Improved Saccharification Efficiency by Inhibiting a Xylosyltransferase

Tech ID: 23951 / UC Case 2012-162-0

FULL DESCRIPTION

Pamela Ronald and researchers at the Joint BioEnergy Institute (JBEI) have identified a glycosyltransferase encoded by a rice gene that is critical for xylose biosynthesis in plant cell walls. Inhibiting the expression of the gene, Os02g22380, in plants reduces the plants' lignin content, thus reducing recalcitrance of their cell walls and increasing the amount of soluble sugar that can be extracted from them. The technology is applicable to wheat, rice, corn, switchgrass, sorghum, millet, miscanthus, sugarcane, barley, turfgrass, hemp, bamboo and Bracypodium.

Mutant rice plants based on this finding demonstrated reduced height with leaves deficient in xylose, as well as ferulic acid and coumaric acid – acids linked with the inhibition of microbes' ability to covert sugars to fuels. In addition, using a promoter to limit the action of this gene to non-vascular tissue improves plant height. For more details, see the publication linked below.

The Joint BioEnergy Institute (JBEI, www.jbei.org) is a scientific partnership led by the Lawrence Berkeley National Laboratory and including the Sandia National Laboratories, the University of California campuses of Berkeley and Davis, the Carnegie Institution for Science and the Lawrence Livermore National Laboratory. JBEI's primary scientific mission is to advance the development of the next generation of biofuels.

APPLICATIONS

- Biofuel production

FEATURES/BENEFITS

- Pathway to more efficient saccharification in bioenergy plants
- Increases soluble sugar extraction compared to wild type plants

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	10,233,457	03/19/2019	2012-162

STATE OF DEVELOPMENT

The technology has been tested in rice plants, which demonstrated leaves deficient in xylose, ferulic acid and coumaric acid. Specifically, cell wall extracts given a hot water pre-treatment exhibit a 62% increase in the total sugars released in an enzyme mixture that contains cellulase, α-mannosidase, and hemicellulases. Phenolic composition indicates a strong decrease in ferulic acid (59%) along with a decrease in coumaric acid (44%), which are downstream inhibitors. For more details, see the publication linked below.

RELATED MATERIALS

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OTHER INFORMATION

KEYWORDS

xylose biosynthesis, reduced lignin, improved saccharification

CATEGORIZED AS

- **Agriculture & Animal Science**
  - Plant Traits
  - Transgenics

RELATED CASES

2012-162-0

▶ Chiniquy, D., Sharma, V., Schultink, A., Baidoo, E.E.,Rautengarten, C., Cheng, K., Carroll, A., Ulvskov, P., Harholt, J., Keasling, J. D., Pauly, M., Scheller, H.V., Ronald, P.C. XAX1 from glycosyltransferase family 61 mediates xylosyltransfer to rice xylan. PNAS, Vol. 109, No. 42, 17117-17122, October 16, 2012. - 10/16/2012

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Improved Xylan Extraction
- Novel Peptide Capable of Stimulating Disease Resistance in Plants
- Energy Crops Engineered for Increased Sugar Extraction through Inhibition of snl6 Expression

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