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WHEAT STRAW FRACTIONATION BY ETHANOL-WATER MIXTURE: OPTIMIZATION OF OPERATING CONDITIONS AND COMPARISON WITH DILUTED SULFURIC ACID PRE-TREATMENT

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ABSTRACT

The fractionation of wheat straw by ethanol-water (EW) pre-treatment was studied regarding its main operating conditions: time, temperature, L/S ratio and ethanol percentage were optimized by using an orthogonal experimental design (Taguchi). Afterwards, diluted sulfuric acid (DSA) hydrolysis and EW treatments have been compared in terms of energy consumption and yield of a cellulosic solid residue able to be enzymatically hydrolyzed to glucose. Experimental results show that temperature is the only variable of EW with a significant effect on the quality of the pretreated solids. EW pre-treatment of wheat straw is more effective than DSA hydrolysis due to its higher capacity of delignification. Moreover, a high glucose yield (80 %) can be obtained by enzymatic hydrolysis of a solid pretreated with a moderate energy input EW (160 ºC, 45 min.) while wheat straw needs of a higher energy input during DSA to produce a similar yield of glucose after saccharification.

KEYWORDS

Wheat straw; Ethanol-water fractionation; Acid hydrolysis; Biorefinery