Molecular Breeding of Switchgrass as a Bioenergy Feedstock

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Abstract
Switchgrass (Panicum virgatum L.) is a perennial, warm season prairie grass native to most of North America. It is currently used for hay, pasture, and conservation, but was recently identified by the United States Department of Energy (DOE) as a main herbaceous, dedicated bioenergy crop due to its ability for high yields, environmental enhancement characteristics, and ability to grow well on low input, marginal cropland. As a bioenergy crop, switchgrass is projected as a feedstock for cellulosic biofuel (mainly ethanol) production. Improving its feedstock value through plant breeding is relatively new. Switchgrass is a self-incompatible, out-crossing species, therefore, traditional breeding methodologies include population improvement to produce and identify parents for synthetic cultivars, and the possible production of F1 hybrid cultivars. The main traits slated for improvement include biomass yield, better seedling establishment, and increased feedstock quality (higher digestibility and lower lignin). However, application of genomic and transgenic molecular tools to supplement and enhance these traditional approaches is now underway in switchgrass. Genetic markers are being developed, and initial framework maps and mapping populations are in use. Effective tissue culture regeneration methods are documented, and transformation is successfully achieved using both microprojectile bombardment and Agrobacterium protocols. Recent grant awards from DOE should continue to advance genomic and transgenic information available for use in switchgrass improvement efforts.