

Release of Sugars for Fermentation to Ethanol by Enzymatic Digestion of Corn Stover Pretreated by Leading Technologies

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Corn stover was pretreated by ammonia fiber explosion (AFEX), ammonia recycle pretreatment (ARP), controlled pH, dilute sulfuric acid, flowthrough, and lime technologies, and the enzymatic digestion of the solids was evaluated. Most of the glucan in corn stover was solubilized in the subsequent enzymatic digestion step at cellulase enzyme loadings of 60 and 15 FPU/g glucan for all of these pretreatments, demonstrating that all pretreatments were effective in making cellulose accessible to enzymes. Furthermore, the glucose released was predominately as monomers, demonstrating virtually complete hydrolysis by cellulase. The data showed slightly higher yields for lime, ARP, and flowthrough technologies that remove substantial amounts of lignin. However, because AFEX achieved such yields even though no lignin was removed, lignin removal does not appear to be essential to enhance the digestibility of corn stover cellulose. Although most of the xylose was released during pretreatment for dilute acid, flowthrough, partial flow, and controlled pH pretreatments, the cellulase formulation used was effective in releasing residual xylose for the solids from all pretreatments. The high-pH pretreatments of AFEX, ARP, and lime particularly benefited from this xylanase activity in that about half was solubilized by enzymes for ARP, two thirds for lime, and essentially all for AFEX. A more detailed study is now in progress with corn stover and then poplar wood to understand the relationship of cellulase and hemicellulase actions to balance of activities and interactions for the different pretreatments.