ACTIVITY OF PHOTOSYSTEM II INHIBITORS IN COMBINATION WITH MESOTRIONE ON TRIAZINE-RESISTANT AND SENSITIVE AMARANTHUS SPP. 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.

Current weed management practices frequently utilize combinations of herbicides with different modes of action to broaden the weed control spectrum and reduce the likelihood of herbicide resistance evolution. Combining mesotrione with photosystem II (PSII)-inhibiting herbicides, such as atrazine, has demonstrated enhanced weed control, possibly through a synergistic interaction. Greenhouse studies were conducted in which single and paired herbicide treatments were applied to four biotypes of *Amaranthus spp.*: triazine-sensitive and triazine-resistant waterhemp (*Amaranthus tuberculatus*) and triazine-sensitive and triazine-resistant redroot pigweed (*Amaranthus retroflexus*). Dose-response curves were generated for each herbicide and each biotype, and percent growth reduction was used to determine the most appropriate rates to use for joint treatments of atrazine plus mesotrione. Rates of atrazine ranged from 0.6g ai ha^{-1} to 1633g ai ha^{-1}, and rates of mesotrione ranged from 0.7g ai ha^{-1} to 561g ai ha^{-1}. Combinations of mesotrione and atrazine were applied such that the lowest rates of each herbicide were paired, and continued through pairing of the highest rates of the two herbicides. Dry weight data, taken two weeks after treatment, were then statistically analyzed to determine the nature of the interaction between the two herbicides. Based on the levels of injury that were biologically achievable (less than 100 percent growth reduction), only combined rates below the GR_{50} for each herbicide were analyzed using a method previously described by Colby. Synergistic, antagonistic, and additive effects between atrazine and mesotrione were displayed among the four *Amaranthus* biotypes, revealing an inconsistency among biotypes and application rates in the nature of the interaction. This variability may indicate that the joint action of atrazine and mesotrione is dose-dependent. Additional studies were initiated to further investigate joint action of atrazine and mesotrione, as well as investigate the activity of other PSII-inhibiting herbicides combined with mesotrione in triazine-sensitive and triazine-resistant redroot pigweed. Rates of PSII inhibitors were based on fractions of the field usage rates of atrazine, metribuzin and bromoxynil. A full field usage rate of each herbicide was applied, as well as one-third, one-tenth, and one-twentieth of the full rate. Herbicide rates ranged from: atrazine, 112g ai ha^{-1} to 2242g ai ha^{-1}; metribuzin, 16g ai ha^{-1} to 315g ai ha^{-1}; and bromoxynil, 17g ai ha^{-1} to 341g ai ha^{-1}. The same treatments of atrazine, metribuzin, and bromoxynil were also paired with a GR_{50} rate of mesotrione, 42g ai ha^{-1}. Visual results from this experiment indicate a more pronounced synergism between treatments combining mesotrione and bromoxynil in both biotypes of redroot pigweed, compared with treatments of mesotrione combined with either atrazine or metribuzin.

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