Transgenic Plants Lower the Costs of Cellulosic Biofuels

A new transgenic maize was observed to be less recalcitrant than wild-type biomass, as manifested through lower severity requirements to achieve comparable levels of conversion.

Expression of a single gene derived from bacteria in plants has resulted in transgenic plants that are easier and cheaper to convert into biofuels. Part of the high production cost of cellulosic biofuels is the relatively poor accessibility of substrates to enzymes due to the strong associations between plant cell wall components. This biomass recalcitrance makes costly thermochemical pretreatment necessary.

Scientists at the National Renewable Energy Laboratory (NREL) have created transgenic maize expressing an active glycosyl hydrolase enzyme, E1 endoglucanase, originally isolated from a thermophilic bacterium, *Acidothermus cellulolyticus*. This engineered feedstock was observed to be less recalcitrant than wild-type biomass when subjected to reduced severity pretreatments and post-pretreatment enzymatic hydrolysis. This reduction in recalcitrance was manifested through lower severity requirements to achieve comparable levels of conversion of wild-type biomass. The improvements observed are significant enough to positively affect the economics of the conversion process through decreased capital construction costs and decreased degradation products and inhibitor formation.

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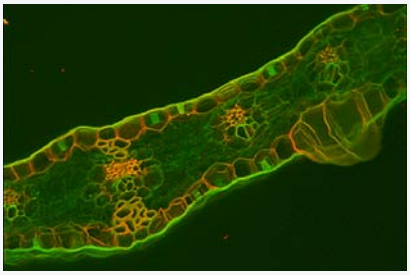

E1 cellulase expression in maize leaf. Red structures indicate localization of E1 using specific antibody staining. Image by Roman Brunecky, NREL

Key Research Results

Achievement

Transgenic plants engineered by NREL researchers are easier and less expensive to convert into biofuels.

Key Result

Through expression of a single gene derived from bacteria, transgenic maize was observed to be less recalcitrant than wild-type biomass.

Potential Impact

Reduction in recalcitrance through NREL-engineered feedstock could decrease capital construction costs, degradation products, and inhibitor formation.

NREL
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