Self-incompatibility of *Miscanthus sinensis* Depends on Pistil Age

Self-incompatibility (SI) is an effective genetic mechanism that promotes outcrossing and maintains a high degree of heterozygosity in plants. Self-incompatibility also prevents inbreeding, and consequently, F1 hybrid breeding in species possessing SI is difficult.


The team established a robust procedure to produce viable pollen consistently and performed more than 1,000 semi-in-vivo reciprocal and self-pollinations to study pollen–pistil interaction in *M. sinensis*. The team presented direct evidence that gametophytic self-incompatibility is operative and likely controlled by a two-locus, S and Z system in *M. sinensis*. In addition, they showed that self-incompatibility is influenced by the developmental stage of the pistils with younger pistils being less discriminatory against self-pollen.

Currently, *M. sinensis* cultivars are primarily developed by population improvement. F1 hybrids, which explore the full potential of heterosis, are therefore more desirable. The current study provides evidence that a two-locus, gametophytic SI is likely working in *M. sinensis*, and inbred development may be achieved by pollination of immature pistils with self-pollen.

Adapted from Jiang, J., Y. Guan, S. McCormick, J. Juvik, T. Lubberstedt, and S. Fei. 2017. Gametophytic self-incompatibility is operative in Miscanthus sinensis (Poaceae) and is affected by pistil age. Crop Sci. 57. View the full article online at http://dx.doi.org/10.2135/cropsci2016.11.0932

Maize Breeding Enhances Efficient Use of Nitrogen

Nitrogen is applied yearly to the more than 90 million ac of maize produced in the U.S. While grain yield has continued to increase through breeding and agronomic practices, evidence exists that N application rates have plateaued. A study evaluating the contribution of maize hybrid breeding to potentially greater agronomic productivity has not been conducted.

In a recent *Crop Science* article, researchers from DuPont Pioneer report on a multi-year, multi-location study using the ERA hybrids (a set of high-volume Dupont Pioneer hybrids sold in each of the decades beginning in 1930 and continuing through 2010) grown under two planting densities and in both sufficient and insufficient N applications. The researchers found that modern hybrids produced greater yield with the same amount of N compared with older hybrids, documenting increased nitrogen use efficiency due to breeding. They also conclude that factors such as reduced grain protein and increased kernel mass and kernel number, along with greater synchrony in flowering, support yield improvement in modern hybrids. An additional key finding was that cumulative N uptake in the grain has increased over time as well, and this provides insight into future N uptake requirements.

Results from this experiment indicate that maize breeding programs are a foundational part of ensuring grain yield can increase without the need for increasing N applications. Maintaining similar N application rates with greater total N uptake in the crop limits the potential for N runoff into the environment, reduces the cost of N to the producer, and results in greater profitability.

New *Crop Science* research indicates that maize breeding programs are foundational for increasing grain yield without increasing N applications. Source: Screenshot from YouTube video by Marc Hutlet Seeds.

Adapted from DeBruin, J.L., J.R. Schussler, H. Mo, and M. Cooper. 2017. Grain yield and nitrogen accumulation in maize hybrids released during 1934 to 2013 in the US Midwest. Crop Sci. 57. View the full article online at http://dx.doi.org/10.2135/cropsci2016.08.0704

Adapted from DeBruin, J.L., J.R. Schussler, H. Mo, and M. Cooper. 2017. Grain yield and nitrogen accumulation in maize hybrids released during 1934 to 2013 in the US Midwest. Crop Sci. 57. View the full article online at http://dx.doi.org/10.2135/cropsci2016.08.0704