RESPONSES OF TOLERANT AND SENSITIVE SWEET CORN INBREDS AND NEAR ISOGENIC HYBRIDS TO POSTEMERGENCE HERBICIDES WITH DIFFERENT MODES OF ACTION. *Dean S. Volenberg, Martin M. Williams II, Jerald K. Pataky, and Dean E. Riechers, Agricultural Agent Univ. of Wisconsin Cooperative Extension, Door County, WI 54235, Assistant Professor, Department of Crop Sciences USDA-ARS, Univ. of Illinois, Urbana, IL 61801, Professor and Associate Professor, Department of Crop Sciences, Univ. of Illinois, Urbana, IL 61801.

While certain sweet corn hybrids are consistently injured by applications of nicosulfuron or mesotrione, other hybrids are only occasionally injured. Recent research indicated a single gene in a nicosulfuron-sensitive inbred (CR1) is associated with sensitivity to mesotrione, dicamba+diflufenzopyr, carfentrazone, foramsulfuron, and primisulfuron. Two sets of experiments were undertaken to determine if plants heterozygous for the gene in inbred CR1 had responses that were intermediate to CR1 and a nicosulfuron-tolerant inbred (CR2). The first experiment characterized herbicide dose response of two- to three-leaf sweet corn plants (CR1, CR2, and their respective F_1 hybrid) to nicosulfuron, mesotrione, topramezone, and dicamba. Based on visual assessment of injury eight days after treatment (DAT), inbred CR2 was more tolerant to nicosulfuron, mesotrione, topramezone, and dicamba compared to inbred CR1, and the F_1 hybrid had a response intermediate to inbreds CR1 and CR2. To further characterize the effect of gene dosage on herbicide tolerance in a uniform genetic background, S_5 near isolines were developed from the selfed F_1 hybrid. After five generations of selfing, homozygous sensitive or homozygous tolerant lines were selected from segregating S_5 families. S_5 near isolines from different families were crossed to produce nicosulfuron homozygous tolerant (TT), nicosulfuron homozygous sensitive (tt), and heterozygote (Tt) near-isogenic hybrids. The second experiment characterized postemergence herbicide dose response of one- to two-leaf stage near isogenic hybrid sweet corn plants (TT, Tt, and tt hybrids) to tritosulfuron, mesotrione, topramezone, dicamba, and atrazine 14 DAT. Similar to the results above, the TT hybrid was more tolerant to mesotrione compared to the tt hybrid and the heterozygote Tt hybrid had a response intermediate to TT and tt (based on plant dry biomass). However, the Tt hybrid biomass response to tritosulfuron was not intermediate between TT and tt hybrids, as the GR_{50} values for TT, Tt, and tt were 54, 112, and 25 g ai ha^{-1}, respectively. The responses of TT, Tt, and tt hybrids to topramezone, dicamba, and atrazine were similar based on plant dry biomass. Plants heterozygous for the gene in inbred CR1 clearly have intermediate responses to mesotrione. Although the heterozygous F_1 hybrid had responses to topramezone and dicamba that were intermediate to inbreds CR1 and CR2 in the first study, the heterozygous Tt hybrid was similar in responses to TT and tt hybrids in the second study. The first set of experiments used visual ratings of crop injury, while the second set of experiments used plant biomass to assess injury. One possible explanation for inconsistent results with topramezone and dicamba is that 14 DAT was not sufficient time to detect differences in biomass among near isogenic hybrids to these herbicides. Alternatively, the TT, Tt, and tt hybrids may partition assimilates differently after exposure to topramezone and dicamba, resulting in visual height differences among near isogenic hybrids, but with similar biomasses. Sweet corn hybrids with variable response to mesotrione, and perhaps additional herbicides, may be the result of being heterozygous for the gene in inbred CR1.

2006 North Central Weed Science Society Proceedings 61:213.