ENGINEERED MICROORGANISMS FOR BIOCONVERSION OF PECTIN-RICH WASTE STREAMS

Tech ID: 25734 / UC Case 2016-128-0

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,332,723	05/17/2022	2016-128

BRIEF DESCRIPTION

Citrus pulp and sugar beet pulp are pectin-rich agricultural wastes that are globally produced in significant amounts and have the potential to contribute towards the greater bioeconomy as a source of raw, inexpensive carbohydrate biomass. There is currently limited use for these waste streams. In some cases, pulps are dried, pelleted, and repurposed as an inexpensive livestock feed, however this application is barely profitable due to high production costs. There is a need for technologies that can cost-effectively transform pectin-rich waste streams into value-added products of commercial interest.

UC Berkeley researchers developed an efficient microbial strain technology and metabolic fermentation methods for the bioconversion of pectin-rich waste streams to useful bio-based commodity chemicals and biofuels. In addition to the beneficial environmental impact of utilizing a waste-stream, the fermentation technologies achieve three design goals set to optimize the productivity of bioconversions and economic viability. First, the technology allows for anaerobic fermentation, eliminating the need for culture oxygenation. This lowers operating costs by simplifying the metabolic requirements of high-density fermentation cultures. Second, co- utilization of the major component monosaccharides in the hydrolysate broth allows for productive conversion of the predominant, energy- rich biomass sugars. Third, fermentations can be conducted at low pH, discouraging contaminant growth and eliminating the need to buffer the hydrolysate mixture.

SUGGESTED USES

» Utilization of all pectin component sugars as a carbon source for biomass accumulation in fermentation processes

» Import of D-galacturonic acid into engineered yeast as a carbon source for producing: 1) non-native catabolic intermediates; and 2) native yeast metabolic intermidates, or 3) downstream engineered intermediates

ADVANTAGES

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INVENTORS

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OTHER INFORMATION

CATEGORIZED AS

» **Biotechnology**
» Industrial/ Energy
» **Environment**
» Remediation
» **Materials & Chemicals**
» Biological
» **Agriculture & Animal Science**
» Chemicals

RELATED CASES

2016-128-0

» Generates useful metabolic products in appreciable amounts and are not physiologically stressed in pectin hydrolysate conditions (unlike many naturally-occurring microorganisms)

» Not susceptible to contaminating microbes

» Has low operating costs (unlike unbuffered, anaerobic processes)

» Does not require long growth phases which would slow the productivity of bioprocesses

» Tolerates high osmotic pressures, enabling the use of a concentrated culture medium, and dense concentrations of bioconversion products

PUBLICATION

Identification and characterization of a galacturonic acid transporter from Neurospora crassa and its application for Saccharomyces cerevisiae fermentation processes

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