

INVESTIGATING LINKAGE OF DIFFERENT HERBICIDE RESISTANCES AND SEED DORMANCY IN WATERHEMP BY SEGREGATION ANALYSIS. Gurpreet S. Smagh, Patrick J. Tranel and William L. Patzoldt. Graduate Research Assistant and Associate Professor, Department of Crop Sciences, University of Illinois, Urbana, IL 61802, and Agricultural Biologist, BASF Corporation, Research Triangle Park, NC 27709.

Waterhemp populations are quickly evolving resistance to different herbicides in Illinois. Many populations have been found resistant to ALS-inhibiting, PPO-inhibiting and/or triazine herbicides. Different waterhemp populations have shown different levels of seed dormancy. In this study, we investigate genetic linkage of seed dormancy with the above three herbicide resistance traits. To develop a segregating population, two parental lines were utilized. One line, ACR from Adams County, IL, was resistant to atrazine, ALS-inhibiting, and PPO-inhibiting herbicides, and had limited seed dormancy. The second line, WCS from Wayne County, IL, was susceptible to atrazine, ALS-inhibiting, and PPO-inhibiting herbicides, and had high seed dormancy. F₁ lines were created by crossing ACR with WCS plants. After maturity, seeds were harvested from each female individually as full-sib lines. F₁ male plants were crossed with female plants from the WCS biotype, ACR biotype or F₁ full sibs to create BCS, BCR or F₂ lines, respectively. F₁, F₂ and BCS were tested for dormancy levels and resistances to atrazine, ALS-inhibiting, and PPO-inhibiting herbicides. Herbicide resistance segregation ratios for BCS lines were analyzed. Segregation for triazine resistance in plants from BCS lines were evaluated two weeks after spraying with atrazine at 500 g a.i./hactare on greenhouse-grown plants. Segregation for PPO and ALS resistance genes was determined by using *PPX2* and *ALS* CAPS molecular markers. Seed dormancy is being evaluated with a petri-plate assay. By determining which, if any, of these traits are linked, we expect to gain insights into how multiple herbicide resistance may evolve in waterhemp. If seed dormancy is linked to one or more of the resistances, then the results will also have practical implications for studies designed to determine the genetics of the resistances.