GreenWood Resources licenses ORNL invention to boost biofuel yield

October 4 2016, by Sara Shoemaker

ORNL lead inventor Wellington Muchero and his team studied natural genetic variants of poplar trees with lower lignin content that best benefits ethanol production. Credit: Oak Ridge National Laboratory

GreenWood Resources has licensed an Oak Ridge National Laboratory technology based on the discovery of a gene in poplar (*Populus*

trichocarpa) that makes it easier to convert poplar trees into biofuels.

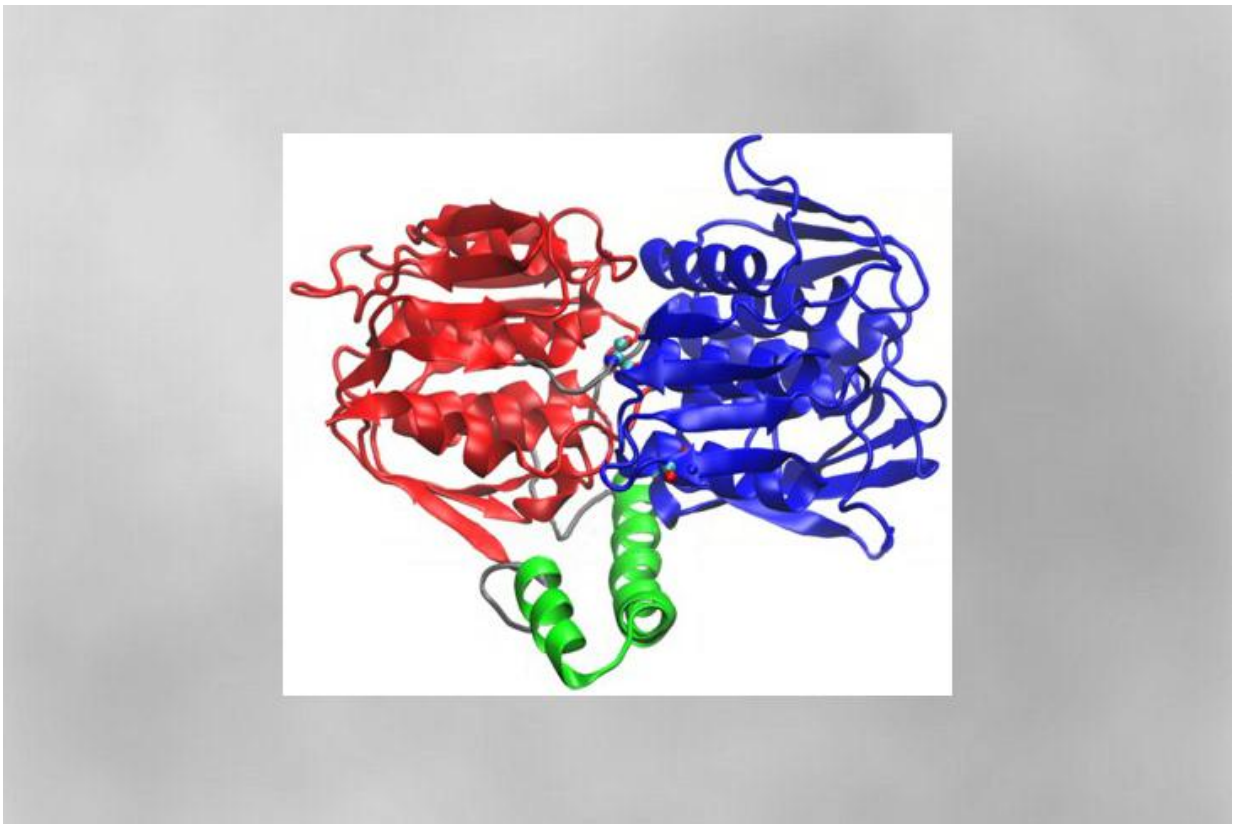
GreenWood, a global timberland investment and asset management company based in Oregon, plans to commercialize the technology to select and breed better varieties of poplar with less lignin content, which simplifies the conversion process and ultimately lowers the overall costs of biofuel production.

Led by Wellington Muchero, a team from the Department of Energy's ORNL, the University of Tennessee and West Virginia University identified a gene linked to the synthesis of lignin, a key component of plant cell walls that provides sturdiness but hinders the production of biofuels. Growing poplar trees with less lignin would provide easier access to the plant sugars that are converted into renewable fuels.

The team's research showed the gene could reduce lignin content by up to 50 percent and increase ethanol yield by up to 250 percent on biomass that was not chemically or mechanically pretreated.

"We began with field studies, looking at poplar trees growing in their natural environment as well as experimental field sites in the Pacific Northwest region, and found naturally occurring genetic mutations that caused the most lignin reduction in these trees," ORNL's Muchero said.

The research team determined that plants carrying a variant of the lignin-producing gene showed an increase in sugar release of up to 280 percent, which resulted in the 250-percent increase in ethanol yield.



An ORNL-led team discovered the new plant protein (represented in green) responsible for regulating lignin biosynthesis that showed an increase in sugar release of up to 280 percent, resulting in the 250-percent boost in ethanol yield. Credit: Oak Ridge National Laboratory

"What sets this discovery apart from similar studies is that this technology represents a 25 to 50 percent reduction in lignin content with a single gene, and the plants are still healthy, which is quite remarkable," said Thomas Zacharia, deputy director for science and technology at ORNL. Previous research in poplar and other biofuels crops has typically shown between 5 and 10 percent reductions, often resulting in plants that performed poorly in field tests.

GreenWood has licensed the genetic technology developed by the ORNL-

based BioEnergy Science Center. They will continue to partner with ORNL as they conduct field studies over the next few years to validate the benefits of this novel plant system in GreenWood's commercial varieties. The technology could also create commercial opportunities in the pulp and paper industry.

"Incorporating this technology into GreenWood's poplar breeding program will lead to a new, superior class of bioenergy plantation varieties with which biorefineries can produce transportation fuels at a reduced cost, owing to significant savings during the pretreatment and enzymatic hydrolysis stages," said Brian Stanton, GreenWood's chief science officer. "This technology will accelerate GreenWood's efforts to improve biomass chemical composition that is important in helping move the United States toward energy independence."

Along with Muchero, co-inventors of the technology include ORNL's Jin-Gui Chen, Lee E. Gunter, Sara Jawdy, Anthony C. Bryan and Gerald A. Tuskan; Stephen P. DiFazio, WVU, and Hao-Bo Guo, UT.

This research was funded by BESC, a U.S. Department of Energy Bioenergy Research Center supported by the DOE Office of Science, and the technology matured under ORNL's Technology Innovation Program.

Founded in 1998, GreenWood Resources, Inc., is an integrated global investment company focused on the development and operations of forestry assets with operations in North America, Latin America, and Europe. GreenWood's core competencies —capital investment management, forest science, forest operations and sales and marketing— address the broad skills required to produce superior, risk-adjusted return for investments into intensively-managed forestry assets. Learn more about GreenWood at http://www.greenwoodresources.com.

UT-Battelle manages ORNL for DOE's Office of Science. The Office of Science is the single largest supporter of basic research in the physical sciences in the United States, and is working to address some of the most pressing challenges of our time. For more information, please visit science.energy.gov.

Provided by Oak Ridge National Laboratory