IN-SITU XYLANASE PRODUCTION USING AGRO-INDUSTRIAL RESIDUES FOR LIGNOCELLULOSIC ETHANOL

Marques, Susana [1], Vorobieva, Ekaterina [1], Tavares, João [1], Faria, Nuno [1,2], Fonseca, César [3] & Gírio, Francisco [1]

[1] Bioenergy Unit, Laboratório Nacional de Energia e Geologia, I.P., Estrada do Paço do Lumiar 22, 1649-038 Lisboa, Portugal
[2] Department of Bioengineering and iBB-Institute for Bioengineering and Biosciences, IST, Universidade de Lisboa, Av. Rovisco Pais, 1049-001 Lisboa, Portugal
[3] Section for Sustainable Biotechnology, Department of Chemistry and BioScience, Aalborg University, A. C. Meyers Vænge 15, C2, 2450 Copenhagen SV, Denmark
*Corresponding author. *E-mail*: francisco.girio@lneg.pt.

Keywords: Bioethanol, Enzymatic hydrolysis, Lignocellulosic biomass, Xylanases

Abstract

Enzymes cost still constitutes one of the major barriers to commercial implementation of lignocellulosic ethanol. Therefore, search for more efficient and cost-effective enzymes is desirable. Given the market availability of efficient commercial cellulases, focus should be given to novel effective xylanases to boost hemicellulose conversion.

In the present work, two strains of *Moesziomyces* spp., *M. antarcticus* and *M. aphidis,* have been used to produce hemicellulases using agro-industrial residues as inexpensive inducing substrates.

Cellulase-free xylanases were successfully produced by both strains using barley straw, sweet corn cobs and blue agave bagasse, previously subject to mild pretreatment in a twin-screw extruder. Maximal extracellular xylanase activity, 211 IU/mL, was produced by *M. aphidis* on sweet corn cobs. The in-house hemicellulases were assessed in co-supplementation of commercial Cellic® CTec2 towards the same extrudate materials used for their production. These novel 2G enzyme cocktails did increase by 30% the xylan hydrolysis yield on the extrudates at solids loadings as high as 33% (w/v), providing yields close to 80% for both glucan and xylan.

The on-site production of these xylanases by *Moesziomyces* spp. provides an attractive integrated solution for the conversion of lignocellulosic feedstock into biofuels or chemicals, which might lead to lower operational costs for 2G bioethanol plants.

This work has been co-funded by the European Commission (Horizon 2020 Program) under Grant agreement no. 654362 (BABET-REAL5 Project).