



MINISTRY OF EDUCATION
AND SCIENCE OF UKRAINE
NATIONAL UNIVERSITY
OF FOOD TECHNOLOGIES
NATIONAL ERASMUS+ OFFICE IN UKRAINE
EUROPEAN STUDIES PLATFORM



PROCEEDINGS
VIII INTERNATIONAL CONFERENCE
EUROPEAN DIMENSIONS OF
SUSTAINABLE DEVELOPMENT



MAY 5-7, 2026, KYIV

BIOTECHNOLOGICAL ASPECTS OF MICROBIAL SYNTHESIS OF L-GLUTATHIONE BY *SACCHAROMYCES CEREVISIAE* YEAST IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT OF UKRAINE'S BIOECONOMY

Liubov Dolia*, Svitlana Starovoitova

National University of Food Technologies, Kyiv, Ukraine

*Speaker: dolya.lyba@gmail.com

The increasing prevalence of chronic liver diseases and Ukraine's dependence on imported pharmaceutical raw materials necessitate the development of domestic production of biologically active antioxidants. Establishing national biotechnological production supports sustainable development by combining economic benefits through import substitution with social value by ensuring access to essential compounds. One of the key endogenous antioxidants is L-glutathione (GSH), which plays a central role in detoxification, redox homeostasis, and immune regulation.

The aim of this study was to substantiate the factors influencing the efficiency of microbial synthesis of GSH using *Saccharomyces cerevisiae*. A comprehensive analysis of recent scientific publications was conducted, including comparative evaluation of microbial strains, nutrient media composition, and cultivation parameters. Among the analyzed strains, *S. cerevisiae* HBSD-W08 demonstrated the highest efficiency, with a GSH concentration of 3.73 g/L (on 48 hour), and a productivity – 0.0777 g/h (Hu et al., 2023). The calculated conditional production cost was 1.67 UAH/g, which is significantly lower compared to alternative strains and competitive with imported products. Optimization of the nutrient medium (glucose, nitrogen sources, mineral salts, and glutamic acid) ensured high biomass yield and enhanced intracellular GSH synthesis.

Based on epidemiological data on hepatitis B and C prevalence in Ukraine, the potential number of patients requiring antioxidant therapy is estimated at approximately 1.5 million people. Considering a target market share of 0.8%, the projected annual demand for GSH is about 180 kg. To meet this demand, a biotechnological production scheme was proposed using a fermenter with a geometric volume of 1 m³ and a working volume of 0.6 m³, including a three-stage inoculum preparation process and controlled aeration conditions to ensure metabolic shift toward glutathione biosynthesis.

Special attention was paid to downstream processing, as GSH is an intracellular metabolite. The proposed purification strategy includes cell separation by centrifugation, thermolysis for extraction, ultrafiltration to remove macromolecular impurities, nanofiltration for concentration, and lyophilization for stabilization. This approach ensures high product purity while minimizing energy consumption and eliminating the use of toxic solvents, thus meeting environmental safety requirements. The proposed technology complies with sustainable development principles. Environmentally, it relies on water extraction and membrane technologies with minimal waste; economically, it ensures competitive costs and reduces import dependence; socially, it improves public health by increasing access to antioxidant therapy.

References:

Hu, X., Shen, X., Zhu, S., Zeng, H., & Shuai, Y. (2023). Optimization of glutathione production in *Saccharomyces cerevisiae* HBSD-W08 using Plackett-Burman and central composite rotatable designs. *BMC microbiology*, 23(1), 11.