Benefits of barley as a biofuel crop studied

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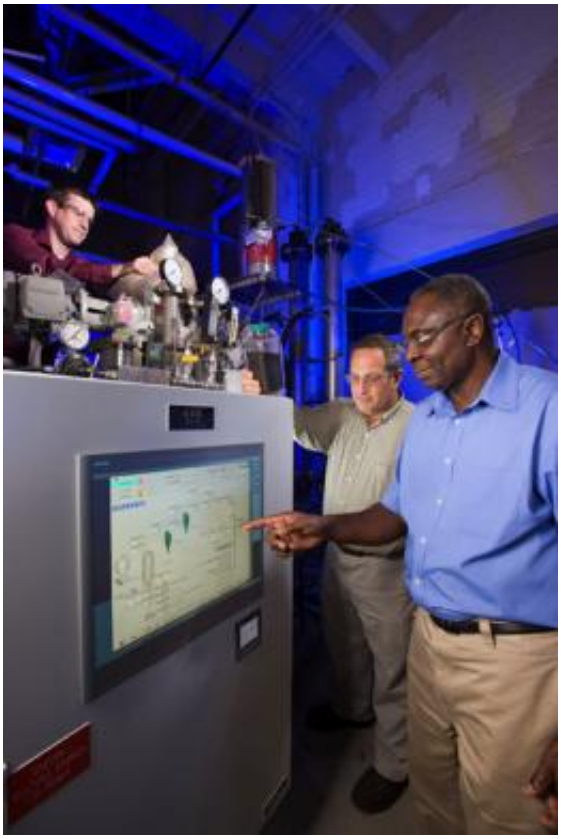

A team of ARS scientists including chemical engineer Akwasi Boateng (right), mechanical engineer Neil Goldberg (center) and chemist Charles Mullen (left) have made bio-oil by processing leftover barley byproducts with an intense burst of heat in the absence of oxygen. Click the image for more information about it.

The benefits of using barley for bioenergy production don't stop at the gas pump, according to U.S. Department of Agriculture (USDA) studies.

Scientists with USDA's Agricultural Research Service (ARS) have found that barley grain can be used to produce ethanol, and the leftover byproducts-barley straw, hulls, and dried distillers grains (DDGS)-can be used to produce an energy-rich oil called bio-oil. The bio-oil could then be used either for transportation fuels or for producing heat and power needed for the grain-to-ethanol conversion. ARS is USDA's principal intramural scientific research agency, and these results support the USDA priority of developing new sources of bioenergy.

The barley work was conducted by several scientists at the ARS Eastern Regional Research Center at Wyndmoor, Pa., including chemical engineer and pyrolysis team leader Akwasi Boateng, chemist Charles Mullen, mechanical engineer Neil Goldberg, chemist Robert Moreau and research leader Kevin Hicks. The researchers produced bio-oil from all three barley byproducts using a technology called "fast pyrolysis," an intense burst of heat delivered in the absence of oxygen.

In the lab, a kilogram of barley straw and hulls yielded about half a kilogram of bio-oil with an energy content of about half that of No. 2 diesel fuel oil. The energy content of bio-oil made from barley DDGS, including DDGS contaminated with mycotoxins, which can't be used to supplement livestock feed, was even higher, about two-thirds of the level in No. 2 diesel fuel oil. However, the bio-oil was more viscous and had a shorter shelf life than bio-oils produced from straw or hulls.

The process also created a solid byproduct called "biochar" that might improve the water-holding capacity and nutrient content of soils. Amending soils with biochar can sequester carbon in the soil for thousands of years.

Farmers in the Mid-Atlantic states and the Southeast could cash in on the production of winter barley cover crops while continuing to raise corn and other food crops in the summer. Growing winter barley for biofuel

production would also help reduce soil erosion and nitrogen leaching, a major concern for farmers in the Chesapeake Bay watershed.

More information: Results from this work were published in Energy & Fuels. Read more about this research in the November/December 2010 issue of *Agricultural Research* magazine, available online at: www.ars.usda.gov/is/AR/archive/nov10/crop1110.htm

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