sausage showed the lowest protein content (14%), while the second and third samples showed 16.2% and 19.2%, respectively. Substantial differences were also observed in the fat content of the finished product. The lowest level of this indicator was in Sample 3 and was 6.4%, which is 22.8% and 13.6% lower compared to Sample 1 and Sample 2. This difference in protein content is due to the different composition of raw materials of the investigated samples. The lowest caloric content (134 kcal) is identified in Sample 3 sausage, which had the highest protein levels and the lowest fat content. The results obtained practically allow assessing the dietary characteristics of the investigated assortment and orient the consumer in choosing a product in accordance with their individual preferences and needs, characteristics, and nature of the diet

Keywords: sausage fermentation, microbiological indicators, protein mass fraction, fat mass fraction, sodium nitrite, organoleptic assessment, pathogenic microorganisms

Introduction

In recent years, the problem of a clean environment in the world is quite relevant among more than 150 countries, including Ukraine. Due to the deterioration of the environmental situation and other adverse factors in people's lives, the problem of improving the safety of meat, in particular, sausage products, is of particular importance. Today, providing the population with high-quality, environmentally friendly and safe food products is quite an urgent task, due to a number of reasons, such as: environmental pollution, expanding the range of food products, creating new and improving existing production technologies, using food additives, etc. (Lupenko, 2013).

Every year in the developed countries of the world, the demand for organic products is growing, which is associated with a high level of consciousness in the population. Society is interested in healthy and safe nutrition, which is manifested by concern for health and the environment. The European Green Deal (Mission of Ukraine to the ..., 2021) is central to the policy agenda of the European Commission. Its main goal is a sustainable, climate-neutral Europe by 2050 (European Green Deal, 2021). The European Green Deal (2021) highlights that it is extremely important to manage the transition to a more sustainable food system aimed at combating climate change, protecting the environment, and preserving biodiversity. As part of its efforts to promote organic production, the European Commission is implementing large-scale activities in the production and marketing of food chains and food establishments (Communication from the Commission..., 2021). For example, Copenhagen became the first city where the share of organic food in public catering establishments reached 100%. Vienna has a network of urban organic gardens with an area of about 860 hectares, which also supply food to public catering establishments, in particular, to nurseries. Public catering establishments in Rome serve approximately 1 million organic meals a day (Communication from the Commission..., 2021). This shows the determination of Europe to switch to full organic production, which cannot be ignored by Ukraine, which is seeking official EU membership.

The organisation of organic production in Ukraine is relatively just beginning its activity. The Ukrainian market is not crowded with organic products, but still, the consumer can find them among the affordable assortment. At the beginning of the development of Ukrainian organic production, it is important to pay special attention to the examination of technologies and products directly, make sure that novice producers are conscientious and that organic business is effective. In addition, in the context of the desire of Ukraine to officially become a member of the European Union, it is important for researchers to focus not just on technology or production aspects. The main problem of the organic segment in Ukraine is the restructuring of capacities for product safety. One of the ways to solve it is to examine the Ukrainian organic product, namely, to determine the quality and nutritional value indicators, to identify and eliminate shortcomings. In the absence of the latter, it is necessary to publish the success of existing Ukrainian organic production facilities to popularise and develop the industry. It is important to scientifically substantiate the feasibility of conducting organic production, which encourages the change in the concept of conventional production towards organic.

Consumers of sausage products are almost 90% of the total population of Ukraine. Nine out of ten Ukrainians consume sausage, so their production is one of the most important in the meat industry. Due to advances in biotechnology, it is possible to obtain environmentally friendly and high-quality meat products with new sustainable quality indicators (Shevchik *et al.*, 2018).

Fermentation is one of the most relevant technologies among the methods of producing healthy food (Pilevar & Hossein, 2017). Under appropriate temperature and relative humidity conditions, fermented sausages are made by combining microbiological, biochemical, and physical activity. As a result of these important processes, the taste properties of the product change during maturation. Fermentation not only increases the shelf life and microbiological safety of products but also increases their digestibility (Caplice & Fitzgerald, 1999).

In the composition of fermented sausages, the main part is meat (at least 70-80%) (DSTU 4427:2005, 2006), which is a source of proteins, B vitamins, minerals, and

biologically active substances that play an important role in human nutrition, as they are involved in metabolism, growth, and development of the body (Tsiprian *et al*., 2007). Due to the fact that dried sausages are not subjected to heat treatment, the content of all nutrients in the finished product remains unchanged. Thus, the fermentation of sausages allows not only getting products that have a high nutritional value but also have a positive impact on human health.

In addition to technology, the quality of raw materials also plays an equally important role in obtaining high-quality sausage products. Due to the fact that the internal market is overflowing with low-quality food products, consumers are increasingly inclined to buy organic products. According to the results of the study (DSTU 4427:2005, 2006), about 7850 thousand kg of organic food products of Ukrainian production were sold on the internal market of Ukraine in 2020, which is more than 709 million UAH, which is the equivalent of 25.1 million US dollars at the NBU exchange rate as of 31.12.2020. One of the prerequisites for the development of organic production was also the promotion of a healthy lifestyle. In this regard, manufacturers are faced with the task of producing high-quality and environmentally friendly food products (Lupenko, 2013).

The analysis of papers available in the public space showed the interest of researchers in finding alternative components of sausages to replace conventional ones. Often, the goal is to develop cheaper, more cost-effective recipes while maintaining the quality of the product. Researchers from the Philippines C.J.A. Domingo, K.J. Sartagoda, N.J.C. Catandijan, and N.K. Yasin (2023) conducted a study on the introduction of vegetable fat into the recipe of sausages. The Chinese researchers also became interested in vegetable fat substitutes in sausages. C. Li, W. Xie, X. Zhang, J. Liu, M. Zhang, J. Shao (2023) showed the feasibility of using pea protein – chitosan, as a new fat substitute, to improve the quality of pork sausages. There are also studies on the organic production of raw meat using natural growth stimulants in animal feeding (Fraz *et al*., 2023). In the context of organic production of boiled meat products and sausages, researchers focus on replacing undesirable acidifiers (Chattopadhyay *et al*., 2023), preservatives (Yaghoubi *et al*., 2023), and emulsifiers (Adiamo *et al*., 2023) of a chemical nature. Despite the fact that the use of $NaNO_2$ to preserve the attractive commercial colour of meat products is still allowed in organic production, Turkish (Serdaroglu *et al*., 2023) and Polish (Szymański *et al*., 2023) researchers have begun work to replace it due to its high toxicity. M. Serdaroğlu, H. Can, B. Sarı, H.S. Kavuşan, F.M. Yılmaz (2023) published interesting results of using natural sources of nitrites from arugula and barberry extract in the production of heat-treated fermented sausages. Polish researchers R. Szymański, V. Łaszkiewicz, A. Kern-Jędrychowska, U. Siekierko, D. Kołożyn-Krajewska (2023) were interested in the ability of enzymes to perform the function of forming the desired colour in boiled meat products.

In Ukraine today, there is not enough scientific literature on the production of organic sausages, which is due to the beginning of its introduction. The scientific community should pay attention to this because the experimental justification of the feasibility of producing organic sausages can be a catalyst in the development of this food area.

The purpose of the study is the justification of the feasibility of producing organic dried sausages by determining their quality and nutritional value indicators for meeting the demand formed by a wide range of consumers with different nutritional needs.

Materials and Methods

The study was conducted in 2021 based on the Enterprise LLC "Organic Meat Product", which is part of the vertically integrated company PE "Galex Agro". All products of the company are certified by the international certification company Organic Standard LLC and meet the requirements of Bio Suisse and Naturland (Organic Meat Product, 2021). Organic Meat Product LLC produces products from its own raw materials, which are also certified as organic. From the range of sausages that are produced at this enterprise, three types of dried sausages were selected for research: Sample 1, Sample 2, and Sample 3. Organoleptic, microbiological, and physico-chemical analyses were performed in the studies.

First, an external inspection of each type of product was conducted. 10% of the total amount of products from the batch were selected (50 kg). For the following experiments, units of products were selected: 2 units for each experiment (DSTU 4427:2005, 2006).

For organoleptic studies, 2 single samples were first taken from different units of products weighing 400-500 g, from which a total sample of 800-1000 g was formed. During the organoleptic study, the following indicators were evaluated: appearance, consistency, type of minced meat (or sausage product) on the cut, taste, and smell. The assessment was conducted visually in accordance with DSTU 4427:2005 (2006).

A tasting assessment of compliance of dried sausages with the standard was conducted according to a five-point system. According to it, the main quality indicators are: appearance, appearance and colour on the cut, smell (aroma), taste, consistency (tenderness, hardness), and juiciness. Each indicator has 5 degrees of quality: for excellent quality – 5, very good, good – 4, average, acceptable quality – 3, acceptable quality, but not desirable – 2, unacceptable quality – 1.

For microbiological studies, 2 single samples with a length of 15 cm each from the edge of the sausage were taken with sterile instruments, which makes up the total sample. In accordance with the recommendations, the following indicators were evaluated: pathogenic microorganisms, in particular, bacteria of the genus *Salmonella* (DSTU EN 12824:2004, 2005); Escherichia coli bacteria (coliforms) (DSTU GOST 30726-2002, 2003); sulfitreducing clostridia (DSTU ISO 7937:2006, 2007); L. *Monocytogenes*; S. *Aureus* (DSTU ISO 11290-1:2003, 2004; DSTU ISO 6888-1:2003, 2004).

For physical and chemical studies, 2 single samples were first taken from different units of products weighing 200-250 g, and then a total sample of 400-500 g was formed (for each type of product separately) (DSTU 4427:2005,

2006). The mass fraction of fat, protein, and moisture was determined using Food Scan Meat Analyser. The salt concentration was determined by the Mohr method (DSTU 4427:2005, 2006), and the content of nitrites using the colourimetric method. The obtained research results are processed by statistical analysis methods.

The approaches of abstraction, analysis, synthesis, systematisation, and generalisation of data were used to conduct general scientific research. Abstraction included: fixing the specific features and principles of organic sausage production technology; forming and describing analytical, synthetic, and predictive information of the authors. Methods of analysis and synthesis were used in close unity, which allowed isolating and recording important data that were in the array of available information. In addition, the synthesis approach was actively used to describe the results of the observations of this study. Systematisation and generalisation of data were used both for logical and consistent presentation of the processed information, and for forming conclusions based on research materials (Danilyan & Dzoban, 2019).

Results and Discussion

During the quality assessment, first of all, the composition of the fermented sausages was examined. The composition of the sausages of Sample 1, organic top grade, includes: organic beef of the highest and first grade, organic low-fat and semi-fat pork, organic spine lard, nitrite-salt mixture, and organic spice blend. The composition of Sample 2, organic, top grade includes: premium organic beef, organic spine lard, nitrite-salt blend, and organic spice blend. The composition of Sample 3 sausage from organic beef of the top grade includes: organic beef of the highest grade (50%), organic beef of the first grade (50%), nitrite-salt mixture, organic sugar, organic ground black pepper, organic garlic, organic ground cinnamon. For the production of sausages, beef and pork of own production certified as organic are used. The organoleptic evaluation of sausages is shown in Table 1.

Table 1. *Organoleptic evaluation of organic sausages*

Parameter	Sample 1	Sample 2	Sample 3
Appearance	Sausages have a clean, dry surface, no damage or deposits of minced meat	The product is rounded in shape, the surface is dry and clean without damage	The products are square in shape, have a dry surface without damage or deposits of minced meat
Consistency	Elastic	Elastic	Elastic
Type of minced meat on the cut	The colour of minced meat is from dark pink to dark red without grey spots and voids	Dark red without grey spots and voids, minced meat is evenly mixed with the inclusion of small pieces of fat	Dark red without grey spots and cavities, minced meat evenly mixed
Taste and smell	Characteristic of this type of product with the aroma of spices, moderately salted	The smell is pleasant with the aroma of spices, moderately salty, without foreign taste and smell	Characteristic of this product with the aroma of spices, moderately salty without foreign taste

The results of the study showed that all the sausages were fresh, had a dry, whole surface without damage, deposits of minced meat, fat, mould, or mucus. In all samples on the section, both in the centre and on the periphery, the consistency was elastic and dense, the minced meat looked evenly mixed and without grey spots, the difference was in colour, fat content, and size. Sample 3 differed the moost, it was dark red in colour, which is due to the fact that the composition of this product includes only beef, according to the recipe, the composition of this sausage does not include lard and pork. The other two samples had a colour from dark pink to red with the inclusion of lard, in the sausage Sample 2 pieces of lard were the largest. The smell in all three samples was pleasant with the aroma of spices, in Sample 3 it was more pronounced.

Tasting assessment of experimental sausages was conducted on a 5-point scale. Results of the examination (Fig. 1) indicate that the samples meet the regulatory organoleptic parameters of the standard.

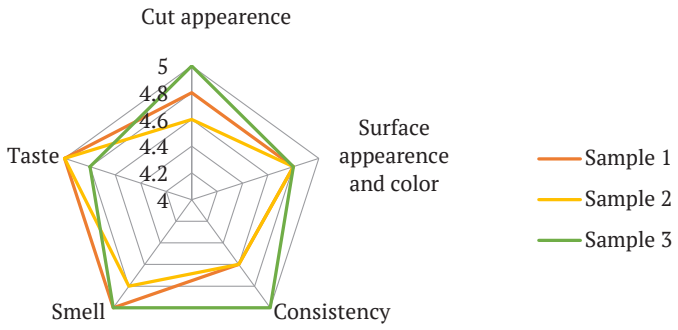

Figure 1. Tasting evaluation of experimental sausages

Sample 3 received the highest scores in terms of smell, cut appearance, and consistency.

The microbiological stability of fermented sausages depends on compliance with all technological operations during production and a number of factors that allow obtaining a high-quality and safe product. According to the results of numerous studies, it is known that the process of maturation of dried sausages is based on the vital activity of milk bacteria. These microorganisms are used as starter cultures that promote meat fermentation (Caplice and Fitzgerald, 1999). Lactic acid bacteria increase the safety and stability of the product, stabilise the colour, prevent rancidity, and release various aromatic substances. During the maturation of the product, they inhibit the development of unwanted harmful microflora (Papamanoli *et al.*, 2003; Francesca *et al.*, 2013). Therefore, a microbiological study was conducted, the results of which are shown in Table 2.

Table 2. *Microbiological quality indicators of dried sausages*

Parameter	Sample 1	Sample 2	Sample 3	Control methods
Pathogenic microorganisms, in particular, bacteria of the *Salmonella* genus	Not detected	Not detected	Not detected	DSTU EN 12824:3004
Escherichia coli bacteria (coliforms) in 0.01 g	Not detected	Not detected	Not detected	DSTU GOST 30726-2002
Sulfitreducing clostridium, in 0.01 g	Not detected	Not detected	Not detected	DSTU ISO 7937:2006
L. monocytogenes, 25.0 g	Not detected	Not detected	Not detected	DSTU ISO 11290-1:2003
S. aureus, d 1.0 g	Not detected	Not detected	Not detected	DSTU ISO 6888-1:2003

According to the results of the study, it was identified that in terms of microbiological indicators, all three samples met the standards of the current regulatory documentation, which is shown in Table 2. The finished product does not contain bacteria of the Escherichia coli group, *Salmonella* genus, sulfitreducing clostridium, L. *Monocytogenes*, or S. *Aureus*. Based on the results of microbiological analysis, it can be argued that the enterprise where the samples of the investigated sausages were made adhere to technological processes at all stages of maturation of dried sausages.

While examining sausages, in addition to microbiological analysis, it was necessary to conduct a physico-chemical analysis of the finished product, which will give an idea of the quality of the product, nutritional value, which depend on the ratio, moisture, fat, protein, salt, and sodium nitrite. The research results are shown in Table 3.

Table 3. *Physical and chemical parameters of dried sausages, %*

Parameter	Sample 1	Sample 2	Sample 3	Control methods
Mass fraction of moisture	27.6±1.13	28.2±0.92	26.9±1.32	DSTU 4427:2005
Mass fraction of table salt	5.76±0.20	5.66±0.21	5.75±0.22	
Mass fraction of sodium nitrite	0.0026 ±0.0003	0.0028 ±0.0002	0.0026 ±0.0003	
Mass fraction of protein	14.0±0.54	16.2±0.37	19.2±0.33	
Mass fraction of fat	29.2±0.44	20.0±0.33	6.4±0.27	

It is known that one of the most important indicators of the quality of readiness of dried sausages is the moisture index, which directly affects organoleptic, microbiological indicators, and, most importantly, the shelf life of the product. This indicator is strictly regulated by the requirements of DSTU 4427:2005 (2006), which is due to its substantial impact on a large number of indicators and, accordingly, on the quality and safety of the product. The moisture content of dried sausages is regulated according to the requirements in the range of 22-30%. If the indicator is below the limit, it will negatively affect the residual amount of beneficial microflora and indicators such as consistency and juiciness (Kapreliants *et al.*, 2015).

Analysis of the results of sausage examination showed that the moisture content in all three samples did not exceed the maximum permissible value and met the regulated requirements of DSTU 4427:2005 (2006). The highest moisture content was in Sample 2 – 28.2%, which is 0.6 and 1.3% higher than in Sample 1 and 2, respectively. All sausages in terms of table salt content met regulatory requirements (DSTU 4427:2005, 2006).

One of the important indicators, the content of which in sausages must be strictly controlled, is sodium nitrite. The properties of this additive do not allow for full replacement of it with food additives and components of natural or microbiological origin. Due to the fact that the exclusion of sodium nitrite from the formulation can lead to microbiological risks and deterioration of product quality, it is allowed in organic production (Oshchypko, 2019; Holck *et al.*, 2017). The assessment showed that the content of this indicator in all samples was within the normal range. In the first and third samples, it was 0.0026%, in the

second – 0.0028%, which meets the requirements of DSTU 4427:2005 (2006).

The biological value of sausage products is characterised by such an indicator as protein content. Analysis of the results showed that in Sample 3, the protein content was the highest and amounted to 19.2%. The high content of this indicator is due to the fact that the composition of this product includes only beef of the highest and first grade. From the literature data and scientific papers, it is known that beef contains more protein than pork, about 18-20%, while pork – 12-17% (Yancheva *et al*., 2021). The lowest protein content was in the first sample, which included pork in addition to beef, it was 14%, which is 2.2 and 5.2% lower, respectively, compared to the second and third samples.

One of the indicators that determine the energy value of the finished product is the fat content. The mass fraction of this indicator largely depends on the recipe and must meet the requirements of DSTU 4427:2005 (2006). As a result the examination, it was identified that the lowest fat content was in the third sample, only 6.4%, which is due to the recipe of this sausage, since it does not include lard and pork. The highest content of this indicator was in the first sample and amounted to 29.2%, which is 9.2 and 22.8% higher compared to the second and third. Analysis of energy value showed that the highest caloric content was identified in sausage Sample 1 – 322 kcal, while in Sample 2 and Sample 3 – 244 and 134 kcal, respectively.

The studies of the state and development of organic production and the organic products market in Ukraine are limited to agriculture. European suggestions of environmental challenges and threats are felt in the public space. Guz M.M. draws attention to the problem of organic farming management (Guz, 2021). Also of concern are possible problems with agricultural exports, which, without strict monitoring of chemical pesticide and antimicrobial residues, could be reduced by 50% by 2030 (Popova *et al*., 2022). Ukraine regularly conducts operational monitoring studies on the areas of agricultural land engaged in organic production (as of 31.12.2021, 422,299 hectares (1% of the total area of agricultural land in Ukraine) (Organic production in Ukraine, 2021), which allows assessing the degree of the development of organic grain, fruit, and vegetable production. The share of imported grain to Europe in 2021 is 47.3%, and fruit – 10.6% (Organic production in Ukraine…, 2022). Modern papers also maintain the tendency to cover the state of organic agricultural production, as evidenced by the papers by N. Novak, O. Davydenko, A. Salnikova, N. Makarenko (Novak, 2020; Davydenko, 2021; Salnikova, Makarenko, 2021). However, if currently Ukraine remains the leader in the production and export of organic grain crops, then there is no information on the production of sausage products, which was one of the motivational reasons for the authors to start the research on this topic.

Conclusions

The results of organoleptic evaluation showed that all samples had a dry, whole surface without damage, deposits of minced meat, fat, mould, or mucus, an elastic, dense consistency, evenly mixed minced meat without grey spots. Differences in smell, colour, fat content, and size were identified: Sample 3 had a more intense dark red colour and the most pronounced spice flavor; Sample 2 differed in the largest pieces of lard.

After conducting microbiological studies, no Escherichia coli bacteria, *Salmonella* genus, sulfitreducing clostridium, L. *Monocytogenes*, or S. *Aureus* were detected in these samples. Therefore, it can be concluded that the sausages of the highest grade under study met microbiological safety indicators since they did not contain pathogenic microflora. Analysis of the energy value identified that the most caloric was Sample 1, which had the highest mass fraction of fat – 29.2%. Sample 3 was identified as diet, it had the highest protein content (19.2%) and the lowest fat content (only 6.2%).

According to the results of the tasting assessment, Sample 3 received the highest scores for most indicators (smell, appearance on the cut, and consistency), but Sample 2 was the best in terms of taste properties. The results of the study confirm the feasibility of introducing organic sausage production to meet the demand formed by a wide range of consumers with different nutritional needs and individual preferences, such as diet, taste, appearance, etc., which contributes to the successful sale of products on the internal market. The possibility of organising organic production of dried sausages in Ukraine with a wide range of products that meet the quality and safety requirements, which allows entering foreign markets, was identified. The necessity of developing organic production of the Ukrainian food complex was highlighted.

The prospect of further research is to determine the quality and nutritional value of other types of organic products in Ukraine.

References

[1] Adiamo, O.Q., Netzel, M.E., Hoffman, L.C., Gidley, M.J., Osborne, S., & Sultanbawa, Y. (2023). *Effects of incorporating processed Acacia seed as an emulsifying agent on the quality attributes of beef sausage*. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S0309174022003370.

[2] Caplice, E., & Fitzgerald, G. (1999). Food fermentations: Role of microorganisms in food production and preservation. *International Journal of Food Microbiology*, 50(1-2), 131-149.

[3] Chattopadhyay, K., Xavier, K.A.M, Balange, A.K., Bhowmick, A., Nayak, B.B. (2023). *Interaction of chitosan gel at different pH conditions prepared with acetic acid as food acidulant in fish protein emulsion sausages*. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S2212619822000419.

[4] Davydenko, O.O. (2021). Legal regulation of certification of organic production and labeling of organic products. *Juris Europensis Scientia*, 2, 66-69. https://doi.org/10.32837/chern.v0i2.207.

[5] Danylian, O.H., & Dzoban, O.P. (2019). *Methodology of scientific research.* Kharkiv: "Pravo".
[6] Domingo, C.J.A., Sartagoda, K.J., Catandijan, N.J.C., & Yasin, N.K. (2023). Impact of vegetable fat on the sensory and physicochemical quality characteristics of chevon sausage. *Applied Food Research,* 3(1), 1-6.
[7] DSTU 4427:2005. (2006). "Dry-cured and raw-smoked sausages. General technical conditions". Kyiv: State Standard of Ukraine.
[8] DSTU EN 12824:2004. (2005). "Microbiology of food and animal feeding stuffs. Horizontal method for the derection of *Salmonella*". Kyiv: State Standard of Ukraine.
[9] DSTU GOST 30726-2002. (2003). "Food products. Methods for the detection and enumeration of *Escherichia coli"*. Kyiv: State Standard of Ukraine.
[10] DSTU ISO 11290-1:2003 "Microbiology of food and animal feeding stuffs. Horizontal method for the detection and enumeration of *Listeria monocytogenes*. Part 1: Detection method". (2004). Kyiv: State Standard of Ukraine.
[11] DSTU ISO 6888-1:2003. (2004). "Microbiology of food and animal feeding stuffs. Horizontal method for the enumeration of coagulase-positive staphylococci (*Staphylococcus aureus* and other species). Part 1: Method using Baird-Parker agar medium". Kyiv: State Standard of Ukraine.
[12] DSTU ISO 7937:2006. (2007). "Microbiology of food and animal feeding stuffs. Horizontal method for the enumeration of *Clostridium perfringerns*. Colony-count technique". Kyiv: State Standard of Ukraine.
[13] EUR-Lex-52021DC0141R (01). (2021). "Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on an Action Plan for the Development of Organic Production". Brussels: European Commission. Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52021DC0141R%2801%29.
[14] Fraz, A., Parker, N.B., Löhr, C.V., & Cherian, G. (2023). Evaluating the impact of organic chromium with flax seed in broiler diets: effects on production performance, breast muscle pathology, and meat quality aspects. *Poultry Science*, 102(2), 1-12.
[15] Francesca, N., Sannino, C., Moschetti, G., & Settanni, L. (2013). Microbial characterisation of fermented meat products from the Sicilian swine breed "Suino Nero Dei Nebrodi". *Annals of Microbiology*, 63, 53-62. doi: 10.1007/s13213-012-0444-5.
[16] Holck, A., Axelsson, L., McLeod, A., Rode, T., & Heir, E. (2017). Health and safety considerations of fermented sausages. *Journal of Food Quality*, 1, article number 9753894. https://doi.org/10.1155/2017/9753894.
[17] Huz, M.M. (2021). *Information and analytical support of organic farming production management* (PhD dissertation, National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine).
[18] Kapreliants, L.V., Shlapak, H.V., & Buzhylov, M. (2015). Development of jerked sausage technology with grain bioproducts. *Technology Audit and Production Reserves*, 5(4(25), 17-23. https://doi.org/10.15587/2312-8372.2015.51028.
[19] Li, C., Xie, W., Zhang, X., Liu, J., Zhang, M., & Shao, J. (2023). *Pickering emulsion stabilized by modified pea protein-chitosan composite particles as a new fat substitute improves the quality of pork sausages.* Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S0309174022003540.
[20] LLC "Organic Meat Product". Retrieved from http://organic-meat.com.ua/uk/pro-kompanyu/.
[21] Lupenko, Yu.O. (2013). Formation of supply and demand in the market of organic products. In *Organic production and food security: The International Scientific and Practical Conference* (pp. 3-9). Zhytomyr: Polissia Organic.
[22] Ministry of Agrarian Policy and Food of Ukraine. (2022). Organic production in Ukraine. Retrieved from https://minagro.gov.ua/napryamki/organichne-virobnictvo/organichne-virobnictvo-v-ukrayini.
[23] Mission of Ukraine to the European Union. (2021). European Green Deal. Retrieved from https://ukraine-eu.mfa.gov.ua/posolstvo/galuzeve-spivrobitnictvo/klimat-yevropejska-zelena-ugoda.
[24] Novak, N. (2020). Administrative-legal relations in the field of manufacturing and turnover of organic products. Entrepreneurship. *Economy and Law*, 11, 138-141. https://doi.org/ 10.32849/2663-5313/2020.11.23.
[25] Oshchypko, I.M. (2019). Use of meat raw materials subjected to biocorrective action of microorganisms with denitrifying activity for the manufacture of sausages. *Science and Practice: Implementation to Modern Society*, 3(39), 1607-1614.
[26] Papamanoli, E., Tzanetakis, N., Litopoulou-Tzanetaki, E., & Kotzekidou, P. (2003). Characterization of lactic acid bacteria isolated from a Greek dry-fermented sausage in respect of their technological and probiotic properties. *Meat Science*, 65(2), 859-867. https://doi.org/10.1016/S0309-1740(02)00292-9.
[27] Pilevar, Z., & Hosseini, H. (2017). Effects of starter cultures on the properties of meat products: A review. *Annual Research & Review in Biology*, 17(6), article number 36330. https://doi.org/ 10.9734/ARRB/2017/36330.
[28] Popova, O., Koval, V., Vdovenko, N., Sedikova, I., Nesenenko, P., & Mikhno, I. (2022). *Environmental footprinting of agri-food products traded in the European market.* Retrieved from https://www.frontiersin.org/articles/10.3389/fenvs.2022.1036970/full
[29] Salnikova, A.V., & Makarenko, N.A. (2021). To the issue of prospects and problems of organic production of agricultural products in Ukraine. *Scientific Reports of NULES of Ukraine*, 6(94). https://doi.org/10.31548/dopovidi2021.06.004.
[30] Serdaroğlu, M., Can, H., Sarı, B., Kavuşan, H.S., Yılmaz, F.M. (2023). *Effects of natural nitrite sources from arugula and barberry extract on quality characteristic of heat-treated fermented sausages.* Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S0309174022003588.

[31] Shevchik, R.S., Ykimuk, N.G., & Bliaskavka, K.Yu. (2018). Features of production technology and assessment of quality and safety of smoked sausages. *Science and Technology Bulletin of SRC for Biosafety and Environmental Control of AIC*, 6(2), 12-18.
[32] Shor, K. (2022). *Organic production in Ukraine remains one of the priorities. Retrieved from* https://organicinfo.ua/news/organic-remains-one-of-priorities/.
[33] Szymański, P., Łaszkiewicz, B., Kern-Jędrychowska, A., Siekierko, U., & Kołożyn-Krajewska, D. (2023). *The effect of the use of Limosilactobacillus fermentum S8 isolated from organic acid whey on nitrosyl pigment concentration and the colour formation of uncured cooked meat products*. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S0309174022002996
[34] Tsypriian, V.I., Anistratenko, T.I., Bilko, T.M., & Blahodarova, O.V. (2017). *Nutritional hygiene with the basics of nutrition*. Kyiv: Medicine.
[35] Yaghoubi, M., Alirezalu, K., Hesari, J., Peighambardoust, S.H., Marcinkowska-Lesiak, M., Barzegar, Y., Hoseinian-Khosrowshahi, S.R., Marszałek, K., & Khaneghah, A.M. (2023). *Application of oleaster leaves (Elaeagnus angustifolia L.) essential oil and natural nanoparticle preservatives in frankfurter-type sausages: An assessment of quality attributes and stability during refrigerated storage*. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S0309174023000037.
[36] Yancheva, M.O., Peshuk, L.V., & Dromenko, O.B. (2017). *Physico-chemical and biochemical bases of technology of meat and meat products*. Kyiv: Center of Educational Literature.

Оцінка якості та харчової цінності органічних сиров'ялених ковбас

Марина Олександрівна Хоменко
Кандидат сільськогосподарських наук
Національний університет біоресурсів і природокористування України
03041, вул. Героїв Оборони, 15, м. Київ, Україна
https://orcid.org/0000-0001-7023-3676

Наталія Михайлівна Слободянюк
Кандидат сільськогосподарських наук, доцент
Національний університет біоресурсів і природокористування України
03041, вул. Героїв Оборони, 15, м. Київ, Україна
https://orcid.org/0000-0002-7724-2919

Аліна Миколаївна Омельян
Національний університет біоресурсів і природокористування України
03041, вул. Героїв Оборони, 15, м. Київ, Україна
https://orcid.org/0000-0001-9004-5250

Микола Васильович Себа
Кандидат сільськогосподарських наук, доцент
Національний університет біоресурсів і природокористування України
03041, вул. Героїв Оборони, 15, м. Київ, Україна
https://orcid.org/0000-0001-9696-934X

Інна Дмитрівна Брюхачова
Кандидат сільськогосподарських наук
ВП НУБіП України «Ніжинський агротехнічний інститут»
16600, вул. Шевченка, 10, м. Ніжин, Чернігівська обл., Україна
https://orcid.org/0000-0003-3098-8200

Анотація. Все більшої актуальності у розвинених країнах, зокрема Україні, набуває органічне виробництво, яке сфокусоване на виготовлення якісних, з високою харчовою цінністю та екологічно безпечних, продуктів харчування. Метою досліджень є визначення показників якості та харчової цінності органічних сиров'ялених ковбас. Для її реалізації використано фізико-хімічні, мікробіологічні, органолептичні, статистичні методи досліджень та підходи абстракції, синтезу, аналізу, систематизації та узагальнення даних. Для проведення дослідження відібрано три види ковбас: «Зразок 1», «Зразок 2», «Зразок 3». У результаті досліджень було встановлено, що всі показники досліджуваних зразків контролюються та відповідають вимогам нормативних документів. Під час органолептичної оцінки встановлено, що всі досліджувані зразки мали суху без пошкоджень поверхню, пружну консистенцію, приємний запах з ароматом прянощів. Різниця спостерігалась тільки за кольором, він був від темно рожевого до темно червоного, що зумовлено різною рецептурою ковбас. Мікробіологічний аналіз виробів показав, що у всіх зразках була відсутня патогенна мікрофлора. За результатами фізико-хімічного аналізу встановлено, що вміст вологи, солі та нітриту натрію були в межах норми. Різниця спостерігалась за вмістом білку та жиру. У першому зразку ковбаси виявлено найнижчий вміст білку (14 %), тоді як другому та третьому – відповідно 16,2 % та 19,2 %. Значні відмінності спостерігались і за вмістом жиру в готовому продукті. Найнижчий рівень цього показника був у зразку 3 і становив 6,4 %, що на 22,8 % та 13,6 % нижче порівняно зі Зразком 1 та Зразком 2. Така різниця за вмістом білку зумовлена різним складом сировини досліджуваних зразків. Також встановлено, що найнижча калорійність (134 ккал) була у ковбасі Зразку 3, яка мала найвищий рівень білка та найнижчий вміст жиру. Отримані результати практично дають можливість оцінити дієтичність досліджуваного асортименту і зорієнтувати споживача у виборі продукту відповідно до його індивідуальних вподобань і потреб, особливостей і характеру дієти

Ключові слова: ферментація ковбас, мікробіологічні показники, масова частка білку, масова частка жиру, нітрит натрію, органолептична оцінка, патогенні мікроорганізми