THE FATE OF GIANT RAGWEED (*AMBROSIA TRIFIDA L.)* SEED IN NATURAL AND ARTIFICIAL SOIL SEED BANKS. Xianhui Fu, Joanne Chee-Sanford, Martin M. Williams II and Adam S. Davis, Ph.D student, Department of Natural Resources and Environmental Sciences, University of Illinois, Urbana, IL 61801, Environmental Microbiologist, United States Department of Agriculture-Agricultural Research Service, Affiliate, Department of Natural Resources and Environmental Sciences, University of Illinois, Affiliate, Department of Crop Sciences, University of Illinois, Urbana, IL 61801, Ecologist, United States Department of Agriculture-Agricultural Research Service, Assistant Professor, Department of Crop Sciences, University of Illinois, Adjunct Professor, Natural Resources and Environmental Sciences, University of Illinois, Urbana, IL 61801, and Ecologist, United States Department of Agriculture-Agricultural Research Service, Assistant Professor, Crop Sciences, University of Illinois, Faculty member, Program in Ecology and Evolutionary Biology, University of Illinois, Affiliate, Natural Resources and Environmental Sciences, University of Illinois, Urbana, IL61801.

The dominant use of herbicides in agricultural weed control strategies has raised issues concerning development of resistance or tolerance to herbicides by weeds, residual carry-over, and environmental contamination. The primary focus is to control emergent plants, with far less emphasis on controlling underground seed reserves, or weed seed banks, which are the greatest source of annual weed infestation in the crop systems. Seeds of many annual weed species are resilient and highly adaptive, and their abundance and persistence in soil makes weed control a continuing challenge. Knowledge of mechanisms affecting the fate of weed seeds in soil is critical for development of long-term and sustainable weed management strategies. To investigate the fate of weed seeds in soil, we conducted a study at the Northern Agronomy Research Center at Dekalb, IL, at a field site with an extensive seed bank of an annual weed species, giant ragweed (*Ambrosia trifida* L.). *In situ* assessments of seed fate, along with seed bank dynamics, were examined in both natural and artificial seed banks from Nov. 2005 to Nov. 2006. The natural seed bank was examined using soil cores removed from the study site containing the natural dispersed seeds, while the artificial seed bank was comprised of mesh bags containing defined numbers of seed and soil from the study site. Experimental variables included burial depth, seed density, and time. Germination, predation, and microbial-mediated seed decay accounted for the majority fate of giant ragweed seed in the natural seed bank, while germination and microbial-mediated seed decay accounted for most of the seed depletion in the artificial seed bank. The seed density of the natural soil seed bank changed over soil depth and time with the highest density of 732 seeds/ m^2 in the depth of 0-3 cm in Mar. 2006, and the lowest density of 0 seed/m^2 at a depth of 12-15 cm in Nov. 2006. Microbial-mediated decayed seeds accounted for most of the seed depletion in later seasons of 2006. The results from the artificial soil seed bank showed that giant ragweed seeds began to deplete after 1 month following initial burial, and the proportion lost to germination or decay significantly increased over time with the highest depletion ratio as high as 97% by Nov. 2006. Following 2 to 4 months of burial, germination was the major mechanism contributing to seed depletion, with the onset of decay becoming major mechanism of seed depletion after 7 to 12 months of burial. Few intact and viable seed remained by the end of the year study. During the one year time period, the effects of burial depth and seed density on both germination and seed decay were not significant ($P > 0.05$). The outcome of the study supported the hypothesis that microbial-mediated seed decay was a major mechanism of seed bank depletion, and provided the basis for a follow-up study that is currently ongoing to closely examine the microbial populations involved in seed decay processes. This research increases our understanding of the fate of weed seeds in soil and provides useful information for development of future weed management strategies.

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