

GENETIC BASIS OF SWEET CORN SENSITIVITY TO AE 0172747. Martin M. Williams II and Jerald K. Pataky, Ecologist, United States Department of Agriculture – Agricultural Research Service, Urbana, IL 61801 and Professor, Department of Crop Sciences, University of Illinois, Urbana, IL 61801.

Tembotrione (AE 0172747) inhibits the 4-hydroxyphenyl-pyruvate-dioxygenase (HPPD) enzyme and is presently being considered for registration for use in all types of corn, including sweet corn. Some sweet corn hybrids are severely injured or killed by tembotrione, yet a mechanistic understanding of sensitivity in sweet corn to tembotrione has not been reported. Field studies were used to 1) test the hypothesis that the genetic basis of sweet corn sensitivity to tembotrione is the same recessive gene that conditions sensitivity to mesotrione (also an HPPD inhibitor), and 2) compare the extent of early-season herbicide injury from tembotrione and mesotrione on sweet corn hybrids. The first objective was tested using a total of 136 S₂ families derived from a cross of two inbreds; one known to be sensitive to mesotrione and one known to be tolerant. The numbers of S₄ plants with and without injury symptoms in each family were used to classify families as sensitive, segregating, and tolerant seven days after application of 184 g tembotrione ha⁻¹ plus isoxadifen-ethyl at the four- to five-leaf stage. Based on Chi-square goodness of fit tests, responses of families both years fit a 3 sensitive : 2 segregating : 3 tolerant ratio ($p=0.24$), which would be the expected segregation pattern if sensitivity to tembotrione was conditioned by a single recessive gene. The second objective was tested in six field experiments by quantifying the extent of early-season injury to 249 sweet corn hybrids from application of tembotrione (184 g ai ha⁻¹) plus isoxadifen-ethyl or mesotrione (210 g ai ha⁻¹). An association between sensitivity to tembotrione and mesotrione was also evident among sweet corn hybrids; 193 hybrids had minimal (<10%) injury from both herbicides, while seven hybrids were severely (>50%) injured or killed by both herbicides. Responses of hybrids to tembotrione and mesotrione shared a distinct pattern for hybrids that previously were identified as being homozygous for alleles at a locus on chromosome 5S conditioning sensitivity to mesotrione, homozygous for alleles conditioning herbicide tolerance, or heterozygous. We conclude that the single recessive gene that conditions sensitivity to tembotrione is the same gene or a closely linked gene that conditions sensitivity to mesotrione and several other postemergence herbicides. Despite the apparent common genetic basis for sensitivity to tembotrione and mesotrione, important practical differences were observed in early-season response to these two herbicides for plants that were presumably homozygous recessive and heterozygous for the allele conditioning herbicide sensitivity.