GIANT RAGWEED POPULATION DYNAMICS IN GLYPHOSATE-RESISTANT CORN AND SOYBEAN CROPPING SYSTEMS. Mark R. Jeschke and David E. Stoltenberg, Graduate Research Assistant and Professor, Department of Agronomy, University of Wisconsin, Madison, WI 53706.

Weed species with extended emergence periods pose a potential management problem in glyphosate-resistant cropping systems, as this characteristic may allow them to avoid exposure to glyphosate. One such weed species is giant ragweed, which is of particular concern due to its rapid growth rate and high level of competitiveness with crop species. Research was conducted at the University of Wisconsin Arlington Agricultural Research Station from 1998 through 2004 to determine the effects of crop rotation, primary tillage system, and glyphosate-use intensity on weed population dynamics. Six weed management treatments were compared in continuous corn and a corn-soybean annual rotation, across three primary tillage systems: moldboard plow, chisel plow, and no-tillage. Weed management treatments were based on six levels of glyphosate-use intensity: glyphosate applied post-emergence (POST), glyphosate applied POST and late POST, glyphosate applied POST followed by inter-row cultivation (in corn only), glyphosate applied POST rotated annually with a non-glyphosate herbicide program, a soil-residual herbicide applied pre-emergence followed by glyphosate applied POST, and a non-glyphosate program. The experimental design was a randomized complete block with a split-split block arrangement and three replications. Treatments were maintained in the same location for the duration of the experiment. Plant density of each weed species was counted several times during each growing season and shoot biomass production of each weed species was measured at the end of each season.

Giant ragweed was almost entirely absent from sampled areas in the first year of this experiment. However, within 3-yr, giant ragweed occurred at high densities in the non-glyphosate treatments, and was strongly associated with crop yield losses of up to 87%. This result demonstrated not only the ability of giant ragweed to become established relatively rapidly in corn and soybean, but also to become the dominant species in these crop-weed communities. In subsequent years, giant ragweed occurrence increased in other treatments as well and was associated with substantial crop yield losses. Specifically, giant ragweed densities increased steadily over time in all glyphosate-based treatments. The glyphosate POST/LPOST treatment, which provided an extended period of control for late-emerging giant ragweed relative to other treatments, was the most effective of the glyphosate-based treatments in managing giant ragweed and protecting crop yield. Crop rotation and primary tillage were significant sources of variation in early-season giant ragweed density, with densities typically greater in continuous corn and chisel plow systems. The heterogeneous spatial pattern of giant ragweed populations over 7 yr may have been due in part to a relatively limited seed dispersal range. These results suggest that some glyphosate-based weed management systems are vulnerable to highly-competitive weed species, such as giant ragweed, which can emerge over extended periods of time. However, the extent to which such species proliferate can be affected greatly by other cropping system factors in addition to glyphosate use.

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