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Abstract. The article presents the main aspects of ensuring the safety and quality of cultured meat for the food industry, ways to solve it and ensure control.

In the case of different nutritional quality between cultured meat and natural meat, it is necessary to add nutrients to ensure a nutritional profile similar to that of the reference product. In this sense, it is also necessary to assess whether the added nutrients have a bioavailability similar to that of traditional meat. In the case of a difference in nutritional composition with respect to its analogue.

To control the hazard, the minimum level of nutrients in the culture medium sufficient to achieve the desired cell growth is used, and cellular parameters are monitored during cultivation, as well as the nutritional quality of the food, comparable to a similar product.

The development direction of the safety assessment of a new product, such as cultured meat, is based on the principle that the safety of new products is assessed according to a traditional analogue with a history of safe use, taking into account both predictable and unpredictable studies, after hazards can arise unintentionally at any point during the production of cultured meat.

Keywords: Cultured meat, quality, safety, nutritional value, culture medium.

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ASSESSMENT OF THE QUALITY OF DAIRY-BASED PRODUCTS WITH MINOR COMPONENTS OF FUNCTIONAL PURPOSE

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Анотація: У сучасному харчовому виробництві існує тенденція до створення функціональних молочних продуктів шляхом поєднання тваринної та рослинної сировини, що дозволяє покращити властивості кінцевого продукту та підвищити його термін зберігання. Метою дослідження було теоретичне обґрунтування та експериментальне

підтвердження формули жиро-олійного модуля для збагачення молочного жиру, спрямованого на розробку збагачених молочних продуктів. Об'єктами дослідження були молочний жир, рослинні олії (кукурудзяна, соєва, соняшникова, олія зародків пшениці) та мінорні компоненти, отримані з олії зародків пшениці. В результаті досліджень було обґрунтовано формулу модуля, що містить (на 100 г молочного жиру) 15±2.0% кукурудзяної олії; 1.5±0.5% мінорних компонентів (токофероли, стероли, каротиноїди, фосфоліпіди). Встановлено, що додавання мінорних компонентів суттєво змінює фізико-хімічні та органолептичні властивості жиро-молочної суміші. Ця зміна є важливою, оскільки вона забезпечує поліпшення консистенції, текстури та зовнішнього вигляду кінцевого продукту, що має значні переваги для виробництва функціональних продуктів на молочній основі.

Ключові слова: молочний жир, збагачені продукти, жиро-олійний модуль, мінорні компоненти, кристалізація, функціональні продукти.

Statement of the problem. The modern food industry allows for the comprehensive processing of dairy raw materials and the creation of functional products based on modern nutritional science requirements. There is a steady trend toward increasing production volumes of products from animal-based raw materials with the addition of plant-based components. This combination allows for the desired product properties, reducing raw material and energy costs for production, and increasing the shelf life of the product. The use of minor components of milk fat in combination with plant-based antioxidants allows them to be used as physiologically functional food ingredients in the production of dairy-based products to improve their consumer properties. The development of enriched milk products is an actual direction of the food industry at the present time (Tsisaryk et al., 2024).

The objects of the study were samples of milk fat, vegetable oils (soybean, corn, sunflower, and wheat germ oil); minor components obtained from wheat germ oil; compositions based on them; modified milk fat.

Traditional research methods were used, such as integral antioxidant activity was determined using an Expert-006 instrument by coulometric titration using electrogenerated halogens.

Morphological analysis of milk fat crystallization was performed using an Olympus BH polarizing light microscope (Olympus, Tokyo, Japan).

When selecting vegetable oil samples for the oil-fat module, a number of factors were considered: resources, composition, and consumer characteristics. Analysis of the fatty acid composition of vegetable oils demonstrated the possibility of adjusting the fatty acid composition by using a mixture of oils rather than a single type. Wheat germ oil, a source of essential fatty acids, primarily linoleic acid (omega-3) and minor components (tocopherols, sterols, phospholipids), and corn oil, a source of PUFAs, primarily omega-6, were selected. Furthermore, wheat germ oil and corn oil have a pleasant taste and aroma.

As a result of the research, a formula for a fat-and-oil module was theoretically substantiated and experimentally validated. It includes, per 100 g of milk fat: 15±2.0% corn oil; 1.5±0.5% minor components (tocopherols, sterols, carotenoids, phenolic compounds, mono- and diglycerides, phospholipids, and free fatty acids).

The addition of vegetable oils to milk fat alters its physicochemical and organoleptic properties, so a morphological analysis of the crystallization of the butter-vegetable mixture was conducted. After adding minor components in different dosages (0.5; 1.0; 1.5; 2.0 and 3.0%), the onset of crystallization of the creamy-vegetable mixture decreased from 52.51 to 41.55; 50.01; 45.02 and 47.51 °C ($P < 0.05$). It was found that minor components delay the onset of crystallization at low temperatures. It was hypothesized that the addition of minor components leads to polymorphism in the butter-vegetable mixture. To confirm these observations, morphological studies of crystals in test samples were conducted. Crystallization of milk fat with the addition of corn oil and MC in amounts ranging from 0.5 to 3.0% was studied microscopically. Morphological analysis was compared to a control. Crystallization was carried out for 24 hours at 25°C. Morphological analysis of crystals in the test samples compared to the control revealed that minor

components can participate in crystallization and stimulate the process of crystal nucleation and growth. When minor components are added at a concentration of no more than 1.5%, milk fat transforms from a coarse crystalline form to a uniform crystalline form.

Minor lipid components, even at low concentrations, can influence the crystallization process. Instead of forming large, irregular crystals, the minor components act as nucleation sites, promoting the formation of more numerous, smaller, and uniform crystals.

This change from coarse to uniform crystals can lead to a product with improved consistency, texture, and appearance, which is beneficial for dairy products like butter and chocolate. For example, in chocolate, it helps prevent bloom (the white, powdery surface).

The research successfully theoretically substantiated and experimentally validated a formula for a fat-and-oil module to be added to milk fat, aimed at developing enriched dairy products. This module comprises milk fat supplemented with 15±2.0% corn oil; 1.5±0.5% minor components (including tocopherols, sterols, carotenoids, and phospholipids) derived from sources like wheat germ oil, which was selected for its valuable essential fatty acid content, particularly omega-3 and minor lipid components.The study confirmed that the incorporation of these plant-based oils and minor components significantly alters the physicochemical and organoleptic properties of the milk fat-vegetable oil mixture. Specifically, the minor components, even at low concentrations, were found to influence the crystallization process by acting as nucleation sites. This led to a beneficial transformation of the milk fat's crystal structure from a coarse crystalline form to a uniform crystalline form. This change is crucial as it can result in a final product with improved consistency, texture, and appearance, offering clear benefits for the food industry in the production of functional dairy-based products.

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Abstract. There is a contemporary trend in the food industry toward creating functional dairy products by combining animal and plant-based raw materials, which improves the final product's properties and extends its shelf life. The research aimed to theoretically substantiate and experimentally validate a formula for a fat-and-oil module to enrich milk fat, intended for the development of enriched dairy products. The objects of the study included milk fat, vegetable oils (corn, soybean, sunflower, and wheat germ oil), and minor components derived from wheat germ oil. The research substantiated a module formula containing (per 100 g of milk fat) 15±2.0% corn oil and 1.5±0.5% minor components (tocopherols, sterols, carotenoids, phospholipids). It was found that the addition of minor components significantly alters the physicochemical and organoleptic properties of the fat-dairy mixture. This change is crucial as it ensures improved consistency, texture, and appearance of the final product, offering significant benefits for the production of functional dairy-based products.

Keywords: milk fat, enriched products, fat-and-oil module, minor components, crystallization, functional foods.