

Impact of *Miscanthus* harvesting date and acid chlorite pretreatment on biosugar yield

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[Introduction]

Geodae-Uksae (GU; the Korean term for Giant *Miscanthus*), is a variety of *Miscanthus sacchariflorus* recently discovered in Korea. In general, *Miscanthus* plants used for paper and composites are harvested at the end of their growing season. While the yield of an early harvest is low, there is an advantage for biosugar in that there is reduced energy consumption during the pretreatment process for bioenergy production.

[Materials and Methods]

GU was planted in April 2010 and grown for six years in experimental fields at Muan (Korea) without nitrogen amendment. The plants were harvested in September 2016 (early harvest; EH-GU) and February 2017 (delayed harvest; DH-GU). The average weight was estimated from three random blocks in the field at different area. Structural carbohydrates of EH-GU and DH-GU were analyzed for neutral sugar content using gas chromatography (GC). The Brunauer-Emmett-Teller (BET) was conducted to analyze the pore size and volume of samples. The relative crystallinity of samples was measured by X-ray diffraction (XRD). Cellulase and xylanase were added to the biomass at concentrations of 2.2–36 FPU/g and 2.3–9.2 mg/g biomass, respectively.

[Results and Discussions]

Total biomass yields were 20.1 t DM/ha and 18.0 t DM/ha for EH-GU and DH-GU, respectively. Carbohydrates in EH-GU mainly consisted of 45.1% glucose and 20.1% xylose with 18.0% lignin, while DH-GU carbohydrates comprised 47.4% glucose, 22.6% xylose, and 20.1% lignin. The total carbohydrate content of GU increased from 67.7% to 93.9% in EH-GU, and from 73.3% to 91.7% in DH-GU. The lignin content decreased from 18.0% and 20.1% to 2.1% and 3.8% in EH-GU and DH-GU, respectively. The surface area of EH-GU was 1.52 m²/g, greater than the surface area (0.72 m²/g) of DH-GU. Enzymatic hydrolysis was performed on pretreated EH-GU with 14.4 mg of cellulase and 9.2 mg of xylanase/g GU at 45°C for 48 h. After enzymatic hydrolysis, 381 g of glucose and 147 g of xylose were produced for a total 528 g of biosugar from 1 kg of EH-GU.

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