WATERHEMP'S RESPONSE TO GLYPHOSATE SELECTION. Patrick J. Tranel, William L. Patzoldt, and Dean S. Volenberg. Associate Professor, Graduate Research Assistant, and Postdoctoral Research Scientist, Department of Crop Sciences, University of Illinois, Urbana, IL 61801.

Glyphosate, applied postemergence, effectively controls waterhemp. Recently however, anecdotal reports from the field have suggested that waterhemp control with glyphosate is becoming less consistent. Therefore, we initiated experiments to evaluate glyphosate responses in waterhemp. Five waterhemp populations were obtained from sites near Everly, IA, Sutter, IL, St. Elmo, IL, and Altamont, IL (two populations) following reports of poor glyphosate control at those locations. Waterhemp populations were also selected based on geographic location, with the assumption that distant populations would have different genes or alleles contributing to reduced glyphosate susceptibility. Using these waterhemp populations, plus three waterhemp populations serving as glyphosate-susceptible controls, our objective was to determine if repeated cycles of glyphosate selection would lead to decreased glyphosate sensitivity. At each cycle of selection, 1000 plants were treated with glyphosate, and 100 surviving plants allowed to randomly mate to generate progeny for the next cycle. Thus far, three cycles of selection have been completed, with plants from the first two cycles (C1 and C2) treated with glyphosate at 216 g ae ha^{-1}, while plants in the third cycle (C3) were treated with glyphosate at 325 g ae ha^{-1}. Following treatment, percent injury ratings were taken 2, 4, 8, and 16 DAT. In all cycles of selection, progeny among female waterhemp lines were significantly different, suggesting that genetics play a role in glyphosate responses. During C1 and C3, significant genotype by environment interactions were identified, which are characteristic of quantitatively inherited traits. Using the glyphosate-susceptible waterhemp populations to assess the efficacy of glyphosate at each cycle, it appears that selection for decreased glyphosate sensitivity is possible. Additionally, notes were taken before glyphosate treatment in an attempt to describe the phenotypic architecture of each plant. Phenotypic ratings for lateral bud growth, leaf shape, and leaf area relative to height were assessed to determine if these traits contribute to variation of glyphosate responses. Lateral bud growth was significant in C1, C2, and C3, with plants having more lateral bud growth exhibiting significantly less sensitivity to glyphosate.

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