Comparison of fermentation strategies for ethanol production from pretreated brewers spent grains

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Abstract

Brewers spent grain (BSG) is an important co-product derived from beer making process with limited practical applications. The bioconversion into ethanol of this renewable resource can be interesting because of its carbohydrate content. Untreated brewers spent grain contains 20.5 % glucans and 25 % hemicellulose, mainly xylose and arabinose. This work focuses on the bioethanol production from this feedstock after phosphoric acid pretreatment at previously determined optimal conditions. The sequential and simultaneous process configurations for saccharification and fermentation were compared at different solid loadings, 5 %, 10 % and 15 % (w/v). In the sequential process, the enzymatic hydrolysis showed good performance. The cellulose saccharification was almost complete even when the enzymatic hydrolysis was performed at the highest solid loading (15 % w/v).

The final ethanol concentrations and yields did not differ significantly between both process configurations tested at 5% and 10% solid loading. However, at the highest solid loading the separate process appears to be more favourable. Thus, the best results were achieved when the pretreated BSG was saccharified and fermented by a sequential process with maximum bioethanol production of 22.5 g/L. This ethanol concentration corresponds to a yield of 37 g ethanol/100 g glucose in pretreated BSG and 72 % of the theoretical ethanol yield.

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