**Biofuels, Commodity Chemicals, Biomass Utilization, Genetic Engineering**

The University of Georgia Research Foundation, Inc.

# Technology Commercialization Opportunity

## A Co-fermentation Strategy to Remove the Key Inhibitors and More Efficiently Co-ferment Mixed Sugars

UGARF Case: 1303
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School: College of Agricultural and Environmental Sciences (BioAg Engineering)
Intellectual Property Status: Pending

**Introduction**

The efficient use of agricultural biomass for the production of any biochemical is problematic. Technical challenges to be overcome in order for bio-based industrial products to be cost-competitive include finding new technology and reducing the cost of technology for converting biomass into desired bio-based industrial products. Research resulting in cost-effective technology to overcome the recalcitrance of cellulosic biomass would allow bio-refineries to produce fuels and bulk chemicals on a very large scale. The untapped sources of biomass are largely lignocellulosic in nature. One promising use of lignocellulose for liquid fuel is in the microbial production of ethanol. Unfortunately, when broken down into constituents, a very complex mixture remains. This mixture contains sugars (*e.g.*, pentoses, hexoses and oligo/polysaccharides) which individually but not collectively are suitable for fermentation, and the mixture also contains inhibitors. The pentose:hexose (C5:C6) ratio from different substrates can range from ca. 70:30 to 15:85. Because the unit value of chemical products derived from biomass (*e.g.*, ethanol) is generally low while the potential market is large, the economic viability of such processes depends on the yield and productivity. Yield is the quantity of product formed per mass of material input, while productivity is the rate at which the product is generated. Achieving high yield demands that all biomass components be converted, while high productivity requires that the complex conversions be accomplished quickly. Currently, technologies that allow for the efficient and simultaneous conversion of both "C5" and "C6", at any C5:C6 ratio is inexistent.

**Technology Summary**

UGA researchers have developed a method for the simultaneous (and at approximately the same rate) fermentation of pentoses and hexoses obtained from any hydrolyzed biomass. Furthermore, the method also provides for the concomitant consumption of fermentation inhibitors (e.g., acetate, furfural) produced during the biomass hydrolysis (or as fermentation-by-products), thus obviating the need to purify the hydrolysis broth while allowing for higher yields of targeted bio-products at lower levels of microorganism usage. The method can be implemented in single-, two-step and continuous/fed-batch conditions. The method is adaptable to any C5:C6 ratio and can be directed to the maximum production of any product from sugar fermentation, such as ethanol, butanol, succinate, lactate, pyruvate, butyric acid, acetone, etc.

**Advantages**

- Applicable in conjunction with any biomass hydrolysis' broth
- Passive to custom-engineering for the production of a multitude of biochemicals (including $C_2$, $C_3$ and $C_4$ alcohols)
- Fermentation inhibitors are consumed during the process

**Potential Applications**

- Production of biofuels and other commodity chemicals such as succinate and pyruvate from any hydrolyzed cellulosic biomass

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