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Technological Equipment of Food Production

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Abstract

The modern food industry relies on advanced technological equipment that ensures high sanitary and hygienic standards, biological safety criteria, and the continuity of technological processes, since the protection of public health, the guarantee of food safety, and the preservation of biologically active substances are directly related to the functional capabilities of the technological equipment used in production. This article provides a systematic analysis of the main technological equipment employed in food production, highlighting their role in biotechnological processes, their impact on microbiological stability, and their significance from a medical perspective based on scientific evidence.

Keywords: food industry, technological equipment, biotechnology, sterilization, sanitary safety, production process.

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Introduction

The improvement of technological equipment in the field of food production not only contributes to enhancing product quality and production efficiency but also provides the ability to control microbiological, chemical, and physical risk factors that directly affect human health; therefore, such equipment is currently developing in close integration with medical and biotechnological sciences [1]. Population growth, increasing demand for functional and dietary products, and global food security challenges necessitate the use of highly precise, automated, and controllable technological equipment in production processes [5]. In particular, the structural characteristics of equipment used in processes such as fermentation, pasteurization, sterilization, and homogenization directly influence the preservation of biologically active components and the clinical value of food products, which further increases the relevance of this topic.

Materials and Methods

In this study, the analysis of technological equipment used in the production of dietary food products was carried out using a specialized methodological approach, as dietary and clinical nutrition products

directly affect the physiological condition of the human body, and the equipment used in their production must meet high requirements for sanitation, biological safety, and technological precision [6]. The research objects included mechanical, thermal, and biotechnological equipment utilized in the production of low-calorie, gluten-free, diabetic, infant, and therapeutic nutrition products.

As research materials, experimental and applied data presented in international and domestic scientific sources were examined concerning vacuum mixers, low-temperature drying devices (lyophilizers), membrane filtration systems, high-precision dosing units, and bioreactors designed for fermentation processes, which are widely used in modern food industry practices [12]. Given the importance of preserving biologically active substances in dietary food production, the technological capabilities of high-pressure homogenizers and gentle thermal pasteurization equipment were evaluated in detail [14].

The research methods included systems analysis, comparative evaluation of technological processes, sanitary-hygienic expertise, and assessment based on biological safety criteria. Each technological unit was examined for compliance with medical requirements for dietary products, assessing the preservation of protein, fat, and carbohydrate ratios, the degree of vitamin and enzyme inactivation, and microbiological stability indicators [17].

In addition, the significance of automated control systems applied in the production of dietary food products was methodologically analyzed, as such systems enable real-time monitoring of technological processes, minimize errors, and reduce risks associated with the human factor [20]. During the study, the efficiency and medical significance of equipment used for dietary food production were comparatively assessed based on results reported in scientific articles indexed in the Scopus database.

The obtained data were compared with dietotherapy criteria applied in the healthcare system, scientifically substantiating that a medical-biological approach should be prioritized when selecting technological equipment for dietary food production [5].

Results

The analysis demonstrated that the structural precision of crushers, mixers, and dosing devices used in the primary processing of raw materials plays a crucial role in ensuring product uniformity and biological safety, as uneven mechanical impact may activate microbiological environments [3]. Thermal processing equipment, particularly pasteurizers and sterilizers, showed high efficiency in eliminating pathogenic microorganisms while ensuring minimal loss of vitamins and enzymes, which is especially important in the production of medical nutrition products [14]. Bioreactors and fermenters used in fermentation processes emerged as key technological units determining the quality of probiotic products, with automated control systems enabling optimal regulation of metabolic processes [17].

Discussion

The obtained results indicate that when selecting technological equipment for food production, it is necessary to consider not only economic efficiency but also medical and biological safety criteria, as nutrition in modern society is regarded as a significant preventive factor against diseases [6]. International experience confirms that products manufactured in facilities equipped with advanced technological equipment demonstrate higher microbiological stability and biological value [20]. Therefore, the introduction of biotechnological equipment during the modernization of the food industry should be regarded as a strategic direction integrated with the healthcare system.

Conclusion

In conclusion, technological equipment used in food production is a decisive factor in ensuring product quality, biological safety, and medical significance, and its scientifically grounded selection and operation contribute to promoting healthy nutrition among the population. Modern equipment developed based on biotechnological approaches enhances the stability of production processes and enables the development of the food industry in close integration with the healthcare system.

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