

The Impact of Stand Age and Fertilization on the Soil Microbiome of *Miscanthus x giganteus*

Objective

The perennial grass *Miscanthus x giganteus* (*M x g*) is a promising bioenergy crop due to its high yields and low input requirements. However, the sustainability of this crop hinges on optimization of management practices, which are still being explored. Published studies have reported inconsistent response of *M x g* to nitrogen (N) fertilization with stand age. This study investigated the relationship between the *M x g* microbiome and its response to N fertilization.

Approach

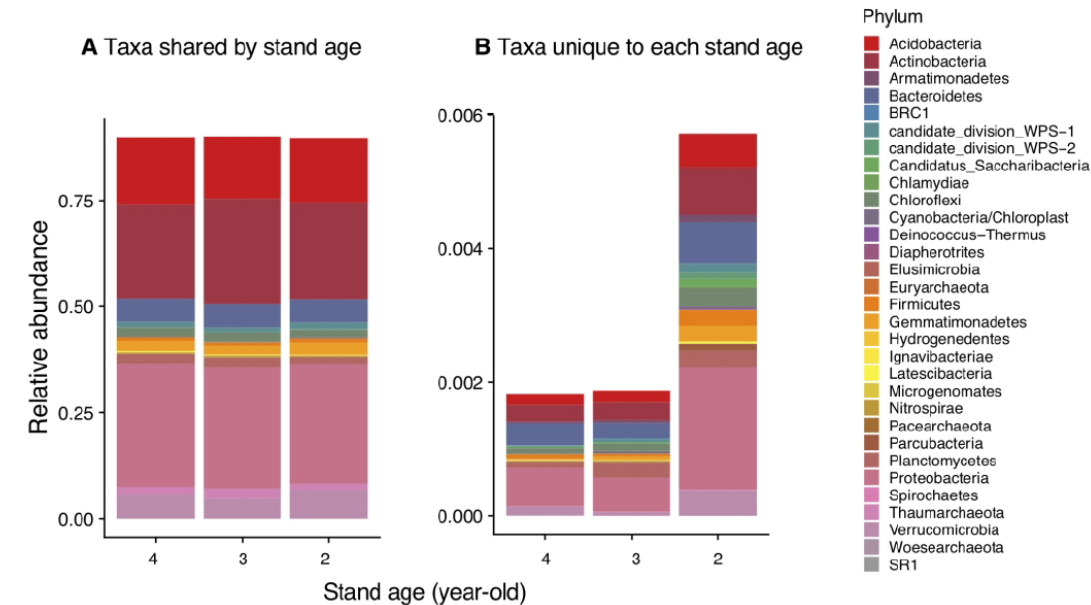
- ❖ *M x g* was grown in Iowa, under a staggered-start experimental setup which contained three stand ages (2-, 3-, and 4-year old *M x g* plants), each split into three N fertilization treatments (0, 224, and 448 kg ha⁻¹).
- ❖ Soil samples were collected from all plots during the 2018 growing season at five time points spaced before and after fertilizer application. The soil microbial community was characterized via 16S rRNA gene amplicon sequencing.

Results

- ❖ Microbial community differences across different stand ages and fertilization rates were mainly due to shifts in relative abundance of shared microbial taxa rather than different community membership.
- ❖ Microbial community response to N fertilization was greater in younger stands than older stands.
- ❖ Increased aboveground biomass was generally associated with increased microbial diversity and N fertilization.

Significance

This study is the first to demonstrate a relationship between the productivity of aboveground biomass and microbiome characteristics. Plant age and fertilization impact the microbial community structure and productivity of *M x g* and highlight the need to consider these factors for sustainable management of this crop.



While relative abundance of shared taxa remained similar across all stand years (A), unique taxa represented a greater proportion of the microbial community at the youngest stand age than at older stand ages (B).