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Native Cover Crops and Timing of Planting: Three Years of Establishment

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Abstract
Deciding when and how to plant prairie to simultaneously establish native prairie seedlings and prevent weed (non-prairie species) invasion can be challenging. Planting cover crops is an increasingly common management practice for prairie plantings. The idea is based on the assumption that the cover plant will act as a nurse plant to prairie seedlings and will have a positive effect on seedling recruitment by increasing weed suppression. This is predicted to lead to reduced weed biomass and increased prairie establishment in restoration plantings. However, the evidence supporting these benefits is mostly anecdotal and has been challenged by some.

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RFR-A1087

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Introduction

Deciding when and how to plant prairie to simultaneously establish native prairie seedlings and prevent weed (non-prairie species) invasion can be challenging. Planting cover crops is an increasingly common management practice for prairie plantings. The idea is based on the assumption that the cover plant will act as a nurse plant to prairie seedlings and will have a positive effect on seedling recruitment by increasing weed suppression. This is predicted to lead to reduced weed biomass and increased prairie establishment in restoration plantings. However, the evidence supporting these benefits is mostly anecdotal and has been challenged by some.

Planting native prairie at different times during the growing season may also affect how well it establishes or how weedy it becomes in the long term. Clearly, further scientific evidence is needed on the efficacy of cover plants and when it may be best to establish prairie. As part of an ongoing project, we have varied cover crop identity and timing of seeding to determine whether prairie establishment will be affected by treatments.

Materials and Methods

There are several native species that have great potential as cover crops. During the 2005 growing season, we established five native species as cover crops at two separate sites (Horticulture Station and Western Research Farm) and varied the timing of seed additions. Here we present data from the first three growing seasons.

Experimental plots were set up in a split-plot design. Seed mixes containing 30 prairie species were added to main plots that contain one of six cover crop treatments. Cover crop treatments include:

1. Canada wild rye (*Elymus canadensis*).
2. Partridge pea (*Chamaecrista fasciculata*).
3. Black-eyed susan (*Rudbeckia hirta*).
4. Side-oats grama (*Bouteloua curtipendula*).
5. No cover crop (control).
6. All four cover crop species combined.

These species are all early emerging species that have the potential to reduce weed establishment and facilitate establishment of later emerging prairie species. Five replicate main plots were established for each treatment at each of the two sites, the Horticulture Station and the Western Research Farm. Plots were 5 × 5 m and were established on tilled areas that were formerly dominated by brome. Within each main plot, four sub-plots (2 × 2 m) were established to receive one of four seed timing treatments: 1) spring-seeded with prairie mix added at the same time that cover crops were established, 2) spring-seeded with prairie mix added the spring after cover crops were seeded, 3) fall-seeded with prairie mix added at the same time that cover crops were established, or 4) fall-seeded with prairie mix added the following growing season in the spring. Biomass of prairie and weed species was estimated with point intercept sampling, which involved counting plant contacts with a metal pin dropped through the canopy in the middle of each plot during July of each year.

Results and Discussion

Some cover crops prevented weed invasion and promoted prairie more than others. Side-oats grama and the mixture of all four species had the highest proportion of weeds and lowest prairie establishment, so these native cover crops are to be avoided ($P < 0.05$). Canada wild rye had the highest prairie establishment and lowest proportion of weeds, suggesting this species may be a suitable cover crop ($P < 0.05$). However, planting Canada wild rye was nearly the same as having no cover crop, suggesting cover crops may not be as beneficial as predicted.

The most interesting results come from altering when the prairie mix was added during the growing season, and whether it was added with the cover crop or the year after the cover crop established. Our plots were similar in 2006, but were very different after three years (Figure 1). Prairie grass and forbs had much better establishment when plots were seeded in spring with the cover crop than when they were seeded in the fall, or when they were seeded after a cover crop was established ($P < 0.01$). The proportion of weeds was also much lower in spring plots with the cover crop added at the same time compared with all other plots (Figure 1, $P < 0.01$).

In conclusion, we found that only some cover crops can be beneficial by reducing weed biomass, but the most important factor for establishing native prairie species and reducing weeds is when the mix is seeded. Thus, we suggest that prairie establishment will be highest and weed abundance will be the lowest with spring plantings.

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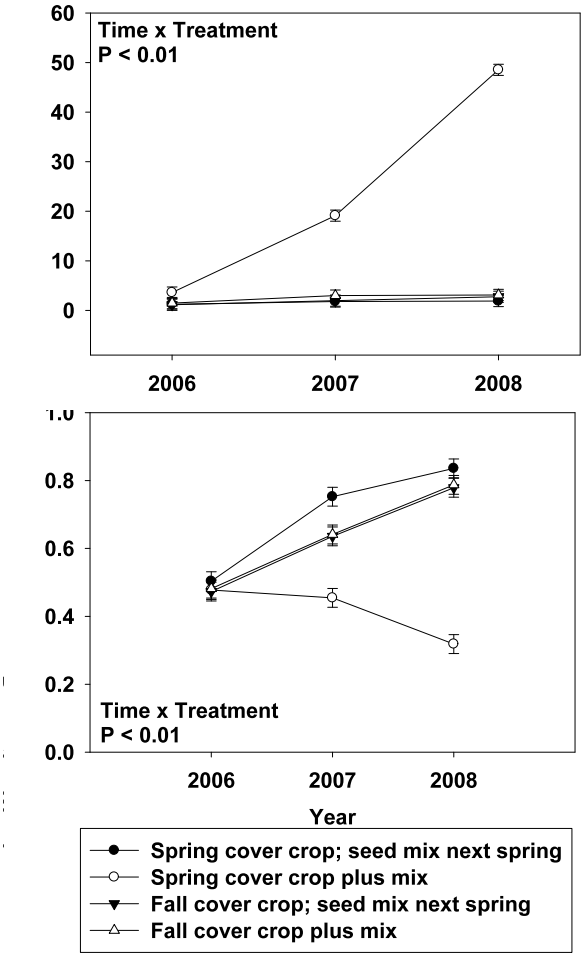

Figure 1. Changes in abundance of prairie species (top) and proportion of weeds (bottom) after changing timing of seed addition over three years of the study. Data merged from two locations–Horticulture Research Station, Ames, IA and Western Research Farm, Castana, IA.