

CHARACTERIZING WEED RESISTANCE TO GLYPHOSATE: THE GIANT RAGWEED AND COMMON LAMBSQUARTERS STORY IN WISCONSIN

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Abstract

In Wisconsin, nearly 70% of farmers perceive that weeds have become more difficult to control with glyphosate over time, including both common lambsquarters and giant ragweed. Many have reported variable or inconsistent response of common lambsquarters to glyphosate. One of our goals has been to investigate the variable response of common lambsquarters to glyphosate, including potential resistance to glyphosate. We have characterized the response of more than 40 common lambsquarters populations to glyphosate from across southern Wisconsin. We have not found any of these populations to be resistant to glyphosate. However, we have observed variable responses among these populations to glyphosate. Our results suggest that variability of common lambsquarters to glyphosate is most apparent following treatment with low rates of glyphosate (e.g., 0.375 lb ae/acre). Such variability is much less or not apparent following treatment with higher rates of glyphosate (e.g., 1.5 lb ae/acre), at which shoot biomass is greatly reduced and injury is severe relative to non-treated check plants. We've also found that the relationship between a field history of exposure to glyphosate and less sensitivity to glyphosate was inconsistent. That is, in some instances less sensitivity (to low rates of glyphosate) was associated with a field history of previous glyphosate use, but in other instances, such a relationship was not apparent. We think it's likely that our results reflect natural or inherent variability among common lambsquarters populations to glyphosate.

Subsequent field research conducted to determine the role of several factors that may contribute to the inconsistent control of common lambsquarters to glyphosate found little relationship between poor control and several environmental conditions (relative humidity, temperature at the time of treatment, minimum and maximum temperature before and after treatment). Although we didn't identify environmental conditions that explained reduced glyphosate efficacy in all cases, we found that rainfall occurring up to 4 hours after glyphosate application and greater plant height (e.g., 8-inch compared to 4-inch tall plants) can be important factors contributing to the inconsistent control of common lambsquarters.

Giant ragweed is considered to be the most competitive weed species in Midwest cropping systems. In Wisconsin, farmers consider giant ragweed as their most troublesome weed in corn and second most troublesome weed in soybean (second to common lambsquarters). Although resistance of several giant ragweed populations to glyphosate has been confirmed in other states, resistance has not to date been confirmed in Wisconsin. However, we are currently investigating a giant ragweed population from southwest Wisconsin (Grant County) for potential resistance to glyphosate, as well as a second population from southeast Wisconsin (Rock County). Preliminary greenhouse experiments on the Grant County giant ragweed population found differential injury among plants to glyphosate applied at 0.75 lb ae/acre. However, at 3.0 lb ae/acre, plants were severely injured or killed. Subsequent lab experiments on the Grant County population showed little or no difference in target site enzyme (EPSP synthase) response to glyphosate between suspected resistant and susceptible plants. Additional experiments are being conducted to more fully characterize the response of the Grant County population to glyphosate. Suspected resistance of the Rock County giant ragweed population was reported in 2010. Experiments are being planned or are underway to quantify the whole-plant and enzyme response of this Rock County giant ragweed population to glyphosate.

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