



Project title: Sustainable Microbial Valorisation of Waste Lipids into Biosurfactants (Waste2Surf)

Project No. 1.1.1.1/19/A/047

Project leading partner: University of Latvia

Project partners: JSC "Biotehniskais Centrs"

Project report on the tasks completed in the period from 01.04.2021. till 30.06.2021.

During the reporting period, laboratory and modelling experiments were carried out to characterise the extraction of biosurfactants in lipid-rich fermentation environments. Experiments were continued in the Laboratory of Yeast Nutritional Physiology to adapt analytical methods for quantifying biosurfactants and carbon sources (lipids/glucose) on site directly in the culture solution (medium), minimizing the required treatment. The suitability of the glucose oxidase and antrone-sulphuric acid test for the quantification of biosurfactants was tested, and yeast growth tests were performed in the presence of oils (including waste cooking oils) and additionally added carbon and nitrogen source. The growth of yeast biomass under different conditions (in the presence of fresh/used oil and different sources of nitrogen) and the production of biosurfactants under the given conditions, as well as the chemical composition of raw materials (oils) and biosurfactants produced, were assessed. In the Fermentation Laboratory of the JSC Biotehniskais centrs, a number of experiments focusing on the removal (filtration) of biomass/product during the fermentation process were carried out, as well as biosurfactant washing and enconcentring experiments with two variations of the tangential filtration system (10 and 20 kDa membrane) were carried out. The experiments resulted in the collection of the required experimental data on the performance of the biological system in the production of biosurfactants.

Modelling tasks continued work on the development of genome-scale stoichiometric models, as well as work on the structure of kinetic models. During the reporting period, work was continued on adaptation of the *Yarrowia lipolytica* genome scale model. Work on the development of the stoichiometric model of *Starmerella bombicola* was launched on the basis of available sequencing data. In order to improve the quality of initial metabolic reconstructions, a variety of software for analysis of sequencing data is used in the design of models. In parallel, the development of a structure of kinetic models for the manufacture of surfactants was initiated using the models of *Starmerella bombicola* and *Yarrowia lipolytica*. A variety of scenarios for which life cycles will be compared in the follow-up study process were developed and evaluated to determine the environmental impact of the biosurfactant production scheme. A detailed structure was established for the basic model providing for a separate environmental impact assessment for medium, yeast fermentation and various fermentation regimes. At the same time, work was launched on collecting and processing data on the social and economic parameters of the management of waste cooking oils.

In cooperation with laboratory and modelling team researchers, work on the preparation of a scientific article on the use of yeasts for the production of biosurfactants from waste cooking oils and fats was completed. The manuscript was submitted to the journal Fermentation (ISSN: 2311-5637, IF (2020) = 3.975).

Information about the project at the partner's website: <https://www.bioreactors.net/wastetosurf>

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