http://www.moderntechno.de/index.php/meit/article/view/meit26-01-071
DOI: 10.30890/2567-5273.2023-26-01-071

УДК: 636.54: 664.9.002.5

IMPROVEMENT OF METHODS OF IDENTIFICATION OF MEAT TYPES

УДОСКОНАЛЕННЯ МЕТОДІВ ІДЕНТИФІКАЦІЇ ВИДІВ М'ЯСА

Prylipko T.M. / Приліпко Т.М.,
d.a.s., prof. / д.с.н.. проф.
ORCID: 0000-0002-8178-207X
Publons: AAF-5445-2019
KostashV. B. / Косташ В.Б.
ORCID:0000-0002-2182-7723
c.a.s., / к.с.н.
Pidlisnyj V.V. / Підлісний В.В.,
Ph.D., Associate Professor. / к.т.н.. доцент
ORCID: 0000-0002-4718-7787
Publons: AFL-8080-2022
Semenov A. / Семенов О.М.,
Ph.D in Engineering, Asc. Prof. / к.т.н., доц.
ORCID: 0000-0002-9990-2658
Publons: AHC-2602-2022
Higher Educational Institution "Podillia State University",
Kamianets-Podilskyi, Shevchenko str., 12, 32316
Заклад вищої освіти "Подільський державний університет"

Abstract. *It was established that it is practically impossible to control all indicators of meat quality, and it has no meaning from the point of view of the requirements of specific market segments, as well as from the point of view of ensuring the efficiency of business activities. Meat is identified by type, sex, age, fattening and heat treatment. Depending on the type of slaughtered herbivore, the following types of meat are distinguished: beef, pork, lamb, goat, horse and rabbit. Classical methods are physical and chemical research methods developed in the XVII-XX centuries. Modern measuring methods of food research are characterized by the use of improved measuring tools, often of high accuracy. This requires well-equipped research laboratories and highly qualified personnel. The most common modern measuring methods include chromatographic, spectral, photoelectrocolometric, potentiometric, refractometric, rheological and microscopic. Assortment falsification of meat is most often observed in markets and places of spontaneous trade, as well as when meat is subjected to further technological processing. Assortment falsification and sale of meat in small pieces, as well as chopped meat, when it is absolutely impossible to determine the biological and morphological belonging of the type of meat, helps. Unfortunately, the standard of Ukraine does not oblige to print the list of substances included in the composition of products. Prospective ways of developing methods of operational identification of meat can be considered those that use optical and electrical methods of measuring meat properties.*

Key words*: meat adulteration, control methods, identification, consumer, nutritional value.*

In recent years, the range and sales volumes of meat products have grown significantly. The meat market, which enjoys a stable demand from the consumer, presents various types of meat, and it is sometimes difficult for the buyer to choose a quality product from this variety. Therefore, the development of methods for operational identification of meat types at the places of their sale is an extremely important need today [1, 2, 10,12].

When determining the quality of meat, it is necessary to highlight the most characteristic properties of meat for the consumer. It should be borne in mind that it is practically impossible to control all indicators of meat quality, and it has no

meaning from the point of view of the requirements of specific market segments, as well as from the point of view of ensuring the efficiency of business activities.

The problem of recognizing assortment falsification of meat is becoming more and more urgent every year, simple and reliable methods of detecting such falsification have not yet been developed. Meat is one of the most important food products, as a source of complete proteins, as well as fats, minerals, extractive substances and some vitamins[7].

The nutritional value of meat is determined by its chemical composition, energy value, taste properties and level of digestibility. According to modern scientific assessment, meat is a functional food product that provides "healthy nutrition" and people's ability to work [1,8]. Meat is a food product consisting of muscle tissue of warm-blooded herbivores and poultry, which has undergone certain technological processing and is ready for sale and use as food. Meat is identified by type, sex, age, fattening and heat treatment. Depending on the type of slaughtered herbivore, the following types of meat are distinguished: beef, pork, lamb, goat, horse and rabbit[9].

Classical methods are physical and chemical research methods developed in the XVII-XX centuries. They have not lost their importance even now. For the most part, classical methods are characterized by a long preparation of samples before examining them and obtaining results. They are characterized by relatively low sensitivity and low measurement accuracy. But, despite these flaws, a significant number of classical methods are used even now, because they have a high probability when determining many macro indicators. In addition, in the case of using classical methods, less scarce funds and sometimes less time are spent on research.

If it is necessary to obtain accurate results with a high degree of sensitivity, as well as to determine individual components that are included in a complex mixture of substances, modern measuring methods developed over the last thirty years are used. Modern measuring methods of food research are characterized by the use of improved measuring tools, often of high accuracy. This requires well-equipped research laboratories and highly qualified personnel.

The most common modern measuring methods include chromatographic, spectral, photoelectrocolometric, potentiometric, refractometric, rheological and microscopic.

The chromatographic method is a physicochemical method based on the separation of a complex mixture of substances into components using sorption principles under dynamic conditions. Using the chromatographic method, the content of free and bound amino acids, organic acids, carbohydrates, aromatic, coloring substances, fatty acid composition of lipids, pesticides, vitamins and many other substances is determined.

The spectral method is based on measuring the transmission or absorption of light of a certain wavelength by various substances. Emission and absorption spectroscopy are distinguished. For emission spectroscopy, the emissivity of a substance is used, and for absorption, its absorptivity. The spectral method is used to determine various organic substances, as well as mineral substances in a concentration of 10-2-10-6 mol. Complex devices - spectrophotometers - are used

during spectral methods of food research. With the help of absorption spectroscopy, the degree of oxidation of fats in various fat-containing products, the presence of pectin and coloring substances, phenolic compounds, caffeine and theobromine, myoglobin (in meat) and trace elements are determined.

The photoelectrocolorimetric method is based on the selective absorption of light by the investigated substances. It is widely used to determine the concentration of colored solutions. However, colorless solutions cannot be studied using this method, unlike the spectral method. Photoelectrocolorimeters are used to measure the investigated solutions by this method.

The potentiometric method is based on determining the potential between an electrode saturated with hydrogen and a liquid containing hydrogen ions. This method is used to measure pH during determination of active acidity. The refractometric method is based on measuring the refractive index of light during its passage through a liquid sample, which is applied to the lower prism of the refractometer. Used to determine the concentration of dry substances, sugars and fats in food products.

Rheological methods are based on measuring the deformation of various substances and materials. They are intended for determining the structural and mechanical properties of food products (viscosity, elasticity, elasticity and density), most of which characterize their consistency. Using rheological methods, the viscosity of minced meat and the consistency of margarine are determined. Viscometers of various brands, dynamometric scales, plastomers and other devices are used for measurement here[1, 2, 5].

The microscopy method is based on the use of a microscope as a measuring device. Conventional biological and electron microscopes are used. Microscopy is used to determine the structure of tissue, cells and their organelles, as well as the specific and quantitative composition of microorganisms.

Comparing the methods of assortment falsification and quality falsification, we see that some methods (dilution of products with water, introduction of cheaper components of raw materials at the expense of more expensive ones) cause both types of falsification at the same time. They were considered in assortment falsification. Assortment falsification of meat is most often observed in markets and places of spontaneous trade, as well as when meat is subjected to further technological processing. Assortment falsification and sale of meat in small pieces, as well as chopped meat, when it is absolutely impossible to determine the biological and morphological belonging of the type of meat, helps. Unfortunately, the standard of Ukraine does not oblige to print the list of substances included in the composition of products. Although, in accordance with the Law of Ukraine "On the Quality and Safety of Food Products and Food Raw Materials" it is specified that the labeling should contain "information about the composition of the food product, if it is made of several components, with a list of names used in the process of manufacturing other food products, food additives, dyes, other chemicals or compounds" [3, 9,11]

The consumer can only welcome those manufacturers who list all the substances included in the product. Organoleptic and measuring (physico-chemical) methods are most often used to determine the quality indicators of food products [4,8].

The organoleptic method is a method of determining the quality of products directly using human senses: (sight, hearing, touch, taste, smell). A significant advantage of this method is the speed of obtaining data, compared to the use of chemical analysis or analysis with the help of tools. A significant drawback of the method is weak verifiability and significant subjectivity. Physico-chemical methods of determining quality indicators are used in those cases when substances of chemical composition are determined with the help of physical devices [4; 5]. These include modern methods of electronic analysis, all types of chromatography.
The classification of physico-chemical methods for determining quality indicators of meat products is given in table. 1.

Table 1 - Classification of physicochemical methods for determining quality indicators of meat products

Methods	Indicators to be determined	Advantages	Disadvantages
Spectral (spectroscopy, colorimetry, photocolometry, spectrophotometry)	elemental composition of ash residue, chemical composition, presence of impurities, traces and spoilage of products	high sensitivity, selectivity and speed of obtaining results	complexity, carried out in laboratory conditions
Electrochemical (electrogravimetry, potentiometry, polygraphy)	content of heavy metals, acidity, chemical composition, concentration	the freshness of the meat can be judged by the value of pH, and the quantitative content can be determined with great accuracy	long duration of definition, long duration of definition
Electrophoretic (frontal, electrophoresis, zonal electrophoresis)	chemical composition, presence of impurities, traces of decay, deterioration	makes it possible to quantify each component of the mixture	complexity, carried out in laboratory conditions
Luminescent (visual luminescence, fluorimetry, spectral luminescence analysis	freshness of meat, chemical composition, presence of impurities, traces of decay and spoilage	high sensitivity	

These results are subject to joint processing, which could allow to reveal the artificial origin of substances and details of the technological processes of their processing; the difference between products and similar substances; determine the smallest amount of impurities.

During the examination, various methods of quality control of meat and meat products are used [6; 7, 13].

In order to increase the reliability of the identification of the quality of meat and meat products, it is necessary to improve the existing methods of controlling the characteristics of meat and create new methods. The task of organizing modern processes should be to have an operational impact on the process of manufacturing meat and meat products in order to minimize risks for consumers and the environment.

The existing methods have a number of disadvantages, including the selectivity of the action, expensive equipment, a long duration of determination, the need to use a large number of reagents, the need for qualified personnel and specialized laboratories.

Therefore, today one of the urgent tasks in the practice of consumer rights protection is the development of new and improvement of existing methods of quality control of products of animal origin.

Conclusions. Therefore, those that use optical and electrical methods of measuring meat properties can be considered promising ways of developing methods for operational identification of meat**.**

References

DSTU 8380:2015 Meat and meat products. The method of measuring the mass fraction of fat. Valid from 2017-07-01. Kind. officer Kyiv: Derzhspozhivstandard of Ukraine, 2017. P. 26

2. DSTU ISO 936:2008 Meat and meat products. Method for determining the mass fraction of total ash (ISO 936:1998, IDT). Valid from 2008-01-01. Kind. officer Kyiv: Derzhspozhivstandard of Ukraine, 2008. 30 p.

3. Bal-Prylypko L.V. Actual problems and characteristics of the state of the meat industry of Ukraine. Meat business. Kyiv: 2010. No. 9. P. 4-17.

4. Bal-Prylypko L.V. Innovative technologies of high-quality and safe meat products: monograph. Kyiv: Publishing Center of NUBiP of Ukraine, 2012. 207 p.

5. Bal'-Prilipko, L.V., Patyka, N.V., Leonova, B.I., Starkova, E.R., Brona, A.I. Trends, Achievements And Prospects Of Biotechnology In The Food Industry. Mikrobiolochichnyi zhurnal. 2016. Vol. 78(3). p. 99-111.

6. Peresichnyi M.I. Technology of functional food products: monograph. Kyiv: KNTEU, 2008. 718 p.

7. Bogatko N.M., Sakhniuk N.I., Bogatko D.L. Application of microbiological criteria in Ukraine for establishing the safety of food products. Collection of sciences. Proceedings of the Kharkiv State Veterinary Academy. Problems of animal engineering and veterinary medicine. Veterinary sciences. Kharkiv. Vol. 26. Part 2. 2013. P. 254–259.

8. Prylìpko, T.M., Prylìpko, l.V. (2016) Task and priorities of public policy of Ukraine in food safety industries and international normative legal bases of food safety. Proceedings of the International Academic Congress "European Research Area: Status, Problems and Prospects. Latvian Republic, Rīga, September 01–02, 2016. S.85-89.

9. Cherednichenko O.O. To the issue of production and preservation of the quality of meat and meat products. Science release National agrarian university 2007.

No. 110 (part 2). P. 163-165.

10. Havrylenko O.C, Khomitska O., Zagorulko O. Microbiological control of meat and meat-vegetable preserves. Bulletin of the Poltava State Agrarian Academy. No. 4. 2017. pp. 81–84.

11. Yefimova O. M, Kasyanchuk V. V. Microbiological safety analysis of national products of animal origin intended for export. Veterinary medicine of Ukraine. No. 1. 2014. P. 30–34.

12. Kotsyumbas G.I., Urbanovych P.P., Mysiv O.V. Microstructural characteristics of dumplings minced meat in the aspect of food quality control. Scientific Bulletin of S.Z. LNAVM. Gzytsky T. 6 (№1), Part 2. 2004. P. 37-43.

13. Lozhkina O.V., Mezhenska N.A., Kalinovska I.G., Marchuk O.T., Teplikh N.I., Andrienko O.V. Methodical instructions for determining the components of all types of meat raw materials, semi-finished products and finished products from meat raw materials. Kyiv, DNDILDVSE. 2010. 28 p.

Анотація. *Встановлено, що контролювати всі показники якості м'яса практично неможливо, та й не має змісту з погляду вимог конкретних сегментів ринку, а також з погляду забезпечення ефективності підприємницької діяльності. Ідентифікують м'ясо за видом, статтю, віком, вгодованістю та термічною обробкою. Залежно від виду забійної травоїдної тварини розрізняють такі види м'яса: яловичину, свинину, баранину, козлятину, конину та кролятину. Класичні методи – це фізичні та хімічні методи дослідження, розроблені у XVII-XX ст. Для сучасних вимірювальних методів дослідження харчових продуктів характерне використання удосконалених засобів вимірювання, часто високої точності. Для цього потрібні добре обладнані дослідні лабораторії й висококваліфікований персонал. До найпоширеніших сучасних вимірювальних методів відносять хроматографічний, спектральний, фотоелектроколометричний, потенціометричний, рефрактометричний, реологічний та мікроскопічний. Найчастіше асортиментна фальсифікація м'яса спостерігається на ринках та місцях стихійної торгівлі, а також, коли м'ясо піддається подальшій технологічній переробці. Сприяє асортиментна фальсифікація і реалізація м'яса дрібними шматками, а також подрібнене, коли зовсім неможливо визначити біологічну та морфологічну належність виду м'яса. На жаль, стандарт України не зобов'язує друкувати перелік речовин, які входять до складу продуктів. Перспективними шляхами розвитку методів оперативної ідентифікації м'яса можна вважати ті, які використовують оптичні та електричні методи вимірювання властивостей м'яса.*

Ключові слова: *фальсифікація м'яса, методи контролю, ідентифікація, споживач, харчова цінність.*