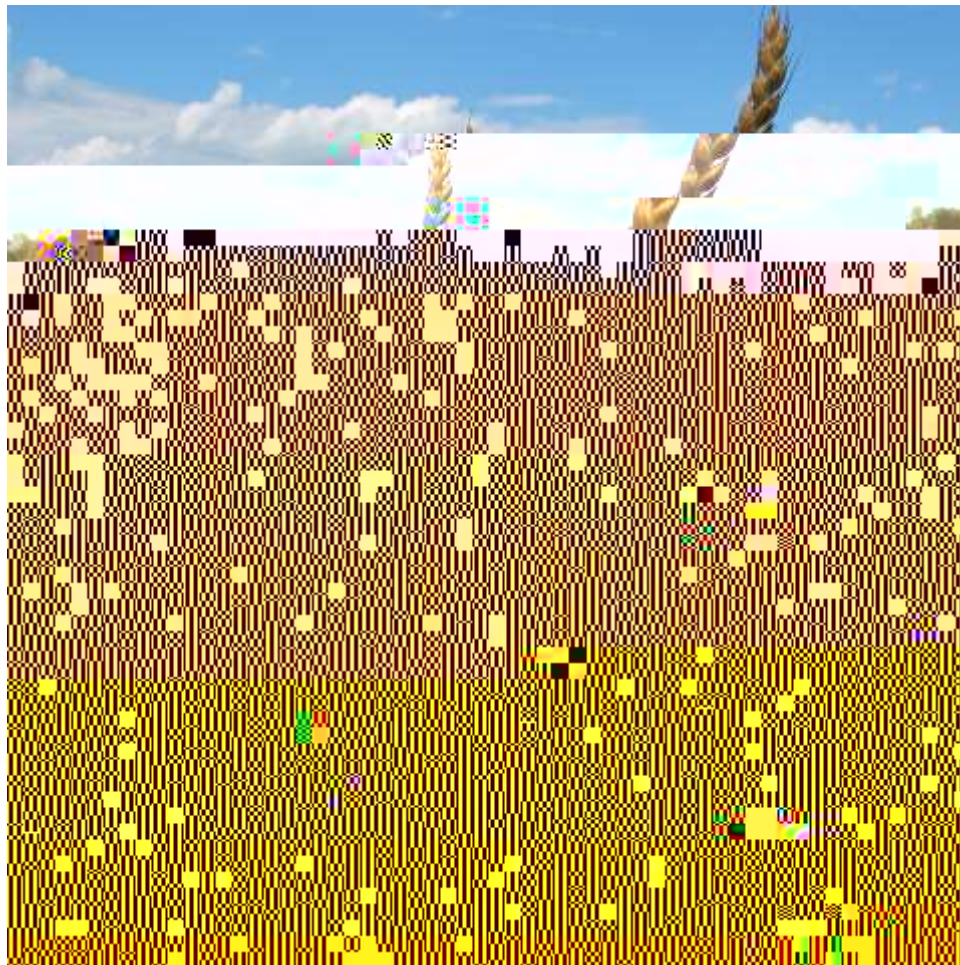




2015 Organic Heirloom Winter Wheat Variety Trial



Dr. Heather Darby, UVM Extension Agronomist
Hillary Emick, Lily Calderwood, Erica Cummings, Abha Gupta, Julian Post, and Sara Ziegler
UVM Extension Crops and Soils Technicians
802-524-6501

Visit us on the web: <http://www.uvm.edu/extension/cropsoil>

2015 ORGANIC HEIRLOOM WINTER WHEAT VARIETY TRIAL

Dr. Heather Darby, University of Vermont Extension
heather.darby[at]uvm.edu

Many consumers are interested in heirloom wheat for flavor, perceived health benefits, or its history, while many farmers are interested in heirloom wheat because it may have superior genetics better adapted to the challenging growing conditions in the Northeast. Production of heirloom wheat may also provide a farmer with a value added market with increased returns. This variety trial was established to determine heirloom winter wheat varieties that are suitable for production in Vermont's growing conditions. This was the fourth year that this trial was conducted in Vermont. These projects were funded through the UNFI Foundation that has set a priority to **protect the biodiversity** of our seed supply and the stewardship of genetic resources of organic seed.

MATERIALS AND METHODS

In the fall of 2014, an heirloom winter wheat variety trial was initiated at Borderview Research Farm in Alburgh, VT. General plot management is listed in Table 1. The experimental design was a randomized complete block with 4 replicates. Treatments were 34 winter wheat heirloom varieties (Table 2). Plots were managed with practices similar to those used by producers in the surrounding area. The previous crop was oats and barley. The field was disked and spike tooth harrowed prior to planting. Plots were seeded with a Great Plains Cone Seeder on 22-Sep 2014 at a seeding rate of 125 lbs ac⁻¹.

Plots were harvested with an Almaco SPC50 small plot combine on 3-Aug 2015. The harvest area was 5' x 20'. Grain moisture, test weight, and yield were determined at harvest. Seed was cleaned with a small Clipper M2B cleaner (A.T. Ferrell, Bluffton, IN) and a subsample was collected to determine quality characteristics. Samples were ground using the Perten LM3100 Laboratory Mill. Flour was analyzed for protein content using the Perten Inframatic 8600 Flour Analyzer. Most commercial mills target 12-15% protein content. Falling number was measured (AACC Method 56-81B, AACC Intl., 2000) on the Perten FN 1500 Falling Number Machine. The falling number is related to the level of sprout damage in the grain. It is determined by the time it takes, in seconds, for a stirrer to fall through a slurry of flour and water to the bottom of a test-tube. Falling numbers greater than 350 indicate low enzymatic activity and sound quality wheat. A falling number lower than 200 indicates high enzymatic activity and poor quality wheat. Deoxynivalenol (DON), a vomitoxin, was analyzed using Veratox DON 5/5 Quantitative test from the NEOGEN Corp. This test has a detection range of 0.5 to 5 ppm. Samples with DON values greater than 1 ppm are considered unsuitable for human consumption. The varieties of heirloom winter wheat grown, and their market class, year, and origin, are listed in Table 2. Results were analyzed with an analysis of variance in SAS using the PROC MIXED procedure with the Tukey-Kramer adjustment, which means that each cultivar was analyzed with a pairwise comparison (i.e. 'Turkey Red' statistically outperformed 'Clark's Cream', 'Turkey Red' statistically outperformed 'Gold Drop', etc.). Relationships between variables were analyzed using the GLM procedure.

Table 1. General plot management.

Trial information	Alburgh, VT Borderview Research Farm
Soil type	Benson rocky silt loam
Previous crop	Oats and barley
Seeding Rates (lbs ac⁻¹)	

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 p value is presented for each variable (i.e. yield). A small p-value indicates strong statistical differences between varieties. A large p-value indicates weak statistical differences between varieties. A p value of 0.1 indicates that the differences between varieties are significant at 10% level of probability. Where the p value is 0.1, you can be sure in 9 out of 10 chances that there is a real difference between the varieties. Treatments that were not significantly lower in performance than the highest value in a particular column are indicated with an asterisk.

RESULTS AND DISCUSSION

Seasonal precipitation and temperature recorded at a weather station in Alburgh, VT are shown in Table 3. Temperatures were below average in November of 2014, and March, April, June and July of 2015. Temperatures were higher than normal in October 2014 and May 2015. Although June was wetter than average, it was the only month that was wetter than average, and overall 2014-2015 was a very dry winter wheat growing season (between September 2014 and July 2015, there were 12.76 inches of precipitation less than normal). While few months were warmer than average, overall temperatures were very mild and resulted in 5269 growing degree days (GDD) at a base temperature of 32°F through the

Hybrid 63 was the tallest growing heirloom wheat, which grew 49.2 inches (Table 4). Vermont Read was the shortest growing heirloom wheat, which grew 34.3 inches. Two of the tallest varieties, Sonora and Federation, had no lodging although they were not significantly shorter than the tallest variety. Even with its height, Hybrid 63 was not

Insect and disease scouting was conducted on 12-Jun (data not shown). Research technicians looked for the presence of a variety of foliar diseases, including loose smut, powdery mildew, and *Fusarium* head blight (FHB), as well as the presence of mites or insects and evidence of pest damage.

Thrips are small insects with fringed wings that feed on a variety of plants by puncturing the cells and sucking up the contents. Damage caused by thrips includes discoloration and leaf scarring, reduced growth of the plant, and they can also act as a disease vector. Thrips were observed in 13 of the 34 varieties (Red Russian, Genesee Giant, Gold Drop, Coppei, Kharkov, Pride of Genesee, Sonora, Bacska, Wahsatch, Michicof, Rio, Turkey Red, and Federation). Thrips were present in all three replicates of the Federation variety, and in the other 12 varieties were only present in one of the three replicate plots.

Mites were observed in 29 out of 34 heirloom winter wheat varieties. The varieties that were mite-free are Gold Coin, Triplet, Hybrid 63, Red Russian,

Table 5. Yield and quality of heirloom winter wheat varieties, Alburgh, VT, 2015.

Variety	Yield @ 13.5% moisture	Moisture	Test weight	Crude protein @ 12% moisture	Falling number	DON
	lbs ac ⁻¹	%	lbs bu ⁻¹	%	seconds	

variety from the 2012, 2013 and 2014 trials (Forward, which yielded 2849 lbs ac⁻¹ in 2014) was among the lowest yielding varieties in the 2015 trial.

Test weight is the measure of grain density. It is determined by weighing a known volume of grain. Generally, the heavier the wheat is per bushel, the higher baking quality. Sonora had the highest test weight at 57 lbs bu⁻¹. This was statistically similar to all varieties except Forward, Genesee Giant, and Honor. Sonora, Minard, Turkey Red, Gold Drop, and Russian all had test weights meeting the industry standard of 56-60 lbs bu⁻¹. Of these varieties, Sonora, Minard, Turkey Red, and Russian were also high yielding varieties. Harvest moisture ranged from 9.7% (Lennox) to 19% (Genesee Giant) with an average harvest moisture of 13.5%

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