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Light Interception, Use-Efficiency and Energy Yield of Switchgrass (Panicum Virgatum L.) Grown in a Short Season Area.

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Abstract
Switchgrass (Panicum virgatum L.) has been identified as a potential biomass crop in North America. A two-year study was conducted to characterize leaf area development and estimate radiation-use efficiency (RUE) of switchgrass in eastern Canada. Three cultivars, Cave-in-Rock (CIR), Pathfinder (PF) and Sunburst (SB) were grown in solid stands in a randomized complete block design. Dry matter (DM) yield, leaf area development and light interception were monitored bi-weekly throughout the growing season. Herbage subsamples were hand separated into leaf and sheath-stem fractions. Mean seasonal maximum leaf area indices (LAI) were 6.1, 5.3 and 5.1 for CIR, PF and SB, respectively. By early July of each season the canopies were intercepting about 90% of the incoming light. End of season DM yields were 12.2, 11.5 and 10.6 Mg ha_{y1} for CIR, PF and SB, respectively. The stem plus leaf sheaths constituted the major component of DM and its accumulation trend paralleled that of total DM. End of season stem-sheath components averaged 764, 714 and 691 of the total g kg_{y1} DM for CIR, PF and SB, respectively. Energy contents of the switchgrasses averaged 17.4 MJ g_{y1} DM and did not vary among cultivars or during the season. This translated into total energy yields haÿ1 of 216 GJ for CIR, 197 for PF and 186 for SB. Radiation-use efficiencies computed using total incoming solar radiation, for the near linear growth phases, averaged 1.07 g DM MJÿ1 for CIR, 0.90 for PF and 0.89 for SB. The respective values based on photosynthetically active radiation were 2.20, 2.00 and 1.96 g DM MJ_{y1}. Changes in LAI, relationships between LAI and light interception and DM yield could all be described by predictive regression equations. These results indicate the potential of switchgrass as a biomass crop in short season areas.

Reference: Madakadze, I.C., Stewart, K., Peterson, P.R., Coulam, B.E., Samson, R. and D.L. Smith. 1998. Biomass and Bioenergy. Vol 15, No. 6. pp 475-482