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Screening and comparative metabolic profiling of high lipid content microalgae strains for application in wastewater treatment

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Abstract

New strains of green microalgae were isolated and screened for growth and the production of lipids from municipal wastewater. It was shown that the strain *Micractinium* sp. IC-76 has a biomass productivity of $37.18 \pm 4.12 \text{ mg L}^{-1} \text{ d}^{-1}$ and a lipid content of $36.29 \pm 0.11\%$, with a total content of saturated and monounsaturated fatty acids of 71.9%. The efficiency of nitrogen (N-NH₄) and phosphorus (P-PO₄) removal was 96.4 ± 0.7 and $77.8 \pm 5.6\%$, respectively. The metabolic differences at the exponential and stationary phases of growth between the closely related strains with different patterns of lipid accumulation were revealed via gas chromatography mass spectrometry metabolic profiling. The strain *Micractinium* sp. IC-76 in the stationary phase of growth shows a significant difference in carbohydrate metabolism, especially sucrose concentration. High lipid induction during cultivation in wastewater was also driven by changes in the biosynthesis of amino acids, fatty acids and the tricarboxylic acid cycle.

Keywords: microalgae, wastewater, metabolic profiling, lipid metabolism

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