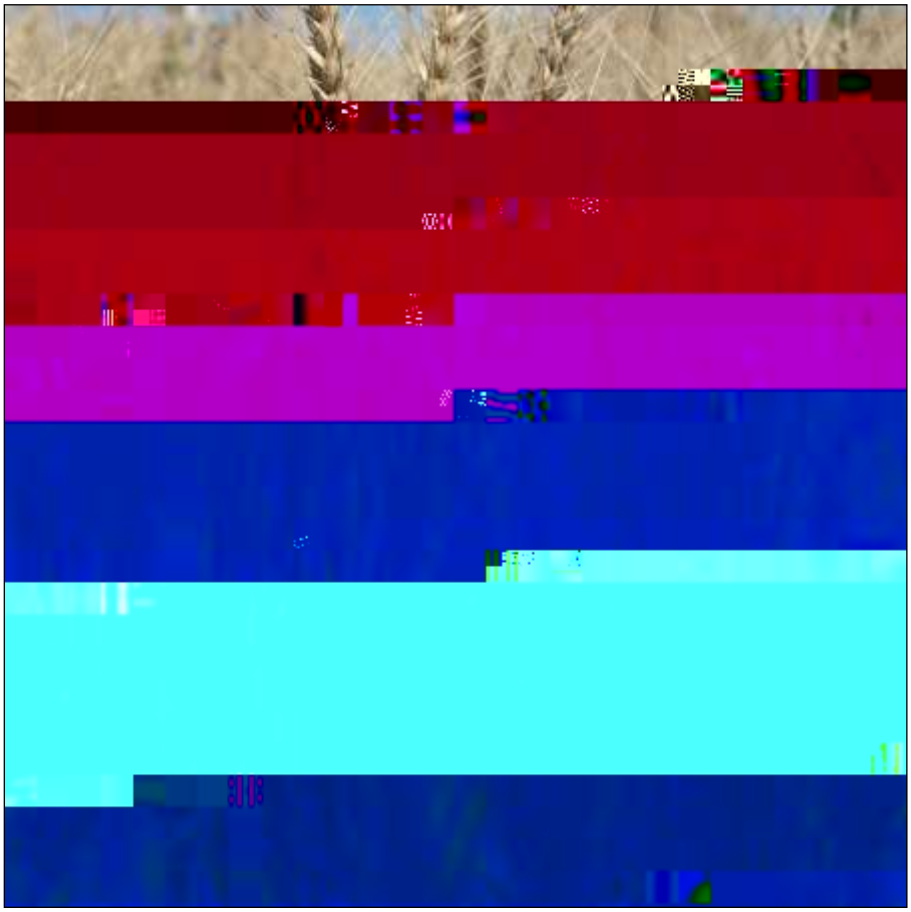
NORTHWEST CROPS & SOILS PROGRAM

# 2016 Organic Spring Wheat Variety Trial



Dr. Heather Darby, UVM Extension Agronomist
Nate Brigham, Julija Cubins, Erica Cummings, Hillary Emick, and Sara Ziegler
UVM Extension Crops and Soils Technicians
(802) 524-6501

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UNIVERSITY OF VERMONT EXTENSION
CULTIVATING HEALTHY COMMUNITIES

**2016 ORGANIC SPRING WHEAT VARIETY TRIAL**

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

In 2016, the University of Vermont Extension Northwest Crops and Soils Program evaluated eighteen hard red spring wheat to determine which varieties thrive in organic production systems. The trial was established at the Borderview Research Farm in Alburgh, Vermont. Several varieties that did not perform well in previous trial years were eliminated from the 2016 variety trial. Newly released varieties were also sought for evaluation.

## MATERIALS AND METHODS

The experimental plot design was a randomized complete block with four replications. Spring wheat varieties evaluated and their sources are listed in Table 1.

**Table 1. Eighteen spring wheat varieties trialed in Alburgh, VT, 2016.**

| Spring wheat varieties | Type | Origin and release year | Seed source |
|---|---|---|---|
| AC Scotia | HR | Semican Inc. | Semican Atlantic Inc., Canada |
| AC Walton | HR | AAFC, PEI, 1995 | 2012 saved trial seed, VT |
| Forefront | HR | SDAES, 2012 | South Dakota State University, SD |
| Glenn | HR | NDAES, 2005 | Albert Lea Seed, MN |
| Kingsey | HR | Semican Inc. | Semican Atlantic Inc., Canada |
| LCS Anchor | HR | Limagrain Cereal Seeds | Limagrain Cereal Seeds, LLC, CO |
| LCS Iguacu | HR | Limagrain Cereal Seeds | Limagrain Cereal Seeds, LLC, CO |
| LCS Nitro | HR | Limagrain Cereal Seeds | Limagrain Cereal Seeds, LLC, CO |
| LCS Prime | HR | Limagrain Cereal Seeds | Limagrain Cereal Seeds, LLC, CO |
| LCS Pro | HR | Limagrain Cereal Seeds | Limagrain Cereal Seeds, LLC, CO |
| LCS Trigger | HR | Limagrain Cereal Seeds | Limagrain Cereal Seeds, LLC, CO |
| Magog | HR | Semican Inc. | Semican Atlantic Inc., Canada |
| Moka | HR | Semican Inc. | Semican Atlantic Inc., Canada |
| Prevail | HR | SDAES, 2014 | South Dakota State University, SD |
| Prosper | HR | NDAES & MAES, 2012 | Albert Lea Seed, MN |
| RB07 | HR | MAES, 2007 | Minnesota Foundation Seed |
| Rocket | HR | Semican Inc. | Semican Atlantic Inc., Canada |
| Sy Rowyn | HR | Syngenta Seeds Inc., 2013 | 2013 saved trial seed, VT |

Abbreviations: AAFC, Agriculture and Agri-Food Canada; HR, hard red wheat; MAES, Minnesota Agricultural Experiment Station; NDAES, North Dakota Agricultural Experiment Station; PEI, Prince Edward Island; and SDAES, South Dakota Agricultural Experiment Station.

The seedbed at the Alburgh location was prepared by conventional tillage methods. All plots were managed with practices similar to those used by producers in the surrounding areas (Table 2). The previous crop planted at the site was a summer annual grown for forage. In April 2016, the field was

disked and spike tooth harrowed to prepare for planting. The plots were seeded with a Great Plains NT60 Cone Seeder on 21-Apr at a seeding rate of 125 lbs $ac^{-1}$ (Image 1). Plot size was 5'x 20'.

**Table 2. General plot management of the spring wheat trial, 2016.**

| | |
|---|---|
| **Location** | Borderview Research Farm<br>Alburgh, VT |
| **Soil type** | Benson rocky silt loam |
| **Previous crop** | Summer annuals |
| **Row spacing (in)** | 6 |
| **Seeding rate (lbs $ac^{-1}$)** | 125 |
| **Replicates** | 4 |
| **Planting date** | 21-Apr |
| **Harvest date** | 9-Aug |
| **Harvest area (ft)** | 5 x 20 |
| **Tillage operations** | Fall plow, spring disk & spike tooth harrow |

In May, wheat populations were determined by taking three one-foot counts per plot. Flowering dates of the wheat were recorded when at least 50% of the spikes were in bloom. Throughout the growing season, other pertinent observations such as disease and wheat development were recorded.

Insect and disease scouting was conducted on 7-Jul. 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 thrips and evidence of insect damage. Five plants in each plot were examined for disease and insect damage.

Grain plots were harvested with an Almaco SPC50 plot combine on 9-Aug. The harvest area was 5' x 20' (Image 2).

Mill. At this time flour was evaluated for its protein content, falling number, and mycotoxin levels. Grains were analyzed for protein content using the Perten Inframatic 8600 Flour Analyzer. Grain protein affects gluten strength and loaf volume. Most commercial mills target 12-15% protein. Protein was calculated on a 12% moisture. The determination of falling number (AACC Method 56-81B, AACC Intl., 2000) was measured on the Perten FN 1500 Falling Number Machine. The falling number is related to the level of sprout damage that has occurred in the grain. It is measured by the time it takes, in seconds, for a stirrer to fall through a slurry of flour and water to the bottom of the 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) analysis 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.

Cereal leaf beetles (*Oulema melanopa* were observed on thirteen of the eighteen varieties not

In the Northeast, *Fusarium* head blight (FHB) is predominantly caused by the species *Fusarium graminearum*. This disease is very destructive and causes yield loss, low test weights, low seed germination and contamination of grain with mycotoxins. A vomitoxin called Deoxynivalenol (DON) is considered the primary mycotoxin associated with FHB. The spores are usually transported by air currents and can infect plants at flowering through grain fill. Eating contaminated grain greater than 1ppm poses a health risk to both humans and livestock. In the 2016 trial, DON levels (Table 7) were significantly lower than in previous years. In the 2015 trial, the mean DON level was 2.53, and in the 2016 trial the mean DON level was 0.12.

Plant populations were not significantly different between varieties (Table 5). The average plant population was 293 plants per $m^2$. The tallest variety was AC Walton

| Variety | Plant population | Plant height |
|---|---|---|
| | $m^2$ | inches |
| AC Scotia | 251 | 29.9* |
| AC Walton | 260 | **31.5** |
| Forefront | **344** | 28.6* |
| Glenn | 323 | 26.4 |
| | 319 | 27.6 |

The highest yielding variety was LCS Nitro (1975 lbs $ac^{-1}$), which was statistically similar to ten other varieties (Table 6; Figure 2). The lowest yielding variety was Moka (847 lbs $ac^{-1}$). The variety with the lowest moisture at the time of harvest was 'Prosper' (11.1%). Rocket, AC Scotia, and 'Kingsey' had not reached optimal grain storage moisture of 14% or less by harvest.

The common measures used by commercial mills to evaluate wheat quality are: grain protein, falling number, test weight, and mycotoxin (DON) content. Varieties differed significantly in terms of crude protein, falling number, and DON (Table 7; Figure 2). LCS Anchor was the variety with the highest percentage of crude protein (16.7%). Other varieties that were significantly similar for protein included, Forefront (16.6%), 'Prevail' (16.2%), 'Glenn' (16.1%), RB07 (15.9%), Sy Rowyn (15.8%), and 'LCS Pro' (15.6%). The variety with the lowest crude protein percentage was 'LCS Trigger' (12.7%). All varieties had protein levels that met or exceeded industry standards of 12-14%. The falling number differed statistically among the varieties. The variety Glenn had the highest test weight of 59.5 lbs $bu^{-1}$. AC Scotia was the only one of the 18 spring wheat varieties trialed that did not reach the optimal 56 to 60 lb $bu^{-1}$ test weight for wheat, it was at 53.8 lbs $bu^{-1}$. All of the spring wheat varieties trialed were below the FDA's 1ppm DON limit (Table 7). The lowest DON level in Alburgh was LCS Trigger

**Table 6. Harvest data of the 18 spring wheat varieties, Alburgh, VT, 2016.**

| Variety | Yield @13.5% moisture | Harvest moisture | Test weight |
|---|---|---|---|

**Table 7. Quality results of the 18 spring wheat varieties, Alburgh, VT, 2016.**

| Variety | Crude protein @ 12% moisture | Falling number @ 14% moisture | DON |
|---|---|---|---|

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