Researchers target eucalyptus as source of fuel for biomass production

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(Phys.org) —University of Florida Institute of Food and Agricultural Sciences researchers working to produce ethanol from plant material are taking a hard look at eucalyptus as a possible source for the clean fuel.

Joe Sagues, director of operations at the UF's Stan Mayfield Biorefinery Pilot Plant in Perry, Florida, and Ismael Uriel Nieves, project director at the plant, recently switched the focus of their lab-scale research from sugarcane and sorghum to eucalyptus for this study. They say the tree, most commonly associated with Australia and food for koalas, is a fast-growing hardwood that is easier to store and transport.

In their study, published online by the journal Applied Energy in April, they found that some eucalyptus had an increased sugar content, making it viable as a sustainable feedstock for biofuel production.

In addition, during pretreatment, they switched from the more corrosive sulfuric acid to phosphoric acid to increase sugar yields. Sulfuric acid requires special metal alloy containers, while phosphoric acid can be housed in commercial steel, which cuts down on initial capital costs in building a biofuel plant. The phosphoric acid also doesn't break down the released sugars as much, which increases overall yield.

The process involves injecting eucalyptus plants with phosphoric acid while under high temperature and pressure from steam, then rapidly releasing the pressure—a process known as a steam-explosion. After this step, enzymes are added to the mix to improve the release of sugars.

After it cools, air, chemicals and trace minerals are added, and the slurry ferments.

At the end of the process, the mixture becomes fuel.

"The Stan Mayfield Biorefinery Plant in Perry allows our team to develop and succeed in experiments at the lab scale, and then prove the same methods on a much grander industrial demonstration scale," Sagues said. "It essentially acts as a bridge from the lab to commercial production."

Nieves explained that the phosphoric acid creates a phosphate byproduct.

"The remaining liquid could be used as fertilizer," Nieves said, "which would help recover some of the cost of chemicals."

They both say their research is all part of UF/IFAS' work to improve biofuel production in a way that makes economic sense.

The $20 million Stan Mayfield Biorefinery Plant opened in 2012 and is a cooperative research venture between UF/IFAS and Buckeye Technologies Inc. It is expected to be fully operational later this summer, producing up to 400 gallons of fuel ethanol and 5,000 pounds of organic acids for bioplastics each day.

Researchers with the University of Florida are developing economical and environmentally friendly ways to produce cellulosic ethanol – a clean-burning fuel produced from inedible plant material that could end up replacing much of the country's gasoline.

Provided by University of Florida