https://www.proconference.org/index.php/usc/article/view/usc29-00-005
DOI: 10.30888/2709-2267.2025-29-00-005

UDC 637.5

MODIFICATION OF MEAT RAW MATERIAL PROPERTIES BY BIOTECHNOLOGICAL METHODS

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Abstract. *The paper examines the achievements of food biotechnology, which are actively used in the production of meat products. In recent decades, the focus of society's attention has been on improving food quality, especially its organoleptic and nutritional properties. Commitment to quality and high standards of the final product involves the use of not only modern and effective, but also completely safe for health functional additives. Therefore, functional additives are now of great importance in shaping the texture of meat products. Among such additives, natural and modified hydrocolloids obtained from plants and animals, which participate in the formation of the texture of meat products, are of interest to manufacturers.*

Key words: *food biotechnology, meat raw materials, meat product production, functional additives, quality of meat products.*

Introduction.

The production of meat and meat products is one of the main and priority areas of the agro-industrial complex of Ukraine. Today, scientists are faced with the task of finding resources for irreplaceable food components by using different types of raw materials and combining them, which allow producing high-quality products with increased nutritional and biological value [1,6].

The scientific basis of food production is the study of biotechnological, biochemical and microbiological processes that occur in raw materials during their processing. Food manufacturers have wide opportunities in the application of new technologies, equipment, quality control and safety of food products produced. The development of meat products is an innovative direction in the food industry, based on the principles of resource-saving technologies and expanding the range of meat

products. The composition of meat, along with high-quality easily digestible proteins, includes connective tissue proteins that are not balanced in amino acid composition. The functional and technological properties of connective tissue are not high and do not give the desired effect in the formation of quality indicators of the finished product. When processing meat, it is also necessary to take into account that meat products are potential sources of toxic substances entering the human body [4,5,7]. Therefore, one of the main aspects of biotechnology is the search for ways to solve the problems of improving the quality and safety of food products.

Thus, the relevance of the study is determined by the enormous potential for the positive impact of biotechnology on the food industry, in particular the production of meat products and the improvement of their quality, appearance, texture, taste, shelf life and nutritional qualities, and therefore the efficiency of meat production in general.

Main text.

One of the most important tasks in addressing the issue of ensuring food security is to increase food production through the development of agriculture, in particular animal husbandry.

Meat and meat products contain biologically active substances necessary for the human body, such as protein, fats, macro and microelements: iron, zinc and selenium. Iron helps to improve hemoglobin, selenium has an antioxidant effect. Product quality plays an important role in the health of the population, but for the country's economy, the most important indicator of the efficiency of enterprises is profit. Since the cost of production in meat processing enterprises accounts for the main share of the cost of raw materials, producing the maximum amount of products from a unit of raw materials and eliminating its losses is a mandatory condition for the economy, that is, it is necessary to create and develop waste-free technology [1,3], as well as ensure animal welfare to obtain quality products [2].

In recent years, special attention in the production of competitive meat products has been paid to the use of meat of specialized meat breeds of cattle [1], as well as pigs to obtain pork obtained from purposefully fattened livestock of domestic breeds. It should be borne in mind that the production of high-quality meat delicacies is a rather

laborious and complex process, for the implementation of which it is necessary to strictly observe all technological regimes.

Meat products are characterized by a fairly high content of sodium chloride, which can vary widely and be up to 10% depending on the type of product. Sodium is one of the important and vital nutrients for the body, but its excessive consumption is associated with a high risk of developing hypertension, cardiovascular diseases and strokes. Sodium affects the removal of calcium from the body, thereby reducing the strength of bone tissue, which causes osteoporosis. According to WHO recommendations, the risk of developing these diseases can be significantly reduced by consuming less than 87 mmol (2300 mg) of sodium per day. A current and promising direction in the meat industry is currently the production of meat products using raw materials obtained from certain breeds of farm animals, using dietary salt, the composition of which is characterized by a reduced sodium content, an increased potassium and magnesium content [5].

The production of salted meat products using salting agents with a balanced mineral composition and bacterial starter cultures with a directed multifunctional action is the most efficient use of raw materials, as well as obtaining food products of high biological value for different population groups.

The technological process of producing meat products must be carried out in accordance with the technological instructions in compliance with veterinary and sanitary requirements for slaughtering animals and sanitary rules for meat industry enterprises.

Ripening is characterized by a change in chemical, physicochemical and colloidal processes in meat. As a result, the rigidity of the matured meat disappears, the meat acquires elasticity, juiciness, tenderness and its own specific pleasant smell, a film forms on the surface, when pressed with a finger, the dimple is quickly and completely restored. The ripening process, depending on the age of the cattle, takes about 20-48 hours, but this process can be accelerated by increasing the temperature of the environment and introducing starter cultures.

Salting of raw materials is a very important stage in the production of meat

products. Salting is characterized by a change in the colloidal state of the protein, during which autolytic changes occur, the development of microbiological processes. Salting refers not only to mixing meat with a multi-component brine, but also to aging the raw materials.

Multi-component brine gives the meat the necessary taste and aroma, preserves its natural color and improves its properties. In addition, multi-component brine regulates such internal processes as inhibiting the growth and development of microorganisms.

Today, new technologies are aimed at intensifying the complex of biochemical transformations that occur in meat raw materials during the salting and precipitation process in the production of sausage products [4,5,6]. One of the ways to solve this problem is associated with the biotechnological principle of modification of meat raw materials - targeted regulation of the course of biotechnological, physicochemical and microbiological processes, as a result of which the structure, color and taste characteristics of meat raw materials change and the finished product is formed.

In recent years, in order to rationally use meat and reduce the cost of production, some manufacturers of sausages and meat products enrich the product with raw materials of animal and plant origin. There are many types of additives that are used and recommended for meat products. Previously, they were used mainly as substitutes for meat protein. However, currently the most important of them are their functional properties, in particular the formation and maintenance of the desired texture. The awareness of the importance of the texture of meat products for the consumer has been confirmed in many studies of consumer preferences. Therefore, functional additives are now of paramount importance for the formation of the texture of meat products [3,8].

Currently, there is an increased interest of technologists in natural and modified hydrocolloids obtained from plants and animals, which are involved in the formation of the texture of meat products. The addition of these substances has a decisive effect on increasing moisture binding due to the formation of a mesh structure, which reduces losses, increases the aggregation of jelly, improves the texture, juiciness and aroma of

the product, and stabilizes the meat and fat emulsion. Certain additives contribute to improving the degree of binding of certain components of small and medium-sized raw materials, as a result of which the appearance improves, slicing is simplified, which allows to increase the number of types of sliced meat products. Other additives are used to thicken and stabilize sauces, jellies, marinades, which are used in many meat products [3].

Starches belong to the group of additives that affect texture. They are recognized and used in the meat industry. Starch is a polysaccharide produced by most green plants as an energy storage agent. It accumulates in the form of grains, the size and shape of which depend on the plant species. Amylose and amylopectin are the main components of starch. Amylose consists of linear molecules that form a helical structure. Amylopectin contains a large number of branches arranged in a spiral shape. As a rule, the content of amylose in starch is 15-25% and 75-85% - amylopectin. The higher the content of amylopectin in starch, the greater the stability of the aqueous solution. Amylose easily precipitates from solution, while amylopectin gives a stable solution. Native starch creates a slurry, the viscosity of which depends on its origin. The main disadvantage of starch is the lack of stability in the production of slurry. The viscosity of a starch solution changes over time due to temperature, agitation, and pH changes. Pure hot solutions of native starch, after gel formation, rapidly degrade to a cloudy slurry [3].

Bonded starch has identical technological processes, maintains the same shape and properties as natural starch, but the binding of starch increases its resistance, solubility in cold water and promotes the formation of fine-crystalline starch, which affects the tenderness of products. Scientific data related to the use of modified starches as a component of meat products indicate a high safety of their use without harmful effects on the health of consumers. A number of studies have shown that modified starches provide a variety of beneficial technological effects and should be used more widely in the meat industry. However, starch doses should be compatible with food consumption, as well as with current health and nutrition recommendations. Modified starches do not affect the health of consumers, as they are easily metabolized.

Recently, more and more attention has been paid to rational nutrition and products with reduced fat content. The use of modified starch for meat products allows for a better balance of consumers' diets, as well as expanding the market for products with reduced calorie content.

Conclusions.

Modern scientific approaches and developments in the field of meat processing technologies based on biotechnological methods are considered. Commitment to quality and high standards of the final product involves the use of not only modern and effective, but also completely safe for health functional additives.

The results of the review showed that the quality requirements imposed on meat products are also designed to ensure constant, unchanging, desired organoleptic indicators at each stage of production, distribution and storage. Therefore, functional additives are now of particular importance in shaping the texture of meat products. Among such additives, natural and modified hydrocolloids obtained from plants and animals, which participate in shaping the texture of meat products, are of interest to manufacturers. The article reflects the main achievements and prospects of biotechnological approaches in the production of meat products.

References:

1. Growth energy and quality of beef from bulls of Maine-Anjou, Chianina, and Santa Gertrudis breeds grown in Ukraine / [V. Kozyr, V. Mykytiuk, O. Kalinichenko et al.] // Scientific Horizons || Наукові горизонти / Поліський нац. ун-т. – 2023. – Vol. 26. – № 4. – P. 21-32. https://dspace.dsau.dp.ua/handle/123456789/7764.

2. Mylostyvyi, R., & Izhboldina, O. (2021). Problems of livestock reproduction with a focus on climate change. *Multidisciplinary Reviews*, *4*, e2021011-e2021011. https://10.29327/multi.2021011

3. Neelam K., Vijay S., Lalit S. 2012. Various Techniques for the modifica- tion of starch and the applications of ist derivatives. Int. Res. J. Pharmacy. 3, (5): 25-31.

4. Safonova, Y. A., Skrypnikov, A. V., Kovaleva, E. N., Lemeshkin, A. V., & Machtakov, S. G. (2022, July). Evaluation of the effect of fermentation conditions on

the functional and technological characteristics of the semifinished meat product. In IOP Conference Series: Earth and Environmental Science (Vol. 1052, No. 1, p. 012049). IOP Publishing.

5. Villamonte G., Simonin H., Duranton F., Cheret R., Lamballerie de M. Functionality of pork meat proteins: impact of sodium chloride and phosphates under high- pressure processing // Innovative Food Science & Emerging Technologies, 2013,Vol. 18, P. 15–23.

6. World Health Organization. Reducing Salt Intake in Populations: report of a WHO Forum and Technical Meeting, 5-7 October 2006, Paris, France; WHO: Geneva, Switzerland, 2007.

7. Методологічні основи та методи наукових досліджень у ветеринарній гігієні, санітарії та експертизі : навч.-метод. посіб. / [П. П. Антоненко, А. В. Доровських, М. П. Високос та ін.] ; Дніпровський ДАЕУ. – Дніпро : «Свідлер А. Л.», 2018. – 276 с.
http://dspace.dsau.dp.ua/jspui/handle/123456789/963.

8. Пришедько В. М. Харчові добавки та їх застосування в харчовій промисловості / В. М. Пришедько, А. О. Тущенко // Теорія і практика сучасної науки : матеріали V міжнар. наук.-практ. конф. (Київ, 26-27 черв. 2020 р.) / Міжнародний центр науки і досліджень. – Київ, 2020. – С. 42-44. – Режим доступу : http://dspace.dsau.dp.ua/jspui/handle/123456789/2800.

Статтю відправлено: 12.01.2025 г.