

F.45. VALORIZATION OF AGRI-FOOD BY-PRODUCTS IN THE DEVELOPMENT OF FUNCTIONAL PROBIOTIC BEVERAGES

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Abstract. The valorization of food waste represents a key modern direction in the development of a circular economy. Transforming agri-food by-products into functional products, such as

probiotic beverages, provides both nutritional benefits and ecological advantages. Bran, traditional fermented wheat bran broth (borş), grape pomace, and damaged or unsellable wild berries are nutrient-rich resources well suited for fermentation and for producing value-added probiotic beverages. Probiotic beverages are fermented products that contain live beneficial microorganisms, primarily lactic acid bacteria (*Lactobacillus*, *Bifidobacterium*) and non-pathogenic yeasts. The fermentation process transforms raw materials into products that are more digestible and microbiologically stable, while enabling microorganisms to synthesize essential compounds, including vitamins (such as B-complex vitamins), polyphenols, carotenoids, and organic acids (lactic, acetic), which exert prophylactic effects on human health. These bioactive compounds primarily improve digestion by promoting a healthy gut microbiota, suppressing putrefactive microorganisms, and supporting intestinal microbial balance. Fermentation also creates a prebiotic environment that promotes the proliferation of beneficial bacteria, enhances intestinal barrier function, and reduces systemic inflammation.

Recent studies demonstrate that plant-based fermented beverages also reduce blood pressure, cholesterol levels, and insomnia symptoms due to their antioxidant activity. Moreover, these products support the reduction of adipose tissue and body weight by enhancing sugar metabolism and stimulating intestinal thermogenesis. For example, polyphenols from sea buckthorn and resveratrol from grape seeds inhibit lipid peroxidation, contributing to obesity management by promoting lipolysis and modulating gut microbiota composition.

In the academic context, the valorization of agro-industrial waste aligns these beverages with the principles of the circular economy by minimizing post-harvest losses. Current research focuses on optimizing fermentation parameters to maximize probiotic viability, which is essential for substantiating health claims in accordance with EU Regulation 1924/2006. Thus, fermented beverages not only diversify the sustainable food supply but also support public health through integrative nutritional prevention. We consider that probiotic beverages obtained from bran, borş, grape pomace, and wild berries represent an innovative and sustainable solution for the valorization of food waste. They combine the tradition of fermentation with modern demands for healthy, functional, and environmentally friendly products. The development of such technologies can significantly reduce environmental impact while creating new economic opportunities within the agri-food industry.

Keywords: probiotic beverages, fermentation, agri-food waste.

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