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"Gheorghe Asachi" Technical University of Iasi, Romania

ALKALI PRE-TREATMENT AND ENZYMATIC HYDROLYSIS OF *Arundo donax* FOR SINGLE CELL OIL PRODUCTION

Stefano Cianchetta[1], Monica Nota[2], Nakia Polidori[2], Stefania Galletti[1]*

[1]Council for Agricultural Research and Economics, Research Centre for Agriculture and Environment, Via di Corticella 133, Bologna, 40128, Italy
[2]Department of Pharmacy and Biotechnology, University of Bologna, Viale Risorgimento 4, Bologna, 40136, Italy

Abstract

Microbial oil obtainable from the fermentation of lignocellulose hydrolysates represents a promising and sustainable alternative to first generation biodiesel. Among the lignocellulosic crops, giant reed (*Arundo donax*) is attracting interest due to the impressive biomass yield and the low input requirement. However, a delignification step is needed to facilitate the fermentable sugar release from the lignocellulosic matrix, paying attention to the production of growth inhibitors that represent a bottleneck in the development of microbial oil production. The aim of this study was to evaluate the suitability of an enzymatic hydrolysate of alkali pre-treated *A. donax* biomass, as a substrate for the growth of the oleaginous yeast *Lipomyces starkeyi*. Specific attention was also paid to possible inhibitory effects of compounds generated by the alkaline pre-treatment (10% slurry, NaOH 0-1.5% w/w, 120 °C, 20 min). Increasing NaOH levels enhanced the release of phenolic compounds and increased the fermentable sugar yield after enzymatic hydrolysis of the washed pre-treated fiber. Saccharification yields reached a plateau in correspondence to NaOH 1.2% dose, which gave 407 mg of sugars per g of dry biomass. A medium containing 30 g/L of reducing sugars from the hydrolysate resulted suitable for the growth of *L. starkeyi* and for lipid accumulation, achieving 12.2 g/L of dry cell biomass with 43% w/w of total lipids. The pre-treatment produced soluble inhibitors that affected moderately the yeast growth in an initial phase, followed by a recovery. Thus, extensive washing of the fiber could be avoided, while a thorough filtration after the pre-treatment would be recommended.

Key words: fermentable sugars, giant reed, inhibitors, *Lipomyces starkeyi*, microbial oil

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* Author to whom all correspondence should be addressed: e-mail: stefania.galletti@crea.gov.it; Phone: +39 0516316836; Fax: +39 374857