Available Technologies

Microorganisms Having Enhanced Resistance To Acetate (Related Compositions And Methods of Use)

Applications:

- *Bioenergy production using microorganisms*
- *Resistance to inhibitors of the bioconversion process*
- *Zymomonas mobilis*
- *Saccharomyces cerevisiae*

Advantages:

- *Increased tolerance of microorganisms to inhibitors*
- *Decreased lag phase*
- *Faster Growth in the presence of inhibitors*
- *Decreased biofuel cost*

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Summary:

Problem

Biomass-based bioenergy is crucial to meet the goal of making cellulosic biofuels cost-competitive with gasoline. Lignocellulosic materials represent an abundant feedstock for cellulosic-biofuel production. A core challenge in coverting cellulosic material to biofuels such as ethanol and butanol is the recalcitrance of biomass to breakdown. Because of the complex structure of lignocellulosic biomass, pretreatment is necessary to make it accessible for enzymatic attack. Severe biomass pretreatments are required to release the sugars, which along with by-products of fermentation can create inhibitors in the production of ethanol or butanol, for example. During the pretreatment processes, a range of inhibitory chemicals are formed. In addition, the metabolic byproducts such as ethanol, lactate, and acetate also impact the fermentation by slowing and potentially stopping the fermentation prematurely. The increased lag phase and slower growth increases the ethanol cost due to both ethanol production rate and total ethanol yield decreases.

Efficient conversion of lignocellulosic hydrolysates to biofuel requires high-yield production and resistance to industrially relevant stresses and inhibitors. To overcome the issue of inhibition caused by pretreatment processes, there are two approaches, one is to remove the inhibitor after pretreatment from the biomass physically or chemically, which requires extra equipment and time leading to increased costs. A second approach utilizes inhibitor tolerant microorganisms for efficient fermentation of lignocellulosic material to ethanol and their utility is considered an industrial requirement.

Technology Application

This invention relates to microorganisms that display enhanced resistance to acetate as a result of increased expression of an antiporter gene, and are therefore advantageous for use in fermentation of biomass materials to produce biofuels such as ethanol. Related compositions, including promoter sequences, expression vectors, genetically engineered microbial strains, as well as methods of making and using the strains, are also provided by the invention.

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