

Tipo de Comunicación:

Póster: P_BB_34

Simposio:

BIOENERGÍA Y BIOPRODUCTOS

Título:

Improvement of nutritional value of Portuguese agro-industrial wastes by SSF

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Palabras Clave:

agro-industrial wastes; xylanases; cellulases; animal feed

Comunicación:

Presently, there is a growing interest in the exploitation of the residues generated by the food industry. In Portugal, the most important are the beer, wine and olive oil agro-industries, producing in average 750,000 t of beer (FAOSTAT, 2012) 7 million hl of wine and 0.7 million hl of olive oil per year (INE, 2013). These wastes are frequently used as animal feed without processing, however they are used in small amounts and mixed with other materials due to their very low nutritional value and its antinutritional factors such as phenolic components that reduce their palatability and digestibility. An improvement in animal feeding is one of the important and basic conditions for the better management of farming of animals. The rapid changes in animal farming imply scrutiny in the studies on nutrition evaluation with respect to the target animals and low-cost technology approach.

Solid-state fermentation using fungi is a low-cost biotechnology that allows the upgrading the solid wastes improving their digestibility and increases the nutritional value. In this work, four agro-industrial wastes brewery spent grain (BSG), exhausted olive pomace (EOP), exhausted grape marc EGM and vineshoot trimming VTS were fermented by filamentous fungi under SSF to improve their protein content and to produce enzymes. Three fungi from MUM collection (Micoteca of University of Minho) were evaluated: *Aspergillus ibericus*, *Aspergillus niger* and *Aspergillus uvarum* and urea was added to substrate except to BSA due to its high content of N. After fermentation, their protein content, cellulose and xylanase activity were analysed.

The results showed that *A. ibericus* was the fungi further increase the protein content and it achieved the highest enzyme activities. The highest enzyme activities were achieved using no supplemented BSG. The best increases in protein were achieved in wastes from olive mills and wineries. These wastes had a low nutritional value before fermentation, the N content was below 1%. After fermentation their protein content was increased up to 3-fold due to the growth of fungi. Thus, the use of SSF allowed to improve the potential of these agro-industrial wastes to be used as animal feed.