



Evaluation of filamentous fungi for the treatment of olive mill waste-waters

Luís Abrunhosa, Danielle Dantas, Cristiana Gonçalves, Felisbela Oliveira, Armando Venâncio and Isabel Belo

IBB-Institute for Biotechnology and Bioengineering, Centre of Biological Engineering, Universidade do Minho, Campus de Gualtar, 4710-057 Braga, Portugal

In Portugal, olive mill wastewater (OMW) production is estimated at 100×10^3 - 350×10^3 m³/year and constitutes an important seasonal pollution problem to be solved by the local olive oil industry. OMW is a dark liquid residue with high organic content composed mainly by sugars, tannins, polyphenols, polyalcohols, organic acids, proteins, pectins and lipids. Different treatments and disposal alternatives can be found in the literature in order to provide solutions for the OMW problem. OMW biological treatments with its simultaneous valorisation through the co-production of added-value products are one of the main approaches possible. The aim of this work is to evaluate the capability of several filamentous fungi to reduce the polluting characteristics of OMW and to produce extracellular enzymes. Under this study, strains of *Trametes versicolor*, *Aspergillus ibericus*, *Aspergillus niger* and *Penicillium expansum* were tested. Agitated batch fermentations were carried out at 27 °C for seven days using culture media prepared with different concentration (10, 50 and 100 %) of centrifuged OMW. Daily changes on the concentration of reducing sugars, protein, phenolic and aromatic compounds, COD, colour and pH were determined. Additionally, produced lipase, lignin and manganese peroxidase and laccase were followed. When 10 % of OMW was used, *T. versicolor* and *A. ibericus* were found to be the most effective strains, reducing OMW colour (30 and 55 %, respectively), aromatic compounds (16 and 39 %, respectively), phenolic compounds (55 and 37 %, respectively) and COD (55 and 39 %, respectively). In those same conditions, the maximum lipase activity was 108 U/L, 291 U/L, 77 U/L and 47 U/L for *T. versicolor*, *A. ibericus*, *A. niger* and *P. expansum*, respectively. For the oxidative enzymes, activity was only detected in fermentations conducted with *T. versicolor* - maximum recorded activity was 12 U/L and 83 U/L for laccase and lignin peroxidase, respectively. When 100 % of OMW was used, *A. ibericus* reduced OMW colour and COD by 97 % and 45 %, respectively, but no reductions of aromatic and phenolic compounds were observed. In those conditions lipase produced by *A. ibericus* reached 2927 U/L.

Luís Abrunhosa and Cristiana Gonçalves want to acknowledge the support from Fundação para a Ciência e Tecnologia (FCT) from Portugal (grant SFRH/BPD/43922/2008 and SFRH/BD/27915/2006 respectively). The authors also acknowledge FCT for the financial support through the project PTDC/AMB/ 69379/2006.