

**Variation of S/G ratio and lignin in a *Populus* family influences the release of fermentable sugars by dilute acid hydrolysis.** N. P. Nghiem\*, B. H. Davison\*, G. A. Tuskan\*, and S. R. Drescher\*. \*Oak Ridge National Laboratory, Oak Ridge, Tennessee 37831.

Samples from a second generation *Populus* cross grown together were shown to have different lignin contents and S/G ratios. (S: Syringyl-like lignin structures; G: Guaiacyl-like lignin structures). The lignin contents varied from 22.7 to 25.8% and the S/G ratio from 1.8 to 2.3. Selected samples spanning the range were hydrolyzed with dilute sulfuric acid to release fermentable sugars (1w% solids, 1w% acid, 175°C maximum, 12-minute hydrolysis time). The hydrolysis was stopped with only partial hydrolysis of the hemicellulosic fraction to maximize the variation. The results indicated that both lignin contents and S/G ratio had significant effects on the yield of xylose. For example, the xylose yield of the 25.8% lignin and 2.3 S/G (high lignin, high S/G) sample was 30% of theoretical yield, and the xylose yield of the 22.7% lignin and 1.8 S/G (low lignin, low S/G) was 55% of theoretical yield. Interaction between lignin contents and S/G ratio also was observed. These results are consistent with other observations indicating that a high S content has more crosslinking, thus making hydrolysis more difficult. These results indicate that lignin content and composition among genetic variants within a single species can influence the hydrolyzability of the biomass.