Yields and Ethanol Production Potential of Switchgrass and Miscanthus on Reclaimed Mine Lands

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

Abstract Herbaceous species like switchgrass (*Panicum virgatum* L.) and Miscanthus (*Miscanthus x giganteus*) have been proposed as potential cellulosic crops to meet bioenergy fuel goals. Both are warm season grasses and show potential for biomass production on marginal lands and reclaimed mine lands in the eastern USA. The objectives of this study were to determine yields, theoretical ethanol yield (TEY, L Mg^{-1}), and theoretical ethanol production (TEP, L ha^{-1}) of these two grasses grown at the Alton, WV, mined site. Alton was reclaimed in 1985 with less than 15 cm of topsoil thickness replaced over mixed overburden. An herbaceous ground cover was maintained at the site for 25 years before two cultivars of switchgrass (Kanlow and BoMaster) and two varieties of Miscanthus (Public and Private) were planted in herbicided plots in 2010. Both species established and after 6 yrs. produced 13.9 and 11.7 Mg ha^{-1} DM for Private Miscanthus and Kanlow switchgrass, respectively. Carbohydrate analyses to estimate TEY were done using near-infrared reflectance spectroscopy (NIRS). Pentose sugars (C5) were significantly greater in switchgrass therefore TEYs were significantly higher for switchgrass (479 L Mg^{-1}) compared to Miscanthus (467 L Mg^{-1}). But when TEYs were multiplied by biomass yields, Miscanthus TEP was significantly greater than switchgrass TEP (5,802 vs 4,275 L ha^{-1}). Kanlow and BoMaster TEPs were similar, but Private was significantly greater than Public TEPs. The results show that both species can produce high yields and good quality feedstock on reclaimed mined lands.

Keywords: Bioenergy crops, BoMaster, Forage analysis, Kanlow, Land reclamation, Ligno-cellulosic traits, Near-infrared reflectance spectroscopy, Revegetation, Theoretical ethanol yield

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