Sun Grant Western Regional Center
Oregon State University

Feasibility of Biopolymer Production in Poplar

Steven Strauss, Oregon State University (2009-2011)

Overview

The production of bioplastics from plants is a proven technology; however, the biological yield has generally been too low to be economically viable or production compromises plant health to an unacceptable degree. Dr. Strauss and his co-PIs have found in preliminary work that significant levels of polyhydroxybutyrate (PHB) can be produced in and extracted from poplar, the first woody plant in which PHB production has been confirmed, with no apparent negative effects on plant health. The team will test new genetic lines of poplar for increased PHB output in the leaves without harming biomass production for wood products. They will also develop practical methods for extraction and bioprocessing of PHB, and analyze the economic, environmental and regulatory feasibility of PHB production in poplar.

Progress to Date

PHB levels were confirmed in selected high expression events via gas-liquid chomatography analysis at Reed College.

Plant material was propagated at OSU for a large growth vs. PHB production "tradeoff" experiment. Greenhouse experiments are currently ongoing at Reed College with these materials. Initial growth analysis shows that there are no significant differences between growth rates of transgenic and control plants subjected to varying treatments..

Gene cloning efforts continue with the PHB (35S::ABC) pathway and a poplar senescence promoter (a DNA sequence that controls leaf drop). Promising hybrids that give continuous, high level PHB production were cultivated, then harvested; shoot regeneration is in progress. Many of these regenerates are slow forming and slow growing, a likely consequence of adverse effects of continuous PHB biosynthesis with this construct. Because many of the original co-cultivated explants (tissue from a portion of the plant shoot, leaves, etc.) have shown slow regeneration, additional explants were co-cultivated with the PHB construct in order to get more transgenic shoot regeneration.

Collaborators

Co-PIs: Ganti Murthy, Oregon State University, and David Dalton, Reed College
Academic/Industrial collaborators: Michael Penner, Oregon State University;
Brian Stanton, Greenwood Resources;
Kristi Snell, Metabolix; Lynn Wright, consultant

Funding Sources

- U.S. Department of Transportation, Research and Innovative Technology Administration
- Cost share: Oregon State University

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