

High Efficiency Bioethanol Production from Barley Straw using Continuous Pretreatment Reactor

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Barley straw was pretreated by continuous pretreatment reactor with NaOH for high efficiency bioethanol production. The continuous twin-screw reactor was manufactured by Changhae Ethanol Co., Ltd, Jeonju, Korea, designated as Changhae Ethanol Multi ExTruder (CHEMET). Biomass to ethanol ratio (BTER) for optimal pretreatment condition was evaluated by response surface methodology (RSM). The simultaneous saccharification and fermentation (SSF) was carried out to investigate BTER with 30 FPU/g cellulose of enzyme and 7 v/v% of yeast (*Saccharomyces cerevisiae* CHY 1011) using 10 w/v% of pretreated biomass at various conditions. Maximum of BTER was calculated as 73% at optimal pretreatment conditions (86.61°C, 0.58M, and 84.79 mL/min for temperature, NaOH concentration, and flow rate, respectively). And BTER was $70.01 \pm 0.59\%$ to check reproducibility using pretreated biomass at optimal conditions. Also, the SSF was carried out to investigate the optimal enzyme and biomass dosage at 33°C, 150 rpm, 88 h. Based on these results, maximum ethanol concentration and ethanol yield were 46.00 g/L and 77.36% at loading pretreated biomass of 20 w/v% with 30 FPU/g cellulose of enzyme dosage.