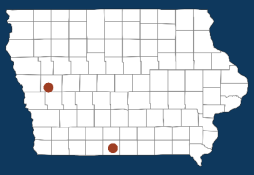
PRACTICAL FARMERS OF IOWA
COOPERATORS' PROGRAM Farmer-Led Research

EXPERIMENT



2024

PFI Contact:
Emma Link, (515) 232-5661 ext. 1052,
emma.link@practicalfarmers.org

Interseeding Cover Crops to Corn in Early Summer

In a Nutshell:

- Managing fall cover crop planting around soybean and corn harvest schedules is a major barrier to successful cover crop establishment for many Iowa farmers.
- Some farmers instead interseed cover crops into their standing crops before canopy closure to give the cover crops an earlier start.
- Eric Mahaney and Laban Miller conducted trials investigating how interseeded cover crop type (Mahaney) and presence (both) affected cover crop biomass production and corn yield.

Key Findings:

- Miller interseeded a diverse cover crop mix in late May but had very little germination, likely due to residuals from a spring 2,4-D application.
- Mahaney found no difference in corn yield between oat, alfalfa and control (no interseeded cover) treatments. Alfalfa looked much better and yielded more biomass (2.2 tons/ac) than oats (1.3 tons/ac).
- Mahaney also had some establishment issues in his trial that affected corn and cover crop performance. Wet conditions required him to replant corn, prevented early season cultivation and caused washouts in some parts of the replanted field.

Cooperators

Eric Mahaney – Arion, IA

Laban Miller – Leon, IA

Funding

USDA-NRCS

BACKGROUND

All of the benefits that cover crops provide – feeding livestock, reducing soil erosion, suppressing weeds, increasing infiltration, enhancing nutrient cycling or fixing nitrogen, increasing soil organic matter – rely on biomass growth [1, 2, 3]. However, planting cover crops after corn or soybean harvest in Iowa leaves very little time for the plants to put on significant biomass before winter dormancy. Knowing this, farmers in Iowa cite planting timing as one of the major barriers that they face in successfully adopting cover crops [4].

Establishing cover crops by interseeding them into standing corn or soybeans early in the summer is one potential solution that extends the cover crop growing season. Interseeding usually involves planting covers into inter-row spaces when the cash crops are still small, but some farmers also fly on cover crop seed a bit later in the season. Though timing of interseeding around cash crop maturity is tricky and germination or growth can be poor in dry years, farmers hope that in a good year, interseeding covers may lead to significant fall biomass growth [4]. However, many farmers worry that interseeding cover crops could affect their cash crop yield and want to know that the practice pays off with increased biomass.

PFI farmers have conducted over a dozen research trials on interseeding cover crops in corn and soy systems in the past decade [5-15]. This research demonstrated that interseeding covers in corn at V4-V6 stage does not usually negatively affect corn yield, but interseeding earlier might, and increasing corn row widths to allow for more light for the covers almost certainly will. This year, PFI farmers Laban Miller and Eric Mahaney continued the research and conducted trials investigating how interseeded cover crop type (Mahaney) and presence (both) affected cover crop biomass production and corn yield. Both farmers are motivated to maximize cover crop growth because they believe it will positively impact their farm economics and environmental health.

METHODS

Design

Miller planted corn on 60-in. row spacing. On April 30, he interseeded a diverse cover crop mix containing brown flax (2 lb/ac), impact forage collards (2 lb/ac), Kentucky Pride crimson clover (1 lb/ac), Mancan buckwheat (3 lb/ac), Sunn hemp (3 lb/ac), Trophy Rapeseed (1 lb/ac) and purple top turnips (1 lb/ac).

Mahaney planted corn on 30-in. rows and interseeded cover crops in three treatments: oats (10 lb/ac), alfalfa (8 lb/ac) and control (no cover crop). He interseeded the cover crops 44 days after corn planting after about 558 growing degree days had accumulated [16]. Planting and management details are presented in **Table 1**. Mahaney established treatments in randomized, paired strips: 3 treatments x 4 replications = 12 strips total (**Figure A1**).

Measurements

Mahaney recorded grain yield and moisture using a yield monitor or weigh wagon. Reported corn yields are corrected to 15.5% moisture. Mahaney also documented costs of equipment passes and seed.

Data analysis

To evaluate whether interseeding cover treatment affected corn, we conducted a two-way ANOVA that accounts for treatment and replicate location at the 95% confidence level. We followed the ANOVA with a Tukey's test which produces an Honest Significant Difference (HSD) statistic. If the difference in corn yield between any two treatments was greater than the HSD, we say that the treatment significantly affected yield. We would expect such a difference to occur 95 times out of 100 under the same conditions. On the other hand, if the resulting difference between the two treatments was less than the HSD, we would say that the treatment did not affect corn yield. We can perform this analysis because Mahaney planted a completely randomized and replicated experiment (**Figure A1**).

RESULTS AND CONCLUSIONS

Miller was unable to complete the trial because of poor cover crop germination. He had previously applied 2,4-D to his field, which he believes is the reason for the germination failure. While he now has a plan for how he can manage his preplant herbicide treatments to allow for cover crop germination, he reflects that a major challenge remains: how can he manage weeds in the mid-season while allowing cover crops to grow. Other farmers have suggested that some grass cover crops may allow farmers to use some herbicides, or that planting on 60-in. rows may allow for later cover crop interseeding.

Mahaney found that interseeding alfalfa and oat into his standing corn did not significantly affect corn yield compared to a control treatment (**Figure 1**). While he did not weigh biomass samples of the cover crop from each if his treatment replicates, he did observe that alfalfa gathered from several areas of the trial averaged 2.2 tons/ac while oat straw averaged 1.3 tons/ac. The alfalfa definitely seemed to be doing better than the oats after corn harvest. However, alfalfa seed cost him $40/ac to plant while oat cost only $3/ac.

Despite successful germination and some biomass accumulation, Mahaney does not consider the trial to be a fair assessment of interseeding as a practice because wet weather prevented early season cultivation and led to a much weedier than usual field. This weed pressure likely affected both corn and interseeded cover performance. He plans to repeat the trial and predicts that in a drier year he will see more biomass from interseeded alfalfa and oat cover crops.

TABLE 1. Trial management details at Eric Mahaney's in 2024.

Manure	Nov. 1, 2023 3 ton/ac turkey manure
Tillage	Apr. 12, 2024 Light tillage
Corn planting	Apr. 25, 2024 37,000 seeds/ac on 30-in rows
Weed control	May 6, 2024 Rotary hoe June 9, 2024 Cultivation pass
Interseeding alfalfa	June 9, 2024 8 lb/ac alfalfa on 30-in. rows
Interseeding oats	June 9, 2024 10 lb/ac oats on 30-in. rows
Collect cover crop biomass	Aug. 20, 2024
Corn harvest	Sept. 30, 2024

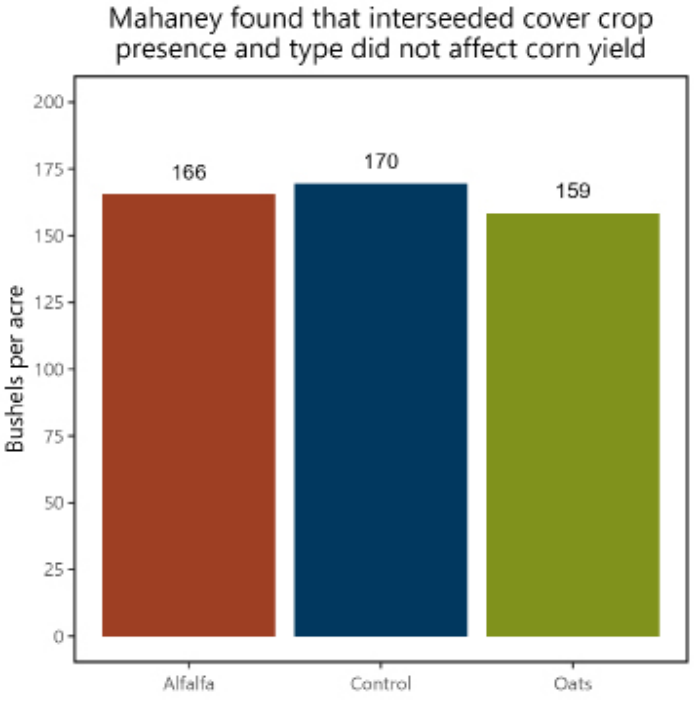


FIGURE 1. Corn yields as affected by interseeding oat or alfalfa cover crops at Eric Mahaney's in 2024. Because none of the treatments differed by more than the honest significant difference (HSD = 15 bu/ac), we considered the results statistically similar at the 95% confidence level.

Mahaney also plans to experiment with using cover crops for early season weed suppression by planting soybeans green into rye and planting corn into standing alfalfa. "I will be planting my cover crops in 30-in. rows during the fall and come back in the spring to plant my row crops between those rows. I believe this will have better weed management than waiting until after my main crop is growing (to plant covers)."

APPENDIX – TRIAL DESIGN AND WEATHER CONDITIONS

Alfalfa	Oats	Control	Oats	Control	Alfalfa	Alfalfa	Oats	Control	Oats	Alfalfa	Control
Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	Plot 10	Plot 11	Plot 12
REP 1			REP 2			REP 3			REP 4		

FIGURE A1. Example of experimental design used Mahaney which included randomized replicated interseeding cover crop treatments. This design allowed for statistical analysis of the results.

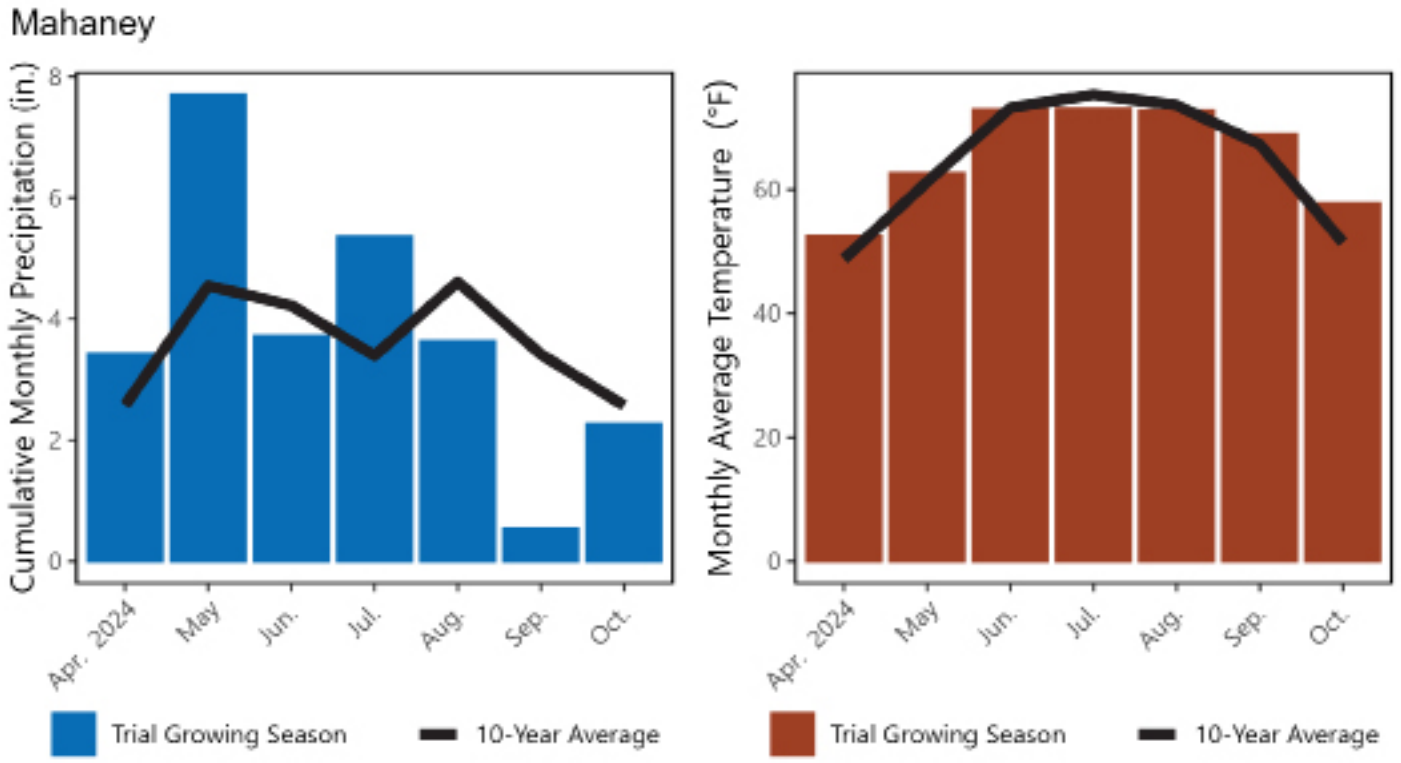


FIGURE A2. Modelled mean monthly temperature and rainfall at Mahaney's during the study period and the ten-year historic averages. Data is from the NasaPOWER climate dataset [17, 18]

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PRACTICAL FARMERS of Iowa

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