Researchers improve process to create renewable chemicals from plants (w/ Video)

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(Phys.org) —Crops aren't just for food, fiber and fuel. Researchers at the University of Florida are making new industrial applications possible for them as well.

They've developed a method to turn sugarcane bagasse—the crushed-stalk waste product of sugar production—into succinic acid that can be used to make pharmaceuticals, protective coatings and compostable bags.

The process uses no food crops or petroleum as raw materials. In contrast, most currently produced succinic acid is petroleum derived. The research is detailed in a study in the March 5 issue of the journal *Proceedings of the National Academy of Sciences*.

"I believe renewable chemicals will be at least a part of the future of our chemical industry, if we want to decrease the demand for petroleum," said Xuan Wang, the study's lead author and an assistant scientist in UF's microbiology and cell science department.

Renewable chemicals are created from materials that can be replenished, whereas nonrenewable chemicals are produced from limited resources, such as petroleum.

The research is part of a larger project led by Lonnie Ingram, a distinguished professor in the department and a member of UF's Institute of Food and Agricultural Sciences. His work seeks to turn

discarded plant material, as well as sugars produced from crops such as sweet sorghum, into fuel and renewable products in a cost-effective and economically viable manner.

Key to the research are E. coli bacteria that Ingram and his team have genetically engineered to produce specific products by fermenting sugar. The team's previous accomplishments include E. coli strains that can produce fuel ethanol and ones that make lactic acid, which is used to create biodegradable and recyclable bioplastics.

To achieve cost-effective succinic acid production using waste plant materials, however, the researchers had to make an E. coli strain tolerant to growth-stopping inhibitors. The newly engineered strain, called XW 136, produced more than 30 grams per liter of succinate using sugars derived from sugarcane bagasse.

This was the first time succinic acid production from sugarcane bagasse had been achieved without the use of expensive and cost-prohibitive steps to remove the inhibitors, Wang said.

"The inhibitors produced from waste plant materials are barriers for the industrial chemical production using renewable sources," Wang said. "Now our work provides a direction for effectively improving inhibitor tolerance."

The ethanol production technology from Ingram's research team, including the genetically engineered bacteria, is currently in use in fuel plants in Florida, Louisiana and Japan. Microorganisms the team has engineered to make bioplastics are being used in facilities in Louisiana and Spain.

Provided by University of Florida