

INVESTIGATING THE INTERACTION BETWEEN ATRAZINE AND MESOTRIONE. Josie A. Hugie, Dean E. Riechers, and Patrick J. Tranel, Graduate Research Assistant, Assistant Professor, and Associate Professor, Department of Crop Sciences, University of Illinois, Urbana, IL, 61801.

Mesotrione is a potent inhibitor of the 4-hydroxyphenylpyruvate dioxygenase (HPPD) enzyme in plants. The HPPD enzyme is involved in conversion of tyrosine to plastoquinone (an essential cofactor for phytoene desaturase) and alpha-tocopherol; thus inhibition of HPPD leads to photobleaching in sensitive plants through the inhibition of carotenoid biosynthesis. Mesotrione is used in corn for both pre- and postemergence broadleaf weed control. Previous field studies have shown that combining mesotrione with a photosystem II-inhibiting herbicide, such as atrazine, results in enhanced weed control, possibly through a synergistic interaction between the two herbicides. Growth response curves (commonly used to determine interactive relationships between herbicides) were used in our experiments to investigate the interaction between atrazine and mesotrione applied postemergence. Greenhouse studies were conducted in which single herbicide treatments were applied to triazine-sensitive and triazine-resistant (site of action based) waterhemp (*Amaranthus rudis*). Rates of atrazine ranged from 5.6 g ai/ha to 1122 g ai/ha, and rates of mesotrione ranged from 3.3 g ai/ha to 210 g ai/ha. Percent visual injury was recorded throughout the initial 10 days after treatment, and plants were harvested two weeks after treatment for dry weight measurement and generation of growth response curves. Triazine-resistant waterhemp was injured more than triazine-sensitive waterhemp by mesotrione alone, indicating a possible negative cross-resistance to mesotrione. Application of 561 g ai/ha of atrazine combined with 105 g ai/ha of mesotrione to the triazine-sensitive biotype showed more atrazine-like injury symptomatology (contact burn on older leaves), while in the triazine-resistant biotype the predominant injury symptomatology was more indicative of mesotrione (bleaching of newer leaves). GR₅₀ values will be generated from growth response curves from the single herbicide treatments and will be used to determine the correct rates to use for joint treatments of atrazine plus mesotrione. A final growth response curve will then be generated from the dry weights of plants treated with mesotrione plus atrazine to graphically demonstrate the interaction between atrazine and mesotrione for postemergence activity on triazine-sensitive and triazine-resistant waterhemp.