ASSESSING GLYPHOSATE SENSITIVITY IN ILLINOIS WATERHEMP (AMARANTHUS RUDIS) COLLECTIONS. Joseph L. Matthews, Bryan G. Young, and Julie M.Young, Researcher, Professor, and Researcher, Dept. of Plant, Soil and Agricultural Systems, Southern Illinois University, 1205 Lincoln Dr., MC-4415, Carbondale, IL 62901.

The commercialization of glyphosate-resistant crops has resulted in Illinois growers adopting postemergence glyphosate applications as a primary strategy for control of summer annual weeds in both soybean and corn. Reports from growers experiencing inconsistent control of common waterhemp with glyphosate prompted interest in assessing the glyphosate sensitivity of an existing Illinois waterhemp collection. In fall 2006 waterhemp seed was collected from five mature, female waterhemp plants per field in 77 random Illinois fields in 43 counties, as well as 26 fields in 12 counties that were suspected to contain PPO-resistant biotypes. An initial screen of the waterhemp collections was conducted in the greenhouse using the discriminating doses of 0, 860, and 2580 g ae/ha of glyphosate when waterhemp was 6 to 10 cm in height with two waterhemp seed sources included as comparative glyphosate-sensitive populations. This initial screen used a composite sample of the five mother plants from each collection site and included eight replications and was conducted twice. In addition to visual control estimates taken at 7, 14, and 21 days after treatment (DAT), waterhemp plants were harvested at 21 DAT and dry weight was determined and converted to a percentage of the nontreated. Less than 50% growth reduction was observed from 21 and 1.5% of plants treated with glyphosate at 860 and 2580 g/ha, respectively, with the surviving plants occurring in 95% of the seed sources and noticeably clustered in 41% of the seed sources. Further analysis identified 12 of the seed sources had the greatest frequency of plants with less than a 50% growth reduction over both runs of the experiment.

In order to further quantify glyphosate sensitivity in these 12 seed sources a dose response experiment was designed using glyphosate applications of 108, 215, 430, 860, 1,720, 3,440, 6,880, and 13,760 g/ha. The five individual mother plants from each collection site were treated independently to allow for greater characterization of the sensitivity of the waterhemp to glyphosate at each site. Data collection was identical to the previous experiment and data analysis was performed using log-logistic dose response curves fit using the drc package in the R software program. Differences in waterhemp sensitivity to glyphosate were found between collection sites as well as within collection sites. Estimated ED50 values ranged from 10 to 485 g/ha and were typically around 50 g/ha. The comparative glyphosate-sensitive plants grown from seed collected in 1999 and 2002 showed very little variability in glyphosate sensitivity with only 1 of 248 treated plants with less than a 50% growth reduction for any glyphosate dose. These results suggest a wide range of glyphosate sensitivity within the 2006 collection, distinct differences between collection sites, and provide evidence that inherent differences in glyphosate sensitivity among waterhemp populations are likely associated with increasing commercial failures of glyphosate for control of waterhemp.

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