

BIOREMEDIATION OF MIXED DAIRY AND POULTRY WASTEWATER IN PILOT- SCALE SUSPENDED AND ATTACHED GROWTH PHOTOBIOREACTORS USING CYANOBACTERIA-BASED CONSORTIA

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ABSTRACT

A microbial consortium dominated by *Leptolyngbya* sp. was used for the treatment of mixed dairy and poultry wastewaters (MWWs). Laboratory-scale experiments were carried out to determine the optimum mixing ratio for the dairy : poultry wastewaters (50:50%, 60:40%, 70:30% and 85:15%, respectively). The mixing ratio of 70:30% showed significant biomass productivity (263.8 mg L⁻¹d⁻¹) and the highest lipid content (14% d.w.). Pilot-scale experiments were also conducted with suspended and attached growth photobioreactors using the mixing ratio of 70:30%. The results showed that biomass productivities were improved in the attached growth systems (218.8-474.0 mg L⁻¹d⁻¹) compared to the suspended (102.0-349.8 mg L⁻¹ d⁻¹). High nutrient removal rates were achieved in both growth systems (d-COD: 78.6-96.8%, TN: 78.0-98.0%, PO₄³⁻-P: 77.4-92.0%), however the attached systems enhanced the pollutant assimilation by the microbial consortium (d-COD: 96.8%, TN: 98.0%, PO₄³⁻-P: 90.0%). In the attached systems, the biomass contained up to 18.0% d.w. lipids and in the suspended systems 12.0% d.w. lipids. Lipid analysis showed that saturated and monounsaturated fatty acids accounted for over 70% of the total fatty acids in both growth systems. It was concluded that the attached growth systems were more efficient for the treatment of the MWW, while the produced lipids were suitable for biodiesel production.

KEYWORDS: *Leptolyngbya* sp., pilot-scale photobioreactors, mixed wastewaters, lipid production