Covering Ground: Interseeded Cover Crops in Late Season Vegetables

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Abstract

Results from a survey about cover cropping practices on Maine farms (n= 27), showed that 77.8% of respondents (n=21) are limited in their ability to plant cover crops due to "late season cash crops coming out too late". 74.1% of respondents (n= 20) stated that research-based data about interseeding in the Northeast would help them with decision-making about late-season cover cropping. In response to those survey results, this project was developed to investigate best management practices associated with planting cover crops into standing, late-season vegetables. This three-year project launched during the 2022 growing season and will include a total of two years of replicated field trials. We are assessing the timing of seeding, seeding methods, and species selection. Trials are being conducted at Rogers Farm in Old Town, Maine, as well as on 4 collaborating farms throughout Southern Maine.

We hypothesize that 1) Interseeding at an appropriate growth stage of sweet corn and fall cabbage (V5 and 21 days after transplanting respectively) will result in high cover crop biomass and with no negative effects on the crops; 2) Incorporation of cover crop seed into the soil at interseeding will result in the best cover crop germination, biomass, and weed control; and 3) Utilizing lower biomass cover crops such as annual ryegrass and crimson clover will minimize nutrient and water competition. Furthermore, we will develop evidence-based recommendations for interseeding cover crops into late-season vegetables, including equipment and logistical considerations.

Keywords: *Interseeding, late-season vegetables, cover crops, soil health*

Introduction

Vegetable farmers throughout Maine and northern New England contend with relatively short growing seasons. Every year, most farmers leave some portion of their lands bare over winter because late-season cash crops come out too late, preventing them from planting cover crops. Leaving their lands bare makes the soils susceptible to erosion, nutrient leaching and winter-annual-weed seed production (Pimentel et al. 1995; Sainju and Singh 1997; Sarrantonio and Gallandt, 2003). Climate change forecasts relevant to the northeast suggest that the region is likely to experience longer spring wet periods in the coming decades, making bare spring soils increasingly vulnerable to erosion and nutrient loss (Wolfe et al. 2018).

Interseeding cover crops in standing grain crops (primarily corn) have proven successful in warmer regions, like the Mid-Atlantic (Curran et al. 2018; Caswell et al. 2019). However, investigations of interseeding in vegetable crops suggest timing, species selection, and cover crop placement are all key variables for avoiding weed growth and water and nutrient competition in the system (Brainard et al. 2004; Pfeiffer et al. 2015; Brainard and Bellinder 2004; Vanek et al. 2005). These are all variables that farmers consulted with have also faced in early attempts with this practice.

Brainard et al. (2004) and Vanek et al. (2005) showed that interseeding into mid-season cabbage and pumpkins, respectively, with legume cover crops 20 Days After Transplant (DAT) or later can generate cover crop biomass while avoiding crop yield loss. The data from these Michigan and New York-based projects will serve as a launching point for our outreach and the development of our research treatments focused on the Northern New England region.

Through a literature review and conversations with producers throughout Northern New England, we have identified the potential negative effects of improperly implementing this practice. In these conversations, growers have reported instances of crop competition, high levels of rodent damage, and yield loss. In all of these scenarios, we have attributed the loss to planting the cover crop too early in the season, a setback our project is poised to address. We also anticipate other unforeseen logistical setbacks of the practice, such as access to equipment for seeding, labor demands at seeding time, weed management etc. Our project is looking into these factors to develop regionally-specific recommendations to answer the following questions: 1) How does interseeding cover crops in late season cabbage and sweet corn affect crop productivity? 2) What planting methods work best to establish interseeded cover crops? 3) What planting dates (based on crop growth stage) optimize both cover crop biomass development and cash crop productivity in the Northeast? 4) What cover crop species are best suited for late-season establishment in our region? 5) What are equipment, timing, labor and other barriers to establishing a cover crop in an established sweet corn or fall brassica crop in Northern New England?

Materials & Methods

This project includes two distinct experimental trials, referred to in the following sections as Trials A and B.

Trial A:

Late season plantings of sweet corn and fall cabbage are being tested in separate trials. Treatments are the same for both: (a) timing of seeding (main-plot treatment), and (b) seeding method (sub-plot treatment). Our timing treatment for cabbage include planting a cover crop annual ryegrass and crimson clover mixed (25 lb/A 60% ryegrass:40% clover), at 17, 23, and 30 DAT, (Aug. 12, 18, and 25, 2022 respectively) with an additional post-cabbage-harvest cover crop planting date (October 20, 2022) serving as a control. Our timing treatments for sweet corn included v3, v5, and v8, (August 3, 18, and 30, 2022 respectively) using a post-harvest cover crop planting date as our control (September 27, 2022). Within those treatments we are testing the effects of different interseed planting methods in Trial A. While broadcasting seed is the easiest method for distributing cover crop seed, there is significant evidence that incorporation of the seed will significantly speed up germination and increase germination rate (Baker and Griffis, 2009; Barnett and Comeau, 1980; Brennan and Leap, 2014). Therefore, we will test; broadcasting seed, broadcasting and incorporation by cultivation at the time of seeding, and drilling the seed between crop rows with an Earthway® push seeder. We hypothesize that drilled seed will result in the optimal time to germination, cover crop stand density, and long term cover crop biomass.

Trial B:

There is minimal data available about what cover crop species will work best for this practice in northern New England. To address this question, Trial B is testing cover crop species planted in corn at the hypothesized optimal seeding time (v5). Species treatments will include oats and peas mixed (100lb/A 50%:50%), cereal (winter) rye and hairy vetch mixed (55lb rye, 25 lb vetch/A), and annual ryegrass and crimson clover mixed (25 lb/A 60% ryegrass:40% clover), and a control treatment (bare ground), all broadcasted and incorporated.

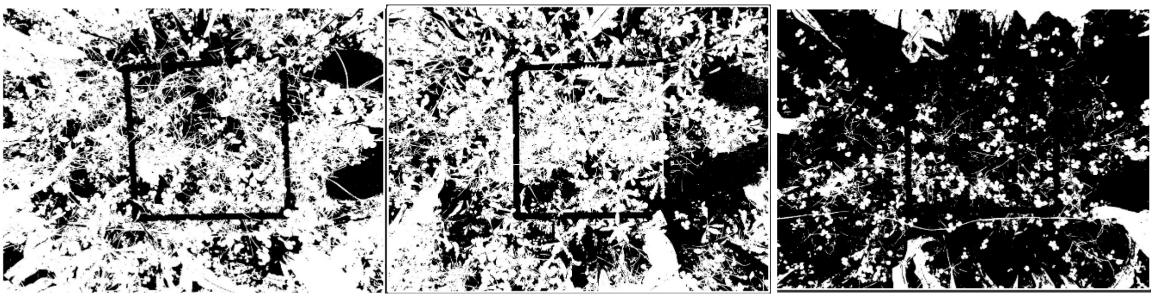
We are collecting data on soil nitrate, soil moisture, weed biomass, crop yields, and cover crop biomass.

Results

This research is still in progress and, as of this writing, the results collected from the first year are yet to be analyzed. Observationally, in the sweet corn timing trial A, our team saw excellent biomass and growth of the cover crop at V3 and v5. V7 plantings had thinner cover crop stands at the time of harvest and mowing (October 4th). In the cabbage timing trial A, the 17 DAT plots (seeded on August 12) appeared to have excessive cover crop growth, with an even distribution of flowering shepherds purse weeds throughout. While no significant disease was observed on any of the crop, the cover crop biomass was decreasing airflow and crowding the crop.

Plots that were drilled or broadcasted and incorporated had fewer weeds and thicker cover crop biomass than broadcasted plots alone. We hypothesize that the very dry conditions during cover crop seeding had significant influence on cover crop germination, ground cover, and biomass. No obvious differences in yields were observed.

a) b) c)



Images 1.a-c: Plant ground cover percentages by cover crop timing treatment (all broadcast incorporated) in Sweet Corn Timing Trial A. Images of coverage percentages captured through *Canopeo App* on September 27th, 2022. *1a, V3 Seeding (66% Coverage): 1b, V5 Seeding (58% Coverage): 1c V7 Seeding (21% Coverage).*

Farmer collaborators had mixed impressions of the demonstration plots installed on their farms. In the cabbage plots, density of planting had significant influence on the ability of the cover crop to germinate. Tight plantings of 12” in-row, 12” between-row, 3 row per bed plantings were too tight to allow germination. Some coverage was obtained in the walk rows, which the growers appreciated for harvest traffic during the muddy fall, and soil erosion prevention down the rows. Wider spacings of 18” in row and 24” between rows, 2 rows per bed allowed for better germination and biomass production especially in the walk rows. In 2022, broadcasting seed at the final cultivation proved efficient and very effective at incorporation of cover crop seed and excellent management of weeds.

In fields with a history of herbicide use, one field showed very poor germination of winter rye. A neighboring field on the same farm, with a similar soil type, planted on the same date showed excellent winter rye germination, leading us to believe that herbicide carry over was responsible. We are diving into spray records to identify specific chemistries that may be responsible.

In corn plots where cover crop seed (annual ryegrass and crimson clover 25lb/A) was broadcasted at last cultivation, or with the final sidressing of nitrogen, the cover crop germinated and provided good cover. In one plot, neighboring bare soil rows showed rill erosion down the between-row zone, while interseeded plots (annual ryegrass and crimson clover 25lb/A) showed no sign of soil loss.

Our research will continue to analyze collected data, and to work with growers on equipment and logistical approaches to this practice.

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