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BIOENERGY POTENTIAL OF HYDROCARBONOCLASTIC BACTERIA FATTENED-UP FROM INDUSTRIAL WASTEWATERS

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Microbial lipids are currently of great interest as raw material for biofuels production. Hydrocarbonoclastic bacteria (HCB), key players in bioremediation of hydrocarbon contaminated ecosystems, can produce and accumulate up to 90 % of its weight in lipids when submitted to growth-limiting conditions (e.g. nitrogen limitation). The intensive usage of crude oil derivatives as lubricants, which corresponds to about 1% of the world's total mineral oil consumption, originates equivalent volumes of wastes. This lubricant wastes (LW) contains hydrocarbons ranging from C9 to C40, which can serve as substrate for HCB. Cultivation of HCB strains either in pure cultures or consortia with this type of industrial wastewater can, under optimized conditions, lead to production and accumulation of microbiological lipids, such as triglycerides (TAG). Combining TAG production with industrial wastewater treatment can contribute to make the process more economic and environmentally sustainable.

This research aims at characterizing the potential of production and accumulation of bacterial lipids using 3. A concentrated wastewater collected from an engine's repairing workshop, scarce in nitrogen and rich in HC, was fed (1.2% v/v) as sole carbon source, to representative HCB bacterial strains. Three different carbon to nitrogen molar ratios (C/N) were tested. After cultivation in nutrients balanced medium, the cells were washed and cultivated in a defined medium with excess of carbon. Different time lengths were evaluated for cultivation in nutrient balanced medium and under unbalanced conditions. For each condition tested, cells were harvested, freeze-dried, and its lipidic content was extracted and analyzed qualitatively. The profile of HC present in the culture media was 4.

For Gram-negative HCB strain, the balanced growth conditions matched the period where the most significant HC removal was achieved. By the end of the exponential growth stage the chromatogram´s unresolved area decrease substantially and a 30% decrease in the concentration of compounds as tricosane and tetracosane was observed. The presence of TAG was detected in cells cultivated in unbalanced conditions. Fatty acids (FA) were detected in both conditions tested. The length of the accumulation period also showed to be an important factor in the experiments made with Gram-positive HCB strain. The late exponential or early stationary growth stages showed to be the most adequate period to transfer the biomass from balanced to unbalanced culture conditions. In general, the Gram-positive HCB strain showed a higher capacity to produce TAG from the tested wastewater. 5. The results obtained in our work show the potential of using hydrocarbon-based wastewaters to produce bacterial lipids. Further research is needed to determine the conditions that allow maximal storage lipid biosynthesis.