Interseeding Summer Cover Crops Between Vegetable Beds - Trial Results Year 2

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Managing weeds between vegetable beds remains an on-going issue for vegetable growers, both organic and conventional. It is common practice for vegetable growers to transplant crops into beds covered with black plastic mulch. This strategy provides excellent weed control in the planted row but leaves soil between beds exposed and vulnerable to erosion, compaction, and weed growth. Conventional growers often use herbicides for weed control, but herbicides applied at crop establishment do not provide season long control. Organic growers can mow or use tillage to control weeds,but this can be difficult between beds with plastic mulch and the soil is continuously disturbed decreasing soil health over time. Planting cover crops to protect and improve soil health is not new and the potential benefits of cover crops are well known. Cover crops planted between plastic-covered, vegetable beds have similar potential to reduce tillage and erosion, build soil health, minimize pesticide use, and suppress weeds if the appropriate species and management strategies are implemented.

Trials conducted in 2020 at the Long Island Horticultural Research and Extension Center (LIHREC) in Riverhead, NY and on-farm identified buckwheat and teff as the most promising cover crop options for weed control between vegetable beds *(Agricultural News,* November 2020). We hypothesized that abnormally dry weather at planting in 2020 was at least one reason for the reduced germination and poor establishment of some of the cover crops. However, with a changing climate, spring is predicted to be cooler and wetter and summers hotter and drier in the Northeast. Therefore, determining the best date for seeding summer cover crops to improve germination rates and the likelihood of good establishment is critical. If summer cover crops can be seeded earlier, at field preparation (in May) instead of at transplanting (in June), the likelihood of capturing spring soil moisture to improve germination may be higher. Also, there is growing interest in more heat-tolerant cover crops such as teff. Additionally, due to equipment availability and time, many growers decide to broadcast fertilizer to the entire field being planted prior to laying the plastic instead of targeting the fertilizer to only the planting row under the plastic and the roots of the cash crop. Fertilizing the entire field means fertilizing weeds, but this practice may also provide the opportunity for cover crops to capture the added nutrients and establish before the weeds.

Thanks to another year of support from the Friends of Long Island Horticulture, we expanded the 2020 trial to evaluate cover crop species (teff, buckwheat), seeding date (early, mid, at transplanting), and fertilization method (in-row vs. broadcast) on weed suppression, cover crop biomass production, soil properties, and crop yield.

Materials and Methods:

A replicated research trial was conducted at LIHREC using a randomized complete block design with four replications per treatment. Three in-between row treatments, two cover crops (teff and buckwheat) plus control (straw mulch), were established between plastic mulch beds (Image 1). Buckwheat is a quick growing short-season summer cover crop, good for weed suppression and attracting pollinators and beneficial insects. Teff is a heat and drought tolerant, warm-season grass useful for suppressing weeds, and requires little maintenance. Jalapeno peppers, Jedi variety, were grown on raised beds covered with black-plastic mulch with drip tape for irrigation. Pre- and post-trial soil samples were collected and analyzed to evaluate differences in soil properties between treatments. Fertilizer was broadcast applied to half of each block and applied only within the planting row on the other half prior to laying the plastic. The cover crops were drill seeded, using a Jang 5-row push seeder, on three different dates: early (at field prep, 5/26/2021), mid (2 weeks later, 6/8/2021), and late (at transplanting mid-June, 6/22/2021).

Cover crop and weed height, determined as the average of six random measurements per plot, weed species present, and percent weed biomass using the Canopeo App, were determined weekly. Aboveground cover crop biomass weight, determined using a 1x1-ft sampling grid with three samples per plot, was collected twice during the growing season (mid and end season). End-of-season biomass was analyzed for

carbon and nitrogen content. Harvest data was collected weekly on the middle six plants per plot to assess any treatment effect on pepper yield and quality. Statistical analysis was conducted using analysis of variance (ANOVA) for a balanced, completely randomized, full factorial experiment in JMP. Statistical significance was assessed at the 5% alpha level.

Image 1. Overview photo of trial after all treatments had been planted on July 6th, 2021. Photo credit: Erin Myers

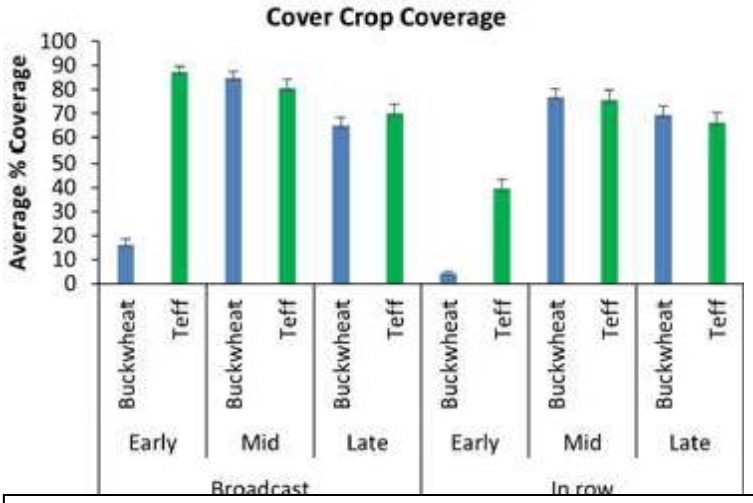

Figure 1. Percent cover crop coverage across all treatments. Average of three random samples per plot with standard error bars

Results and Discussion:

Average cover crop and weed height were significantly affected by cover crop species, fertilization type, and planting date ($p<0.0001$). For the early planting date, teff produced the tallest biomass compared to buckwheat and the control treatments, but for the middle and late planting dates buckwheat was the tallest followed by teff then the control. Weed height was comparable to cover crop height across all treatments. Weed species present included purslane, pigweed, lambs quarter, grasses, chickweed, nightshade, knotweed, sedges, and ragweed. Weed height was surprising consideringthe percent cover crop coverage, except for the early buckwheat seeding which failed to germinate due to old seed (Figure 1).

Pepper yield, determined as the number and weight (lbs) of peppers harvested from the center six plants per plot, was significantly impacted by planting date, cover crop species, and fertilization type ($p<0.0001$). For all three planting dates, there was a strong interactive effect of cover crop species and fertilization method. Overall, the mid and late plantings yielded more peppers, and the control in-between bed treatment had the smallest adverse impact on pepper yield ($p<0.05$). Management of the cover crop likely impacted pepper yield, as the cover crops were not mowed or trampled until the end of the experiment so cover crop growth was high or in some cases above the pepper crop. This resulted in the pepper plants growing vertically.

Aboveground cover crop biomass was harvested after four weeks of growth for each respective planting date and at the end of the experiment. Cover crop carbon and nitrogen content differed between species, but this was impacted by fertilization type and planting time. Mid-planting date resulted in significantly higher C/N in the cover crop compared to the early and late plantings ($p<0.0001$), but no difference between cover crop species was found ($p<0.05$).

End-of-season soil samples showed no effect on organic matter content, potential nitrogen release, and some micronutrients (Fe, Mn, Cu, Zn). Soil pH was impacted by planting date, cover crop species, and fertilization type ($p<0.0001$), and several other soil nutrients were affected by the different treatments (P, K, S, Ca, Mg,K, Na, B, Al).

No clear effect of an individual treatment accounted for these differences.

Overall, cover crop biomass production was greater than in 2020, which we attribute largely to weather. The summer of 2020 was a drought year with conditions abnormally dry from mid-June through July and then becoming a moderate drought the entire month of August. Meanwhile, there was adequate rainfall throughout summer 2021 and no abnormally dry or drought period was observed (US Drought Monitor, 2021). Sufficient rainfall and high temperatures likely contributed to the prolific growth, particularly of the teff cover crop. Additionally, this research suggests that if buckwheat or teff are used between beds, they should be seeded at least 2 weeks after the crop is transplanted because of rapid growth particularly under optimum growing conditions and may require mowing or trampling.

Image 2. Teff cover crop produced significantly more biomass than in 2020. Growing on average 36 inches, which was unexpected. Photo credit: Lousie Koepele

Not all details and results of this study are included here, for the full report please contact da352@cornell.edu.

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References and Further Reading

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