NORTHWEST CROPS & SOILS PROGRAM

2013
Organic Spring Wheat Variety Trial

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UNIVERSITY OF VERMONT EXTENSION
CULTIVATING HEALTHY COMMUNITIES

2013 ORGANIC SPRING WHEAT VARIETY TRIAL

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In April of 2013, the University of Vermont Extension, in collaboration with the University of Maine, began the fourth year of extensive organic variety trials evaluating hard red spring wheat in order to determine which varieties thrive in our northern climate. The trials were established at the Borderview Research Farm in Alburgh, Vermont and at Cornell University's Willsboro Research Farm in Willsboro, New York. Several varieties that did not perform well in previous trial years were eliminated from the 2013 variety trials. This trial is one of several in a USDA Organic Research Education Initiative grant focused on the production of high quality organic bread wheat in New England.

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. Spring wheat varieties planted in Alburgh, VT and Willsboro, NY.

Spring Wheat Varieties	Type†	Origin and Release Year‡	Seed Source
AC Barrie	HR	AAFC, Saskatchewan, 1994	Semences RDR, Canada
AC Walton	HR	AAFC, PEI, 1995	Grand Falls Milling Co., Canada
Advance	HR	SDAES, 2011	South Dakota State University, SD
Barlow	HR	NDAES, 2009	North Dakota Foundation Seed
Brick	HR	SDAES, 2000	North Dakota Foundation Seed
Faller	HR	NDAES, 2007	Albert Lea Seed House, MN
Forefront	HR	SDAES, 2012	South Dakota State University, SD
Glenn	HR	NDAES, 2005	Albert Lea Seed, MN
Jenna	HR	Agripro Syngenta, 2009	Syngenta, ND
Kaffé	SW	Semican, Canada	2011 Saved trial seed, VT
Magog	HR	Semican Inc.	Semican Atlantic Inc., Canada
McKenzie	HR	SWP/ARD, Saskatchewan, 1997	2012 Saved trial seed, VT
Megantic	HR	SynAgri, 2008	Semences RDR, QUE
Prosper	HR	NDAES & MAES, 2012	Albert Lea Seed, MN
RB07	HR	MAES, 2007	Minnesota Foundation Seed
Red Fife	HR	Heritage var., ca. 1860	Ehnes Organic Seed Cleaning Ldt., Canada
Roblin	HR	ACRS, Winnipeg, 2001	2011 Saved trial seed, ME
Superb	HR	AAFC, Winnipeg, 2001	Seedway, VT
Sy Rowyn	HR	Sygenta Seeds Inc., 2013	Syngenta, ND
Sy Soren	HR	Agripro Syngenta, 2011	Albert Lea Seed House, MN
Tom	HR	MAES, 2008	Minnesota Foundation Seed
Yorkton	HR	Western Canada, 2013	Semican, Canada

† HR = hard red, SW = soft white‡ Year of release was not always available. Abbreviations: ACRS = Agriculture Canada Research Station, AAFC = Agriculture and Agri-Food Canada, MAES = Minnesota Agricultural Experiment Station, NDAES = North Dakota Agricultural Experiment Station, NPSAS = Northern Plains Sustainable Agriculture Society, PEI = Prince Edward Island, SDAES = South Dakota Agricultural Experiment Station, NDSU = North Dakota State University, SWP = Saskatchewan Wheat Pool, ARD = Agricultural Research and Development.

The seedbed at both the Alburgh and Willsboro locations were 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 Alburgh site was corn. In April 2013, the field was disked and spike tooth harrowed to prepare for planting. The

plots in Alburgh were seeded with a Great Plains NT60 Cone Seeder on 22-Apr at a seeding rate of 350 live seeds per square meter. Plot size was 5'x 20'. At the Willsboro location, the planting of spring wheat followed the 2012 winter wheat variety trial, prior to that there was a 3 year crop of alfalfa/timothy sod. In April of 2013, the field was disked and spike tooth harrowed to prepare for the spring wheat variety trial planting. The plots were seeded on 23-Apr with a custom made eight-row cone planter at 350 live seeds per square meter. Plot size was 6' x 16.5'.

Table 2. General plot management of the spring wheat trials.

Trial Information	**Spring wheat variety trial**	
Location	Alburgh, VT Borderview Research Farm	Willsboro, NY Willsboro Research Farm
Soil type	Benson rocky silt loam	Kingsbury silt clay loam
Previous crop	Corn	Winter wheat
Row spacing (in)	6	6
Seeding rate (live seed/m^2)	350	350
Replicates	4	4
Planting date	22-Apr	23-Apr
Harvest date	5-Aug	16-Aug
Harvest area (ft)	5 x 20	4 x 13
Tillage operations	Fall plow, spring disk & spike tooth harrow	Fall plow, spring disk & spike tooth harrow

Population and vigor were measured on 22-May in Alburgh and 8-May in Willsboro. Populations were determined by taking three, 0.3 meter counts per plot.

Flowering dates of the wheat were recorded at the Alburgh site, when at least 50% of the spikes were in bloom. Flowering dates were not recorded at the Willsboro location. Throughout the growing season other pertinent observations such as disease and wheat development were recorded.

Grain plots were harvested at the Alburgh site with an Almaco SPC50 plot combine on 5-Aug, the harvest area was 5' x 20'. In Willsboro, plots were harvested on 16-Aug with a Hege plot combine; the plot area harvested was 4'x 13'. At the time of harvest, plant heights were measured excluding the awns. A visual estimate of the percentage of lodged plants and the severity of lodging was recorded based on a visual rating with a 0 – 5 scale, where 0 indicates no lodging and 5 indicates severe lodging and a complete crop loss. In addition, grain moisture, test weight, and yield were calculated.

Following harvest, seed was cleaned with a small Clipper cleaner (A.T. Ferrell, Bluffton, IN). An approximate one pound subsample was collected to determine quality. Quality measurements included standard testing parameters used by commercial mills. Test weight was measured by the weighing of a known volume of grain. Generally the heavier the wheat is per bushel, the higher baking quality. The acceptable test weight for bread wheat is 56-60 lbs per bushel. Once test weight was determined, the samples were then ground into flour using the Perten LM3100 Laboratory 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 and 14% moisture basis. 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

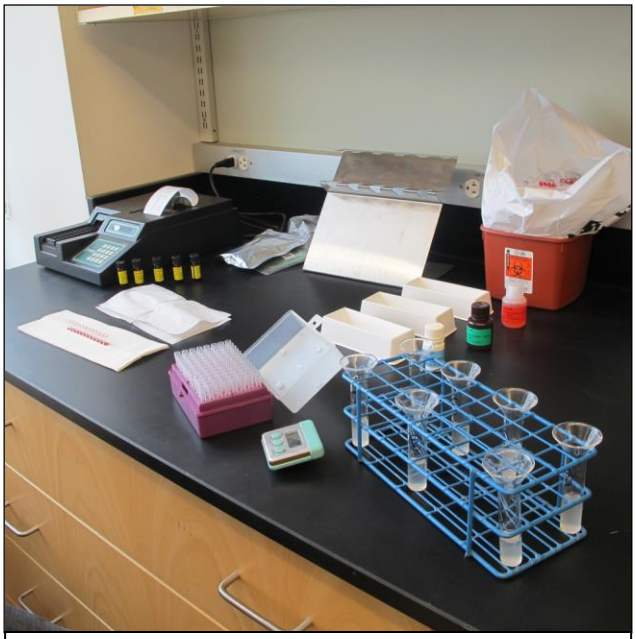

Image 1. DON analysis of wheat samples at the UVM Cereal Testing laboratory- Burlington, VT.

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 (Image 1).

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 ($P< 0.10$). There were significant differences among the two locations for most parameters and therefore data from each location is reported independently.

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 example below, 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.

Variety	Yield
A	3161
B	3886*
C	**4615***
LSD	**889**

RESULTS

Seasonal precipitation and temperature recorded at weather stations in close proximity to the 2013 sites are shown in Table 3. The growing season this year was marked by lower than normal temperatures in April, June, and August and higher than normal rainfall in the months of May and June. From April to August, there was an accumulation of 4510 Growing Degree Days (GDDs) in Alburgh which is 18 GDDs higher than the 30 year average. In Willsboro, from April through August, there were 4106 accumulated GDDs, which is 229 GDDs more than the long-term average.

Table 3. Temperature and precipitation summary for Alburgh, VT and Willsboro, NY, 2013.

Alburgh, VT	April	May	June	July	August
Average temperature (°F)	43.6	59.1	64.0	71.7	67.7
Departure from normal	-1.20	2.70	-1.80	1.10	-1.10
Precipitation (inches)	2.12	4.79	9.23	1.89	2.41
Departure from normal	-0.70	1.34	5.54	-2.26	-1.50
Growing Degree Days (base 32°F)	348	848	967	1235	1112
Departure from normal	-35.5	91.4	-47.0	36.8	-27.2

Based on weather data from a Davis Instruments Vantage Pro2 with WeatherLink data logger.
Historical averages are for 30 years of NOAA data (1981-2010) from Burlington, VT.
ł June 2013 precipitation data based on National Weather Service data from cooperative stations in South Hero, VT. (http://www.nrcc.cornell.edu/page_summaries.html)

Willsboro, NY	April	May	June	July	August
Average temperature (°F)	44.8	60.7	66.5	73.8	69.4
Departure from normal	0.00	4.30	0.70	3.20	0.60
Precipitation (inches)	2.05	8.74	9.86	4.49	3.07
Departure from normal	-0.77	5.29	6.17	0.34	-0.84
Growing Degree Days (base 32°F)	383	890	1034	1253	1161
Departure from normal	-1.50	133.3	19.5	54.3	21.7

Based on Northeast Region Climate Center data from observation stations in Burlington, VT.
Historical averages for 30 years of NOAA data (1981-2010).

Spring Wheat Growth and Development:

During the 2013 growing season, several observations and measurements were recorded on spring wheat development. The flowering date was recorded at the Alburgh location when at least 50% of the plot was in bloom for each of the varieties (Table 4). The majority of the varieties at the Alburgh location were in full bloom by 24-Jun (Image 2). In general, there was minimal bird damage in Alburgh. However, heavy bird damage was observed in several plots at the Willsboro location (Image 3). Several varieties in both locations were observed to have lodged to varying degrees. In Alburgh five varieties, Red Fife, McKenzie, Megantic, Prosper, and Yorkton, had lodging severe enough to impact harvest ability. There were seven varieties, Superb, Faller, Kaffé, McKenzie, Megantic, Prosper, and Sy Rowyn, in Willsboro that had severe lodging. Overall, there was high weed pressure at the both site locations.

Table 4. The flowering dates of 22 spring wheat varieties in Alburgh, VT.

Variety	Alburgh, VT Flowering Date
AC Barrie	1-Jul
AC Walton	1-Jul
Advance	24-Jun
Barlow	21-Jun
Brick	21-Jun
Faller	1-Jul
Forefront	21-Jun
Glenn	21-Jun
Jenna	24-Jun
Kaffe	1-Jul
Magog	1-Jul
McKenzie	24-Jun
Megantic	24-Jun
Prosper	24-Jun
RB07	24-Jun
Red Fife	1-Jul
Roblin	21-Jun
Superb	24-Jun
Sy Rowyn	24-Jun
Sy Soren	24-Jun
Tom	24-Jun
Yorkton	1-Jul

Image 2. Flowering spring wheat, Alburgh, VT

Image 3. Bird ravaged plot, Willsboro, NY

Several foliar diseases were observed during wheat development at both trial locations including; Powdery Mildew (*Erysiphe graminis f. sp. Tritici*) (Image 4), Ascochyta Leaf Spot (*Didymella exitialis*), and Leaf Rust (*Puccinia recondite*) (Image 5). This was the first record of leaf rust in Vermont. Foliar diseases reduce photosynthetic leaf area, use nutrients, and increase respiration and transpiration within colonized host tissues. The diseased plant typically exhibits reduced vigor, growth and seed fill. The earlier occurrence, greater degree of host susceptibility, and longer duration of conditions favorable for disease development will increase the yield loss.

Loose smut caused by the fungus, *Ustilago tritici*, was observed at both locations. At the Alburgh location, eleven varieties, AC Barrie, Barlow, Glenn, Kaffé, McKenzie, Megantic, RB07, Roblin, Sy Soren, Tom, and Red Fife, had infected plants. The loose smut fungus is carried as dormant mycelium within healthy-looking seed and is spread by planting infected seed. A smut-infected seed or plant cannot be distinguished from an uninfected one until the head starts to emerge. The disease is most obvious just after the time of heading by the characteristic dusty black appearance of diseased heads. The spores are dispersed by the wind during wheat flowering and can infect healthy plants.

Image 4. Wheat infected with powdery mildew, Alburgh, VT

Image 5. Wheat infected with leaf rust, Alburgh, VT

There were several observations of bleached grain heads in most of the plots in Alburgh and Willsboro which is associated with the presence of *Fusarium* head blight. 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.

Plant heights were significantly different among varieties at both locations (Table 5). Red Fife was the tallest variety at the Alburgh location, measuring 46.6 inches. McKenzie and Megantic were other tall varieties in Alburgh. In Willsboro, the tallest variety was Megantic at 40.6 inches. Additional tall varieties at this location included, AC Walton, Kaffé, Magog, McKenzie, and Red Fife. Not surprisingly, several of the tall varieties at both sites had severe lodging however, several shorter varieties were observed to have lodged as well.

Image 6. 2013 Spring wheat harvest, Alburgh, VT

Table 5. Plant heights in Alburgh, VT and Willsboro, NY.

Variety	Alburgh, VT **Plant height**	Willsboro, NY **Plant height**
	inches	inches
AC Barrie	40.6	36.5
AC Walton	43.5	40.5*
Advance	33.4	28.9
Barlow	34.2	32.4
Brick	37.6	36.0
Faller	35.8	32.7
Forefront	40.3	36.7
Glenn	38.9	33.6
Jenna	33.6	26.2
Kaffe	42.3	39.1*
Magog	43.3	38.1*
McKenzie	44.3*	38.2*
Megantic	44.8*	**40.6***
Prosper	36.4	34.1
RB07	34.5	29.9
Red Fife	**46.6***	40.5*
Roblin	43.7	36.5
Superb	34.9	32.4
Sy Rowyn	31.0	28.4
Sy Soren	29.4	26.8
Tom	34.9	32.3
Yorkton	42.3	36.4
LSD (0.10)	2.69	3.33
Trial Mean	38.5	34.4

Values shown in **bold** are of the highest value or top performing.
*Wheat varieties that are not significantly different than the top performing variety in a column are indicated with an asterisk.

<u>Spring Wheat Yields and Quality</u>:

The 2013 yields were lower than those in 2012 (Image 6). The mean yield at the Alburgh site was 1889 lbs ac^{-1}, 1500 lbs ac^{-1} less than the average yield in 2012. The mean yield in Willsboro was even lower at 1309 lbs ac^{-1}, approximately 2000 lbs ac^{-1} less than 2012 mean yield. The highest yielding variety in Alburgh was AC Walton (2782 lbs ac^{-1}) and in Willsboro, Forefront (2314 lbs ac^{-1}) yielded the highest (Table 6, 7 and Figure 1, 2). Other top yielding varieties at the Alburgh location include Sy Rowyn, Faller, Forefront, Brick, Jenna, and Tom. In Willsboro, additional top yielders were

Prosper, Brick, Barlow, Faller, McKenzie, and Sy Rowyn. The lowest yielding variety in Alburgh was Red Fife (1057 lbs ac^{-1}) and in Willsboro it was AC Barrie (413 lbs ac^{-1}). The variety with the lowest moisture at the time of harvest was Roblin (9.98%) in Alburgh. The lowest moisture at the Willsboro trial site was Glenn (14.0 %). All of the varieties harvested in Willsboro had to be dried down to below 14% moisture, necessary for optimal grain storability. In Alburgh, Megantic had the highest test weight of 58.5 lbs bu^{-1}. Thirteen of the 22 spring wheat varieties trial did not reach the optimal 56 to 60 lb bu^{-1} test weight for wheat in Alburgh. Test weights could not be determined at the Willsboro site.

Table 6. Harvest data of the 22 spring wheat, Alburgh, VT.

Variety	Yield @13.5% moisture	Harvest moisture	Test weight
	lbs ac^{-1}	%	lbs bu^{-1}
AC Barrie	1090	11.9*	56.6
AC Walton	**2782***	16.1	52.9
Advance	2046	15.1	57.0*
Barlow	1819	15.3	58.3*
Brick	2363*	13.7	56.8
Faller	2503*	15.1	56.3
Forefront	2404*	13.7	57.4*
Glenn	1474	15.2	55.8
Jenna	2340*	12.5*	53.9
Kaffe	1630	14.9	53.5
Magog	2032	12.0*	55.9
McKenzie	1062	11.1*	54.9
Megantic	1375	12.3*	**58.5***
Prosper	1924	13.5	54.6
RB07	2132	11.4*	55.0
Red Fife	1057	19.4	53.3
Roblin	1416	**9.98***	54.8
Superb	1661	11.9*	55.0
Sy Rowyn	2563*	13.4	56.5
Sy Soren	2007	11.3*	56.3
Tom	2304*	15.7	55.5
Yorkton	1582	11.9*	55.3
LSD (0.10)	520	2.98	1.66
Trial Mean	1889	13.5	55.6

Table 7. Harvest data of the 22 spring wheat, Willsboro, NY.

Variety	Yield @13.5% moisture	Harvest moisture
	lbs ac^{-1}	%
AC Barrie	413	18.7
AC Walton	538	18.5
Advance	1322	16.8*
Barlow	1986*	14.3*
Brick	2047*	16.6*
Faller	1865*	17.8
Forefront	**2314***	15.6*
Glenn	1413	**14.0***
Jenna	1546	15.6*
Kaffe	959	18.6
Magog	677	17.6
McKenzie	1737*	14.3*
Megantic	1005	16.7*
Prosper	2143*	14.5*
RB07	1338	16.2*
Red Fife	453	20.5
Roblin	954	18.6
Superb	1129	17.1
Sy Rowyn	1693*	18.2
Sy Soren	1485	15.8*
Tom	1296	17.4
Yorkton	482	17.8
LSD (0.10)	719	3.06
Trial Mean	1309	16.9

Values shown in bold are of the highest value or top performing.

* Wheat varieties that are not significantly different than the top performing variety in a column are indicated with an asterisk.

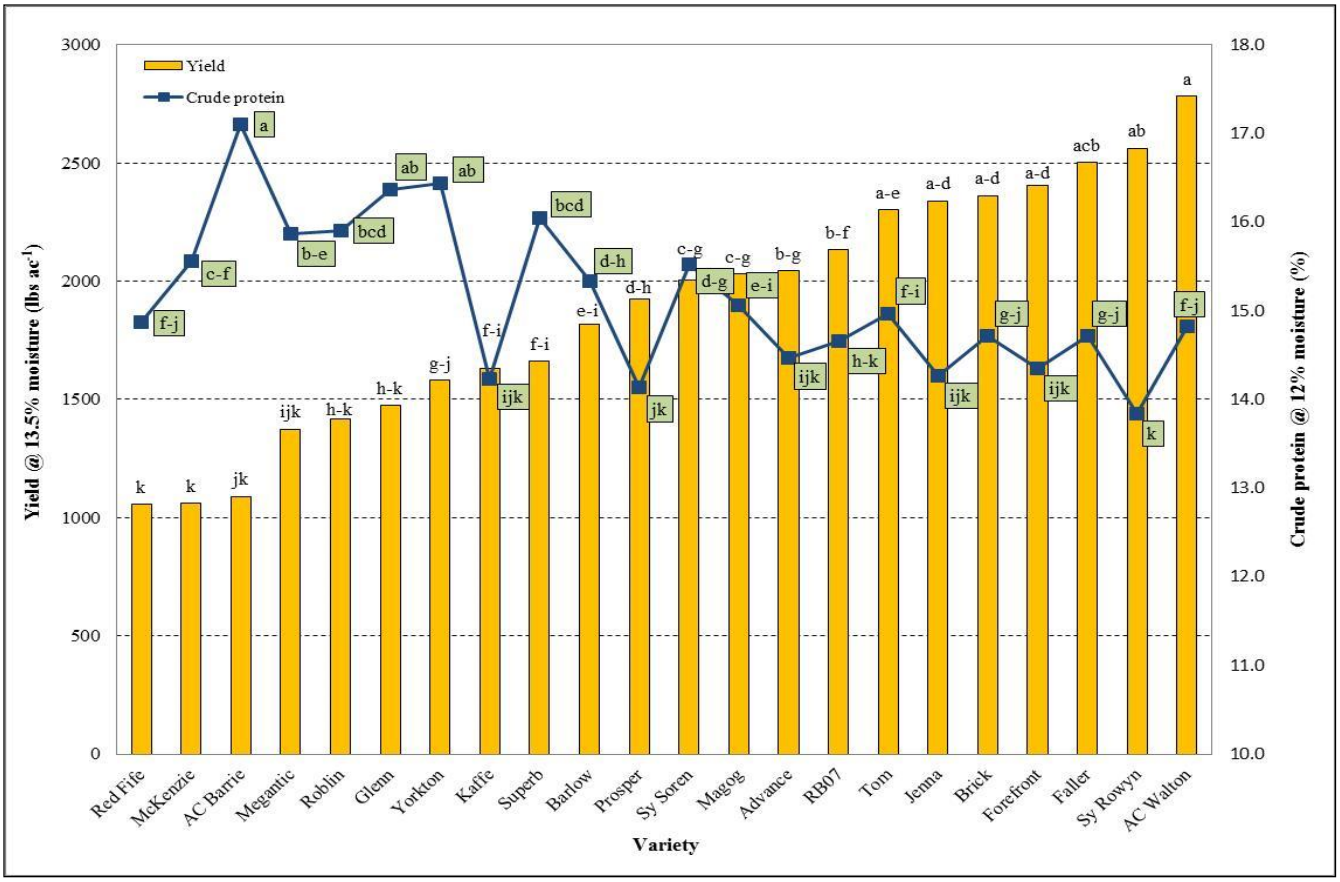

Figure 1. Yield and protein concentrations of 22 spring wheat varieties, Alburgh, VT.
Varieties with the same letter did not differ significantly.

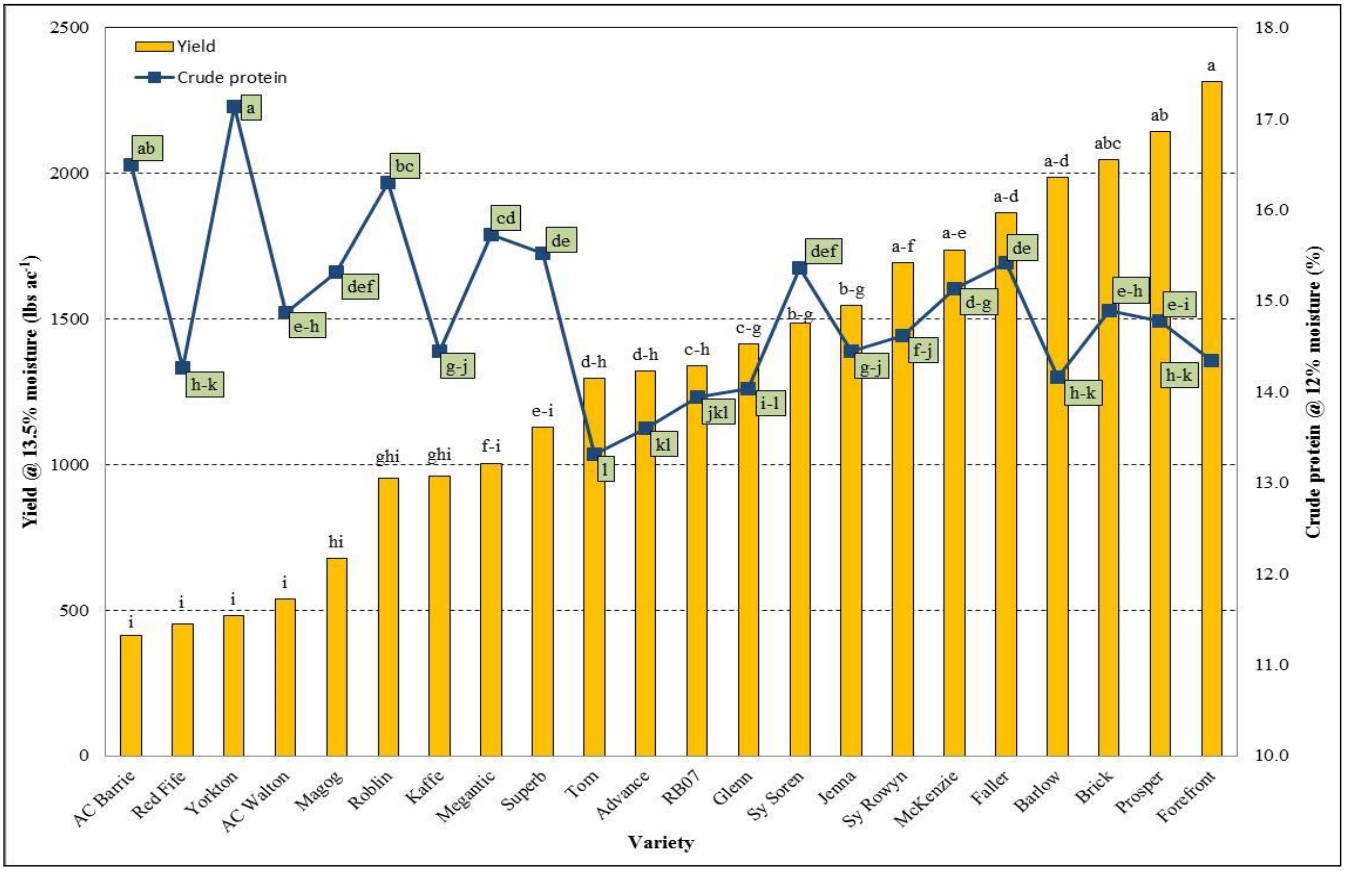

Figure 2. Yield and protein concentrations of 22 spring wheat varieties, Willsboro, NY.
Varieties with the same letter did not differ significantly

The common measures used by commercial mills to evaluate wheat quality are: grain protein, falling number, test weight, and mycotoxin (DON) content. The variety with the highest protein content in Alburgh was AC Barrie (17.1%) and in Willsboro, Yorkton was the highest (17.1%) (Table 8, 9 and Figure 3, 4). All varieties at both trial locations had protein levels that met or exceeded industry standards of 12-14%. All of the falling numbers in Alburgh were above 250 seconds. The highest falling number in Alburgh was Tom (403 seconds) and in Willsboro, McKenzie had the highest falling number (362 seconds). Other varieties from both locations with high falling numbers were AC Barrie, Magog, Megantic, Sy Rowyn, and Yorkton. Kaffé from the Willsboro site had the lowest falling number (117 seconds) indicating sprout damage. Almost every variety had acceptable protein and falling number levels based on mill standards. DON levels were extremely high this year. All of the 22 spring wheat varieties trialed in Alburgh were above the FDA's 1ppm limit and in Willsboro, 20 of the 22 were above 1ppm (Figure 3 and 4). The lowest DON level in Alburgh was Megantic (2.75 ppm) and at the Willsboro site the lowest DON level was Yorkton (0.90 ppm). Interestingly, the mean DON level at the Willsboro location (1.76 ppm) was 3.21 ppm less than the trial mean at the Alburgh site (4.97 ppm).

Table 8. Quality analyses of the 22 spring wheat varieties, Alburgh, VT.

Variety	Crude protein @ 12% moisture	Crude protein @ 14% moisture	Falling number @ 14% moisture	DON
	%	%	seconds	ppm
AC Barrie	**17.1***	**16.7***	396*	3.70*
AC Walton	14.8	14.5	361*	5.54
Advance	14.5	14.1	275	5.20
Barlow	15.3	15.0	261	4.95
Brick	14.7	14.4	326	6.15
Faller	14.7	14.4	344	3.55*
Forefront	14.3	14.0	314	4.20*
Glenn	16.4*	16.0*	282	6.13
Jenna	14.3	13.9	262	6.03
Kaffe	14.2	13.9	297	8.00
Magog	15.1	14.7	394*	4.90
McKenzie	15.6	15.2	345	3.98*
Megantic	15.9	15.5	393*	**2.75***
Prosper	14.1	13.8	326	5.20
RB07	14.7	14.3	276	3.55*
Red Fife	14.9	14.5	253	4.10*
Roblin	15.9	15.5	344	8.53
Superb	16.0	15.7	309	6.95
Sy Rowyn	13.8	13.5	391*	3.15*
Sy Soren	15.5	15.2	318	4.85
Tom	15.0	14.6	**403***	4.08*
Yorkton	16.4*	16.1*	392*	3.83*
LSD (0.10)	0.83	0.81	42.1	1.67
Trial Mean	15.1	14.8	330	4.97

Table 9. Quality analyses of the 22 spring wheat varieties, Willsboro, NY.

Variety	Crude protein @ 12% moisture	Crude protein @ 14% moisture	Falling number @ 14% moisture	DON
	%	%	seconds	ppm
AC Barrie	16.5*	16.1*	339*	1.35*
AC Walton	14.9	14.5	313	1.40*
Advance	13.6	13.3	313	1.91
Barlow	14.2	13.8	322	1.98
Brick	14.9	14.6	343*	2.00
Faller	15.4	15.1	333*	1.83
Forefront	14.3	14.0	346*	1.53*
Glenn	14.0	13.7	333*	1.40*
Jenna	14.4	14.1	289	2.60
Kaffe	14.4	14.1	117	2.68
Magog	15.3	15.0	347*	0.95*
McKenzie	15.1	14.8	**362***	1.93
Megantic	15.7	15.4	347*	1.50*
Prosper	14.8	14.4	344*	1.80
RB07	13.9	13.6	305	1.33*
Red Fife	14.3	13.9	251	1.58*
Roblin	16.3	15.9	282	4.08
Superb	15.5	15.2	320	2.38
Sy Rowyn	14.6	14.3	360*	1.18*
Sy Soren	15.4	15.0	347*	1.28*
Tom	13.3	13.0	361*	1.25*
Yorkton	**17.1***	**16.7***	343*	**0.90***
LSD (0.10)	0.76	0.74	34.2	0.84
Trial Mean	14.9	14.6	319	1.76

Values shown in **bold** are of the highest value or top performing.

* Wheat that did not perform significantly lower than the top performing variety in a particular column are indicated with an asterisk.

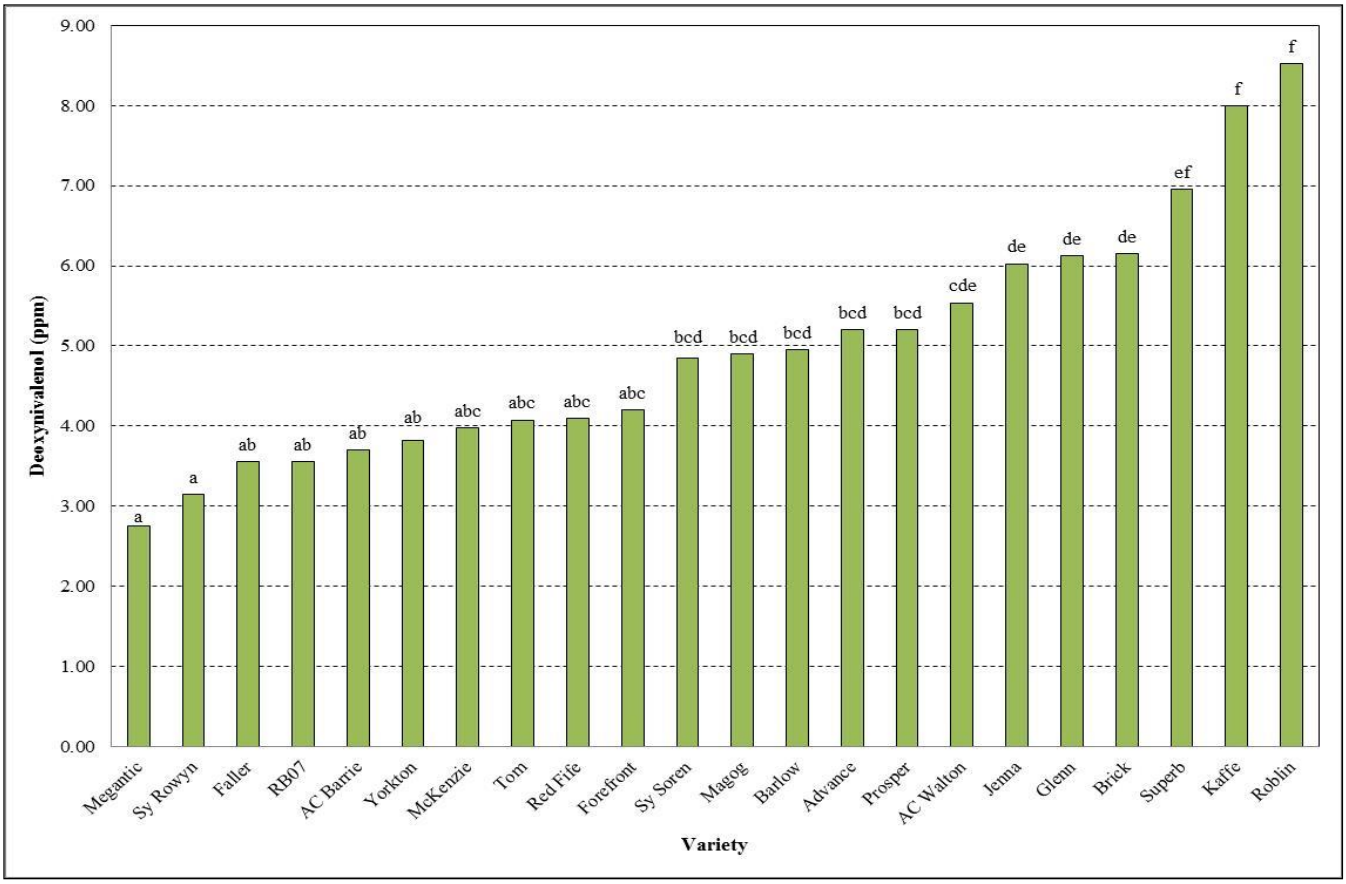

Figure 3. Deoxynivalenol (DON) concentrations of 22 spring wheat varieties, Alburgh, VT.
Varieties with the same letter did not differ significantly.

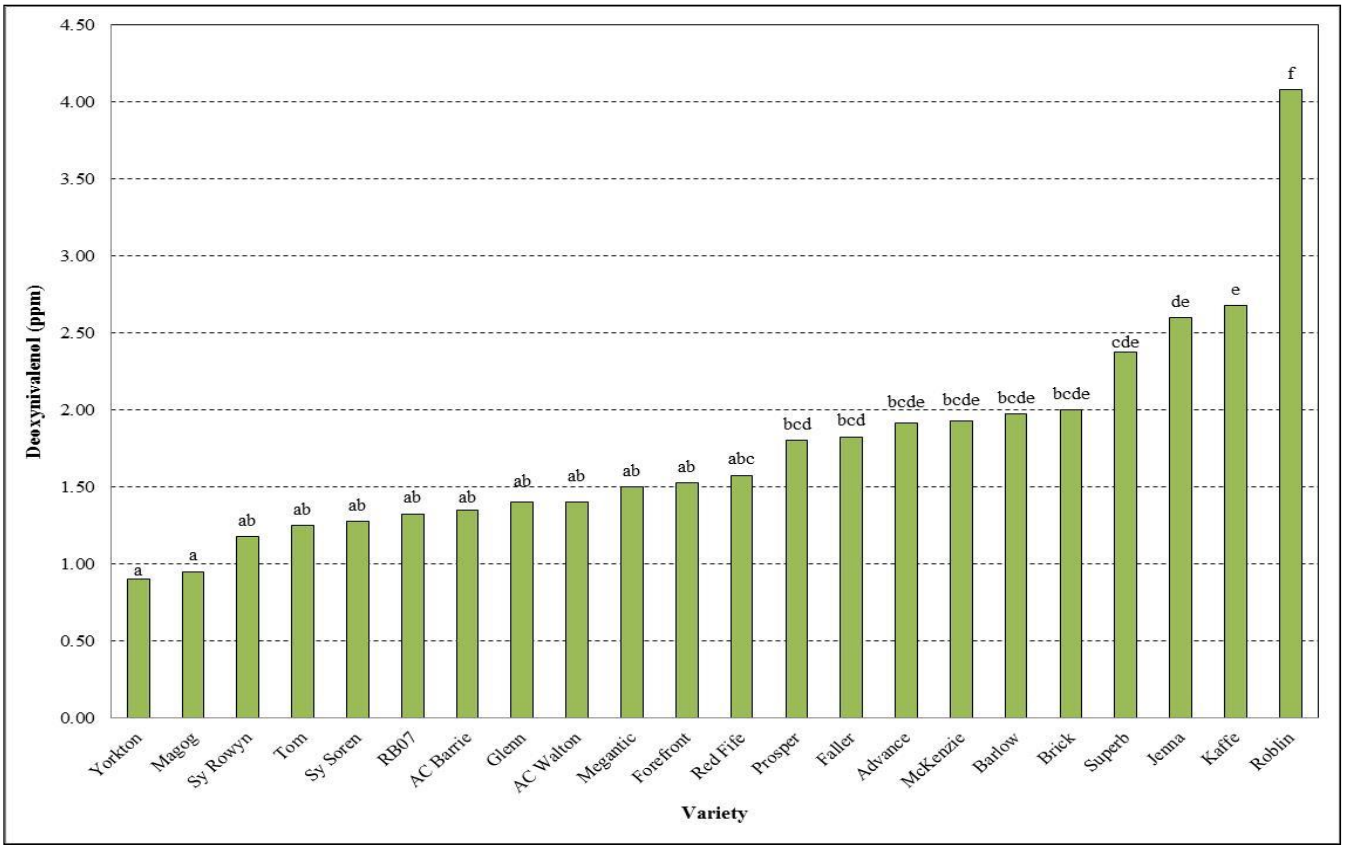

Figure 4. Deoxynivalenol (DON) concentrations of 22 spring wheat varieties, Willsboro, NY.
Varieties with the same letter did not differ significantly.

DISCUSSION

It is important to remember that the results only represent one year of data. The 2013 growing season was by far one of the most challenging in recent history due to the excessive rains during key periods of wheat development. The wet weather in May and June brought an excess of 7 inches of rain to Alburgh and approximately 11 inches above the long-term averages in Willsboro. The rains started soon after planting which saturated the plots during early wheat development impacting stand establishment and plant tillering. This could explain the increase in weed pressure observed at both trial locations which could have contributed to the reduction in grain yields this season. Extremely low yields at Willsboro were also likely a result of poor stand establishment in the early season.

There was more lodging observed at both locations this year than in 2012. This could be due to the heavy rains leaching needed plant nutrients away from the plant consequently weakening plant structure. Also, the heavy rains were often accompanied by high winds which may have contributed to the increased lodging.

In addition, the long periods of wetness created the ideal conditions for fungus growth resulting in a plethora of small grain diseases. Plant leaf diseases are not uncommon but the extent of infection and the number of diseases observed in 2013, were severe enough to have impacted grain yield and quality. However, the most damaging disease this year was Fusarium head blight (FHB) (*Fusarium graminearum*). The continued heavy rains and cool temperatures during flowering provided the perfect conditions for FHB to thrive. A high incidence of premature bleached grain heads and salmon colored spikelets, were observed throughout both trial locations. The infection resulted in some of the highest levels of the mycotoxin deoxynivalenol (DON) seen to date in the Northeast. Interestingly, Willsboro had significantly lower DON levels than the Alburgh trial location which could be attributed to later flowering dates in Willsboro.

Although 2013 was one of the most difficult years for growing wheat, it does provide the opportunity to observe the FHB susceptibility of the different varieties. A variety that can maintain lower levels of FHB infection during such a year certainly indicate it's strength for being grown in the northeast. It is important to note that the variety Roblin had the highest DON levels at both locations and is likely a variety that is risky to grow in this climate.

It is important, as you make variety choices on your farm, that you evaluate data from test sites that are as similar to your region as possible.

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