2016 WINTER BARLEY SEEDING RATE, COVER CROP, AND VARIETY TRIAL

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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. Malting barley must meet specific quality characteristics such as low protein content and high germination. 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. Winter barley has not been traditionally grown in the Northeast due to severe winterkill. However, newly developed varieties and a changing climate have encouraged our team to investigate this crop for the area. In 2015, we undertook this project in coordination with the University of Massachusetts to evaluate the effects of winter barley variety, seeding rate, and nitrogen (N) fixing cover crops on barley yields and quality.

MATERIALS AND METHODS

The winter barley trial was carried out at Borderview Research Farm in Alburgh, VT. The experimental design was a randomized complete block with split-split plots and four replicates. The main plots were cover crops tilled into the soil prior to planting the winter barley crop. The three cover crop treatments (crimson clover, sun hemp, and a crimson clover/sun hemp mix) were planted on 17-Jul 2015. The first split plot was two varieites of winter barley (Endeavor and Wintmalt) planted on 15-Sep 2015 and the second split plot was three seeding rates (300, 400 and 500 seeds per square meter). The seedbed was prepared by conventional tillage methods. Plots were 5’ x 20’ and were seeded into a Benson rocky silt loam at 125 lbs ac^{-1} with a Great Plains cone seeder. Rows were spaced at 6”. All plots were managed with practices similar to those used by producers in the surrounding areas (Table 1).

Cover crop populations, heights and biomass samples were collected 9-Sep 2015. Fall barley populations were taken on 5-Nov 2015 by counting the number of plants in two twelve inch sections. Soil samples were also collected on this date and evaluated for soil nitrates. Winter survival was assessed by a visual estimate on 25-Apr 2016.

All varieties were harvested with an Almaco SPC50 small plot combine on 8-Jul 2016. Following the harvest of winter barley, seed was cleaned with a small Clipper cleaner. A one-pound subsample was collected to determine quality. Quality measurements included standard testing parameters used by commercial malt houses. Harvest moisture was determined for each plot using a DICKEY-john M20P moisture meter. Test weight was measured using a Berckes Test Weight Scale, which weighs a known volume of grain. Subsamples were ground into flour using the Perten LM3100 Laboratory Mill, and were evaluated for crude protein content using the Perten Inframatic 8600 Flour Analyzer. In addition, falling number for all barley varieties was determined using the AACC Method 56-81B, AACC Intl., 2000 on a Perten FN 1500 Falling Number Machine. Samples were also analyzed for Deoxynivalenol (DON) using the Veratox DON 2/3 Quantitative test from the NEOGEN Corp. This test has a detection range of 0.5 to 5 ppm. Each variety was evaluated for seed germination by incubating 100 seeds in 4.0 mL of water for 72 hours and counting the number of seeds that did not germinate.

Data was analyzed using mixed model analysis procedure of SAS (SAS Institute, 1999). Replications were treated as random effects, and treatments were treated as fixed. Mean comparisons were made using the Least Significant Difference (LSD) procedure when the F-test was considered 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 hybrids is real or whether it might have occurred due to other variations in the field. Least Significant Differences (LSDs) at the 0.10 level of significance are shown. At the bottom of each table a LSD value is presented for each variable (i.e. yield).

Table 2. Weather data for winter barley variety trial in Alburgh, VT.

Alburgh, VT	Sep-15	Oct-15	Nov-15	Mar-16	Apr-16	May-16	Jun-16	Jul-16
Average temperature (°F)	65.2	46.5	42.2	33.9	39.8	58.1	65.8	70.7
Departure from normal	4.70	-1.60	4.00	2.90	-4.90	1.80	0.00	0.10

Impact of Cover Crop:

Cover crops tilled into the soil before the winter barley crop significantly impacted the yield of barley (Table 4). The control treatment with no cover crop had the highest yield. This was statisistically similar to the crimson clover and cover crop mix treatments, but higher than the sun hemp treatment (p=0.02). Cover crop treatment did not impact the quality of the barley (Table 4).

Table 4. Impact of cover crop on barley harvest and quality, Alburgh, VT, 2016.

Cover crop	Populations	Winter Survival	Harvest moisture	Test weight	Harvest yield
	plants m^2	%	%	lbs bu^{-1}	lbs ac^{-1}
Control	417	91	11.3	**40.7**	**2953***
Crimson Clover	**461**	88	11.1	39.9	2868*
Sun Hemp	424	85	**12.7**	39.8	2240
Mix	449	**98**	12.5	38	2411*
LSD (0.1)	NS	NS	NS	NS	544
Trial mean	438	91	11.9	39.6	2618

Cover crop	Crude protein @ 12% moisture	DON	Falling number	Germination
	%			

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