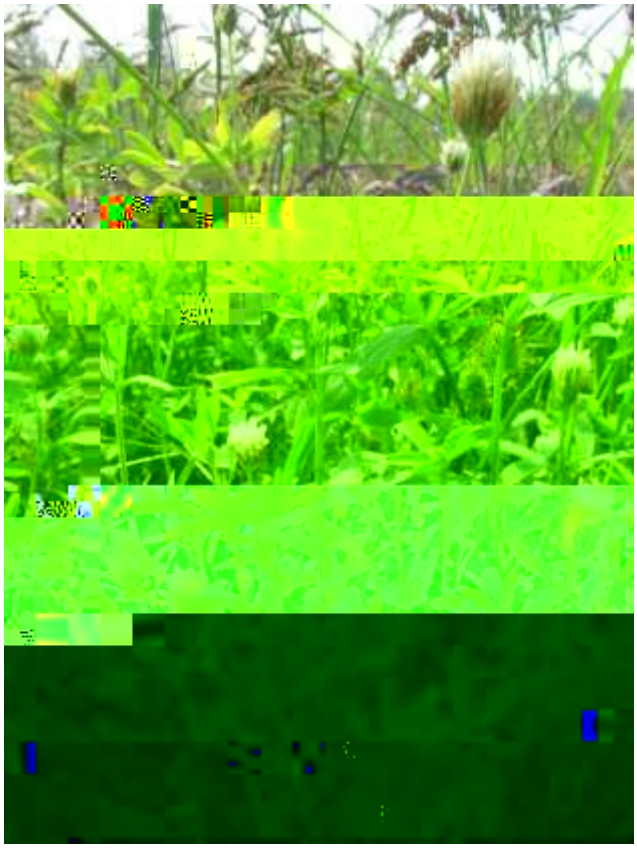
NORTHWEST CROPS & SOILS PROGRAM

Performance of Green Manure Species Seeded into Spring Barley



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PERFORMANCE OF GREEN MANURE SPECIES SEEDED INTO SPRING BARLEY

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With the revival of the small grains industry in the Northeast and the strength of the locavore movement, craft breweries and distilleries have expressed an interest in sourcing local barley for malting. Many farmers are also interested in barley as a concentrated, high-energy feed source for livestock. Depending on the variety, barley can be planted in either the spring or fall, and both two- and six-row barley can be used for malting and livestock feed.

Producers have expressed interest in the best agronomic practices for cultivating spring barley and the use of interseeded cover crops (also known as green manures or living mulches) to increase barley yields and quality. Cover crops grown as living mulches grow with field or row crops to reduce weed pressure, prevent soil erosion, maintain and/or improve soil nutrients, improve soil aggregation, prevent nutrient loss from runoff, and increase water retention. Leguminous living mulches can fix nitrogen and may improve yields and/or quality by adding NO_3 to soil. Varietal selection is very important as living mulches can compete with the main crop. Varieties selected should be shorter than the main crop and shade tolerant. Green manures are typically grown as part of a crop rotation and are plowed under to add nutrients and organic matter to the soil before the main crop is planted.

In this trial, our goals were to evaluate the value of eighteen cover crop treatments both as a living mulch when nterseeded with spring barley, and also their potential as a green manure when their residues are tilled into the soil before planting the next crop in the rotation.

MATERIALS AND METHODS

A field experiment was established at the Borderview Research Farm located in Alburgh, VT on 21-Apr to investigate the ability for green manures to establish in spring barley (variety Newdale . The experimental design was a randomized complete block with four replicates.
The seedbed was prepared by conventional tillage methods (Table 1). The previous crop planted at the site was corn. Prior to planting, the trial area was plowed, disked, and spike tooth harrowed to prepare for planting. The plots were seeded with the Great Plains Cone Seeder on 21-Apr at 125 lbs ac^{-1}. Green manures were broadcast planted by hand on 21-

Table 1. Agronomic information for spring barley green manure trial, Alburgh, VT, 2016.

All data was analyzed using a mixed model analysis where replicates were considered random effects. The LSD procedure was used to separate cultivar means when the F-test was significant (P< 0.10). Variations in yield and quality can occur because of variations in genetics, soil, weather, and other growing conditions. Statistical analysis makes it possible to determine whether a difference among varieties is real or whether it might have occurred due to other variations in the field. At the bottom of each table a LSD value is presented for each variable (e.g. yield). Least Significant Differences at the 10% level of probability are shown. Where the difference between two varieties within a column is equal to or greater than the LSD value at the bottom of the column, you can be sure in 9 out of 10 chances that there is a real difference between the two varieties. In the following example, variety A is significantly different from variety C, but not from variety B. The difference between A and B is equal to 725, which is less than the LSD value of 889. This means that these varieties did not differ in yield. The difference between A and C is equal to 1454, which is greater than the LSD value of 889. This means that the yields of these varieties were significantly different from one another. The asterisk indicates that variety B was not significantly lower than the top yielding variety.

RESULTS

Weather data was collected with an onsite Davis Instruments Vantage Pro2 weather station equipped with a WeatherLink data logger at Borderview Research Farm in Alburgh, VT. Temperature, precipitation, and accumulation of Growing Degree Days (GDDs) are consolidated for the 2016

Green Manure Impacts

Barley populations varied significantly by treatment (Table 4)

Dry conditions through the growing season led to very low moisture at harvest for all treatments (Table 5). The only treatment that was significantly different than the rest in terms of harvest moisture was the chickling vetch/oats treatment, which had the highest moisture content at 9.7%. All treatments also had low test weights. The highest test weight was 41.9 lbs bu^{-1} for the barley with the crimson clover cover crop. This was statistically similar to the berseem clover, mammoth clover, medium red clover, subterranean clover, Italian ryegrass, ladino clover/perennial ryegrass, medium red clover/alsike clover/timothy grass, and medium red clover/perennial ryegrass treatments, and also the control barley with no green manure.

The highest yielding treatment was the medium red clover/perennial ryegrass treatment which produced 3677 lbs ac^{-1} (Table 5). This was statistically similar to the control and all other treatments except the Subterranean clover treatment, which had the lowest yield at 2731 lbs ac^{-1}.

After barley harvest, the amount of weed biomass and the amount of g

Ladino Clover/ Perennial Ryegrass	3116*	8.1	38.1*	873	308*
Medium Red Clover/ Alsike Clover/ Timothy Grass	3582*	8.1	39.3*	1352*	282*
Medium Red Clover/ Perennial Ryegrass	**3677***	8.3	40.0*	985*	203*
Medium Red Clover/ Timothy Grass	3106*	8.0	36.5	685	711
LSD (0.10)	768	0.6	4	478	550
Trial Mean	3332	8.2	38.3	480	589

*Treatments with an asterisk are not significantly different than the top performer in **bold**.

DISCUSSION

It is important to remember that the results only represent one year of data. The 2016 growing season was ideal for growing spring barley. The warmer than average temperatures along with below normal rainfall throughout much of the growing season resulted in high yields.

While the yields of almost all the barley plots were statistically similar to the control, the average yield for the spring barley green manure trial was 3332 lbs ac^{-1}, all treatments (including the control) except the subterranean clover, performed better than the Newdale barley in the 2016 spring barley variety trial (the Newdale barley in the variety trial had a yield of 2869 lbs ac^{-1}). This difference may not be statistically significant and may be due to small changes in microclimates from one field to the next, but some of the increased yield may have been due to the green manures.

Figure 1. Barley yield and weed biomass for eighteen green manure treatments.

Past research has shown that living mulches in the understory of grains can help reduce weed pressure. In this trial, green manures did not significantly reduce weed pressure compared to the control. The very dry growing season affected weeds nearly as much as crops. While there was not a strong correlation between

This trial was planned to run concurrent with a trial examining all the same 18 green manure treatments in winter wheat. The green manures were frost seeded into winter wheat on 21-Mar 2016. The green manures had very poor establishment. While the wheat grew well (information available in our 2016 Winter Wheat Variety Trial reports), no additional data on the green manures was collected.

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