sugary enhancer1 and Endosperm Carbohydrate Composition in Near-Isogenic Maize (*Zea mays)* Inbreds

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Introduction

The endosperm of starchy corn (field, dent) contains 75% amylopectin and 25% amylose. Amylose are long strait chains of glucose molecules and amylopectin are branched chains. Amylose and amylopectin are not water soluble. The polysaccharides in *su1* sweet corn are typically 50 starch and 50% water soluble polysaccharides (WSP). WSP is highly branched and soluble in water contributing to a desirable mouth feel.

When combined with *sugary1 (su1),* the *sugary enhancer1 (se1)* allele, results in maize endosperm with elevated sugar levels and high levels of water-soluble polysaccharides resulting in excellent sweet corn quality. The wild type *Se1* allele has been sequenced, but its function is unknown. The commercially used allele (*se1*) is a presence-absence variant (PAV). We do not know how this mutation results in the phenotype. The objectives of this research were to determine 1) if near isogenic lines differed in vegetative growth and 2) whether the *se1* endosperm phenotype is determined by a dosage effect in the triploid endosperm.

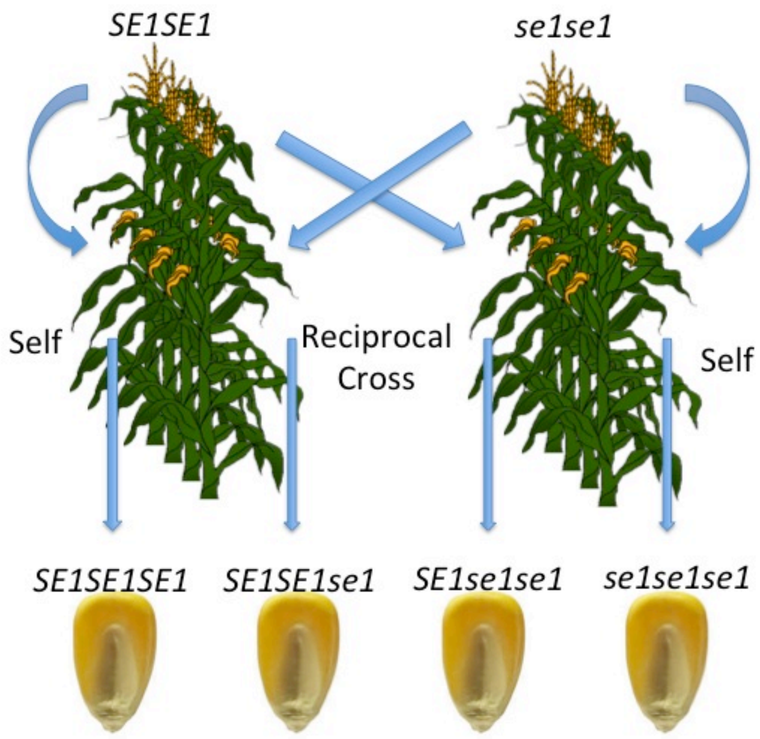
Amylopectin
M. James

Phytotgylcogen
M. James

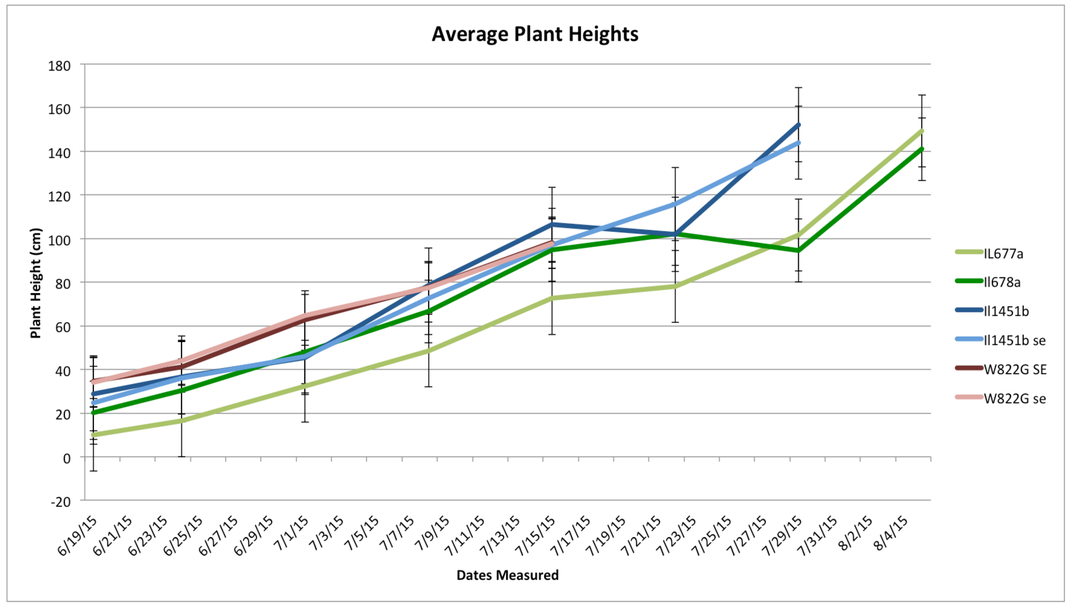
Methods

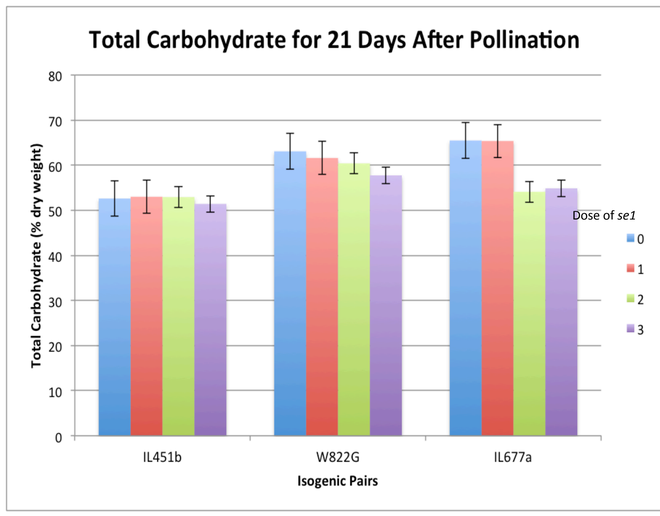
- The experiment used three pairs of lines near isogenic for *se1*
- All materials were planted in a randomized complete block design at the UW-West Madison Ag Research Station at two planting dates with two replications at each planting date
- To create the four dosages of the *se1,* ears were self or cross-pollinated according to the diagram below. The ears were harvested 21 days after pollination and dried at 35^{O}C.
- Carbohydrate composition was measured using Near-infrared Spectroscopy (NIR).
- Throughout the growing period the plants were measured for height each week until flowering.

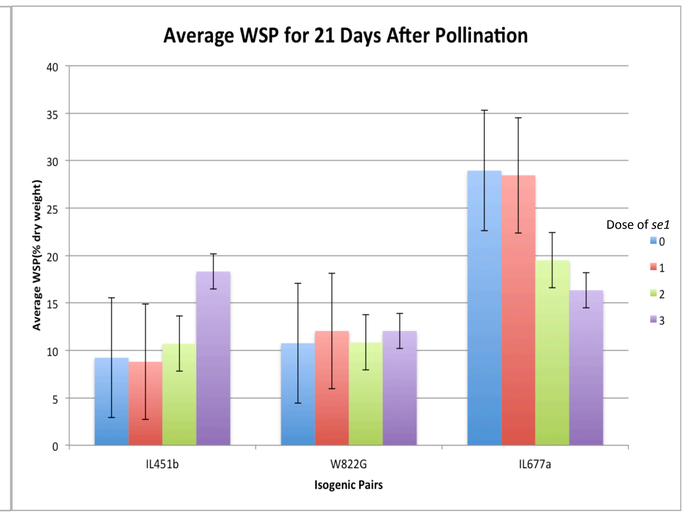
Diagram of Genetic Doses

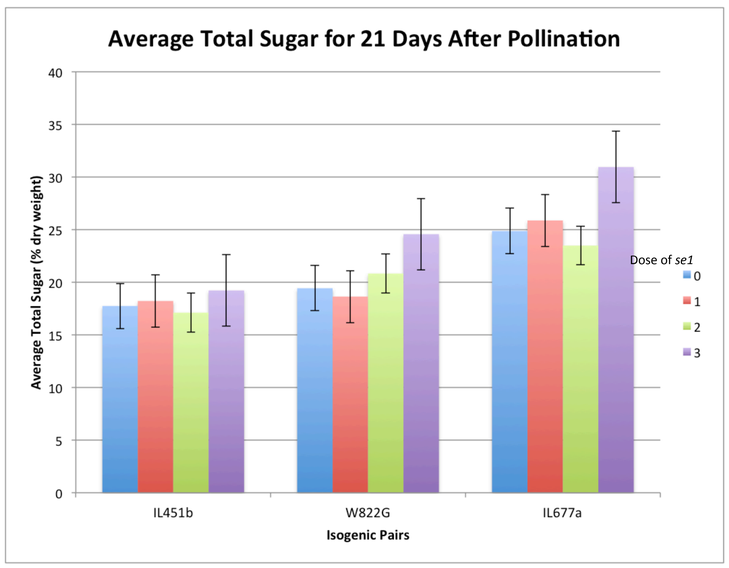


Results









Discussion

1. The *se1* gene does not affect plant height. Those differences detected were during early growth and most likely due to delayed germination of the *se1* kernels.

2. Total carbohydrate content of the kernels was unaffected by dosage at the *se1* allele. Percent WSP did differ due to *se1* dosage, but did not behave consistently among inbreds. Sugar content of the kernels with three doses of *se1* was greater than all other dosages, which did not differ. Thus for sugar content *se1* behaved as a complete recessive.

3. Sweet corn breeders have long known that multiple loci determine the quality of sugary enhancer hybrids and that highest quality is conferred by the recessive state of these. In IL677a and W822G three doses of that allele were required to increase sugar content. When there were three does of *se1* in IL451b sugar content did not increase.

4. On the other hand all three isogenic pairs respond differently from one another in levels of WSP. In IL451b the *se1/se1/se1* had significantly more WSP than the other three dosages. In W822G dosages did not differ for WSP and in IL677a two and three doses of *se1* had significantly less WSP than the 0 and 1 dose endosperms. Since we know all three inbreds share the exact same allele at the *se1* locus, it is likely that other loci are affecting WSP levels.