Modeling Plant Metabolism to Optimize Oil Production

Brookhaven National Laboratory

Contacts: Karen McNulty Walsh [1], (631) 344-8350 or Peter Genzer [2], (631) 344-3174

Modeling Plant Metabolism to Optimize Oil Production

Computational studies aim to increase use of plant oils as renewable resource

UPTON, NY — Scientists at the U.S. Department of Energy's (DOE) Brookhaven National Laboratory have developed a computational model for analyzing the metabolic processes in rapeseed plants — particularly those related to the production of oils in their seeds. Their goal is to find ways to optimize the production of plant oils that have widespread potential as renewable resources for fuel and industrial chemicals.

The model, described in two "featured articles" in the August 1, 2011, issue of *the Plant Journal* (now available online*), may help to identify ways to maximize the conversion of carbon to biomass to improve the production of plant-derived biofuels.

"To make efficient use of all that plants have to offer in terms of alternative energy, replacing petrochemicals in industrial processes, and even nutrition, it's essential that we understand their metabolic processes and the factors that influence their composition," said Brookhaven biologist Jorg Schwender, who led the development of the model with postdoctoral research associate Jordan Hay.

In the case of plant oils, the scientists' attention is focused on seeds, where oils are formed and accumulated during development. "This oil represents the most energy-dense form of biologically stored sunlight, and its production is controlled, in part, by the metabolic processes within developing seeds," Schwender said.

One way to study these metabolic pathways is to track the uptake and allotment of a form of carbon known as carbon-13 as it is incorporated into plant oil precursors and the oils themselves. But this method has limits in the analysis of large-scale metabolic networks such as those involved in apportioning nutrients under variable physiological conditions.

"It's like trying to assess traffic flow on roads in the United States by measuring traffic flow only on the major highways," Schwender said.

To address these more complex situations, the Brookhaven team constructed a computational model of a large-scale metabolic network of developing rapeseed (*Brassica napus*) embryos, based on information mined from biochemical literature, databases, and prior experimental results that set limits on certain variables. The model includes 572 biochemical reactions that play a role in the seed's central metabolism and/or seed oil production, and incorporates information on how those reactions are grouped together and interact.

SOURCE [3]

Source URL (retrieved on *12/08/2013 - 2:23pm*):
http://www.ecnmag.com/news/2011/07/modeling-plant-metabolism-optimize-oil-production?qt-most_popular=0

Links:
[1] mailto://www.bnl.gov/bnlweb/pubaf/pr/kmcnulty@bnl.gov
[2] mailto://www.bnl.gov/bnlweb/pubaf/pr/genzer@bnl.gov
[3] http://www.bnl.gov/bnlweb/pubaf/pr/PR_display.asp?prID=1308