Switchgrass and Giant Miscanthus Biomass from Reclaimed Mine Lands

S. Scagline-Mellor, T. Griggs, and J. Skousen

Abstract: Switchgrass (*Panicum virgatum* L.) and giant miscanthus (*Miscanthus x giganteus* Greef & Deuter ex Hodkinson & Renvoize) are productive on marginal lands in the eastern US, but their productivity and composition have not been compared on mine lands. Our objectives were to compare biomass production, composition, and theoretical ethanol yield (TEY) and production (TEP) of these grasses on a reclaimed mined site. Following 25 years of herbaceous cover, vegetation was killed and plots of switchgrass cultivars Kanlow and BoMaster and miscanthus lines Illinois and MBX-002 were planted in five replications. Annual switchgrass and miscanthus yields averaged 5.8 and 8.9 Mg dry matter ha^{-1}, respectively, during 2011 to 2015. Cell wall carbohydrate composition was analyzed via near-infrared reflectance spectroscopy with models based on switchgrass or mixed herbaceous samples including switchgrass and miscanthus. Concentrations were higher for glucan and lower for xylan in miscanthus than in switchgrass but TEY did not differ (453 and 450 L Mg^{-1}, respectively). Total ethanol production was greater for miscanthus than for switchgrass (5,594 vs 3,699 L ha^{-1}), did not differ between Kanlow and BoMaster switchgrass (3,880 and 3,517 L ha^{-1}, respectively), and was higher for MBX-002 than for Illinois miscanthus (6,496 vs 4,692 L ha^{-1}). Relative to the mixed feedstocks model, the switchgrass model slightly under-predicted glucan and slightly over-predicted xylan concentrations. Estimated TEY was slightly lower from the switchgrass model but both models distinguished genotype, year, and interaction effects similarly. Biomass p-roductivity and TEP were similar to those from agricultural sites with marginal soils.

Additional Keywords: Cellulosic bioenergy feedstock, Mine reclamation, Near-infrared reflectance spectroscopy, theoretical ethanol production, theoretical ethanol yield.

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