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Diversifying Feedstock Options Reduces Risk

URBANA – Researchers are studying novel and traditional woody plants as short rotation crops for biomass production to help diversify and expand bioenergy research efforts at the University of Illinois.

“Diversification of your plant materials for biomass production is sound from an ecological standpoint – a greater diversity of species minimizes the risk from serious disease or insect outbreaks that could threaten a large percentage of production when only a few species are utilized,” said Gary Kling, an associate professor in the Department of Crop Sciences, at the 2011 Bioenergy Feedstocks Symposium held in January at the I Hotel and Conference Center in Champaign.

Kling said there is a wealth of ecological niches and climatic zones where biomass may be produced someday, and likely a wide range of species that will be best adapted to these varying environments.

“The most commonly studied woody plant genus for biomass production (poplar) was selected for pulp production in the manufacture of paper,” Kling said. “Characteristics that make a good paper plant are not necessarily the same as those needed for energy production.”

Plants selected for paper production are typically grown for 12 years before being harvested and replaced. In the bioenergy industry, he said that repeated production is needed from the same plants over a much longer period of time.

“We do not know how the various species, poplar and willows included, will respond to repeated cutting and production over a 30+-year production system,” he said. “It is doubtful that the early selection work that was done for paper production included as wide a range as we are considering – the early selection efforts may have easily missed a superior species. “

Kling and a team of researchers from the Energy Biosciences Institute located in the Institute for Genomic Biology at the U of I selected plants for this study based on their coppicing ability, adaptability to the environment, potential for biomass accumulation, non-invasive status, few major limiting pest and disease problems, availability and inclusion in the USDA database.

Kling said, in general, woody plants offer many advantages as a feedstock for biofuel production.

“Woody plants typically have a lower ash content when burned as compared to grasses, thus reducing the amount of waste generated,” he said. “In addition, grasses usually have a higher chlorine content than woody plants, which can be damaging to boilers. The wide range of woody plants will likely be adaptable to a wider range of environments than grasses alone.”

Because most of the woody plants being evaluated are natives, they represent less of an invasive threat to the environment than introduced species, Kling added. Woody plants can also provide year-round wildlife cover to a much better extent.

The plants chosen for the study include red maple, silver maple, thinleaf alder, river birch, hybrid chestnut, northern catalpa, common hackberry, bloodtwig dogwood, American filbert, American smoketree, possumhaw, American sweetgum, tuliptree, osage-orange, sycamore, eastern cottonwood, black cherry, scarlet oak, flameleaf sumac, black locust, and sherburne willow.

Two-year-old seedlings were planted in the spring of 2010 and will be grown for one to two seasons before cutting back to induce coppicing, Kling said. Then they will be grown for a three- to five-year harvest cycle. Researchers will be collecting growth and environmental data along the way to determine if these woody plants can serve as short rotation crops for biomass production.

Researchers collaborating in this study include Kling, Evan Delucia, Michael Dietze, Stephen Long, Ryan Stewart, Tom Voigt, Anthony Bratsch, Sarah Davis, Ziaohui Feng, David LeBauer and Dan Wang of the Energy Biosciences Institute.

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