

THE CREATING A NEW BIOPRESERVATIVE BASED ON FUSANT STRAIN *LACTOCOCCUS LACTIS* SSP. *LACTIS* F-116 FOR FOOD QUALITY AND ITS SAFETY

Lidia G. Stoyanova^{1*}, Mariy V. Napalkova¹, Alexander I. Netrusov¹

¹Department of Microbiology, Biological Faculty, M. V. Lomonosov Moscow State University, Leninsky Gory 1/12, 119234 Moscow, Russia

*e-mail: stoyanovamsu@mail.ru

Abstract

Biopreservation includes processes to increase shelf life of products, their nutritional and biological value as well as safety by adding a number of microorganisms and/or antimicrobial metabolites. *Lactococcus lactis* have been used by mankind for thousands of years to extend shelf-life of the foodstuffs, due to lactic acid and bacteriocins (nisin, food preservative, E234). However, nisin is not effective against enterobacteria and fungi.

Fusant strain was obtained after protoplast fusion of two related strains with low nisin-synthesizing activities. The probiotic properties of most effective strain F-116 were determined as resistance to gastrointestinal stresses and by measuring of superoxide dismutase (SOD) activity. Analytical chromatography methods were applied to determine the antimicrobial substances. Toxicological studies were performed on ciliates *Tetrahymena pyriformis*.

Fusant strain was identified as *L. lactis* ssp. *lactis* (GenBank EF100777). Fusant formed a new antimicrobial complex effective not only against Gram-positive (like nisin), but also against Gram-negative bacteria and fungi, the potential contaminants of food products. The individual antimicrobial substances differ from each other in molecular masses, electrophoretic mobility values (Rf) and biological properties. Two substances were identified as novel antibiotics. One component, contained alkyl-aromatic ketones with hydroxyl groups was responsible for antifungal activity. Strain F-116 synthesizes metabolites, increasing the shelf life of foodstuffs and its bioavailability: the amount of lactic acid was 8 mmol/L with high antioxidant value (SOD activity - 30 U/mg of protein). Freeze-dried samples of F-116 cells have no inhibitory effect on growth of ciliates *Tetrahymena pyriformis*.

Due to ability to synthesize antimicrobial agents and useful metabolites, the fusant strain F-116 with high antioxidant activity will create effective means for reducing oxidative food spoilage during storage and protection against serious diseases and early aging. Therefore, strain F-116 can be used as biopreservative and can fulfill the growing public demand for safe and healthy foodstuffs.

Key words: Fusant, *L. lactis* ssp. *lactis*, Food-borne pathogens. Bacteriocin, Fungi, Biopreservative, Metabolites.