

Intentional Cultivation of Non-toxic Filamentous Cyanobacteria *Tolypothrix* as an Approach to Treat Eutrophic Waters

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Abstract : Eutrophication, a condition when water becomes over-enriched with nutrients (P, N), can lead to undesirable excessive growth of phytoplankton, so-called algal bloom. This process results in the accumulation of toxin-producing cyanobacteria and oxygen depletion, both possibly leading to the collapse of the whole ecosystem. In real conditions, the limiting nutrient, which determines the possible growth of harmful algal bloom, is usually phosphorus. Algicides or flocculants have been applied in the eutrophicated waterbody in order to reduce the phytoplankton growth, which leads to the introduction of toxic chemicals into the water. In our laboratory, the idea of the prevention of harmful phytoplankton growth by the intentional cultivation of non-toxic cyanobacteria *Tolypothrix tenuis* in semi-open floating photobioreactors directly on the surface of phosphorus-rich waterbody is examined. During the process of cultivation, redundant phosphorus is incorporated into cyanobacterial biomass, which can be subsequently used for the production of biofuels, cosmetics, pharmaceuticals, or biostimulants for agricultural use. To determine the ability of phosphorus incorporation, batch-cultivation of *Tolypothrix* biomass in media simulating eutrophic water (10% BG medium) and in effluent from municipal wastewater treatment plant, both with the initial phosphorus concentration in the range 0.5-1.0 mgP/L was performed in laboratory-scale models of floating photobioreactors. After few hours of cultivation, the phosphorus content was decreased below the target limit of 0.035 mgP/L, which was given as a borderline for the algal bloom formation. Under laboratory conditions, the effect of several parameters on the rate of phosphorus decrease was tested (illumination, temperature, stirring speed/aeration gas flow, biomass to medium ratio). Based on the obtained results, a bench-scale floating photobioreactor was designed and will be tested for *Tolypothrix* growth in real conditions. It was proved that intentional cultivation of cyanobacteria *Tolypothrix* could be a suitable approach for extracting redundant phosphorus from eutrophic waters as prevention of algal bloom formation.

Keywords : cyanobacteria, eutrophication, floating photobioreactor, *Tolypothrix*

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