FROM SEWAGE SCUM UP TO LIPIDS PRODUCTION USING OLEAGINOUS YEASTS AS BIOCATALYSTS

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Biodiesel is one of the most promising biofuels in the transportation sector and it 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 with respect to vegetable oils[1]. Among the oleaginous microorganisms, yeasts are the most promising lipid-accumulating microbes due to their ability to grow fast, independently from environmental conditions and utilize 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], such as sewage scum (SS), a special waste obtained from urban wastewater treatment plants. SS is made up of a polysaccharide fraction[3], which can be used as a potential source of fermentable sugars for the bioaccumulation of lipids with oleaginous yeasts after carrying out the hydrolysis reaction. In this context, the aim of this work was the valorization of the hydrolysate obtained through enzymatic hydrolysis of SS toward the production of SCOs, using a biological catalytic approach based on oleaginous yeasts fermentation. *Trichosporon oleaginosus* was used as a biocatalyst for the fermentative process of undetoxified real substrate. In order to optimize the fermentation of sewage scum hydrolysate (SSH) by *T. oleaginosus* in terms of lipid accumulation, three different C/N ratios were investigated (C/N ratios of 80 g/g, 100 g/g and 120 g/g). At the end of the fermentations, standard acidic cell lysis and liquid-to-liquid extraction of SCOs were carried out, and the main outputs of the bioprocesses were calculated, including intracellular lipid content. The results highlighted that *T. oleaginosus* was able to grow on SSH and to consume almost all glucose and xylose. In addition, the C/N ratio of 80 g/g seemed to be a good compromise to facilitate both the biomass growth and the lipids accumulation by *T. oleaginosus*. In detail, adopting this yeast, the SCOs accumulation of 45.6 wt% was achieved. The FAMEs profile of SCOs obtained in this investigation resulted very similar to those of common vegetable oils, used at the industrial scale for commercial applications, including the production of traditional biodiesel.

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