

Field testing of a low lignin engineering strategy in switchgrass

Kavitha Satish Kumar^{1,2*} (kavithask@lbl.gov), Ramana Pidatala^{1,2}, Mi Yeon Lee^{1,2}, Brenda Perez³, Christopher De Ben³, Jasmine Ortega^{1,2}, Yi-Chun Chen^{1,2}, Daniel Putnam^{2,3}, Corinne Scown^{1,2}, Christa Pennachio^{1,4}, Katherine Louie^{1,4}, Benjamin P Bowen^{1,4}, Trent Northen^{1,4}, Henrik V Scheller^{1,2}, Aymerick Eudes^{1,2}, **Jenny Mortimer**^{1,2}

¹Lawrence Berkeley National Laboratory, Berkeley, CA; ²Joint BioEnergy Institute, Emeryville, California, USA; ³Department of Plant Science, University of California, Davis, California, USA; and ⁴US Department of Energy Joint Genome Institute, Walnut Creek, California, USA

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Project Goals: A multi-species data set will be generated to understand the changes in the molecular mechanism observed in plants as a result of the low lignin engineering strategy using transcriptomics and untargeted metabolomics.

Switchgrass (*Panicum virgatum* L.) is a promising perennial dedicated bioenergy feedstock. It can grow on marginal lands and produce abundant biomass. Modification of lignin composition for improved deconstruction is an important strategy for biomass improvement. Previously, the JBEI Feedstocks team developed a dominant strategy to reduce lignin content, while increasing the proportion of H-lignin, which relied on the expression of a bacterial enzyme - 3-dehydroshikimate dehydratase (*QsuB*) in *Arabidopsis*¹. This strategy was first successfully tested in switchgrass in the greenhouse and is now being tested in a small-scale multi-year field trial. Previously, we had demonstrated that this strategy resulted in increased saccharification efficiency and low lignin content, with no change to growth in *Arabidopsis* or greenhouse-grown switchgrass. Field data collected from three-cuttings showed an increase in plant height and biomass from the *QsuB* lines as compared to untransformed controls (Alamo). We are now using RNAseq and metabolomics to explore the reasons for these changes in collaboration with JGI. We are also testing the *QsuB* strategy in other key bioenergy feedstocks, including sorghum and poplar. Future work will include expanding the field trial to include multiple field sites, as well as a water-deficit trials.

References

1. Eudes A, et al. (2015) Plant Biotech. J. 13:1241.

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