

## IMPACT OF CEREAL RYE COVER CROP ON WEED DYNAMICS, HERBICIDE FATE AND CROP PRODUCTIVITY IN WISCONSIN

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Integrated weed management involves combining multiple weed management tactics into a program that allows a farmer to achieve sustainable weed control. Simplification of production systems with reliance on herbicides for post-emergence weed control has led to the development of herbicide resistant weed populations and potential for the loss of herbicides as effective weed management tools (Young, 2006). Systems which integrate CCs and herbicides for weed control reduce the selection pressure for the development of herbicide resistance and can improve cropping system resiliency by reducing soil erosion (Blanco Canqui et al., 2015), improving nutrient retention (Brandi Dohrn et al., 1997), and improving soil physical quality (Steele et al., 2012). Field research was conducted in the 2019-2020 growing seasons to study the use of integrated weed management with a fall established cereal rye (*Secale cereale*) CC and Pre-emergence herbicides (PRE) in Wisconsin corn-soybean systems. Data collected included early season weed biomass/density, visual weed control prior to post-emergence herbicide application, crop yield, and soil persistence of PRE herbicides. Treatment combinations of PRE herbicide (yes or no) and six soil management strategies including tillage, no-till, and four CC termination timings/strategies (early, at plant, forage harvest at plant, and late) were included to collect 4 site-years of data for each crop.

Use of a PRE herbicide in corn improved weed control prior to POST application in 3 out of 4 site-years when soil was managed with conventional tillage, no-till, and early CC termination. Use of a PRE herbicide improved corn yield at Arlington 2020 (p-value <0.0001) and late CC termination reduced the corn yield at Arlington over both years. At Lancaster, corn yield was highest when soil was managed with conventional tillage for both years. Use of PRE herbicides in soybean improved weed control in all soil management treatment during Arlington 2019 (p-value= 0.017) prior to POST application, and when soil was managed with conventional tillage, no-till, early CC termination, at plant CC termination, and forage harvest CC termination at Arlington and Lancaster 2020. Soybean yield was similar between all treatments in Arlington 2019 and 2020. In Lancaster 2020 soybean yield was reduced in the conventional tillage soil management treatment.

Soil was sampled approximately 30 days after PRE application in all studies to determine the concentration of herbicide persisting in soil. There were differences in the soil concentration of S-metolachlor in corn and sulfentrazone in soybean between site-years. Arlington 2020 had the highest S-metolachlor and sulfentrazone concentration. There were differences in soil concentration of S-metolachlor and sulfentrazone between soil management strategies where conventional tillage had a higher concentration of S-metolachlor and sulfentrazone compared to no-till and CC soil management practices. Delaying cereal rye CC termination until two weeks after planting for late May planting dates greatly improved visual weed control. There is potential for reduced corn yield when delaying cereal rye CC termination until two weeks after planting. Observations of soil management effects on weed control and yield indicate a cereal rye CC with delayed termination can be beneficial prior to late May soybean establishment to help control weeds and provide other CC associated benefits without sacrificing yield.

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