Immature switchgrass could help cellulosic ethanol industry

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ARS geneticist Sarah Hake and her collaborators have inserted a gene from corn into switchgrass, creating a new variety with traits that may help make the plant more suitable for cellulosic ethanol production.

(Phys.org)—A gene that keeps switchgrass forever young could have far-reaching implications for the development of the plant as a biofuel crop, according to U.S. Department of Agriculture (USDA) scientists.

Inserting a specific gene called "corngrass" from corn into switchgrass essentially keeps the perennial grass in its juvenile form—a plant that doesn't flower, doesn't produce seeds, and doesn't have a dormant growth phase. Because of these changes, the sugars making up the plant

starch are more readily available for conversion into cellulosic ethanol.

According to Agricultural Research Service (ARS) geneticist Sarah Hake, the starch in these transgenic plants stays inside the stem because it isn't needed elsewhere for nourishing flower buds and blossoms. As a result, starch levels can increase as much as 250 percent, which increases the sugars that can be fermented into ethanol.

Hake, director of the ARS Plant Gene Expression Center in Albany, Calif., teamed with University of California-Berkeley plant geneticist George Chuck to conduct this investigation. ARS is USDA's chief intramural scientific research agency, and this work supports the USDA priority of developing new sources of bioenergy.

The scientists observed that the leaves in the transgenic switchgrass are not nearly as stiff as leaves in switchgrass cultivars that haven't been modified. In addition, they determined that leaf lignin is slightly different in the transgenic switchgrass than leaf lignin in other plants. This could lead to new findings on how to break down the sturdy lignin and release sugars for fermentation, a development that will be essential to the commercial production of cellulosic ethanol.

The researchers are now introducing DNA segments called genetic promoters that would "turn on" the expression of the corngrass gene just in aboveground switchgrass shoots. This could help increase root mass development that otherwise would be inhibited by the gene. Hake and Chuck also suggest that developing nonflowering switchgrass varieties would eliminate the possibility of cross-pollination between transgenic switchgrass cultivars and other switchgrass cultivars.

Results from this work were published in 2011 in *Proceedings of the National Academy of Sciences.*

More information: Read more about ARS bioenergy research in the September 2012 issue of Agricultural Research magazine.

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