More economical process for making ethanol from nonfood sources

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Switch grass swaying in the breeze could become a more economical source of ethanol to power cars down the highway thanks to discovery of a way to reduce the cost of making ethanol from non-food biomass. Credit: US Dept. of Agriculture

Scientists in Wisconsin are reporting discovery of a way to lower the cost of converting wood, corn stalks and leaves, switch grass, and other non-food biomass materials into ethanol fuel. They describe their process, which reduces amounts of costly enzymes needed to break down tough fibrous cellulose matter in biomass for fermentation into alcohol, here today at the 239th National Meeting of the American

Chemical Society (ACS).

"We believe our finding will have a major impact on the economics of cellulose to biofuels conversions," said Rajai Atalla, Ph.D. "We think it can make cellulose significantly more competitive with corn as the primary source of glucose as a feedstock for biofuels." Atalla is the founder of Cellulose Sciences International in Madison, Wisc.

Ethanol has become a mainstay in stretching out supplies of gasoline as the United States and other countries seek renewable sources of energy to help reduce dependence on fossil fuels and imported oil. Most of the ethanol added to gasoline comes from the starch and sugar in corn, sugar beets, sugar cane, and other food crops. Questions have arisen, however, on whether that approach is sustainable, and about its impact in increasing food prices and reducing the availability of food.

Atalla's involvement with research on cellulose dates to the 1960s, but it was a recent experience that inspired much of his focus on ethanol from cellulose rather than corn. In 2007, he read about people in Mexico struggling with the high cost of corn due to increased demand for corn to make ethanol.

"It got me thinking," Atalla recalled. "I thought, 'This is ridiculous.' If we can produce what we need from cellulose, rather than starch, we won't need to compete with food products. But we faced huge obstacles. The enzymes needed to use cellulose cost about 10 times more than those used for converting corn. With the treatment we've developed, though, we may be able to cut the enzyme cost to about the same range as it is for corn, which would make cellulose a much more viable biomass substrate for the production of biofuel."

The conversion of cellulose to glucose has long remained a challenge for scientists because of its resistance to change into simpler sugars. The

process that Atalla and colleagues have developed makes the cellulose break down more easily and could make cellulosic ethanol more competitive to corn ethanol and a viable energy source. It also is not as energy intensive as other biofuel conversion processes like biomass gasification.

Experiments showed they were able to convert up to 80 percent more cellulose when compared to traditional conversion processes. "Using this new technique, we expect that we will be able to reduce the prerequisite dosage of enzymes by a factor of 10, which could bring the cost of enzymes for cellulose conversion to the same level as that for corn," he said.

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