GlycoMIP at Virginia Tech &
Univ. of Georgia, DMR-1933525

User Program: Research Highlight - 2025

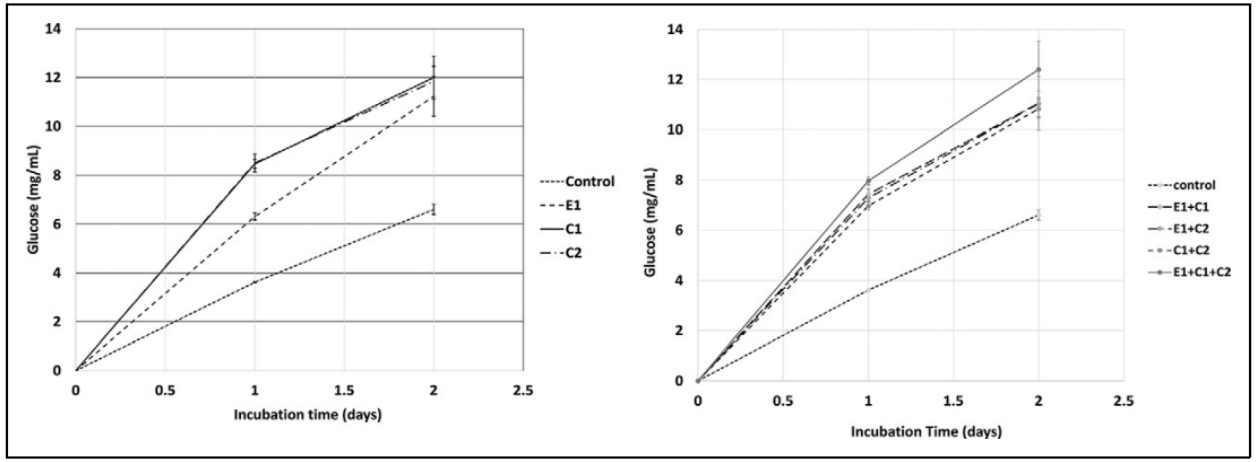
Increasing Glucose Yield from Cellulose in Ground Corn Using Plant-Made Recombinant Cellulases

Hood (Green lab, Arkansas) & Azadi (University of Georgia)

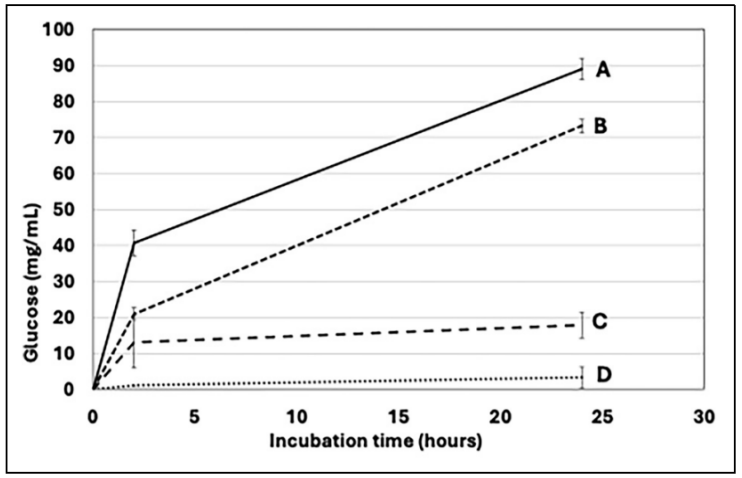
Project: The transition from fossil fuels to renewable energy sources is essential for mitigating climate change, and biofuels remain a key component of this shift. While first generation ethanol is derived from starch and second-generation biofuels utilize lignocellulosic biomass, a hybrid "generation 1.5" strategy seeks to increase ethanol yield by more fully utilizing whole corn. Although starch fermentation converts approximately 62% of the corn kernel to fermentable sugars, substantial cellulose (~15%) and hemicellulose remain unused in the residual biomass.

In this work, Duque and Hood investigate the use of recombinant cellulases produced directly in corn kernels to release additional glucose from residual cellulose in dry-ground corn flour and mash. By applying mixtures of plant-made endoglucanase (E1) and cellobiohydrolases (CBH I and II), together with external β-glucosidase, the study demonstrates that a significant fraction of the cellulose content can be converted to glucose under conditions compatible with existing ethanol processing workflows.

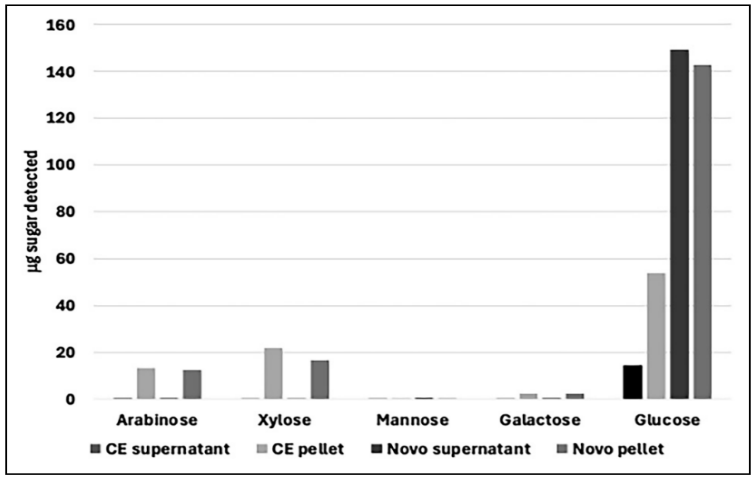
MIP Role: GlycoMIP contributed targeted carbohydrate characterization to this study by performing glycosyl composition analysis of selected corn flour digestion samples. Using established analytical protocols, GlycoMIP staff quantified neutral sugars and other carbohydrate components in reaction supernatants and pellets to assess polysaccharide breakdown products generated under different enzymatic conditions. These analyses supported the interpretation of enzymatic digestion outcomes by providing independent measurements of released sugars and residual carbohydrate components.



Glucose release from flour with single cellulases or combinations of cellulases.



Degradation of corn flour with amylases and cellulases



Glycosyl composition of corn flour samples treated with corn-derived cellulases and β-glucosidases