

**Title:** Genomics of Winter-hardiness and Yield in Diverse *Miscanthus* Germplasm

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**Project Goals:** Develop genomic selection models to improve the efficiency of breeding *Miscanthus* for adaptation to temperate environments and for biomass yield.

**Abstract Text:** The current major *Miscanthus* cultivar, *M. ×giganteus* ‘Illinois’, is not sufficiently winter-hardy in the Midwest U.S., which limits its productivity. Because *M. ×giganteus* is an interspecific hybrid, selecting winter-hardy accessions of its parental species, *M. sinensis* and *M. sacchariflorus*, will be essential for breeding new *M. ×giganteus* cultivars with greater hardiness. *Miscanthus* is most susceptible to winterkill and damage during the first winter after planting. In this study, *M. sinensis* and *M. sacchariflorus* accessions from diverse genetic and geographic backgrounds were evaluated for first-overwintering ability and yield performance. In an initial experiment, 330 half-sib families representing three *M. sinensis* genetic groups (North, Central, and South Japan; 55, 117, 158 half-sib families respectively) were evaluated in Urbana, IL for first winter overwintering ability in spring 2020 (planted in spring 2019), and yield data were collected in autumn 2020 and are currently being collected for the 2021 season. First-winter overwintering ability was relatively high for the *M. sinensis* North and Central Japan genetic groups (81% and 82%, respectively) but low for the South Japan group (49%). Substantial variation among families within genetic groups was observed for overwintering ability and yield, which along with sequence data from JGI will facilitate development of genomic selection models for this important trait. In a subsequent experiment planted in spring 2020 at Urbana, IL, we assessed first-winter overwintering ability for diversity panels consisting of 294 *M. sacchariflorus* accessions and 236 *M. sinensis* accessions, representing the geographic ranges and all known genetic groups of these species (Clark et al., 2014; Clark et al., 2019). First-year overwintering ability of both species varied among genetic groups, which will allow us to more efficiently target our *Miscanthus* breeding efforts to different geographic regions in the U.S.

## References

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