BIOCONVERSION OF CORN STOVER PYROLYSATES USING A COCULTURE OF THERMOTOGA MARTIMA AND METHANOCOCCUS JANNASCHII

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The bioconversion of corn stover pyrolysis fractions (pyrolysates) using the hyperthermophiles *Thermotoga maritima* and *Methanococcus jannaschii* is being evaluated.

Pyrolysis involves heating biomass (corn stover) to high temperatures (400 to 1200 °C) under low oxygenic conditions and results in thermal depolymerization yielding a viscous organic liquid. The produced syrup is a mixture containing sugars including glucose and levoglucosan as well as other compounds and is not yet completely defined. It is known that useful products, such as ethanol, hydrogen and precursor compounds like acetate and lactate can be obtained from bioconversion using *T. maritima*. Utilizing natural products to replace a portion of the petroleum based chemicals may help to alleviate some of the stress the chemical process industry places on the environment. It could also potentially be an economic boost for states that are heavily based in agriculture and a means to decrease their need on government subsidies.

Previous studies have relied solely on *T. maritima*. More recent research has shown that alleviation of inhibitory hydrogen is important to increased fermentation activity. *M. jannaschii* requires hydrogen for growth and when cocultured allows for a large increase in cell density for *T. maritima* and in theory an increase in bioconversion.

Currently the work is being done in batch cultures, but there are future plans to scale up to a continuous culture system. An important step here is to gain a more complete analysis of the pyrolysis mixture composition and of the products generated upon extremophilic conversion. The majority of this work will be accomplished using HPLC analysis.

This research will lead to the development a hybrid thermochemical and extremophile bioconversion process for the production of high value products from agricultural wastes.