

Variation in Poplar Yield and Composition Impacts Biofuel Economics

Background

- There is a wide range of variation in the composition and yield of perennial feedstocks, and yield is widely believed to be the major driver of feedstock cost
- Few analyses of the value of feedstock composition or quality have been conducted in the context of an overall supply chain and biorefinery

Approach

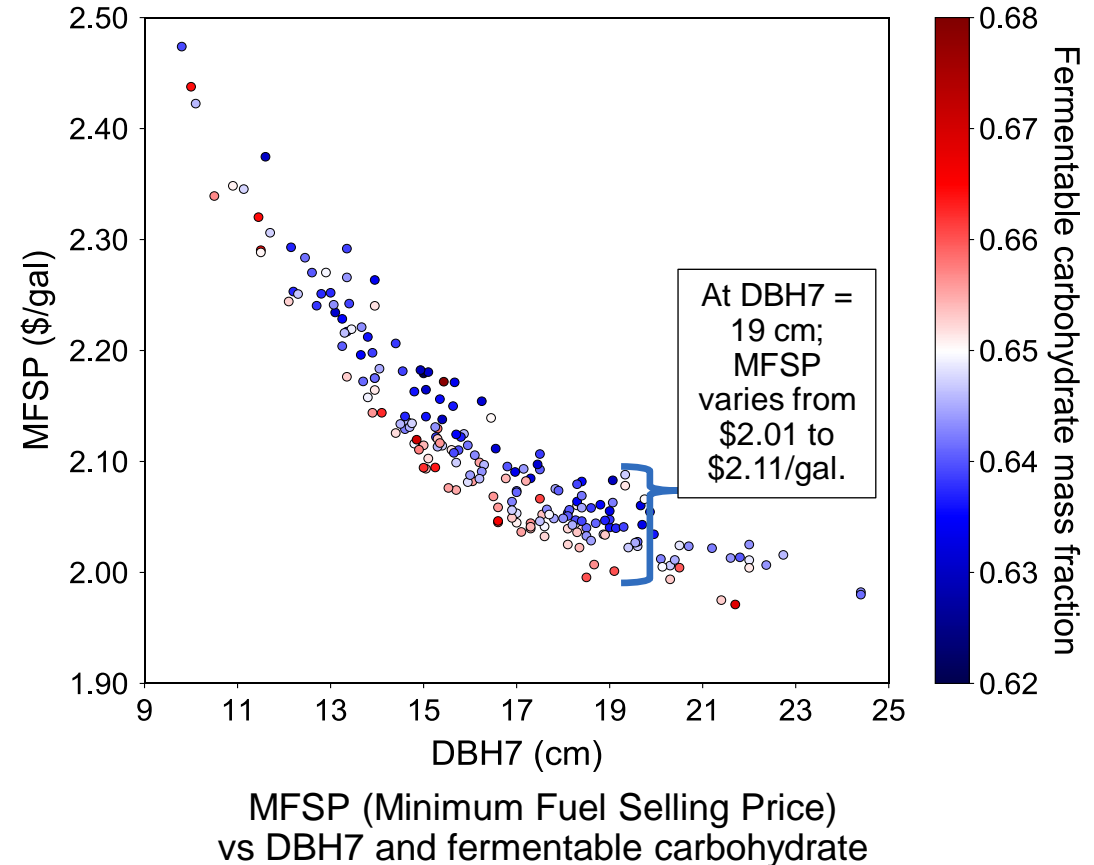
- Improved HTP compositional analytics reveal the full range of natural variation
- A supply chain simulation model was used to estimate the cost of poplar based on tree size delivered to the biorefinery
- Technoeconomic sensitivity was performed on representative sample of 204 poplar clones from GWAS population for biomass yield and carbohydrate composition
- Aspen Plus model based on the NREL biomass conversion base case (pretreatment, enzymes, and fermentation) was used to complete the analysis

Outcome

- As expected, biomass yield (as DBH7) was the strongest influence on economics due to high variation and feedstock costs
- However, among high biomass lines, composition (i.e., feedstock quality) becomes an equally important parameter on minimum fuel selling price

Significance

- Understanding the range of feedstock phenotypic characteristics, including variation in both physical and compositional phenotypes, was demonstrated to be important when selecting economically advantageous genotypes for domestication in an optimized supply chain



Happs, Bartling, Doeppke, Harman-Ware, Clark, Webb, Bidy, Chen, Tuskan, Davis, Muchero, and Davison "Economic Impact of Yield and Composition Variation in Bioenergy Crops: *Populus trichocarpa*" *Biofuels, Bioproducts and Biorefining* (2020): doi.org/10.1002/bbb.2148