P6.6 - OPTIMIZATION OF ENZYMES PRODUCTION BY *ASPERGILLUS NIGER* IN SOLID STATE FERMENTATION OF AGRO-INDUSTRIAL BY-PRODUCTS

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ABSTRACT

The agri-food industry generates significant amounts of by-products that are often discarded or used in low-value applications. Solid by-products of lignocellulolytic structure have been proved to be suitable substrates in solid-state fermentation (SSF) to produce carbohydrases, that have many industrial applications [1]. In this work, the by-products brewer's spent grain (BSG), rice husk (RH), and vine shoot trimmings (VST) were used to carry out SSF experiments using *Aspergillus niger* CECT 2088 and to produce enzymes of relevance in textile industry, such as cellulases, xylanases and amylases. Factors influencing SSF performance were examined such as the substrate granulometry and the supplementation of nitrogen and phosphorous sources. In SSF experiments performed at 25ºC and 75% (w/w) moisture for 7 days, a positive effect of medium supplementation with 2% (w/w) $(NH4)2SO4$ and 1% (w/w) $K2HPO4$ was observed, leading to 2 to 10-fold increase of enzymes production using RH and BSG. Under these conditions SSF was performed with different particle sizes (1, 4 and 10 mm) and the highest enzyme activities were obtained with the highest size of BSG and RH, and with 4 mm VST. With selected granulometry of the three by-products, a Simplex-Centroid mixtures design was performed. Optimal enzyme activities were obtained with 100% BSG for xylanase (651 U/g), β-glucosidase (363 U/g), cellulase (189 U/g) and 72% (w/w) of BSG and 28% of RH for amylase (263 U/g). Besides those optimal values, the use of 50% (w/w) BSG/RH mixture resulted in high production of xylanase (553 U/g) and β-glucosidase (221 U/g), and with 50% (w/w) BSG/VST a cellulase activity similar with 100% BSG was obtained. These results indicates that SSF-based bioprocessing of BSG alone or in mixtures of VST and RH, is an effective and sustainable approach to produce enzymes of textile industry interest, contributing to boost circular economy in this sector.

References:

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