

Dickinson, North Dakota, USA

## Using Ga2<sup>s</sup> to limit undesirable fertilization in commercial organic maize

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There is interest in organic maize that would not cross with transgenic varieties, and traits that prevent unwanted crossing are well known. Gametophytic cross incompatibility was first noticed in popcorn that would set little seed if pollinated by dent corn pollen (Thomas 1955). This trait is controlled by Ga1<sup>s</sup> (Neuffer et al., 1997). Most maize cannot pollinate such lines, although there are a few white and yellow dent lines in the USA with the trait (Kutka, 2009; Poneleit, 2000). Zeigler and Ashman (1994) reported that the trait is used to protect popcorn.

Ga1<sup>s</sup> works because plants with this trait have silks that do not support normal pollen tube growth for pollen carrying the ga allele. Lausser et al. (2010) reported 0-5% of ga pollen tubes growing 8 cm into silks of homozygous Ga1<sup>s</sup> plants with most growing no more than 2 cm. Dent outcrosses are usually low in popcorn fields due to cross incompatibility and the abundance of more competitive Ga1<sup>s</sup> pollen in the popcorn fields (Zeigler and Ashman, 1994).

Tcb1<sup>s</sup> and Ga2<sup>s</sup> are gametophytic cross incompatibility alleles from teosinte that have been crossed into field corn lines (Kermicle and Evans 2010; Evans and Kermicle 2001). These genes work in a similar fashion to Ga1<sup>s</sup> and normal dent lines in the USA are ga2 ga2 and tcb1 tcb1 in genotype. Both genes could reduce undesirable outcrossing in commercial maize.

Lines carrying Ga2<sup>s</sup> from the Maize Genetic Stocks Center were used as donor parents in 2011 in a backcrossing project funded in part by the Organic Farming Research Foundation. Recurrent parents include flint, Oh43, W153R, Mo17, Iodent, B14, and B73 types. Ga2<sup>s</sup> is being crossed into these lines following methods developed by popcorn breeders for Ga1<sup>s</sup> (Zeigler and Ashman, 1994; Thomas, 1955). At the end, plants homozygous for Ga2<sup>s</sup> will be identified by pollinating with pollen from a blue or purple seeded line on one day followed by selfing the next day. Those with strong resistance to outcrossing should have few or no colored kernels at harvest and will be released to the public, although new breeding lines carrying Ga2<sup>s</sup> in recurrent parent cytoplasm should be ready for release to breeders and researchers late in 2012.

## References

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