EVALUATION OF INTEGRATED WEED MANAGEMENT STRATEGIES FOR WEED POPULATION REDUCTION

Rodger B. Farr
Jason K. Norsworthy
Grant L. Priess
Mason C. Castner
University of Arkansas
Fayetteville, AR

Abstract

Multiple herbicide-resistant weeds have resulted in a need to adopt a multifaceted approach to reduce selection pressure and mitigate the evolution of herbicide resistance. Previous studies have suggested that cover crops, deep tillage, zero-tolerance mechanical weed control, and the use of residual herbicides along with postemergence herbicides can all disrupt the emergence of weeds and reduce weed seedbank populations. A long-term study was initiated in Marianna, AR during fall of 2018 to evaluate the influence of a one-time deep tillage, rye cover crop, dicamba- and non-dicamba-based herbicide programs, and zero-tolerance weed removal on Palmer amaranth emergence and density in the soil seedbank. This study was arranged as a split, split, split-plot with zero-tolerance being the whole-plot factor, deep tillage the sub-plot factor, cover crops the sub-sub-plot factor and herbicide programs the sub-sub-sub-plot factor. The moldboard plow inverted the soil to a depth of six-inches and was done in the fall of 2018, prior to planting cover crops. Cereal rye cover crops were planted at 60 pounds per acre in the fall prior to planting and were terminated two weeks prior to planting. The two herbicide programs that were evaluated were a standard, non-dicamba based program that included glyphosate and Glufosinate while the other program utilized a dicamba-based program. Herbicide application were made at the following times: two weeks prior to planting, at planting, 21 days after planting, 42 days after planting, and 63 days after planting. Zero-tolerance treatments were made at 77 days after planting where plots were hand-weeded and the time it took to hand weed a plot was recorded. Weed densities and emergence were measured in four quarter meter squares per plot at 21, 42, 63, and 72 days after planting and weed counts were taken at harvest. Soil cores were taken in the spring prior to planting and after harvest to determine the difference in soil seedbank density. Results from 2019 suggest that the use of deep tillage and zero-tolerance both reduced the amount of weed seed returned to the seedbank. Deep tillage reduced the amount of inflorescence producing Palmer amaranth at the end of the season by 75% from 576 Palmer amaranth down to 145 Palmer amaranth per acre. Zero-tolerance reduced inflorescence producing weed populations at the end of the season by 63% from 525 Palmer amaranth to 194 Palmer amaranth per acre. Deep tillage also reduced cumulative, in season weed emergence by 74% from 106,401 Palmer amaranth down to 25,683 Palmer amaranth per acre. Deep tillage also reduced the amount of time to hand weed an acre by 20 minutes from 2.07 hours to 1.74 hours per acre. This information will be beneficial in assisting crop producers determine how to effectively control and reduce weed populations in an integrated manner.