Public Abstract

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A revolution in production agriculture has occurred over the past decade; the development and use of herbicide-resistant crops. Of particular note has been crop resistance to the herbicide glyphosate. Glyphosate is an effective, broad spectrum and offers flexible application timing with minimal crop injury. With glyphosate's high efficacy rate and increased adoption over many hectares, it could be argued that where it is applied at least one or more times a cropping year, resistant weeds will occur frequently. In 2002, a Missouri population of common ragweed (*Ambrosia artemisiifolia*, L.) was inadequately controlled with glyphosate following six years of continued use. Under greenhouse conditions, common ragweed seedlings were treated at 8-12 cm with glyphosate. At rates that varied from 1/16X to 12X (1X=0.84 kg ae/ha) for the suspect resistant population, and 1/256X to 1X for a known susceptible population. The suspect resistant population exhibited an I_{50} value that was 9.6-fold higher than the susceptible biotype on a dry weight basis. This confirms the suspect common ragweed population to be resistant to glyphosate and represents the 6^{th} weed species world-wide with resistance to glyphosate.

Field observations of glyphosate-resistant common ragweed plants revealed that several plants surviving glyphosate were infested with a stem-boring insect, commonly known as ragweed borer (*Epiblema strenuana,* Walker). Field experiments were initiated to evaluate whether or not the ragweed borer influenced common ragweed response to glyphosate. Two sites were evaluated in 2004 and 2005, with one site containing the glyphosate-resistant population, and a second site containing a glyphosate-susceptible population. Overall, there were no differences in percent reduction of common ragweed biomass between the insecticide treated block (ITB) and the non-insecticide treated block (NITB) at either site in both years. For susceptible common ragweed, percent biomass reduction was influenced only by height, with reductions of 99 and 98% for 12 cm glyphosate treated plants, and 86 and 89% for 24 cm glyphosate treated plants in 2004 and 2005, respectively. For glyphosate-resistant common ragweed, percent biomass reduction varied with both plant height and glyphosate treatment. In 2004, biomass of 12 cm plants was reduced 87 and 97% for 1X and 3X glyphosate rates, respectively; while 24 cm treated plants were reduced 64 and 89% for 1X and 3X rates, respectively. In 2005, percent biomass reduction for 12 cm treated plants was 75 and 90% for 1X and 3X glyphosate rates, respectively and plants treated at 24 cm exhibited 79 and 85% reductions for 1X and 3X rates, respectively. These outcomes provide evidence that glyphosate response in the glyphosate-resistant common ragweed is influenced by glyphosate rate and the timing of applications; with ragweed borer not a significant factor influencing plant response.