Effects of Cover Crops in No-Tillage Crop Rotations in Eastern & Western Kansas

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Introduction

Precipitation patterns in Kansas vary greatly across the state. Western KS is prone to low and variable precipitation patterns, and producers rely on a fallow period (approximately 14 months) to increase plant available water. In eastern KS, winter wheat/fallow is the primary dryland crop rotation. No-tillage systems allow producers to intensify the cropping system due to increased stored available water. In eastern KS, the fallow period after wheat harvested in winter (Typically 9 to 10 months) and summer annual grain crops are usually included in the rotation. Annual precipitation is greater than in western KS, but precipitation is more variable. "Rainfall is higher in the summer in eastern KS and is more likely to be lost due to evaporation, while winter precipitation is greater in western KS and more likely to increase fallow use efficiency, increase soil nitrogen, and reduce weed pressure in no-tillage cropping systems. In addition, cover crops can accumulate large amounts of biomass, and increase the amount of organic carbon in the soil system. Cover crop harvest is flexible because it can be left in place or harvested for forage or for grain, depending on plant available soil water status and anticipated precipitation.

Objectives

• To evaluate the effects of cover crops on subsequent grain crops.
• To determine the suitability of various cover crops in different cropping systems and environments.

Materials and Methods

Western Kansas Study

• Near Garden City, Kansas
• No-tillage cropping system with two-year rotations of winter wheat/fallow, winter wheat/cover crop, or continuous winter wheat.

Eastern Kansas Study

• Near Manhattan, Kansas
• No-tillage cropping system with three-year rotation of winter wheat/grain sorghum/soybean.

Results - Western Kansas

Table 1. Western Kansas study cover crop aboveground biomass and nitrogen accumulation. Values within a column with the same letter are not different at p≤0.05.

Results - Eastern Kansas

Table 2. Significance of cover crop and nitrogen effects and their interactions for flag leaf N and sorghum yield at Eastern Kansas location.

Results cont. - Eastern Kansas

Discussion

The following sections provide a detailed description of the results and discussion of the implications of the findings.

Western Kansas Study

Among fall-planted cover crops, wheat yields were greatest following clover (CL), winter pea (WP), and spring pea (SP) (Figure 1). Among spring-planted cover crops, wheat yields were greatest following spring lentil (L) and spring pea (SP) (Figure 2). Continuous winter wheat produced the least grain yield (Figure 1). Method of cover crop termination did not cause differences in subsequent wheat yields (data not shown). Wheat yields following treatments containing triticale were less than wheat yields following the fallow (Figure 1). Cover crop aboveground biomass was greatest in treatments containing triticale alone or in a mix with other species (Figures 2 and 3).

Eastern Kansas Study

Grain sorghum flag leaf N content was greatest after chemical fallow and least after sorghum-sudangrass and double-crop soybeans at 0 and 45 kg applied N (Figure 4). Sorghum flag leaf N content did not differ with preceding cover crop with 60 or 90 kg applied N (Figure 4). Sorghum grain yields were greatest after late-maturing soybeans, chemical fallow, and sorghum-sudangrass (Figure 5). Sorghum grain yield after double-crop soybean was significantly less than after all other cover crops (Figure 5). Sorghum-sudangrass produced the greatest amount of biomass in both years (Table 1). Farming cover crops increased amounts of biomass compared to the winter cover crops (Table 1). Double-crop soybean yields (Table 1) were similar to long-term yield averages reported by farmers (data not shown).

Conclusions

The following sections provide a detailed description of the results and discussion of the implications of the findings.

Western Kansas Study

Cover crops can be grown during the fallow period without decreasing wheat yields. High biomass cover crops may not be as beneficial as low biomass cover crops. Cover crops containing triticale produced more biomass than other cover crops but resulted in less wheat yield.

Eastern Kansas Study

Sorghum yield was highest after late-maturing soybeans, chemical fallow, and sorghum-sudangrass than after other cover crops. Soybean yield was highest after double-crop soybean than after cover crops and chemical fallow. All cover crops in this experiment show promise for winter wheat/sorghum/soybean rotations.

The large amount of biomass produced by sorghum-sudangrass made planting more difficult and slowed emergence (data not shown).

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