

Screening of oleaginous yeasts for the valorization of sewage scum polysaccharides through the production of Single Cell Oil

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Among renewable energy sources, biodiesel is one of the most promising bio-fuels in the transportation sector. Biodiesel is composed of long-chain alkyl esters of fatty acids (FAMES), which can be obtained from various renewable raw materials, mainly from oilseed crops. Recently, microbial lipids, namely *single cell oils* (SCOs), have received great interest as feedstocks for biodiesel production, due to the advantages given by their use over the vegetable oils, including the overcoming of the concerns about the competition with the food supply chain [1] and the seasonality of crops. Among the oleaginous microorganisms, yeasts are the most promising lipid-accumulating microbes due to their ability of growing faster, independently from environmental conditions, and utilizing a wide range of carbon sources. Moreover, the economic and ecological feasibility of the yeast lipids production process can be enhanced by using low-cost raw materials [2], for examples sewage scum (SS), a special waste obtained from urban wastewater treatment plants. SS is composed of a polysaccharide fraction [3], which can be used as potential source of fermentable sugars for the bioaccumulation of lipids, and a lipidic fraction, which can be directly used for trans-esterification reaction to produce FAMES. The aim of this work was to identify an efficient commercial oleaginous yeast strain able to utilize glucose and xylose contained into the SS enzymatic hydrolysate to produce SCOs. The species *Cryptococcus curvatus*, *Rhodospiridium toruloides* and *Trichosporon oleaginosus* were compared in terms of microbial growth and lipid accumulation and productivity. Considering the estimated concentration of the main monosaccharides present in the undetoxified SS hydrolysate, the screening of the three different oleaginous yeasts was carried out using an equivalent synthetic medium containing glucose and xylose as carbon source. In addition, optimal C/N ratio, pH, type and concentration of micronutrients were formulated for each yeast to ensure its best performance. After fermentation, standard acidic cell lysis and liquid-to-liquid extraction of SCO were carried out. Triglycerides were subjected to hydrolysis and esterification reactions, yielding FAMES, whose profile was characterized. Finally, the main outputs of the bioprocess were calculated for the three selected yeasts, such as cellular lipid content and productivity. The results indicated *T. oleaginosus* as the best oleaginous yeast, due to its high lipid cell content (55 wt%) and productivity (71 (mg/L)/h): this species will be subsequently tested on the real hydrolysate obtained from SS.

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