DETERMINING THE DOSE DEPENDENCY OF SYNERGISM BETWEEN MESOTRIONE AND ATRAZINE. Josie A. Hugie, Dean E. Riechers, and Patrick J. Tranel, Graduate Research Assistant, Associate Professor and Associate Professor, University of Illinois, Urbana, IL 61801.

Previous research has demonstrated that mesotrione and atrazine can interact synergistically to enhance postemergence activity on broadleaf weeds. However, preliminary data have suggested that the synergism is inconsistent as herbicide doses vary. In order to better understand this apparent dose-dependency, mesotrione dose-response curves were generated where a range of mesotrione doses were applied with and without an approximate $GR_{50}$ dose of atrazine – a dose in which 50% biomass is reduced. Doses of mesotrione ranged from 0.316 to 316 g/Ha mesotrione, and the dose of atrazine was held constant at 140 g/Ha. These mesotrione doses (with and without atrazine) were applied to four biotypes of *Amaranthus* spp., including triazine-susceptible and site-of-action based triazine-resistant biotypes of both tall waterhemp (*Amaranthus tuberculatus*) and redroot pigweed (*Amaranthus retroflexus*). Due to model constraints in Colby's equation, calculations of synergism are restricted to a range of certain growth response doses where values of expected injury must remain below biologically achievable injury levels. Analysis of aboveground biomass harvested 14 days after treatment suggested that one specific ratio between mesotrione and atrazine provided the most consistent synergistic interaction in herbicide sensitive waterhemp and redroot pigweed. Synergism was occasionally observed at several ratios surrounding the most synergistic treatment. Furthermore, in the triazine-resistant waterhemp and redroot pigweed, atrazine shifts the dose-response curve of mesotrione such that less mesotrione is necessary to reach a certain level of plant injury. This observation suggests that atrazine is contributing some activity in these triazine-resistant *Amaranthus* spp. Further studies involving fluorescence measurements and metabolite analysis will supplement and more thoroughly characterize the impact of atrazine, in the presence of mesotrione, in these triazine-resistant *Amaranthus* spp.

2005 North Central Weed Science Proceedings 60:157.