

Managing Flowering Time in *Miscanthus* and Sugarcane to Facilitate Intra- and Intergeneric Crosses

Background

The C4 perennial grass *Miscanthus* is a bioenergy biomass crop widely available for commercial production. As a close relative of *Saccharum*, *Miscanthus* is a potentially valuable genetic resource to improve sugarcane, another important bioenergy crop. However, differences in flowering time within and between the two species hinders hybridizations. This study explored the feasibility of synchronizing flowering time of *Saccharum* and *Miscanthus* by understanding the impacts of day length and other environmental factors.

Approach

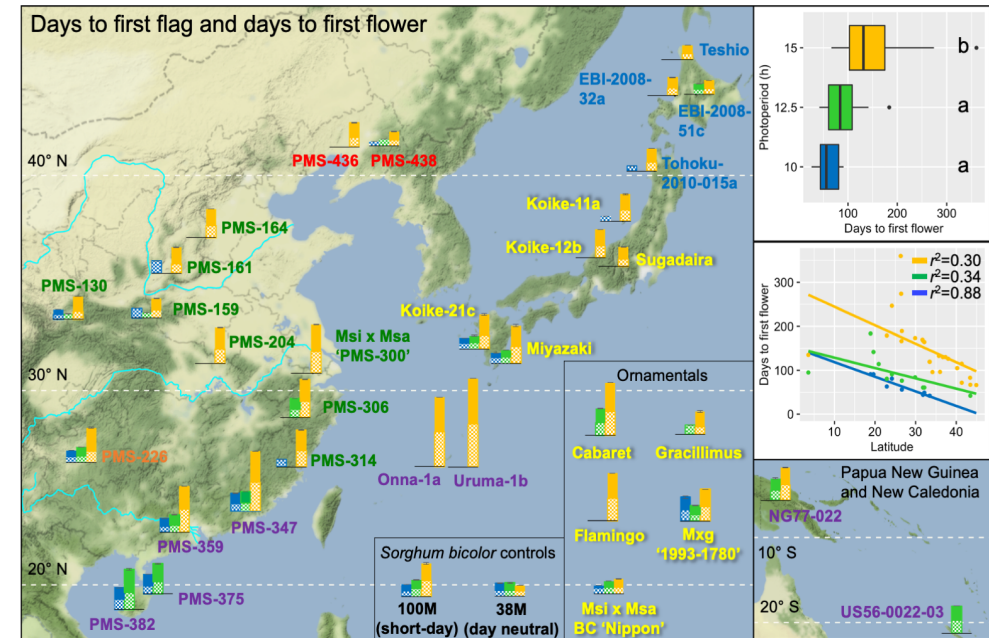
- ❖ In greenhouse experiments over three years, *Miscanthus* and sugarcane were grown under a photoperiod conducive to flowering sugarcane, and treatments were applied to *Miscanthus* to determine how to synchronize its flowering with sugarcane
- ❖ In a growth chamber, 33 *Miscanthus* genotypes from 20.9° S to 44.9° N were evaluated for response to three day lengths (10 h, 12.5 h, and 15 h)

Results

- ❖ Flowering for more than half of the sugarcane genotypes was achieved in a greenhouse at Urbana, IL (40.1° N) by providing a declining photoperiod of 1 min d⁻¹ from 12.5 h to 11 h
- ❖ To flower high-latitude accessions of *M. sinensis* synchronously with sugarcane, *M. sinensis* requires >12.5 h day lengths, whereas sugarcane needs <12.5 h day lengths

Significance

This study identified methods to circumvent barriers of synchronizing flowering time of sugarcane and *Miscanthus*, such as staggered plantings or growing each under different day lengths. These methods will help plant breeders improve these two bioenergy crops by introgressing desirable genes (e.g., cold-tolerance and disease-resistance) via intra- and intergeneric crosses.



Effects of day length on days to first flag and days to first flower for 33 *Miscanthus* and two *Sorghum bicolor* genotypes grown in controlled environment chambers at constant 23 °C.