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**Nationwide collaboration unlocks switchgrass genome**

Collaborative team including JGI and four BRCs publishes complex genome analysis of switchgrass

**The Science**

Switchgrass (*P. virgatum*) is a promising and versatile candidate for producing sustainable alternative fuels. However, outside of their native habitat or cold hardiness zones, individual varieties of switchgrass tend not to be as productive. In the face of climate change, breeding strategies that can improve crop resilience and productivity across a range of environments is increasingly important, but these approaches require sufficient knowledge of the genes that underlie productivity and adaptation. By studying 732 genotypes grown at 10 experimental gardens in eight states spread across 1,100 miles, a large team of researchers have produced a high-quality reference sequence of the complex switchgrass genome.

**The Impact**

The [reference genome](https://phytozome-next.jgi.doe.gov/info/Pvirgatum_v5_1) will provide breeders with the necessary tools to increase switchgrass yield for the sustainable production of bioenergy. This work shows the power and value of the scientific collaborations made possible by the U.S. Department of Energy (DOE). This ambitious project, led in part by the Joint Genome Institute (JGI), a DOE Office of Science User Facility located at Lawrence Berkeley National Laboratory, featured authors from all four of the DOE Bioenergy Research Centers (BRCs)—the [Great Lakes Bioenergy Research Center (GLBRC)](https://www.glbrc.org/), the [Center for Bioenergy Innovation](https://cbi.ornl.gov/), the [Center for Advanced Bioenergy & Bioproducts Institute](https://cabbi.bio/), and the [Joint BioEnergy Institute](https://www.jbei.org/).

**Summary**

Switchgrass is a perennial grass with a large and complex genome that has adapted to grow in a variety of soils, water conditions, and climates. The BRC program has developed switchgrass as a feedstock for plant-based fuels since 2007 and initiated work on sequencing the switchgrass genome that started more than a decade ago. This large and collaborative research team set up 10 experimental gardens in eight states spread across 1,100 miles, each containing a propagated panel of 732 switchgrass genotypes.

The genetic diversity across the set of plants allowed researchers to test what genes affect the plant’s adaptability to various environmental conditions. The combination of field data and genetic information has allowed the research team to associate climate adaptations with switchgrass biology, information that may help guide efforts to develop the crop as a versatile candidate biomass feedstock for producing sustainable alternative fuels. Building off this research, all four BRCs have expanded the network of common gardens and are exploring improvements to switchgrass through more targeted genome editing techniques to improve crop traits and customize the crop for additional end products.

This work led by researchers at the University of Texas at Austin, the HudsonAlpha Institute for Biotechnology, and JGI. Researchers from the University of California, Berkeley, Rutgers University, USDA-ARS, Arizona Genomics Institute, University of Georgia, Athens, Clemson University, Marshall University, Jawaharlal Nehru University, Noble Research Institute, University of Nebraska, Lincoln, South Dakota State University, University of Missouri, Argonne National Laboratory, USDA-NRCS, Texas A&M University, UC Davis, Oklahoma State University, University of Oklahoma, and Washington State University were also involved in this work.

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**Publications**

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**Related Links**

[Press release on the research from JGI](https://jgi.doe.gov/fields-of-breeders-dreams-switchgrass-team-effort-targeted-crop-improvements/)

[The Panicum virgatum reference genome on JGI’s Phytozome database](https://phytozome-next.jgi.doe.gov/info/Pvirgatum_v5_1)