

2015 Organic Heirloom Spring Wheat Variety Trial

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University of Vermont Extension began its heirloom spring wheat trials in 2007 to determine whether heirloom varieties developed before 1950 could thrive in Vermont's climate. 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 spring wheat varieties that are suitable for production in Vermont's growing conditions. 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 April 2015, heirloom spring wheat variety trials were established at Borderview Research Farm in Alburgh, Vermont. The experimental plot design was a randomized block design with four replications. The seedbed was prepared by conventional tillage methods. All plots were managed with practices similar to those used by producers in the surrounding areas (Table 1). The previous crop was summer annual forages. The field was disked and spike tooth harrowed prior to planting. Plots were seeded with a Great Plains Cone Seeder on 19-Apr at a seeding rate of 350 live seeds per square meter. The varieties of heirloom spring wheat grown, and their origin, pedigree, and release date are listed in Table 2.

Table 1. General plot management of the heirloom spring wheat variety trial, 2015.

Trial information	Heirloom spring wheat variety trial
Location	Alburgh, VT Borderview Research Farm
Soil type	Benson rocky silt loam
Previous crop	Summer annuals
Seeding rate (seeds m⁻²)	350
Replicates	4
Planting date	19-Apr
Harvest date	5-Aug
Harvest area (ft)	5 x 20
Tillage operations	Fall plow, spring disk & spike tooth harrow

Table 2. Varietal information of the heirloom spring wheat, 2015.

Variety	Developed in	Pedigree	Release date
AC Barrie	Sask. Canada	Neepawa/Columbus//BW90	1996
Ceres 05	North Dakota	Marquis/Kota	1926
Champlain	Vermont	Black Sea/Golden Drop	1870
Defiance	Vermont	Golden Drop/White Hamburg	1878
Hope	South Dakota	Yaroslav emmer/Marquis	1927
Komar	North Dakota	Marquis/Kota; Sister selection of Ceres	1930
Ladoga	Leningrad, Rus.	-	1916
Marquis	Ont. Canada	Hard Red Calcutta/Red Fife	1910
Mida 05	North Dakota	Mercury//Ceres/Double Cross	1944
Mida 06	North Dakota	Mercury//Ceres/Double Cross	1944

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

Wheat Yield and Quality

Table 4: Growth and harvest characteristics of heirloom spring wheat for Alburgh, VT, 2015.

Variety	Flowering date	Height	Lodging	Yield at 13.5% moisture	Moisture	Test weight
	Date	in	%	lbs ac ⁻¹	%	lbs bu ⁻¹
AC Barrie	25-Jun*	44.6*	0	957	15.7	55.0*
Ceres 05	24-Jun	43.1*	0	1480*	14.7*	56.3*
Champlain	29-Jun	45.2*	0			

combine and 5 signifying that none of the plot could be harvested. Very little lodging was observed in the 2015 trial. Only two varieties (Hope and Scarlett) exhibited lodging. Of those, each only exhibited lodging on one out of the four replicates and the severity was considered low.

Insect and disease scouting was conducted on 19-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 prevalent and observed on all varieties and in more than 75% of plots.

Mites were observed on three varieties, Hope, Scarlett, and Surprise. In each case, mites were only observed on one of the four replicate plots. Mites are very small arthropods that feed on the sap of leaves of wheat and other grain crops. Leaves affected by mites may appear yellowish or silvery in early stages of infestation and later take on a scorched appearance. Injury caused by mites can result in stunted plants.

Cereal leaf beetle is an invasive species native to Europe that was accidentally introduced to the U.S.

Protein levels ranged from 10.7 to 13.1 percent at 12% moisture. Several varieties (AC Barrie, Ceres 05, Defiance, Ladoga, Marquis, Red Bobs, Red Fife, Reliance, Scarlett, Supreme, and Surprise) had crude protein levels below the 12% crude protein level considered optimal for commercial flour production. Mida 06 had the highest crude protein concentrations but was not significantly different than AC Barrie, Champlain, Hope, Komar, Mida 05, and Spinkcota. All of the varieties grown in Alburgh had high falling numbers over 250 seconds. The average falling number was 312 seconds, which once again indicates low enzymatic activity and sound quality wheat. In this year's trial, all the varieties grown in Alburgh had DON levels above 1.0 ppm, higher than the acceptable levels for human consumption.

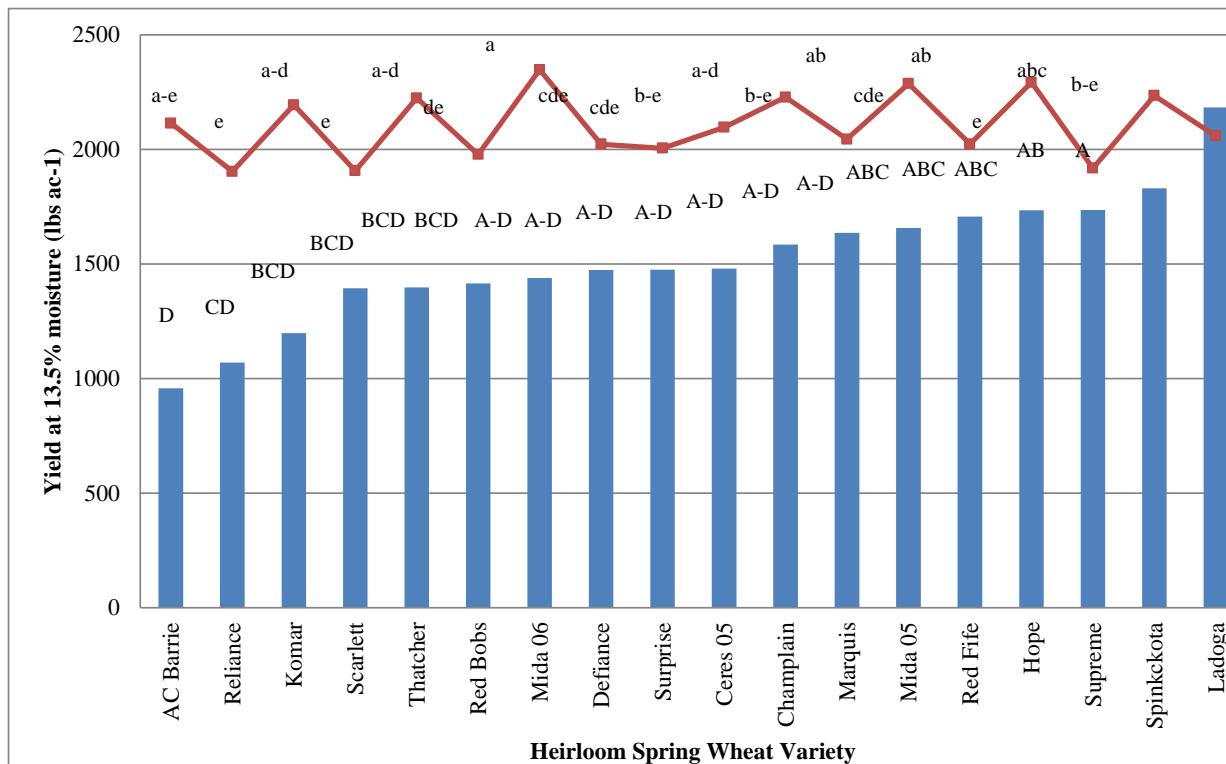


Figure 1. Yield and protein of heirloom spring wheat varieties grown in Alburgh, VT, 2015. Treatments that share a letter did not differ significantly by variety (p=0.10.)

DISCUSSION

Warm temperatures and low precipitation encountered during 2015 contributed to higher yields than in many previous years of heirloom spring wheat trials. However, the warm weather and high precipitation in June were also likely contributors to the high prevalence of foliar disease and accompanying DON levels, which were higher than in many previous years.

There is generally an inverse relationship between yield and protein. As yield increases, protein levels generally decrease, and when yields are low, protein levels are generally high. However, this was not

always the case with the heirloom wheat. Ladoga was the highest yielding heirloom, with a crude protein content of 11.5% at 12% moisture. Several of the other high yielding varieties (Champlain, Spinkcota, Hope, and Mida 05) all had crude protein content above 12% at 12% moisture. This may be evidence that some heirloom varieties are able to outperform modern

