

UNL Leads \$13.5 Million Research to Enhance Sorghum for Biofuel



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LINCOLN, Neb.-- The University of Nebraska-Lincoln will lead a \$13.5 million, multi-institutional research effort to improve sorghum as a sustainable source for biofuel production.

Funded by the U.S. Department of Energy, this five-year grant takes a comprehensive approach to better understand how plants and microbes interact, and to learn which sorghum germplasm grows better with less water and nitrogen.

This research requires a range of expertise, and UNL is teaming with scientists at Danforth Plant Science Center, Washington State University, University of North Carolina-Chapel Hill, Boyce

Thompson Institute, Clemson University, Iowa State University, Colorado State University and the DOE-Joint Genome Institute.

"UNL is delighted to be leading this large project with partners from prestigious institutions," said Prem Paul, UNL vice chancellor for research and economic development. "Only by collaborating across disciplines and institutions can we find solutions to complex challenges, especially those at the intersection of our food, water and energy systems."

Most U.S. biofuels currently are made from corn, but sorghum varieties create more biomass for cellulosic ethanol. That makes it a top contender to replace corn and relieve pressure on an important global food source, said project leader Daniel Schachtman, professor of agronomy and horticulture and director of UNL's Center for Biotechnology, who will lead this project.

"It's becoming more recognized that we need to move biofuel production to more marginal lands, so they don't compete with food crops," Schachtman said. "You also don't want to use a ton of water or fertilizer to keep the **system** productive."

To improve sorghum's productivity under resource-limited conditions, the team is taking a systems approach. Researchers will investigate sorghum genetics as well as the soil microbes that interact with plants.

The research should lead to strategies to increase plant biomass as well as more water use- and nutrient-efficient sorghum crop systems.

The work takes advantage of advances in marker-assisted breeding, metagenomics and computational genomic analysis.

Geneticists will search for and study sorghum varieties that use water and nitrogen more efficiently under limited water or nitrogen conditions. At the same time, microbiologists will identify and characterize soil microbes that interact with and benefit sorghum, such as by enhancing nutrient uptake, water-use efficiency and disease protection.

Bringing both approaches together, the team will experiment to find the genetic and microbial combinations with the greatest productivity benefits.

The team also will create an extensive catalogue and repository of sorghum-related soil microbes and their genetic sequences as a resource for the scientific community.

Looking for microbial solutions to improve plant productivity is not well studied, so the project will advance scientific understanding in a potentially significant direction for other crops as well, Schachtman said.

The project's strength is the interdisciplinary depth and expertise of the team, he added, because it allows the researchers to tackle sorghum production as a whole system. Working together, researchers expect to accomplish far more than is possible at any single institution.

UNL's Ismail Dweikat, sorghum breeder and professor of agronomy and horticulture, and Arthur Zygielbaum, remote sensing expert and associate research professor of natural resources, are teaming with Schachtman on this project.

"Nebraska will be the focal point of a lot of the work," Schachtman said. "The university has developed fantastic field research facilities that really put us ahead. It's highly significant work because we could be creating a more sustainable biofuel system for the United States."

Ronnie Green, Harlan Vice Chancellor for the Institute of Agriculture and Natural Resources and interim senior vice chancellor for academic affairs, said the project "represents a payoff on the investments we're making in faculty and facilities that expands our expertise in critical areas such as sustainable biofuels. Strengthening our capabilities to study the root microbiome enables us to take the systems approach that is so critical in agricultural research."