BRC Science Highlight
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The Older Plant Gets the Sun: Age-Related Changes in *Miscanthus x giganteus* Phenology

Objective

Perennial bioenergy grasses are a key component of the emerging bioeconomy, but age-related physiological and developmental changes have usually been overlooked in perennial grass research. Additionally, conventional experimental designs that study a single stand over multiple seasons confound the effects of plant aging and growing season conditions. In this study, researchers addressed these knowledge gaps by using a staggered-start experimental design to study changes in *Miscanthus x giganteus* phenology during the first three years of its establishment.

Approach

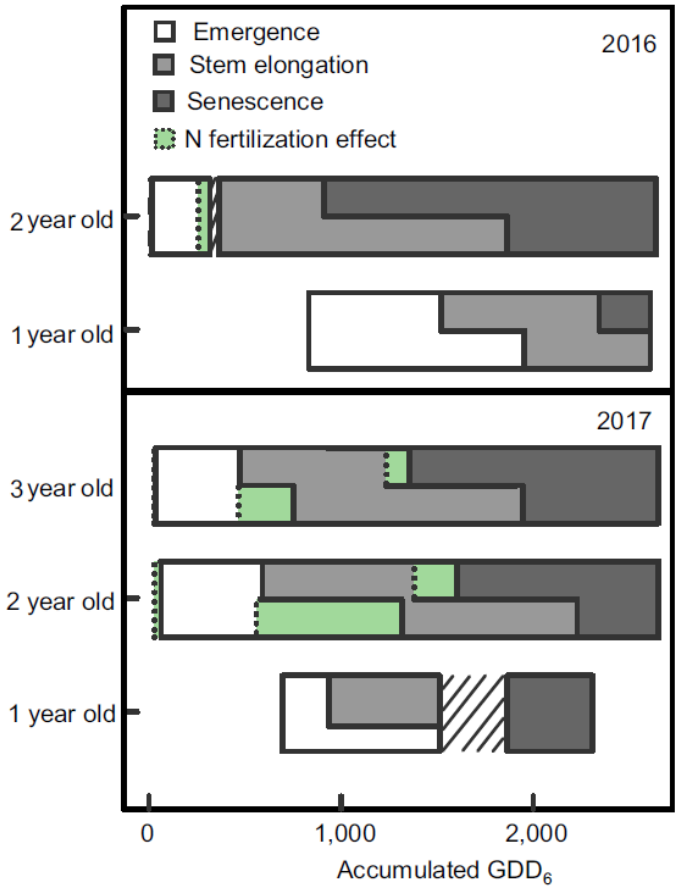
- Implemented a staggered-start *M. x giganteus* experiment with three planting years over two growing seasons in central Iowa, USA. Each planting year included multiple nitrogen(N)-fertilization treatments (0, 112, 224, 336, 448 kg/ha).
- Measured plant phenology over two growing seasons (2016, '17) from emergence through senescence.
- Constructed statistical models of growth stage and thermal time and compared model predictions and parameters to understand influence of stand age and N on plant phenology.

Results

- Stand age impacted plant growth: 1-year-old stands had faster developmental rates, but 2- and 3-year-old stands emerged three months earlier, allowing for the growth of over ~30% more stems and leaves.
- N fertilization did not impact 1-year-old stand growth but did extend 2- and 3-year-old stand growing seasons by more than two weeks.

Significance

These results suggest that management practices that shorten the planting to emergence period may hasten development and increase yields. This study was the first to study the interaction of stand age and N effects through time. This research sets the stage for future work to disentangle these effects on mature stands of bioenergy grasses.



Changes in *M. x giganteus* development during establishment in two growing seasons. During the dashed period, stands remained developmentally unchanged until senescence.

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