UNIVERSITY OF VERMONT EXTENSION

CULTIVATING HEALTHY COMMUNITIES

2009
Wheat Trials

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2009 VERMONT WHEAT VARIETY PERFORMANCE TRIALS

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In 2009, the University of Vermont Extension conducted winter and spring wheat variety trials at the Borderview Research Farm in Alburgh, Vermont. In addition, an heirloom spring wheat variety trial was planted in North Troy. This was the third year of the heirloom wheat project; its primary purpose is to increase the amount of heirloom wheat seed in the region, while at the same time assessing each cultivar's growth and quality characteristics. Due to the increasing demand for locally grown cereal grains, many of the cereal trials focused on grains grown for a foodgrade market.

WINTER & SPRING WHEAT VARIETY TRIALS

The experimental plot design at the Alburgh location was a randomized complete block with four replications. Wheat varieties evaluated are listed in table 1.

Table 1. Spring and winter wheat varieties planted in Alburgh.

Seed Source	Species	
	Type	**Variety**
Winter Wheat Varieties		
SemiCan	Hard Red	Borden
Semences Nicolet	Hard Red	AC Zorro
Advantage Seeds	Hard Red	AC Morley
ProGrain	Hard Red	Maxine
SemiCan	Hard Red	Warthog
Agriculver/Seedway	Hard Red	Harvard
Spring Wheat Varieties		
Semican	Hard Red	AC Barrie
JGL Inc.	Durum	Hallmark
JGL Inc.	Hard Red	Propel
Albert Lea Seed House	Hard Red	Glenn
JGL Inc.	Hard Red	Sable
JGL Inc.	Hard Red	AC Norwell
Semican	Hard Red	AC Walton
ProGrain	Hard Red	AC Brio
JGL Inc.	Durum	SD7006J
JGL Inc.	Hard White	HWS9258J
Albert Lea Seed House	Hard Red	Steele

WEATHER DATA

Seasonal precipitation and temperature recorded at weather stations in close proximity to the 2009 sites are shown in Table 2. This growing season brought cooler temperatures and higher than normal rainfall patterns across the region. The cooler temperatures and increased precipitation encouraged fungal pathogens and increased weed populations.

Table 2. Temperature and precipitation summary, 2009.

Alburgh	April	May	June	July	August	September	October
Average Temperature	44.9	53.9	62.8	65.9	67.7	57.7	44.1
Departure from Normal	+1.4	-2.7	-3.0	-5.2	-1.3	-2.7	-4.7
Precipitation	2.89	6.32	5.19	8.07	3.59	4.01	5.18
Departure from Normal	+0.38	+3.39	+1.98	+4.66	-0.26	+0.55	+0.79
Growing Degree Days (32˚)	406	680.5	923.5	1052.5	1107	771	395.5
Departure from Normal	+61.0	-82.1	-90.5	-158.1	-40.0	-81.0	-125.3

Based on National Weather Service data from cooperative observer stations in close proximity to field trials. Historical averages are for 30 years of data (1971-2000)

CULTURAL PRACTICES

The seedbed at each location was prepared by conventional tillage methods. All plots were managed with practices similar to those used by producers in the surrounding areas (Table 3). The plots in Alburgh were seeded with a John Deere Seed Drill and with a Carter Cone Seeder in North Troy. Grain plots were harvested with an Almaco SP50 plot combine. Yield, moisture, test weight and/or crude protein were recorded. 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 ($P< 0.10$).

Table 3. General plot management of the wheat trials.

Trial Information	Winter wheat variety trial	Spring wheat variety trial
Location	Alburgh, VT Borderview Farm	Alburgh, VT Borderview Farm
Soil type	Silt loam	Silt loam
Previous crop	Sweet corn	Soybeans
Plot size (ft.)	5x20	5x20
Seeding rate	150 lbs/acre	161 lbs/acre
Replicates	3	3
Planting date	9-19-08	4-16-09
Harvest date	7-21-09	8-10-09
Tillage operations	Fall Plow	Spring Plow

WINTER WHEAT RESULTS

The highest yielding variety was Harvard at 4792 lbs ac^{-1}, while Maxine had the lowest yield at 3035 lbs ac^{-1} (Table 4, Figure 1). The winter wheat plots suffered minimal bird damage. The spring wheat harvested almost 3 weeks later was severely impacted by the birds. Plant height was significantly different between varieties; the tallest was Borden at 54.5 inches and the shortest Harvard at 40.5 inches. Lodging was an issue in the Borden plots. We did not observe severe weed pressure in the winter wheat trial. Many of the plots were frost seeded with clover which reduced the weed populations (Image 2). The crude protein (CP) levels were significantly different between varieties. Zorro had the highest CP at 15.2% and Harvard

Image 1. Winter wheat prior to harvest

Image 2. Clover frost seeded into winter wheat

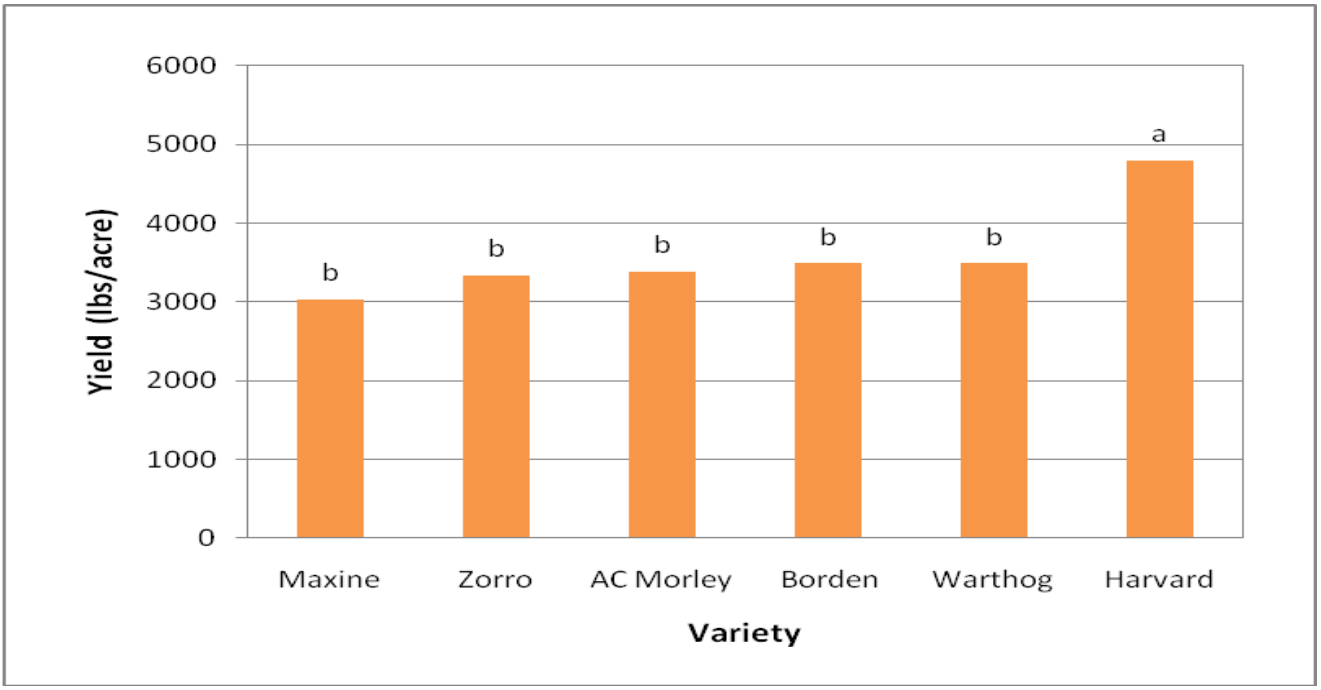
had the lowest 12.7% CP. Harvard was the highest yielding but had the lowest protein level while Zorro had the highest crude protein level but was one of the lower yielding varieties. A correlation between grain quantity and quality has been documented throughout the literature.

Table 4. Wheat variety height, yield, and crude protein levels.

Variety	Plant Height	Yield @ 13.5% Moisture		Crude Protein
	inches	bu/acre	lbs/acre	%
Borden	**54.5***	58.1	3487	14.9*
AC Morley	53.9*	56.4	3387	13.9
Harvard	40.5	**79.9**	**4792**	12.7
Maxine	41.4	50.6	3035	13.6
Warthog	42.4	58.1	3487	13.7
AC Zorro	49.3	55.7	3342	**15.2***
Trial Means	47.0	59.8	3588	14.0
LSD (0.10)	3.70	NS	NS	0.8

* Wheat that did not perform significantly lower than the top performing variety in a particular column are indicated with an asterisk.
** See text for further explanation.
NS - None of the varieties were significantly different from one another.

Figure 1. Yields of winter wheat varieties



Hybrids with the same letter do not differ significantly in yield.

SPRING WHEAT RESULTS

HWS9258J was the highest yielding spring wheat variety at 4098.7 lbs ac^{-1}while AC Walton was the lowest with 1426.1 lbs ac^{-1}. The yields were significantly different (Table 5and Figure 2). There was a considerable amount of bird damage in the spring wheat trials. In the taller varieties (AC Brio & Walton) the birds, by landing on the wheat, would cause them to lodge. Wheat varieties with awns appeared to have advantage over varieties without awns. The Durum wheat, which was significantly shorter, suffered less bird damage but had higher weed pressure. The test weights of varieties were significantly different; Glenn wheat had the highest at 62.0 bu ac^{-1}while the lowest was SD7006J. Both of the Durum wheat varieties, SD 7006J and Hallmark, had the lowest test weight values. There was no significant difference among varities in grain protein levels. We observed more plant disease in the spring wheat this season. Ergot and *Fusarium* Head Blight, *Fusarium graminearum (*sexual stage, *Gibberella zeae*) were found in all of the varieties, and Loose Smut, *Ustilago tritici*, was observed on the Glenn wheat (Image 3).

Image 3. Loose smut infected head

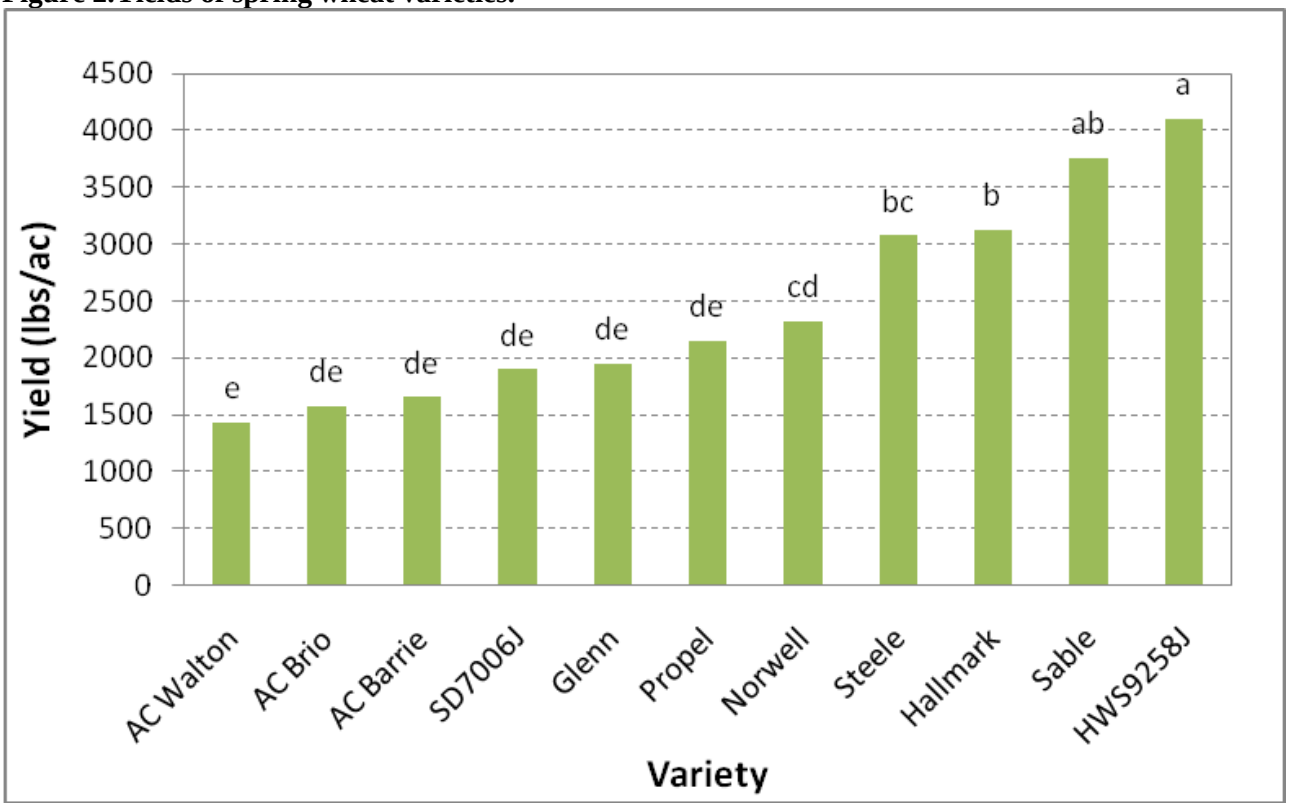
Table 5. Yield, test weight, and protein of spring wheat varieties.

Variety	Yield @ 13.5% moisture		Test weight	Crude Protein
	bu/acre	lbs/acre	bu/acre	%
AC Barrie	27.6	1654	59.7	18.4
AC Brio	26.3	1577	59.9	17.6
Glenn	32.5	1949	**62.0***	17.6
HWS9258J	**68.3***	**4099***	59.2	16.4
Hallmark	52.0	3120	57.6	17.2
Norwell	38.6	2317	60.8*	17.0
Propel	35.8	2148	60.8*	17.8
SD7006J	31.6	1898	55.7	17.8
Sable	62.6*	3754*	60.0	**18.8**
Steele	51.3	3076	**62.0***	17.7
Walton	23.8	1426	58.9	16.9
Trial Mean	40.9	2456	59.7	17.6
LSD (0.10)	12.7	764	1.84	NS

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

NS - None of the varieties were significantly different from one another.

Figure 2.Yields of spring wheat varieties.



Hybrids with the same letter do not differ significantly in yield.

Heirloom Wheat Variety Trial

The heirloom wheat project began in 2007; its primary purpose is to evaluated heirloom wheat varieties to determine if any will thrive in Vermont's climate. Heirloom wheat can bring a premium because of its superior taste. Many farmers are interested in determining what heirlooms are viable for Vermont growing conditions. Through this project three Vermont varieties are being reintroduced into the state; Defiance, Champlain, and Surprise were developed by Vermont Plant Breeder Cyrus Pringle at the turn of the twentieth century. In addition to the heirloom varieties, AC Barrie, a modern spring wheat variety commonly grown in the northeast, was seeded as a comparison.

The experimental design for the heirloom wheat variety trial was a completely randomized design. Each variety had anywhere between two and thirteen replicates depending on the available quantity of seed. Wheat varieties trialed are listed in table 6.

Table 6. Varietal information on the heirloom spring wheat.

Developed	Pedigree	Release Date	Species	
			Type	Variety
Sask. Canada	Neepawa/Columbus//BW90	1996	Hard Red	AC Barrie
ND	Marquis/Kota	1926	Hard Red	Ceres 05
VT	Black Sea/Golden Drop	1870	Hard Red	Champlain
VT	Golden Drop/White Hamburg	1878	Hard Red	Defiance
SD	Yaroslav emmer / Marquis	1927	Hard Red	Hope
ND	Marquis/Kota; Sister selection of Ceres	1930	Hard Red	Komar
Leningrad, Rus.	-	1916	Hard Red	Ladoga
Ont. Canada	Hard Red Calcutta/ Red Fife	1910	Hard Red	Marquis
ND	Mercury//Ceres/Double Cross	1944	Hard Red	Mida 05
ND	Mercury//Ceres/Double Cross	1944	Hard Red	Mida 06
Sask. Canada	Selection from field of Bobs	1926	Hard Red	Red Bobs
OR	Kanred/Marquis	1926	Hard Red	Reliance
WA	*Too many to list	1998	Hard Red	Scarlet
WA			Hard Red	Spinkota
Sask. Canada	Selection from Red Bobs	1922	Hard Red	Supreme
VT	Chile Club/Michigan Club	1909	Hard Red	Surprise
MN	Marquis/Ilumillo//Marquis/Kanred	1934	Hard Red	Thatcher

WEATHER DATA

Seasonal precipitation and temperature recorded at weather stations in close proximity to the 2009 sites are shown in Table 7. This growing season brought cooler temperatures and higher than normal rainfall patterns across the region. The cooler temperatures and increased precipitation encouraged fungal pathogens and increased weed populations.

Table 7. Temperature and precipitation summary, 2009.

North Troy	April	May	June	July	August	September	October
Average Temperature	42.8	51.9	60.5	64.9	66.8	56.1	41.8
Departure from Normal	0	-4.2	-4.1	-4.0	0	-2.1	-5.2
Precipitation	1.63	4.39	5.72	6.12	3.88	2.41	3.19
Departure from Normal	-1.3	+0.72	+1.87	+1.54	-0.3	-1.35	-0.26
Growing Degree Days (32˚)	374.5	622.5	856.0	1023	1073	724	341
Departure from Normal	+41.5	-124.6	-122.0	-119.4	-5.8	-60.5	-124.0

Based on National Weather Service data from cooperative observer stations in close proximity to field trials. Historical averages are for 30 years of data (1971-2000)

CULTURAL PRACTICES

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 8). The plots were seeded with a Carter Cone Seeder. Grain plots were harvested with an Almaco SP50 plot combine. Plot yield and moisture were recorded. Yield per acre of the heirloom varieties was determined based on averaging replicate data. A statistical analysis was not performed on the data.

Table 8. General plot management of the heirloom wheat trials.

Trial Information	Heirloom wheat variety trial
Location	North Troy, VT Butterworks Farm
Soil type	Sandy loam
Previous crop	Soybeans
Plot size (ft.)	5x20
Seeding rate	100 lbs/acre
Replicates	variable
Planting date	4-15-09
Harvest date	8-18-09
Tillage operations	Spring Plow

The highest average yield was Surprise with 1611.8 lbs ac^{-1}while AC Norwell was the lowest yielding at 680.6 lbs ac^{-1} (Table 7). Weeds, especially Wild Mustard, severely impacted plots at this site. The weeds were so prolific that it was necessary to hand weed the trial area three times throughout the season. The most prevalent plant disease found at the North Troy site was *Fusarium* Head Blight (Image 5).
Bird damage was not an issue at this location.

Image 4. Heirloom plots differing in height and awns.

Table 7. Yield of heirloom wheat

Variety	Moisture	Yield @ 13% Moisture	
	%	lbs/ace	bu/ac
AC Barrie	13.9	1332	22.2
Ceres 05	13.4	1265	21.1
Champlain	14.6	1261	21.0
Defiance	13.6	1000	16.7
Emmer	14.7	823	13.7
Hope	14.1	819	13.6
Komar	15.0	961	16.0
Ladoga	15.1	1331	22.2
Marquis	14.5	927	15.5
Mida 05	14.6	1186	19.8
Mida 06	**10.4**	923	15.4
Red Bob	15.3	1257	21.0
Reliance	11.9	1154	19.2
Scarlet	14.8	1165	19.4
Spinkota	12.2	834	13.9
Supreme	14.2	1557	25.9
Surprise	15.1	**1612**	**26.9**
Thatcher	15.2	1306	21.8
Walton	15.3	1177	19.6

Image 5. Wheat with *Fusarium* Head Blight

The UVM Extension Crops and Soils Team would like to thank the Rainville family and Butterworks farm for their generous help with the trials.