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SYNTHESIS OF BIODIESEL FROM HYDROLYSATES OF ARUNDO DONAX

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Abstract

The market penetration of the Ist generation biodiesel is limited by the relatively high cost of the feedstock (i.e. vegetable oils and animal fats), the insufficient availability of fertile land, as well as the social and environmental problems caused in different developing countries.

New promising perspectives are offered by the hydrolysis of lignocellulosic materials to obtain fermentable sugars, as a large range of waste materials can be recycled, such as non-food parts of crops, forest products, and industry wastes. Though so far the hydrolysates of lignocellulose have been mainly used for the production of bioethanol, they can be alternatively employed for culturing oleaginous microorganisms, producing more than 20% of their weight in the form of lipids. These lipids are mainly triglycerides, potentially exploitable as feedstock for the synthesis of biodiesel. In this study, we demonstrate that the oleaginous yeast *Lipomyces starkeyi* can be grown in the presence of lignocellulose hydrolysates obtained from different samples of *Arundo donax*.

L. starkeyi were cultured in the presence of the raw hydrolysate of *A. donax* (ADH) with no external organic supplement. A preliminary dilution was required to obtain a satisfactory cell growth, due to the presence of some products of the lignocellulose hydrolysis that inhibit the cellular growth (furfural, phenolic compounds, etc.). The yeast growth was accompanied by the complete consumption of the reducing sugars and a significant reduction of TOC.

In order to remove the inhibitors, the ADH was treated following three different protocols: (a) overliming treatment with concentrated $Ca(OH)_2$, (b) neutralization with NaOH and adsorption on active carbons, (c) overliming followed by neutralization and adsorption. These treatments made possible the growth of *L. Starkey* in the presence of undiluted raw ADH. The experimental data demonstrate that the best results are obtained by the method (b).