

Using Cover Crops to Control Weeds and Improve Soil Health

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Summary

Herbicide-resistant weeds are challenging for producers to control in crop fields. This study explores the potential of cover crops to reduce weed pressure and improve soil health. Cover crops that had good canopy development, including grasses such as ryegrass and wheat, had the best weed control. Soybean yields were similar for all cover crops, though there was a trend towards lower yields for the brassica cover crops, Graza radish and forage collards. Soybeans grown after ryegrass had the highest yields.

Introduction

Weed management is a critical component of good crop production. Increased use of herbicides has created development of herbicide resistance in many weed species, requiring development of alternative management practices to control these resistant weeds. Use of cover crops is an alternative management practice that has been reported to reduce weed pressure. Cover crops are also useful in increasing the diversity of plants grown in a field, potentially contributing to improved soil health. This study was designed to determine weed emergence and growth in crop fields in southeast Kansas.

Experimental Procedures

Cover crops were planted in replicated blocks in the fall at the Southeast Research and Extension Center in Parsons, KS. Plots included: control (fallow with herbicide, no cover crop); wheat; Graza radish; annual ryegrass; winter oats; spring oats; forage collards; and a commercial cover crop mix. We also compared a mix of radish + ryegrass planted using both drilled and broadcast methods. Initially, there was a difference in cover crop emergence and stand establishment between the drilled and broadcast mixes. However, that difference disappeared by the spring due to winterkill of the radish.

Plant biomass samples were taken in the spring prior to cover crop termination. Total plant biomass was harvested from each plot, weighed, and dried. Soil samples were taken to a depth of 6 in. in the fall and in the spring and assayed for nutrients and biological activity.

In the spring, weed emergence was monitored across all cover crop plots using permanent PVC rings (Figure 1). Weed species were identified, counted, and pulled from each ring, until time of cover crop termination. Plant biomass samples of both cover

crop and weed communities were taken in the spring prior to termination of the cover crops. Soybean was planted as the cash crop. Soybean yields were measured at harvest.

Results and Discussion

Biomass samples of the cover crops and weeds were collected in mid-May of 2021, prior to termination of the cover crops. Some cover crops were poorly established (Graza radish and forage collards) or had strong winter kill (spring oats) and showed significantly reduced biomass. With more solid cover crop stand, weed counts were reduced (Figure 2). Significantly more weed plants were observed with no cover crop, while an approximately 50% reduction in weed counts were observed in the presence of cover crops such as mixtures of radish and ryegrass, the commercial mixture, and winter wheat.

While results from previous years show excellent reduction in weed biomass with cover crops, this year the field had a strong foxtail infestation, increasing the weed biomass.

Cover crops do impact soybean yields (Figure 3). Data from harvest in fall 2020 indicated that soybean yields were 7.6 bu/acre higher than after fallow when grown after ryegrass, but 8.8 bu/acre lower when grown after Graza radish and nearly 7 bu/acre less with forage collards. This was particularly interesting, as the Graza radish and forage collards were winter-killed and did not have a large canopy in the spring. Conversely, the ryegrass had a very full canopy in the spring. The impaired yield from brassica species was somewhat alleviated when these cover crops were mixed with ryegrass. Other grass species (oats and wheat) also increased soybean yield slightly above the overall average across all treatments. Soil microbial composition also changed with cover crop (Figure 4). Bacterial percentage was the highest in all cover crop treatments, with a similar pattern in percentage of actinomycetes and fungi.

Conclusions

Cover crops are a potentially good alternative to chemical use for weed management. Good establishment of the cover crop is important to ensure adequate weed control. Grass species, especially ryegrass and wheat, demonstrated good weed control this year, though additional weed pressure from a weedy grass species reduced their efficacy. In previous years, oats have also demonstrated good control. Additionally, ryegrass, wheat, and spring oats improved soybean yields. Under some conditions, radish or collards are difficult to establish and are winter-killed, providing inadequate weed control. Moreover, these species interfere with soybean production, reducing soybean yield.

Acknowledgments

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Figure 1. Rings installed in cover crop plots to track weed emergence and species.

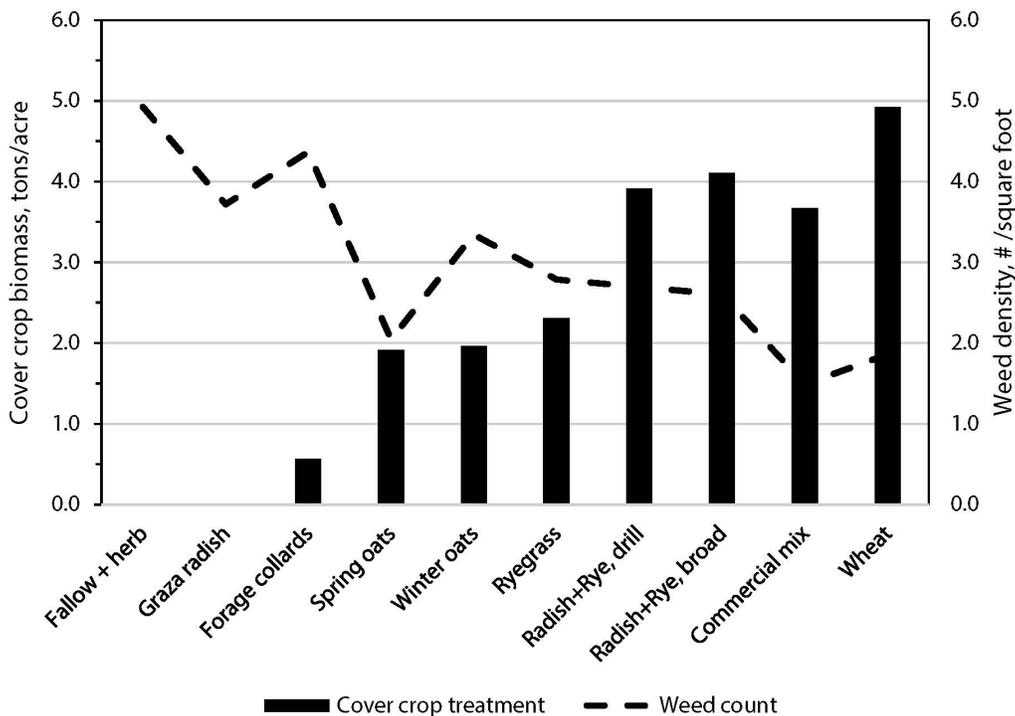


Figure 2. Change in cover crop biomass (tons/acre, left axis and bars) and weed count (number per square foot, right axis and dashed line) with different cover crop treatments.

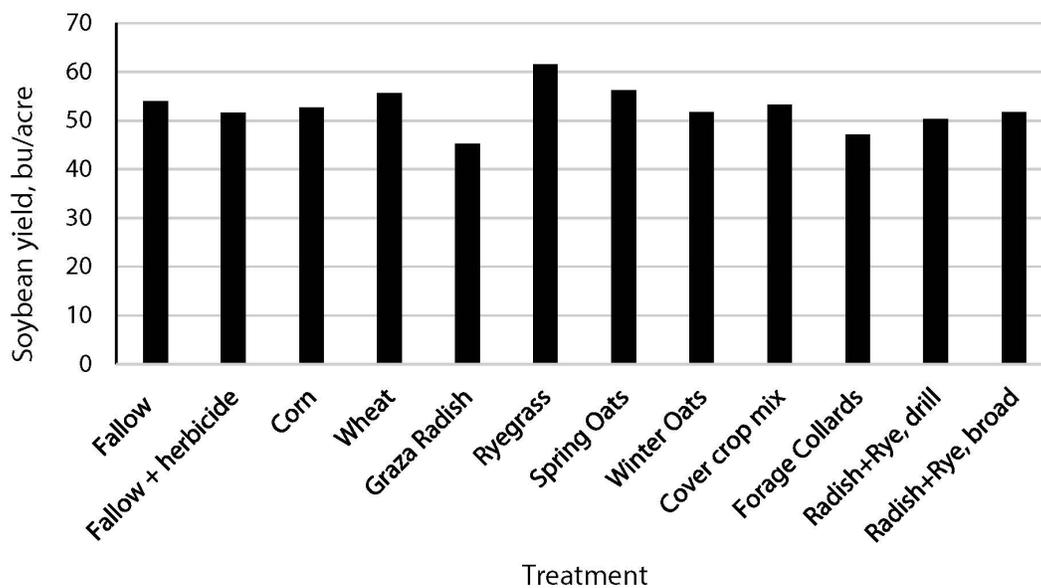


Figure 3. Soybean yield after cover crop treatment in 2020.

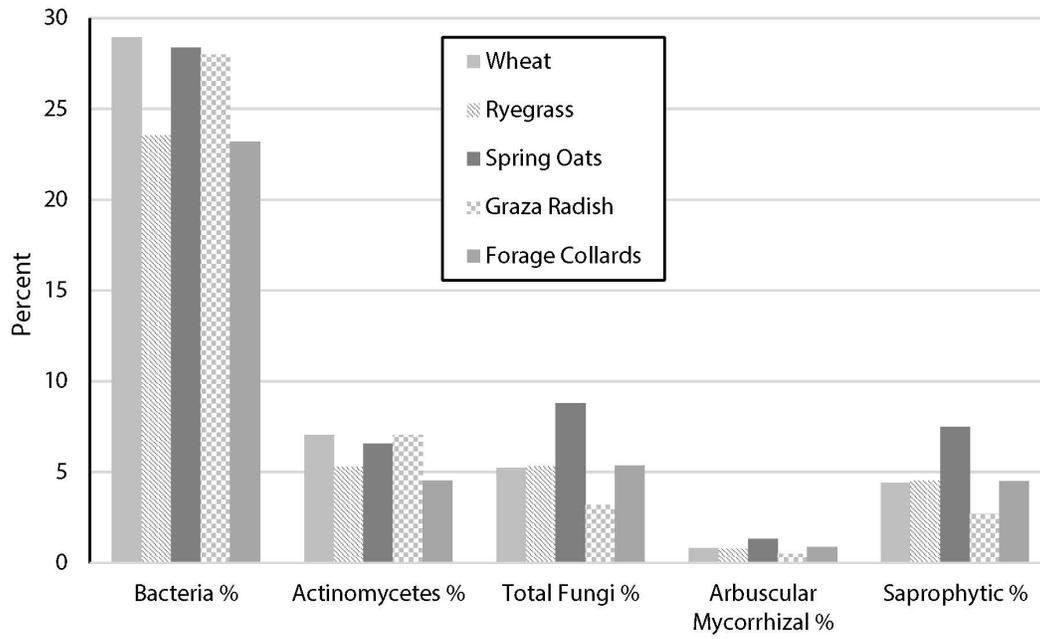


Figure 4. Differences in soil microbiome composition for five different cover crop treatments.