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Identification as a means of detecting counterfeiting of sausages

Currently, the key issues in domestic economy are issues of competitiveness and quality of goods produced in Ukraine. Ukrainian market of meat products conquers consumers with a wide assortment but one should not rejoice at such a rich list of names. Many enterprises focused on the production of meat products use technical requirements as regulatory documentation. Technical requirements make it possible to significantly reduce the quality of manufactured goods and prevent healthy competition. Food products manufactured according to technical requirements have a reduced cost that is beneficial to many enterprises in Ukraine. Responsibility for the quality of finished product lies not on manufacturer but with the buyers and forensic merchandising experts themselves.

Topic relevance is due to the need to inform consumers about quality and consumer properties of cooked sausages of various manufacturers sold in the retail chain.

Therefore, planning as a function of assortment management for the merchant is to determine the way of future actions, content and sequence of steps leading to the intended goal. Assortment planning methods should allow evaluating the product in three areas: profitability, competitiveness, compliance with quality and safety requirements.

Theoretical research basis were research papers in the field of merchandising, in particular: I. I. Shtyk, L. V. Peshuk and N. V. Budnik, who patented the histological method for studying multicomponent meat systems.

Investigating the Ukrainian market of cooked sausages, the methods of commodity assessment of the safety, quality of meat products and their identification were applied.

The Article Purpose is to investigate methods for identifying the quality of sausages to identify counterfeit products, analyze the procedure for conducting merchandising assessment.

Keywords: *identification, product, falsification, raw materials, sausages, dyes.*

Formulation of Research Problem. Sales of sausages in Ukraine have increased significantly in recent years. The various sausage range has a constant

demand from buyers. Today the consumer faces a difficult task — to choose a tasty and high-quality sausage product. Many Ukrainian sausage companies, in the pursuit of profit to increase sales of their products and reduce their cost, use in production such schemes as dilution of raw materials for sausage with blood or water, use of soy textures, non-traditional components. All these factors negatively affect the quality of cooked sausage product (taste and nutritional properties, aroma and even safety).

In particular, counterfeiters (sausages from different manufacturers), which contained too much water are studied. It should be noted that most sausages are used without heat treatment, so the quality of goods is very important: it directly affects the health of consumers. Ukrainian companies should use ingredients such as meat, lard, seasonings and some other components for cooking sausages.

The **Article Purpose** is to investigate methods for identifying the quality of sausages to identify counterfeit products, analyze the procedure for conducting merchandising assessment.

Analysis of Essential Researches and Publications. The beginning of the solution of this problem was laid by such scientists as T. M. Artiukh, N. V. Budnik, S. Vilkova, L. Halun, I. V. Hryhorenko, A. A. Dubinina, A. P. Zakusilov, D. P. Lysovska, Z. V. Lovkis, V. D. Malyhina, N. I. Osypenko, V. A. Pavlova, S. O. Petrov, I. A. Petrova, L. V. Peshuk, I. S. Polikarpov, L. Sarafanova, L. D. Tytarenko, I. I. Shtyk and others ¹, comprehensively exploring various aspects of methods in the field of falsification of sausages. The author of this article relies on their scientific works, as well as on the practice of their application.

¹ Артюх Т. М., Григоренко І. В. Теоретичні основи товарознавства [електронний ресурс] : навч. посіб. Київ, 2014. 263 р. ; Будник Н. В., Пешук Л. В., Штик І. І. Використання гістологічних методів для оцінки якості та ідентифікації складу ковбасних виробів. *Технічні науки: стан, досягнення і перспективи розвитку м'ясної, олієжирової та молочної галузей* : мат-ли 2-ї Міжнар. наук.-тех. конф. (Київ, 25—26.03.2014). Київ, 2014. Р. 61—62 ; Вилкова С. А. Экспертиза потребительских товаров : учебник. Москва, 2007. 252 р. ; Галун Л. А., Лисовская Д. П., Ловкис З. В. Теоретические основы товароведения и экспертиза товаров : учеб. пособ. Минск, 2007. 352 р. ; Дубініна А. А., Овчиннікова І. Ф., Дубініна С. О., Летута Т. М., Науменко М. О. Методи визначення фальсифікації товарів : підручник. Київ, 2010. 272 р. ; Полікарпов І. С., Закусілов А. П. Ідентифікація товарів : підручник. Київ, 2005. 344 р. ; Осипенко Н. І. Інформаційна фальсифікація товарів і комплексне інформаційне забезпечення як захист від неї. *Вісник Львівської комерційної академії. Серія товарознавча*. 2011. Вип. 12. Р. 26—29. URL: https://nbuv.gov.ua/UJRN/Vlca_2011_12_7 (date accessed: 20.03.2021) ; Титаренко Л. Д., Павлова В. А., Малигіна В. Д. Ідентифікація та фальсифікація продовольчих товарів : навч. посіб. Київ, 2006. 192 р. ; Петрова І. А., Петров С. О., Кричковська Л. В., Дубоносов В. Л. Загальні методи визначення якості та безпеки споживчих товарів : навч.-практ. посіб. Харків, 2017. 234 р. ; Сарафанова Л. А. Применение пищевых добавок в переработке мяса и рыбы : учебник. 2-е изд., перераб. Санкт-Петербург, 2015. 240 р.

Main Content Presentation. The fourth position in the list of the most popular food products is occupied by sausages. Only dairy products, vegetables, fruits and bread were ahead of them. Many people consider that the indicator of the nation's well-being is the level of sausage consumption. Sausages are nutritious foods that are in constant demand from consumers who do not want to spend time cooking and consume domestic sausages raw. The market of sausages is growing every year (new types and varieties of sausages are appeared). The number of producers in this field is also increasing, however, the variety of new sausage products complicates the process of assessing the quality of cooked food products (compliance of sausages to technical requirements and DSTU) ¹.

The lion's share in the meat products segment belongs to domestic producers. As a result, it is critical to monitor the quality and degree of conformity with the standards of sausage products that delivered to store shelves from Ukrainian companies.

Sausages contain (except minced meat) offal, salt, fat and spicy spices. This meat mixture is formed into a product using a mesh or sausage casing, and then heated. Finally, the consumer receives a ready-to-eat sausage product ².

Boiled sausage is a ready-to eat food made from minced meat, wrapped in a natural or artificial shell (thick or thin). Bringing cooked sausages to readiness involves several steps: adding of nitrite, frying, cooking. Ready-made cooked sausages have characteristic features – pink (dark or light) color. The moisture content in the cooked product reaches 72 %.

No less popular cooked product is meat bread, made from ripe minced sausage. This product has no shell: it is cooked by baking in metal molds pre-cooked meat mixture.

Identification is the establishment of conformity of an object according to the set criteria. The process of product identification is quite simple that involves identification of matches of the name of the product with the specified information (on the label or in the documentation accompanying the product). Today there are 3 types of good identification (depending on their purpose): species (assortment) analysis, qualitative and shipment identification ³.

Labeling and quality indicators are checked on each product to which the identification method is applied. The following information is obligatory in the labeling: manufacturer's brand and location (the company name, legal and physical address, including the country of origin of the goods); trademark

¹ ДСТУ 4436:2005. Ковбаси варені, сосиски, сардельки, хліби м'ясні (33977) : затв. наказом Держспоживстандарту України від 15.07.2005 р. № 175 [Чинний від 01.01.2007 р.]. URL: https://dnaop.com/html/33977/doc-%D0%94%D0%A1%D0%A2%D0%A3_4436_2005 (date accessed: 10.04.2021).

² Пищевые добавки, используемые для приготовления колбасных изделий // Портал о вкусном и здоровом питании. URL: https://e-pitanie.ru/dobavki_v_produk-tah/kolbasnie_izdeliya (date accessed: 10.09.2020).

³ Сарафанова Л. А. Оп.cit.

(optional); type of product; name and variety; composition, presence of food impurities; nutritional value of the product; date of manufacture; expiration date; storage conditions; weight (if the goods are packed up); designation of the standard; information confirming compliance with the standards applied during production; the inscription *Vacuum-packed* (if the product is placed in a vacuum container or package) ¹.

If the sausage product is in an artificial shell, it is permissible to indicate simplified information: product name, address of production, type, variety, quality standard. Identification of meat products on the basis of assortment involves comparison by organoleptic indicators: shape, color, taste, aroma, consistency and internal structure. The integrity of the shell is a mandatory criterion in cooked sausages: it must be dry and clean. The color of minced meat in the section of boiled sausage is pink, and the color of lard is white. The boiled sausage should not have any cavities. The aroma of cooked sausages is pleasant.

The regulations for sausages specify such a complex indicator as the *type of minced meat in the cut* (this is the internal structure of the product). It is important to analyze its structure when evaluating this factor of cooked sausage (the presence of lard in some varieties of cooked and smoked sausages). There are also unstructured boiled sausages (varieties *Molochna*, *Doktorska*, *Diabetychna*, etc.). Lard is added to the crushed meat mass in their composition. These sausages are more difficult to identify. Some brands of cooked sausages are tied by producers with twine (according to DSTU 4436: 2005). This feature is common in cooked and meat bread: all these products have a large number of loaves. However, there are many varieties of sausages on the market that are not tied with twine. If sausages are produced in accordance with the technical requirements, this rule is not followed. As a result, the binding of loaves is an indication of a higher-quality sausage brand ².

There is often a falsification in the sausage market (from the Latin *falsifico*). Falsification is defined as an act performed for selfish purpose – deception of the consumer (buyer) by forging the object of purchase or sale. A broad understanding of the concept *falsification* – actions aimed at deteriorating the consumer properties of goods or reducing its weight (quantity). For non-food products, the counterfeit is made by giving the counterfeit certain typical features: color, appearance, consistency. At the same time, counterfeit sausages are characterized by deterioration or complete loss of certain properties of food (violation of the appropriate amount of proteins, fats, vitamins, trace elements, etc.) and their safety.

¹ Про основні принципи та вимоги до безпечності та якості харчових продуктів : Закон України від 23.12.1997 р. № 771/97-ВР (as amended and supplemented). URL: <https://zakon.rada.gov.ua/laws/show/771/97-вр> (date accessed: 10.04.2021).

² ДСТУ 4436:2005.

Counterfeit sausages are products of dubious quality. For its production the composition of the cooked raw sausage can be changed as follows: increase the water content; use red dyes of natural (beet juice) or synthetic nature to improve the color; do not follow the recipe during production; violate the manufacturing technology and storage regime; add stale main ingredient (completely or partially replace it with fresh natural meat), non-traditional components, antibiotics and/or conservants, foreign impurities.

For a long time, domestic scientists and researchers have used the method of identification to detect the falsification of sausages and meat products. Biochemical, structural-mechanical, and physicochemical analyses have traditionally been used to determine the component composition of meat-containing products (sausages). However, currently these methods of research and detection of product quality are not enough. Non-traditional methods should also be used for a more effective and in-depth analysis of counterfeit sausage product detection.

Today, there are numerous developments in which identification is considered as a means of detecting counterfeiting in sausages. Unfortunately, given the scientific level of such developments, this problem has been insufficiently studied (particularly the issue of standardization of histological methods), impacting the effectiveness of commodity examinations to assess the quality of sausages in the Ukrainian market.

The acceptable proportion of water in a quality cooked sausage is 70%. Counterfeit products may contain more moisture. To do this, unscrupulous manufacturers are willing to add to their products moisture-binding components (dextrins, gums, starch, inulin, other polysaccharide complexes). Scientists-technologists have proved that sausage with the addition of starch (3—5%) can contain 25% more water than a high-quality analogue without impurities¹.

There are several concepts in production: traditional raw materials and non-traditional raw materials. The traditional raw materials, used to make sausages, include meat (beef and pork), lard, spices (kitchen herbs, salt and sugar), nitrate salt. Non-traditional raw materials are considered milk and soy proteins, emulsion made from pig skin, soy insulators, starch, offal, crystalline cellulose, carrageenan, products of hydrolysis of down, feathers, bones, wool, leather and other impurities.

In order to check the presence of starch in the sausage, it is not necessary to examine the sausage products in the laboratory. This can be done at home by dripping a solution of iodine on a piece of sausage (its cut). If a blue color (blue dots or stain) appears in the place of the drop, then the sausage contains starch, which is unacceptable according to the classic recipe.

Today, there are many ways to counterfeit sausages. Most often by coloring products (adding the most common dyes — beet juice, magenta and

¹ Сарафанова Л. А. Op.cit. P. 33.

other synthetic components). Not only Ukrainian companies, but also foreign enterprises use various dyes in the production of sausage products. In order to check the sausage for falsification at home, you can boil a piece of the product in a small amount of water, paying attention to whether the water has changed color to pink or red. If the water is colored, then the sausage is counterfeit. Examining the sausage for falsification in the laboratory, the dyes in its composition are detected using alcohol (solvent — amyl alcohol). In this experiment, solvents are added to samples of sausage in vitro. If the liquid changes color, then there are dyes in the composition. Another way to detect the dye is to dye the lard. If the sausage contains aniline dyes, then (due to their ability to dissolve quickly in fat) lard will also acquire a different color ¹.

In order to prolong the shelf life of sausages, the production technology is violated and various antibiotics are added. Some producers even use spoiled dangerous products to make sausages: instead of high-quality fresh meat, low-grade raw materials or spoiled ones in general, which have characteristic features (may contain life-threatening parasites — echinococcus, finns) ².

In Ukraine, a wide variety of counterfeit sausages: re-sorting or replacement by external features of a quality product can be found on store shelves. In the case of re-sorting, the manufacturer intentionally replaces products of the highest or first grade with analogues of lower quality (goods of the first or even second sort). The lower sort, the more in the composition of low-quality main product — meat. In counterfeit or low-quality sausage, coarse meat is used, which contains a significant amount of cartilage and tendons. Most often, falsification is made on the well-known classic sorts of sausages. As a result, these products are low-grade, they have a non-traditional recipe (low-quality raw materials with dyes, conservants, antibiotics, foreign impurities). Manufacturers also violate storage conditions and do not follow the rules of the technological process ³.

Re-sorting of high-quality expensive sausages is done by intentionally replacing high-quality and first-sort sausages with low-quality products in which the meat is replaced by ordinary lard or raw materials of dubious quality which contains tendons. In addition to the manufacturing falsification of sausages, there is information, which consists in the distortion of product information (when the accompanying documents provide distorted information, available advertising and false labeling). Most often, the following inaccuracies are characteristic of information falsification of sausages of different sorts: incorrect name of the product, its quantity, incorrect indication of the manufacturer, lack of information about available food impurities, which should not be part of the sausage produced according to the recipe.

¹ Стріха Л. О., Назаренко І. В. Технологічне обладнання та технологія переробки м'яса : курс лекцій для студ. спец. 7.09010201 і 8.09010201 «Технологія виробництва і переробки продукції тваринництва». Миколаїв, 2015. Р. 26.

² Титаренко Л. Д., Павлова В. А., Малигіна В. Д. *Op.cit.* Р. 33.

³ Стріха Л. О., Назаренко І. В. *Op.cit.* Р. 28.

Information falsification of sausage products is deliberate deception by producers of consumers with inaccurate or distorted information about the product. This deception is indicated on the label. Some companies honestly print on the label information about the addition of flavorings (to enhance the taste of meat products), dyes, but often this information is ignored by manufacturers (do not specify). This is consumer fraud.

Forgery of sausage quality certificates, as well as customs documentation, dates of manufacture of products, indication of incorrect bar code and other data are also considered information falsification.

Consumers should pay attention to details when identifying cooked sausages, as methods of counterfeiting quality goods are becoming more professional and sophisticated. Before purchasing a sausage, you should perform a preliminary inspection. If the product was stored in improper conditions, defects may appear on the cooked or other sort of sausage: white plaque, worminess, mold, spots of putrefaction. The taste of spoiled sausage can be bitter.

To protect consumers, new DSTU has been introduced for meat products, which is able to limit the recipe of sausages, clearly regulate the production process. These standards provide for the inspection of the quality of manufactured goods by regulatory authorities. The DSTU compliance documentation has been developed so that Ukrainian sausage manufacturers can compete with foreign sausage brands. These standards are in line with the requirements of the countries of the European Union and are designed to prevent falsification of sausages of different sorts ¹.

However, there is still a problem with the lack of promising research methods for meat products, standardized by the relevant new documents. It is worth noting that currently there is no complete quality control of sausages and the ability to accurately identify the composition of raw materials used by producers. As a result of noncompliance with the standards, producers may commit violations such as using low-grade raw meat, vegetable impurities, and offal in sausages. Consequently, sausages produced in this way are *high quality* only on paper (in such indicators as microbiological, chemical and organoleptic). These accompanying documents do not correspond to the composition and name of the specified sort of sausage.

Thanks to N. V. Budnik, I. Shtyk and L. V. Peshuk, who developed and patented a histological method for the study of multicomponent meat systems, today we can check the quality and compliance of the composition, labeling of sausages. Their method is based on the already existing microstructural study of individual tissues of the sample (study of bone, connective and muscle tissues).

Histological examination of samples of sausages lasts 24 hours in the following conditions: 2.5% glutaraldehyde, phosphate buffer pH — 7.4, temperature +4 °C. After that, the samples are washed in phosphate buffer with

¹ ДСТУ 4436:2005.

pH of — 7.3. *G. M. Millonig* is used for additional fixation in an immersed osmium fixative, in which pieces of meat products are kept for 2 hours. Following that, the samples should be washed from the fixative in 0.1 gram-molecular of phosphate buffer (pH — 7.3), after which the material is subjected to dehydration with alcohol solutions of different strength (10 minutes each): first 50% — and gradually adjusted to 90%. The next step is dehydration in absolute alcohol, followed by a mixture of shirgacegon ¹.

The washed samples are treated according to the Laft method (filling medium — Epon-812). Sections are obtained on an ultramicrotome UMTF-7, using the method of targeted microtoming. The dye used in the experiment is a freshly made 0.1 % solution of toluidine blue (43595). An optical microscope with a photodetector will be required for morphometric analysis ².

The use of this research method to identify non-compliance with sausage recipe allows you to conduct a comparative analysis of product composition with these indicators in DSTU ³.

Conclusions. Technological influence on raw meat for sausages causes changes in the morphological properties of the cooked product (changes in the internal system of the studied composition). Particularly noticeable modification of the structure of the elements of raw meat under the technological influence, if different components (vegetable, animal or even chemical) are used. That is why it is important to use morphological methods to identify the composition of the cooked sausage product, which allows to determine the composition and research the quality of the product as accurately as possible.

Almost every Ukrainian family consumes sausages. Due to the ease of cooking a full meal or a light snack with sausage, people eat it quite often. That is why it is so important to choose high-quality, safe, tasty sausage products that do not contain various impurities. In order to protect yourself from falsification (counterfeit products), it is important to choose a decent manufacturer. To do this, it will be useful to know the methods used by sausage companies to counterfeit products, as well as knowledge of methods to detect such counterfeiting.

Currently, the most popular way to identify the composition of meat products is histological method of examination of samples. It allows you to most accurately determine the composition of the studied products (which meat is used in the composition, whether there are muscle tissue and impurities in the raw material in the form of offal and other impurities). Histological methods of research of sausages need to be standardized for their further use in production laboratories of the enterprises ⁴.

¹ Будник Н. В., Пешук Л. В., Штик І. І. *Op.cit.*

² *Ibidem.*

³ ДСТУ 4436:2005.

⁴ Житенко П. В. Ветеринарно-санитарная экспертиза продуктов животного происхождения : учебник. Москва, 2011, 250 р.

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**Ідентифікація як засіб виявлення
фальсифікації ковбасних виробів**

Станом на сьогодні ключовими у сфері вітчизняної економіки є проблеми конкурентоспроможності та якості товарів, які виробляють в Україні. Багато підприємств, орієнтованих на виробництво м'ясної продукції, послуговуються технічними умовами (далі — ТУ) як нормативною документацією. Виготовлені за ТУ продукти харчування мають занижену собівартість, що вигідно багатьом підприємствам України. У статті досліджено методи ідентифікації якості ковбасних виробів з метою виявити фальсифіковану продукцію, проаналізувати порядок проведення товарознавчого оцінювання.

Ключові слова: ідентифікація, продукт, фальсифікація, сировина, ковбасні вироби, барвники.

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**Идентификация как средство выявления
фальсификации колбасных изделий**

В настоящее время ключевыми в сфере отечественной экономики являются проблемы конкурентоспособности и качества товаров, производимых в Украине. Украинский рынок мясной продукции покоряет потребителей широким ассортиментом, но не стоит радоваться такому насыщенному перечню наименований. Многие предприятия, ориентированные на производство мясной продукции, пользуются техническими условиями (далее — ТУ) в качестве нормативной документации. Технические условия позволяют существенно снижать качество производимых товаров, не допускают здоровой конкуренции. Изготовленные по ТУ продукты питания имеют заниженную себестоимость, что выгодно многим предприятиям Украины. Ответственность именно за качество готового продукта ложится не на производителя, а на самих покупателей и товароведов.

Актуальность темы обусловлена необходимостью информировать потребителей о качестве и потребительских свойствах варёных колбас различных производителей, реализуемых в розничной торговой сети.

Поэтому планирование как функция управления ассортиментом для товароведа заключается в определении способа будущих действий, содержания и последовательности шагов, ведущих к намеченной цели. Методика планирования ассортимента должна позволять оценивать товар по трём направлениям: доходность, конкурентоспособность, соответствие требованиям качества и безопасности.

Теоретической основой исследования послужили труды учёных и практиков в области товароведения, в частности — И. И. Штык, Л. В. Пешук и Н. В. Будник, запатентовавших гистологический метод исследования многокомпонентных мясных систем.

Исследуя украинский рынок варёных колбас, были применены методы товароведческого оценивания безопасности, качества продуктов из мяса и их идентификации.

Цель статьи — исследовать методы идентификации качества колбасных изделий для выявления фальсифицированной продукции, проанализировать порядок проведения товароведческого оценивания.

Ключевые слова: идентификация, продукт, фальсификация, сырьё, колбасные изделия, красители.

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