Biotreatment of Brewery Wastewater Using the Filamentous Cyanobacterium *Leptolyngbya* sp.

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ABSTRACT

Microalgae and cyanobacteria are a diverse group of unicellular, photosynthetic organisms. Their capacity to accumulate large quantities of lipids, carbohydrates and proteins make algae a suitable substrate for a wide range of biotechnological applications (biodiesel, bioethanol, bioplastics, pigment, pharmaceutical substances production etc.)[1]. However, a limiting factor for applying large-scale cultivation is the availability and the cost of nutrients[2]. A practical, sustainable way to overcome this obstacle is the utilization of streams of nutrient-rich wastewaters.

Brewery wastewater is generated from the beer brewing process in large amounts (4-8 m^3 per m^3 of beer produced). Brewery wastewater consists of high organic matter content, significant nitrogen and phosphorus concentrations and easily biodegraded compounds[3]. Even though most biological treatment technologies applied to brewery wastewaters include the use of bacteria, cyanobacteria (photosynthetic microorganisms) constitute attractive means for sustainable and low cost wastewater treatment producing high biomass concentration.

In this study, a mixed culture, consisting mainly of the filamentous, alkaliphilic, photoautotrophic cyanobacterium Leptolyngya sp., is utilized in order to investigate its capacity to treat brewery wastewaters (Table 1.), in combination with accumulating proteins, carbohydrates and lipids. The experiments were conducted in batch mode under non-sterile conditions in lab-scale photobioreactors.

The removal rates of nitrate, ammonium, orthophosphates, total phosphorus and chemical oxygen demand (COD) were almost 49.2%, 100%, 57.1%, 57.9% and 24.3%, respectively, within the first 7 days of cultivation. The maximum biomass concentration was 350 mg/L, while the biomass produced was consisted of approximately 53.5% carbohydrates, 20.2% proteins and 10% lipids. Therefore, the treatment of brewery wastewater using cyanobacteria species could be effective, while the cyanobacterial biomass could be used in numerous fields for diverse applications.

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