

Pro-active late-season weed escape survey identified glyphosate-resistant horseweed present at low frequency in Wisconsin



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Introduction and Objective

Glyphosate-resistant weeds, confirmed in 32 states, continue to be a major threat to corn and soybean production across the Nation. In January 2012, a population of giant ragweed (*Ambrosia trifida*) from southern Wisconsin was announced as the first confirmed case of glyphosate resistance in the state. A pro-active survey of late-season weed escapes in corn and soybean fields was conducted throughout Wisconsin during late-July through early-September of 2012. One objective of the survey was to identify areas where additional populations of glyphosate-resistant weeds may exist.

Methods

- An on-line survey was distributed to Wisconsin producers in June 2012 to generate contact information, field history information, and permission for in-field sampling
- 153 fields (91 corn and 62 soybean) were sampled for late-season weed escapes in 2012.
- While conducting the in-field sampling, seed heads from 30-40 mature plants that escaped postemergence glyphosate applications were collected
- Seed heads were threshed and seedlings were grown in the greenhouse for preliminary glyphosate screening
- Glyphosate was applied to seven to ten putative susceptible and putative resistant plants at rates of 0, 0.43, and 0.87 kg ae ha⁻¹ for numerous populations of horseweed, giant ragweed, waterhemp, velvetleaf, redroot pigweed, and Powell amaranth.
- Preliminary screens warranted a dose response experiment for a population of horseweed (*Conyza canadensis*) from Jefferson County.
- Glyphosate was applied to the putative resistant population from Jefferson County and a putative susceptible population from Grant County at rates of 0, 0.22, 0.43, 0.87, 1.74, and 3.48 kg ae ha⁻¹. Treatments were replicated eight times and the experiment was repeated once.
- Data from the two dose response experiments were combined and analyzed in R statistical freeware.

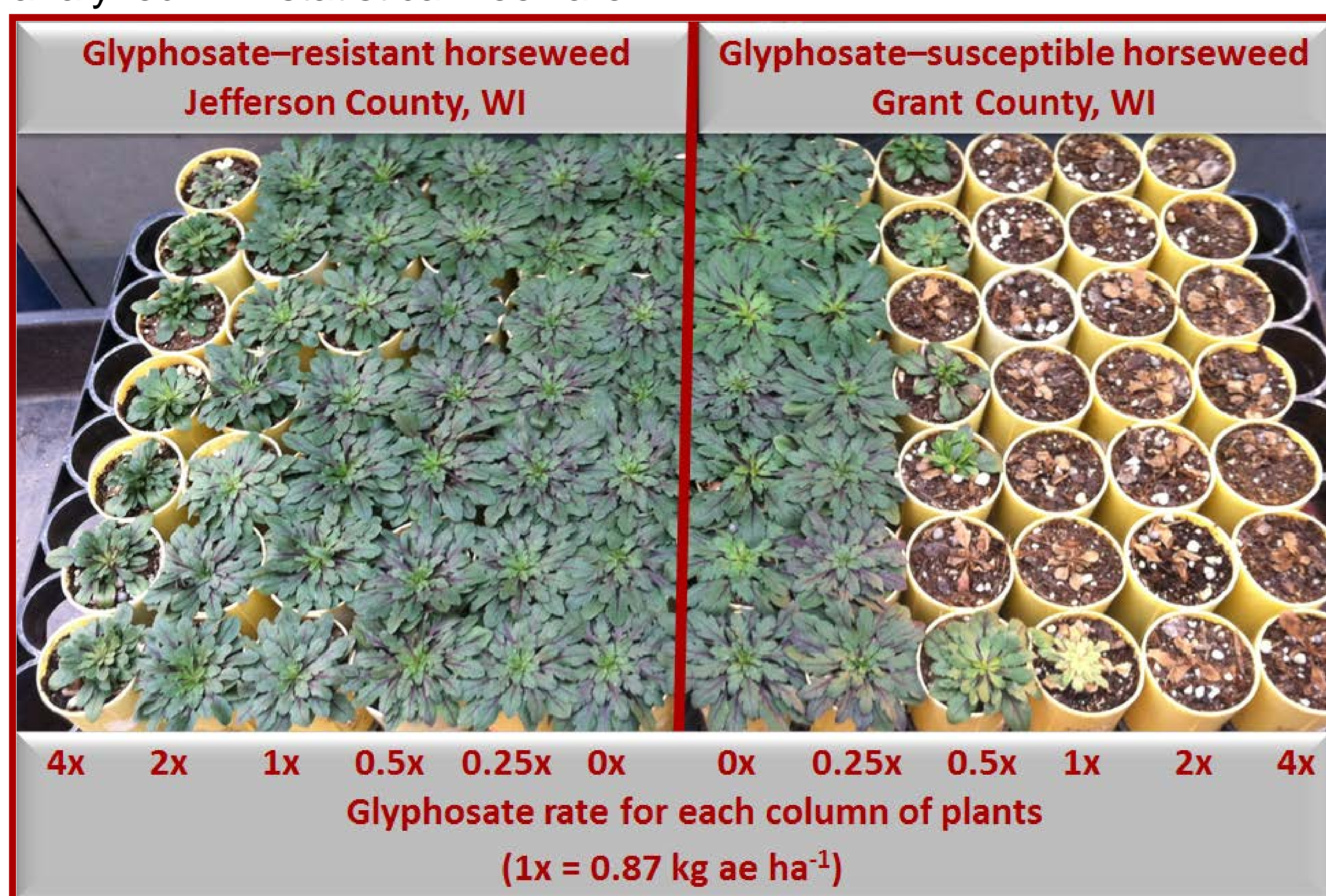


Figure 1. Horseweed plants (glyphosate-resistant) grown from the seed collected in Jefferson County, Wisconsin compared to a glyphosate-susceptible population from Grant County and their response to postemergence glyphosate in the greenhouse at rates ranging from 0x to 4x with 1x being 0.87 kg ae ha⁻¹ (22 fl oz product ac⁻¹). Plants were sprayed when horseweed rosettes measured 2.5 to 5 cm (1 to 2 inches) in diameter.

Results

The population of horseweed from Jefferson County was confirmed resistant. The effective dose of glyphosate needed to reduce dry horseweed biomass by 50% (ED₅₀) was estimated to be 1.59 kg ae ha⁻¹ and 0.28 kg ae ha⁻¹ for the putative resistant and putative susceptible population, respectively (Figure 2). Therefore, the plants from Jefferson County were confirmed glyphosate-resistant with nearly six-fold difference in response from the susceptible plants.

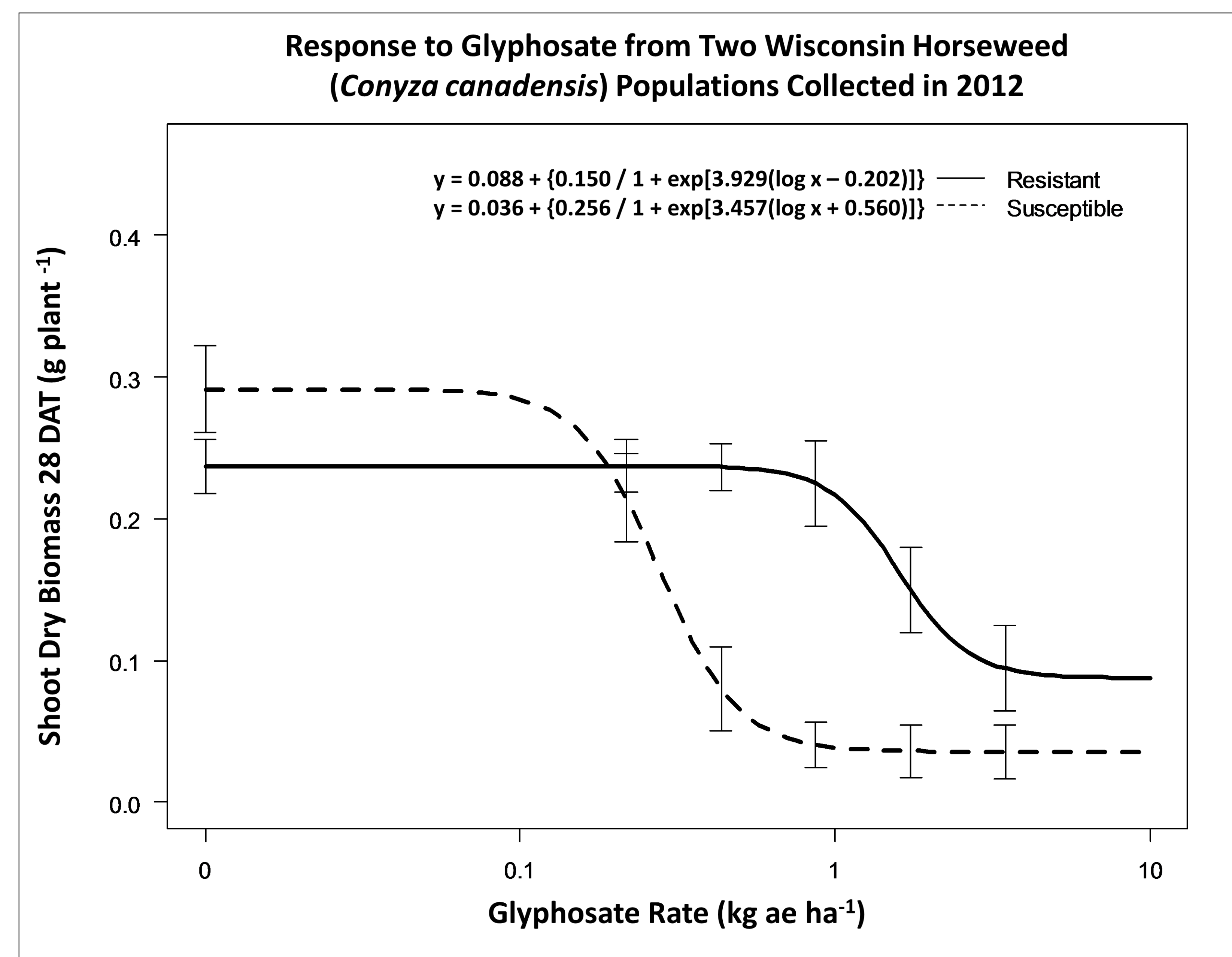


Figure 2. Shoot dry biomass of Jefferson County horseweed and susceptible horseweed following treatment with glyphosate at doses up to 3.48 kg ae ha⁻¹ as estimated by a four-parameter log-logistic regression function.

Conclusions

The identification of this glyphosate-resistant horseweed population demonstrates the effective approach of the pro-active late-season weed escape survey. This approach was particularly successful because farmers do not usually recognize herbicide-resistant weed problems until the frequency of the resistance in a field is fairly high. However in this case, the accession of glyphosate-resistant horseweed occurred in two small patches of about 20 plants per patch. Furthermore, these were the only horseweed plants found throughout the entire late-season weed escape survey. With the early identification of this glyphosate-resistant horseweed population, hopefully future control of glyphosate-resistant horseweed through diversified weed management strategies can still be successful, and other farmers without glyphosate-resistant horseweed will adopt diversified management to augment the threat of this weed in Wisconsin.

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