Evaluation of biosurfactants production capacity by bacteria isolated from sea water and determination of their role in combating food pathogens

Biosurfactants are a diverse group of surface-active compounds that have gained attention among scientists worldwide in recent years. Due to their amphiphilic structure, they possess the ability to reduce surface tension by accumulating at the interface of two phases with different polarities. Unlike to synthetic surfactants, microbially derived compounds are characterized by biodegradability and lower toxicity. They also exhibit greater stability under varying pH, temperature, and salinity conditions. Biosurfactants are produced through microbial biosynthesis, involving bacteria and yeast.

Despite the significant progress in biosurfactant research, their widespread application still faces certain challenges. The main problem is the cost of production, caused by the usage of expensive raw materials and the low efficiency and productivity of microorganisms. Therefore, the aim of this project is to explore renewable and cost-effective carbon sources and develop a novel process for biosurfactants production and purification. The study will include utilizing hydrolysates of waste materials from the agri-food industry, such as sugar beet pulp, wheat bran, and carrot peelings. Microbiological synthesis of biosurfactants mostly depends on the nutrient content in the culture medium. This is particularly important when considering the protein and fat content, as well as the profiles of amino acids and fatty acids. Therefore, our research will determine to what extent the synthesis of microbiological surfactants will depend on the quality of enzymatically hydrolyzed waste materials.

Biosurfactants can act as emulsifiers, foaming agents, dispersants, and moisturizing agents. Some of them also demonstrate antimicrobial activity and inhibit biofilm formation. Due to these unique features, biosurfactants find applications in various industries, including the food industry.

Food safety is crucial for sustaining life and promoting good health. Microbial contamination of food poses a global public health problem, exposing hundreds of individuals to the risk of consuming food contaminated with pathogenic bacteria, such as *Salmonella*. Because of that, the main objective of this project is to evaluate the antibacterial and anti-biofilm effects of novel biosurfactants produced by two bacteria strains *Pseudomonas libanensis* and *Bacillus subtilis* isolated from the Baltic Sea and Norwegian fjords against foodborne pathogens, such as *Escherichia coli*, *Bacillus cereus*, *Yersinia enterocolitica*, *Campylobacter jejuni*, and *Salmonella enteritidis*.

The research hypothesis assumes that the results obtained in this project will enable the identification and characterization of new antimicrobial agents. These studies can have a significant impact on combating hazards related to unsafe food, thereby contributing to ensuring food safety. Furthermore, this research will provide a solid foundation for conducting further advanced research in this field.