

Consolidated bioprocessing inhibition at high biomass is mostly due to hydrolysis inhibition

Background

- Efficient bioconversion of solids at high mass loadings is necessary to produce industrially relevant titers of biofuels from lignocellulosic biomass.
- To date, only a few studies have investigated the inhibitory effects of high-solids loadings of plant biomass on microorganisms of interest for consolidated bioprocessing (CBP).

Approach

- Established a large set of primary and secondary batch fermentations using both switchgrass and model substrates then compared conversion performance based on a suite of analytic capabilities.
- *C. thermocellum* was grown for ten days on 10, 25 or 50 g/L switchgrass or Avicel at equivalent glucan loadings. Residual biomass samples and supernatants were evaluated for recalcitrance and the release of inhibitors during fermentation.

Outcome

- Recalcitrance alone cannot fully account for differences in solubilization and end-product formation between switchgrass and Avicel at increased substrate loadings. Experiments aimed at separating metabolic inhibition from inhibition of hydrolysis suggest that *C. thermocellum*'s hydrolytic machinery is more vulnerable to inhibition from switchgrass-derived compounds than its fermentative

Significance

- The data produced in this study suggest that inhibition of hydrolysis (i.e., cellulase activity) plays a greater role in reduced biofuel production at higher biomass loadings than does metabolic inhibition.

