SYNERGISM OF MESOTRIONE WITH PHOTOSYNTHETIC INHIBITORS. Julie A. Abendroth, Alex R. Martin, and Fred W. Roeth, Graduate Research Assistant, Professor, and Professor, Department of Agronomy and Horticulture, University of Nebraska-Lincoln, Lincoln, NE 68583-0915.

During the summers of 2002 and 2003, the interaction between mesotrione and photosynthetic inhibitors, specifically Photosystem II (PS II), was investigated at multiple sites in Nebraska. Since mesotrione inhibits the 4-HPPD enzyme and as a result, carotenoid biosynthesis, its mode of action (MOA) is complementary to the MOA of the PS II class of herbicides. Greater control of problematic weeds occurs from this complementary interaction. When the observed response from two herbicide's joint application is greater than the expected response, it is termed synergism. Research was conducted to investigate whether this interaction was synergistic across species and rates and also, to quantify the degree to which synergism was seen. Mesotrione was tested at six different rates: 4.4, 8.8, 17.5, 35.0, 70.0, and 105.1 g ai/ha. The PS II herbicides tested were atrazine, at rates of 140.1, 280.2, and 560.4 g ai/ha, metribuzin at 26.3, 52.5, and 105.1 g ai/ha, and bromoxynil, at 70.1 and 140.1 g ai/ha. Treatments consisted of either mesotrione alone, a PS II alone, or a combination of the two. Percent chlorosis and necrosis at 6 days after treatment (DAT) and percent control at 12 DAT were recorded on velvetleaf, sunflower, and Palmer amaranth. The expected treatment means were found by subjecting the observed treatment means to a multiplicative survival method, as described by Colby in 1967. Differences between observed and expected values were compared using an lsd at $\alpha = 0.05$. Synergistic activity occurred between mesotrione and PS II inhibitors with all of the above weed species. Results from 2002 reveal that synergism was observed for velvetleaf and sunflower only in regards to the time of death. Death was quickened by the combination of mesotrione with a PS II. With respect to Palmer amaranth, synergism occurred at both 6 DAT and 12 DAT. At 12 DAT, the percent control achieved with mesotrione (17.5 g ai/ha) alone was 39% and was 28% for bromoxynil (70.1 g ai/ha) alone; however, the observed percent control for the combination was 95%. Initial results from 2003 appear to generally concur with those from 2002.

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