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CULTIVATION OF MARINE CYANOBACTERIA AND DIATOMS ON REFINERY WASTE WATER

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Statement of the Problem: There is a rising interest in connecting biorefinery algal cultivation systems to existing industrial units, such as oil refineries, and wastewater treatment plants particularly due to its positive impact on environment. Therefore the main aim of A3-pico-IIIG project is to reveal potential of the northern Adriatic microalgae for production of biorefinery feedstock by selecting the most suitable according to the following criteria: biomass yield, lipid and carbohydrate productivity, cells harvesting and oil extractability, C16, C18, and FA saturation. Accordingly, the scientifically reliable platform resulting from empirical data and accompanying numerical model will present a base for further development of 3rd generation biofuel in INA Oil Refinery in Urinj, Croatia.

Methodology & Theoretical Orientation: The potential of Adriatic microalgae for cultivation will be acquired through selection of candidate species, based on (i) survey of existing knowledge, (ii) prediction of the optimum required growth conditions through numerical models and (iii) their experimental verification under various feeding-regimes of the photobioreactor. Models will be developed taking into account wastewater characteristics (N, P nutrients, organic C, temperature, salinity, irradiance, light regime) and stoichiometry of the various species.

Findings: Numerous strains of diatoms and cyanobacteria were isolated from Adriatic coastal waters and characterized for tolerance to high NH4 and PO4, low salinity and elevated toxicity. Highest biomass yield observed for Synechococcus sp. was 376 mg/L (dw) and among eucariotic microalgae 800 mg/L (dw) for Microchloropsis gaditana. The same strains demonstrated the least growth inhibition under the 1:1 dilution of industrial with municipal wastewater, and with N:P ratio=28.

Conclusion & Significance: Lessons learned during validation phase will provide a platform for the Adriatic phycoprospecting in biorefining processes, thus enabling INA Oil Refinery to improve the wastewater cleanup procedure through co-generation development. Such co-generation would have a positive environmental impact by reducing pollution and increasing efficiency, as well as positive economic effect by reducing costs of water purification and providing added revenue from the biomass

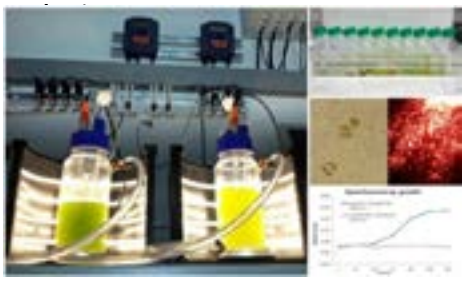

Figure 1: Microalgae growth in photobioreactor under controlled conditions demonstrated high dependence of biomass yield on light spectra characteristics and intensity, 4x higher biomass yield for cyanobacteria under the warm white light and conditions of c(NH4) 800 M, and high growth-dependence on temperature and day/night cycle by 4 different diatom species.

Biography

Biserka Lukarić Špalj works as an Engineer in Energetics focused on water management, including water intake and wastewater treatment. She has over ten years of experience as SD & HSE Senior Specialist; INA Co, Rijeka Refinery in monitoring emission parameters of environmental pollutants (air, water, waste) and reporting results to the authorities. She participated in issuing Permit for environmental protection (environmental permit, waste management), and in rehabilitation programs, studies and plans, as well as in issuing documents for environmental protection (monitoring plan of greenhouse gases). Also, she improved and solved technological issues connected with environmental pollution. From 2001 until 2005 she worked as Product Support Engineer in application and presentation of specialized industrial cleaning products for food industry, hotels resorts and hospitals. She attended University in Zagreb, Faculty of Chemical Engineering.

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