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Thermo-chemical Conversion of Sugarcane Bagasse Polysaccharides to Reducing Sugars under Accelerated Hydrolysis Conditions

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Abstract—*Sugarcane baggase was hydrolyzed using dilute hydrochloric acid for the conversion of higher molecular weight hydrocarbons to reducing sugar. Acid concentration (1-5%), hydrolysis time (30-120 min) and substrate concentration (5-7.5%) were varied based on a central composite rotatable design with 17 experimental sets (including 3 replicates). Collected hydrolysate was filtered and stored at -50°C for further use. Reducing sugar was estimated in mg/ml of hydrolysate using DNS reagent with glucose as standard. A second order model was developed based on the experimental runs with a R^2 of 52.99%. Reducing sugar varied from 3.13-15.21 mg/ml of hydrolysate. Based on the model it was observed that higher acid and substrate concentration resulted in an increased conversion of reducing sugar. Acid concentration and hydrolysis time showed significant negative interaction effect on the reducing sugar ($p<0.1$). On the contrary, increasing the hydrolysis time resulted in a decrease in reducing sugar possibly due to the formation of inhibitors such as 5-HMF and acetic acid. Optimization of the experimental variables revealed that an acid concentration of 4.1%, substrate concentration of 8.4% and hydrolysis time of 36.2 min would result in a 11.59 mg/ml conversion of reducing sugar (desirability of result = 0.837). The resulting hydrolysate could be utilized for production of bio-plastic after suitable microbial fermentation. Further studies will be conducted with alkaline and enzymatic hydrolysis to identify better recovery of reducing sugars. An Artificial Neural Network based model could also be investigated to arrive at improved optimum conditions.*

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