

Associative nitrogen fixation (ANF) in high-yielding switchgrass varieties

S. Carolina Córdova^{1,2,3*} (cordov13@msu.edu), Nyduta Mbogo⁴, Stephen K. Hamilton^{1,2,5},
G. Philip Robertson^{1,2,3}

¹Great Lakes Bioenergy Research Center, Michigan State University, MI;

²W.K. Kellogg Biological Station, Michigan State University, Hickory Corners, MI;

³Department of Plant, Soil, and Microbial Sciences, Michigan State University, East Lansing, MI;

⁴Department of Biology, University of Missouri-Kansas City, Kansas City, MO (REU student);

⁵Department of Integrative Biology, Michigan State University, East Lansing, MI.

Project Goals:

Switchgrass (*Panicum virgatum*), a model bioenergy crop due to its high adaptability to many environments, may obtain much of its nitrogen (N) through a casual association with free-living N fixing bacteria (so-called associative nitrogen fixation or ANF). Quantification of ANF is challenging as this process has not been investigated extensively, and is possibly episodic. Moreover, information on ANF rates among switchgrass varieties or ecotypes is scarce. We used ¹⁵N₂ to measure switchgrass ANF via 1) in-vitro 7-day incubations of plant and soil rhizosphere samples, and 2) 48-hour incubations of whole plants moved from the field to a greenhouse. We contrasted two high-yielding switchgrass varieties, Cave-in-Rock and Kanlow (upland and lowland ecotypes, respectively), grown for 10 years at the W.K. Kellogg Biological Station in southwest Michigan. In-vitro experiments demonstrated ANF in roots and soil samples from both varieties, but not in leaves+stems from either. Preliminary findings from the greenhouse experiment showed a significant interaction between variety and sample type (i.e., plant tissue and soil): Cave-in-Rock roots had ANF rates 25-times higher than Kanlow roots, and rhizosphere soil from Kanlow plots had ANF rates 2.8-times higher than rhizosphere soil from Cave-in-Rock plots. In follow-on experiments, we will further explore how the ANF rate varies with switchgrass variety, especially at different phenological stages.

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