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QUALITY CONTROL AT THE STAGES OF CAKES AND PASTRIES PRODUCTION

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Subject. Cakes and pastries production quality. The objective of the research is to examine an analysis of the quality and safety control system at all stages of cakes and pastries production to ensure products meet regulatory requirements and consumer expectations. This includes monitoring from incoming raw material inspection to final evaluation of finished products and identifying critical points in the technological process that affect the consistency of quality indicators and the epidemiological safety of desserts. **Methods.** The quality parameters of cakes and pastries according to the standard RK ST 985-2013 were evaluated. Gluten content and microbiological parameters were determined according to ISO Standards. The research was based on the principles of a systematic approach to the processed information and abstract logical approach to the research results and conclusions. **Results.** The production of high-quality cakes and pastries is possible with compliance with the requirements of RK ST 985-2013 which defines the specifications for these products. The requirements of this and other applicable regulatory documents guarantee consumers not only taste but also the complete absence of health risks. The quality control of food masses and products is practiced at all stages of the production process: upon acceptance of flour and other raw materials, during the conversion of raw materials into semi-finished products, and during acceptance inspection of finished cakes and pastries. Acceptance inspection is subdivided into sensorial and instrumental (physical, chemical and microbiological). Typical defects of cakes and pastries are analyzed, with possible methods for preventing them are indicated. **Scopes of results.** The fulfilled research has practical significance for the confectionery industry, since it scientifically analyzes rational methods of controlling the quality indicators of cakes and pastries, and ways to improve this control.

Key words: quality control, standard, cake, food safety, incoming inspection, confectionery production, product defects

КОНТРОЛЬ ЯКОСТІ НА ЕТАПАХ ВИРОБНИЦТВА ТОРТІВ І ТІСТЕЧОК

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Предмет. Якість виробництва тортів і тістечок. **Мета.** Вивчити системи контролю якості та безпечності на всіх етапах виробництва тортів та тістечок для забезпечення випуску продукції, що відповідає нормативним вимогам та очікуванням споживачів. Це передбачає моніторинг від вхідної перевірки сировини до фінальної оцінки готових виробів а також виявлення критичних точок технологічного процесу, що впливають на стабільність якісних показників та епідеміологічну безпеку десертів. **Методи.** Об'єктом досліджень було контролювання параметрів якості тортів та тістечок, що випускаються згідно з РК СТ 985-2013. Визначання вмісту клейковини та мікробіологічні параметри визначали згідно зі стандартами ISO. Використовували системний підхід до інформації та абстрактно-логічний підхід до результатів і висновків. **Результати.** Випуск якісних тортів та тістечок можливий за виконання вимог РК СТ 985-2013, який визначає технічні умови на випуск зазначених виробів. Вимоги цього та інших чинних нормативних документів гарантують споживачеві не лише смакові якості, а й повну відсутність ризиків для здоров'я. З цією метою практикують контроль якості проміжних харчових мас та готової продукції на всіх етапах виробничого процесу:

при прийманні борошна та інших видів використовуваної сировини, у процесі виробництва при перетворенні сировини на напівфабрикати, а також при приймальному контролі готових тортів та тістечок. Приймальний контроль поділяється на органолептичний та приладовий (фізико-хімічний та мікробіологічний). Проаналізовано типові дефекти тортів та тістечок із зазначенням можливих способів недопущення цих дефектів. **Сфера застосування результатів.** Виконані дослідження мають практичне значення для кондитерської промисловості, оскільки вони на науковому ґрунті аналізують раціональні способи контролювання показників якості тортів і тістечок, шляхи вдосконалення зазначеного контролювання.

Ключові слова: контроль якості, стандарт, торт, безпека, вхідний контроль, кондитерське виробництво, дефекти продукції

Statement of the problem. The confectionery industry is among the most dynamically developing sectors of the food industry, with cakes and pastries production being a very special sector due to their complex composition and high calorie content. A systematic approach to quality is essential given that these products are perishable and are made from multi-component raw materials, including eggs, dairy products, fresh berries, fruits etc. The specific nature of the production cycle makes finished products critically dependent on strict adherence to sanitary and production standards at every stage [1-3]. In today's competitive marketplace, quality is becoming a key factor in the stable operation of an enterprise, as process violations from flour acceptance to final decoration will not only lead to economic losses but also increase the risk for consumers' health caused by microbiological spoilage. Ensuring reliable control methods at all stages of production is a priority for confectionery shops [4, 5]. This study examines the theoretical principles and practical features of organizing quality and safety control, encompassing a set of methods and procedures at various stages of production.

The special attention is paid to the analysis of the regulatory framework, including standards of different levels and current technical regulations, and the determination of critical points of the technological process [6]. Food safety is addressed within the framework of current legislation, which reflects modern approaches to ensuring food safety and certain essential quality indicators. Specifically, it provides for the implementation of HACCP food safety control systems, which facilitate improved product safety while simultaneously optimizing costs. The conceptual core of these systems is a thorough analysis of potential biological, chemical, and physical risk factors, which consistently minimizes the likelihood of incidents occurring at established critical control points (CCPs) [7-9].

Furthermore, continued attention should be paid to determining the sensorial, physical, chemical, and microbiological properties of confectionery products, including cakes and pastries, using the analytical methods required by regulatory documents for incoming, operational, and acceptance inspections [6, 10].

Purpose is to study comprehensive analyses of the quality and safety control system at all stages of cake and pastry production to ensure that products meet regulatory requirements and consumer expectations. This involves monitoring from incoming raw material inspection to final evaluation of finished products – and identifying critical points in the technological process that affect the stability of quality indicators and the epidemiological safety of the above said products.

Materials and methods. The object of the research was to control the quality parameters of cakes and pastries produced in accordance with RK ST 985-2013 “Cakes, rolls and pastries. Specifications” [11]. The sensorial properties of cakes and pastries were determined according to RK ST 985-2013 [11] using the methods described in [6]. Other regulatory documents were also used. Gluten content was determined in accordance with the International Standard ISO 21415-1:2006 “Wheat and wheat four – gluten content – Part 1: determination of wet gluten by a manual method” [12]. Microbiological studies were performed in accordance with the International Standards ISO 4833-1:2013 “Microbiology of the food chain. Horizontal method for the enumeration of microorganisms. Part 1: Colony count at 30°C by the pour plate technique” [13] and ISO 4833-2:2013

“Microbiology of the food chain – Horizontal method for the enumeration of microorganisms – Part 2: Colony count at 30°C by the surface plating technique” [14]. The studies, the results of which are presented in this article, were carried out based on the principles of a systematic approach to the processed information accumulated from the presented list of literature sources, as well as the principles of an abstract-logical approach to the obtained results of the studies performed and the conclusions drawn from them.

Results. Modern confectionery production, particularly, that of cakes and pastries, operates within a strict system of technical regulation. In the Republic of Kazakhstan, the fundamental document is the law [15]. According to the regulatory documentation in force in the Republic of Kazakhstan, product safety is ensured not only by checking the final product but also by organizing processes at all stages of production. One of the key responsibilities of the manufacturer is the development and implementation of procedures based on HACCP (Hazard Analysis and Critical Control Points) principles. This system enables the proactive identification of biological, chemical, and physical hazards [16, 17].

In addition to general regulations, the industry relies on specialized standards, such as RK ST 985-2013 [11], which defines specifications specifically for cakes and pastries. This standard classifies products by semi-finished product type (sponge, shortbread, puff pastries) and finishing method. A key aspect of regulatory control is compliance with labeling requirements [18]. For cream-based products, this is critical: packaging must indicate not only the date but also the time of production, as shelf life is extremely limited – from 6 to 72 hours, depending on the cream's composition.

An effective system at the enterprise also includes monitoring the production environment. This includes monitoring air quality in finishing shops, regularly analyzing equipment and employee hand swabs, and maintaining a consistent production flow to prevent cross-contamination between raw ingredients and finishing decorative elements. Thus, the regulatory framework creates a multi-level filter that guarantees consumers not only taste but also a complete absence of health risks.

The quality of a finished confectionery product depends 70% on the characteristics of its incoming ingredients. Incoming inspection in the confectionery shop is a complex process of verifying each batch of raw materials. Wheat flour, the basis of most recipes, is tested for gluten content and elasticity. For sponge cake dough, flour with a medium gluten strength is preferred, ensuring a porous and elastic structure. Granulated sugar and molasses are tested for purity and dry matter content, which is critical for stable syrups and creams [19–21].

Particular attention is paid to fats and dairy products. Butter is checked for signs of oxidation (rancidity), and its fat content must strictly correspond to the recipe, otherwise the cream structure may "cut off" (syneresis occurs) [22, 23]. Egg products, as the most microbiologically hazardous ingredient, are subject to mandatory testing for the presence of *Salmonella* bacteria. The use of pasteurized egg mixture instead of raw eggs significantly reduces biological risks, which is the standard for modern enterprises.

Operational control during the production process covers key parameters in the transformation of raw materials into semi-finished products. During the dough mixing stage, the temperature of the dough and the duration of beating are monitored. For example, during sponge cake production, over-beating the dough causes it to settle, while under-baking at temperatures below 180°C leads to the formation of a “hardening” – a dense, uncooked layer. The process of making creams requires even more rigid control: the room temperature must be maintained at no higher than 18°C, and the cooling of syrups before adding to the butter must be rapid and uniform to prevent the development of pathogenic flora. Each stage is recorded in process logs, ensuring traceability of the entire production chain.

The final stage of the quality system is the acceptance inspection of finished cakes and pastries. It is conducted by the quality control department (QCD) or responsible workshop foremen before shipping the products to retailers. Acceptance inspection is divided into sensorial and laboratory

(physical, chemical, and microbiological) inspections. Sensorial evaluation includes checking the appearance: clarity of the cream decoration, uniformity of glaze, absence of cracks, and symmetry of shape. The taste and aroma should be characteristic of the product, free of any off-flavors.

Physical and chemical monitoring includes sugar and fat content determination, as well as that of a product's water content. Exceeding water content standards (for example, above 25% for cream cakes) can lead to accelerated spoilage, while below-standard levels can result in dryness and a deterioration in flavor. Laboratory testing also confirms the absence of heavy metals and toxic elements. However, microbiological purity remains the primary safety criterion. Modern rapid analysis methods allow for the prompt detection of QMA and OAMO and coliform bacteria, which is especially important for products with short-crust fillings (custard or buttercream) [19–21].

Identifying defects allows for timely process adjustments (table 1).

Table 1

Defects of ready products and their reasons

Product Defect	Probable Cause	Preventive Measure
Biscuit Settling	Bake Failure	Strict Control of Oven Time and Temperature
Cream Syneresis	Butter and Syrup Temperature Difference	Equalize Component Temperatures Before Mixing
"Temperature Hardening"	Insufficient Oven Temperature or Underbaking	Monitoring Readiness with a Thermometer and Sensory Test
Excessive crumbling of crumb	Excess Flour or Overdrying	Strict Adherence to Formulation, Dosages and Standing
Microbiological Spoilage	Cold Chain Failure (from +2 to +6°C)	Continuous Temperature Monitoring in Storage Chambers

For example, a defect such as glaze “soaking” is often associated with high humidity in the storage chamber, while crumbly crumbs are caused by excess flour or improper biscuit proofing. To prevent defects, factories are implementing automated temperature and humidity control systems, as well as regular staff training. A well-designed system for recording discrepancies allows not only to filter out defective products but also to analyze the causes of failures, constantly improving the formulation and production process. The ultimate goal of this process is to ensure brand stability and consumer trust [24, 25].

Conclusion. The production of high-quality cakes and pastries is possible with strict compliance with the requirements of RK ST 985-2013 [11], which defines the specifications for the production of these confectionery products. The requirements of this and other applicable regulatory documents guarantee consumers not only taste but also the absence of health risks. To this end, quality control of intermediate food masses and finished products is practiced at all stages of the production process: upon acceptance of flour and other raw materials, during the transformation of raw materials into semi-finished products, and during acceptance inspection of finished cakes and pastries. Acceptance inspection is subdivided into sensorial (including the assessment of existing defects) and instrumental (physical, chemical, and microbiological).

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