Pre-treatment and ethanol fermentation potential of olive pulp at different dry matter concentrations

Renewable energy sources have received increased interest from the international community with biomass being one of the oldest and the most promising ones. In the concept of exploitation of agro-industrial residues, the present study investigates the pre-treatment and ethanol fermentation potential of the olive pulp, which is the semi solid residue generated from the two-phase processing of the olives for olive oil production. Wet oxidation and enzymatic hydrolysis have been applied aiming at the enhancement of carbohydrates' bioavailability. Different concentrations of enzymes and enzymatic durations have been tested. Both wet oxidation and enzymic treatment were evaluated based on the ethanol obtained in a subsequent fermentation step by Saccharomyces cerevisiae and Thermoanaerobacter mathranii. It was found that a four-day hydrolysis time was adequate for a satisfactory release of glucose and xylose. The combination of wet oxidation and enzymatic hydrolysis resulted in the glucose and xylose concentration increase of 138 and 444%, respectively, compared to 33 and 15% with only enzymes added. However, the highest ethanol production was obtained when only enzymic pre-treatment was applied, implying that wet oxidation is not a recommended pre-treatment process for olive pulp at the conditions tested. It was also showed that increased dry matter concentration did not have a negative effect on the release of sugars, indicating that the cellulose and xylan content of the olive pulp is relatively easily available. The results of the experiments in batch processes clearly emphasize that the simultaneous saccharification and fermentation (SSF) mode is advantageous in comparison with the separate hydrolysis and fermentation (SHF) mode concerning process contamination.

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