2007 Awards

The U.S. Department of Energy's Office of Science, Office of Biological and Environmental Research, and the U.S. Department of Agriculture Cooperative State Research, Education, and Extension Service National Research Initiative have jointly selected 11 projects for awards totaling $8.3 million for biobased-fuel research*. These awards continue a commitment begun in 2006 to conduct fundamental research in biomass genomics that will establish a scientific foundation to facilitate and accelerate the use of woody plant tissue for bioenergy and biofuel.

Towards a Map of the *Populus* Biomass Protein-Protein Interaction Network

- Eric Beers, Virginia State University

Goal: Map protein-protein interactions relevant to biomass production by focusing on proteins coexpressed in poplar xylem, site of the majority of lignocellulose synthesis and hence biomass accumulation in poplar.

Developing Association Mapping in Polyploid Perennial Biofuel Grasses

- Ed Buckler, USDA-Agricultural Research Service

Goal: Undertake an association-mapping study of two important biofuel grasses, switchgrass and reed canarygrass, to identify molecular markers tightly linked to biomass-related trait loci. This will enable marker-assisted selection and greatly accelerate breeding programs for enhanced biomass production.

Analysis of Small RNAs and mRNAs Associated with Abiotic Stress Responses in *Brachypodium distachyon*

- Pam Green, University of Delaware

Goal: Identify small RNAs related to stresses such as drought, temperature, and nutrient deprivation and relate them to the emerging genome sequence of *Brachypodium distachyon*, thus enhancing its value as a functional genomic model for energy crops and temperate grasses.

Linkage Analysis Appropriate for Comparative Genome Analysis and Trait Selection in Switchgrass

- Christian Tobias, USDA-Agricultural Research Service

Goal: Create a comprehensive marker set for switchgrass based principally on simple sequence repeats, and initiate development of a linkage map.

Development of Brown Midrib Sweet Sorghum as a Dual-Source Feedstock for Ethanol Production

- Wilfred Vermerris, University of Florida

Goal: Maximize the amount of fermentable sugar in the whole sorghum plant by identifying and isolating genes that control the high stalk juice sugar trait and a decreased stalk lignin trait, with the aim of eventually combining both traits in a single germplasm.

Insertional Mutagenesis of *Brachypodium distachyon*

- John Vogel, USDA-Agricultural Research Service

Goal: Create a collection of insertional mutants in *Brachypodium distachyon*. This resource collection can then be used to identify mutations in genes predicted to affect biomass quality and agronomic characteristics of other perennial grass energy crops.

A Functional Genomics Approach to Altering Crown Architecture in *Populus*: Maximizing Carbon Capture in Trees Grown in Dense Plantings

- Jerry Tuskan, Oak Ridge National Laboratory

Goal: Gain a molecular understanding of phytochrome-mediated responses to competition in *Populus* and then use that knowledge to maximize carbon capture per unit of land area for increased biomass production.

Identification of Cell-Wall Synthesis Regulatory Genes Controlling Biomass Characteristics and Yield in Rice (*Oryza sativa*)

- Zhaohua Peng, Mississippi State University

Goal: Examine cell-wall synthesis in rice, a model grass bioenergy species and the source of rice stover residues, using reverse genetic and functional genomic and proteomic approaches.

Development of Genomic Tools to Improve Prairie Cordgrass (*Spartina pectinata*), a Highly Productive Bioenergy Feedstock Crop

- Jose Gonzalez, South Dakota State University

Goal: Develop PCR markers for this species and construct an initial linkage map for prairie cordgrass, a native perennial high-biomass–yielding grass.

Resource Development in Switchgrass, an Important Bioenergy Crop for the U.S.A.

- Katrien Devos, University of Georgia

Goal: Construct a detailed genetic map of switchgrass based on simple sequence repeats and align it with maps produced in rice, maize, and sorghum. This will allow the exploitation of resources and sequence information generated for these well-studied cereals. The genetic maps also will serve as a framework for locating genes that control bioenergy traits.

Strategies for Using Molecular Markers to Simultaneously Improve Corn Grain Yield and Stover Quality for Ethanol Production

- Rex Bernardo, University of Minnesota

Goal: Optimize the use of DNA markers to simultaneously breed for high corn grain yield (for nonenergy and energy uses) and high stover quality for ethanol production.

*More details including Co-PIs and funding amounts are on the web at http://GenomicsGTL.energy.gov/research/DOEUSDA/

2006 Awards

The U.S. Department of Energy's Office of Science, Office of Biological and Environmental Research (OBER), and the U.S. Department of Agriculture (USDA) Cooperative State Research, Education, and Extension Service (CSREES) National Research Initiative have jointly awarded nine grants totaling $5.7 million for biobased-fuel research. CSREES and OBER initiated this fundamental research program to facilitate the use of woody plant tissue, specifically lignocellulosic materials, for bioenergy or biofuels. The research projects will focus on poplar, alfalfa, sorghum, wheat, and other grasses.

Manipulation of Lignin Biosynthesis to Maximize Ethanol Production from Populus Feedstocks
- Purdue University, $1.4 million
- Principal Investigator: Clint Chapple
- Co-P.I.'s: Richard Meilan, Michael Ladisch

Systematic Modification of Monolignol Pathway Gene Expression for Improved Lignocellulose Utilization
- The Noble Foundation, $800,000
- Principal Investigator: Richard Dixon
- Co-P.I.: Fang Chen

Sorghum Biomass/Feedstock Genomics Research for Bioenergy
- Texas A&M University, $800,000
- Principal Investigator: William Rooney
- Co-P.I.'s: John Mullet; Steve Kresovich (Cornell Univ.), Doreen Ware (Cold Spring Harbor Laboratory)

Streamlined Method for Biomass Whole-Cell–Wall Structural Profiling
- USDA-Agricultural Research Service, University of Wisconsin, $333,000
- Principal Investigator: John Ralph

Development of a Proteoglycan Chip for Plant Glycomics
- Carnegie Institute of Washington, $359,100
- Principal Investigator: Chris Somerville

Biochemical Genomics of Wood Formation: O-Acyltransferases for Alteration of Lignocellulosic Property and Enhancement of Carbon Deposition in Poplar
- Brookhaven National Laboratory, $300,000
- Principal Investigator: Chang-Jun Liu

Genomic Knowledgebase for Facilitating the Use of Woody Biomass for Fuel Ethanol Production
- North Carolina State University, $700,000
- Principal Investigator: Vincent Chiang

Genetic Dissection of the Lignocellulosic Pathway of Wheat to Improve Biomass Quality of Grasses as a Feedstock for Biofuel
- Kansas State University, $700,000
- Principal Investigator: Bikram Gill
- Co-P.I.: Wanlong Li

Using Association Mapping to Identify Markers for Cell-Wall Constituents and Biomass Yield in Alfalfa
- University of Georgia, $445,000
- Principal Investigator: Charles Brummer
- Co-P.I.'s: Kenneth Moore (Iowa State Univ.), Jeff Doyle (Cornell Univ.)