

Northern NY Agricultural Development Program 2008-2009 Project Report

Project Title: Variety Trials for Small Grains and Food-Grade Soybeans

Project Leader: Michael Davis Cornell University Agricultural Experiment Station

Collaborators: Anita Deming, CCE Essex County; Jerry Cherney, Dept. of Crop and Soil Sciences, Cornell University Michael Hunter, CCE Jefferson County

Small Grain Variety Trials

Background: Finding varieties with solid agronomic characteristics (yield potential, maturity, disease resistance, stand-ability, quality) that are well adapted to regional growing conditions is an annual challenge for all field crop producers. Trials at the Cornell E.V. Baker Research Farm have provided NNY farmers with variety performance evaluations since the 1980's. These trials test the performance of established varieties from regional seed companies such as W.G. Thompson, JGL Inc., and Seedway, in addition to advanced lines and recently released varieties from Dr. Mark Sorrells' breeding program at Cornell.

Methods: 2008-2009 trials included 19 spring wheat varieties, 15 winter wheat varieties, one winter triticale variety, 10 oat varieties, and 4 spring barley varieties. Variety trials for spring wheat, spring barley, oats, and winter wheat were conducted at the E.V. Baker Research Farm in Willsboro, NY. A randomized complete block design was employed with three replications for each trial. Plots were located on a Rhinebeck clay loam soil with subsurface tile drainage. 200 lb/acre 6-24-24 was broadcast applied and incorporated with a spring-tooth harrow prior to planting each trial. Additionally, the winter wheat plots received a spring topdress application of ammonium nitrate (33-0-0) at a rate of 75 lbs nitrogen per acre. Plant heights, lodging scores, disease incidence, and bird damage data were collected prior to grain harvests. Grain samples from each plot were cleaned, and then tested for moisture content and bushel weight. The 2009 spring barley trial was not harvested due to extensive bird damage and lodging problems.

Results:

Winter Wheat Trial: The 2009 winter wheat trial consisted of eleven soft white (SW), two soft red winter (SRW), and two hard red winter (HRW) varieties (Table 1). Plots were planted at a 2 bu/acre seeding rate on September 24, 2008, and harvested July 28, 2009. There was no lodging and very little bird damage in the 2009 trial. Grain yields ranged from 85.9 bu/acre to 103.4 bu/acre with a trial mean of 94.6 bu/acre. Several advanced breeding lines from Dr. Sorrells' program were included in the trial and they all performed well. The two hard red winter entries, *Harvard* and *Zorro*, while predictably yielding less than the soft white and soft red varieties, also produced excellent yields. Winter grain test weights averaged 57.1 lb/bu, and moisture levels at harvest averaged 15.1%.

Variety	Market Class	% H2O	Yields (bu/acre)	Test Weight. (lb/bu)	Plant Height (inches)	Lodging Scale 0-10
NY03180FHB10	SW	15.3	103.4	57	39.2	0
CaledoniaRes-1	SW	15.2	102.7	57	37.8	0
NY03179FHB12	SW	14.8	100.9	56	37.1	0
E0028	SW	14.6	99.1	55	37.5	0
NY88046-7088	SW	14.7	97.9	57	41.6	0
NY03179FHB10	SW	15.1	97.6	58	38.6	0
Truman	SRW	15.2	96.7	58	36.9	0
Bess	SRW	15.6	94.9	58	35.3	0
Caledonia	SW	14.8	92.1	56	37.1	0
Cal 4PHS-10	SW	14.7	90.5	57	36.3	0
Richland	SW	14.5	90.1	56	41.2	0
Zorro	HRW	15.1	89.1	58	47.2	0
Jensen	SW	14.7	88.8	57	38.1	0
Harvard	HRW	16.2	87.1	59	39.6	0
Cayuga	SW	15.7	85.9	59	46.9	0
Trial Mean:		15.0	94.6	57	39.4	0

Spring Wheat Trial: Nineteen hard red spring wheat varieties were tested in 2009 (Table 2). Spring wheat plots were planted April 20, 2009 and harvested August 13, 2009. The seeding rate was 2.5 bu/acre. No lodging was observed in any of the plots and yields were markedly higher than in last year's trial with a 2009 trial mean yield of 64.1 bu/acre (compared to 43.1 bu/acre in 2008). Solid performers from past trials, including *HRS6002*, *HRS45-025J*, *Russ*, and *Hannah*, produced the highest yields in 2009. Consistently high yields with these four entries over multiple years (2006-2009) indicate that these varieties are particularly well suited to northern New York growing conditions. *Dapps* and *Coteau* produced the lowest mean yields in 2009, which is consistent with previous trial results. The continued poor performance of these two entries suggests that they are not well suited to our region and should probably not be considered for field scale production. Grain moisture readings at harvest averaged 15.4% and test weights averaged 55.4%.

Variety	Market Class	% H2O	Yields (bu/acre)	Test Weight. (lb/bu)	Plant Height (inches)	Lodging Scale 0-10
HRS6002J	HRS	15.5	83.0	57	45.4	0
HRS45-025	HRS	15.5	78.6	57	39.1	0
Russ	HRS	14.8	71.8	55	39.9	0
Hannah	HRS	16.0	71.4	56	42.0	0
2375	HRS	15.2	67.0	55	35.2	0
Alsen	HRS	16.1	66.8	56	34.5	0
SD45-015J	HRS	15.9	64.4	55	30.1	0
Parshall	HRS	15.7	63.9	57	41.2	0
Stoa	HRS	14.3	62.0	53	33.5	0
Freyr	HRS	15.6	61.2	55	36.2	0
HRS45-035	HRS	14.9	60.9	56	36.0	0
CM606	HRS	15.2	60.6	58	35.2	0
Butte 86	HRS	15.1	60.4	54	39.9	0
Profit	HRS	14.7	60.4	54	33.3	0
Knudson	HRS	15.7	58.2	54	30.4	0
Gunner	HRS	14.7	58.0	57	40.0	0
HRS6001J	HRS	16.0	53.6	55	39.1	0
Dapps	HRS	15.3	51.8	53	46.2	0
Coteau	HRS	14.9	50.2	53	45.7	0
Trial Mean:		15.4	64.1	55	38.4	0

Oat Trial: The 2009 oat trial was planted April 20, 2009 and harvested August 13, 2009. The seeding rate was 3 bu/acre. Lodging was not a significant problem in 2009 as *Blaze* exhibited the most lodging with a mean rating of 3 on a scale of 0-10, with 10 equivalent to 100% lodged (Table 3). Mean yields ranged from 81.5 bu/acre to 128.4 bu/acre with a trial average of 114 bu/acre. *Baker, Blaze, Esker, Excel, Ogle,* and *Spur* all produced high yields, while *Woodburn* and *Rodeo* performed relatively poorly. Grain moisture levels at harvest averaged 11.9%

Variety	% H2O	Yields (bu/acre)	Test Weight. (lb/bu)	Plant Height (inches)	Lodging Scale 0-10
Baker	12.0	128.4	31	47.2	0.3
Blaze	11.7	127.6	34	45.8	3
Esker	11.5	126.2	30	46.3	0
Excel	12.1	125.2	32	42.4	0.3
Ogle	12.0	123.6	31	46.2	0.6
Spurs	12.1	120.5	33	41.3	1.3
Newdak	12.2	109.1	30	49.5	1
Robust	11.8	105.5	31	45.4	0
Woodburn	13	93.0	32	43.8	0
Rodeo	10.6	81.5	26	52.9	1.3
Trial Mean:	11.9	114.1	31	46.1	0.8

Food-Grade Soybean Variety Trial

Background. Demand for high quality food-grade soybeans continues to grow, and the establishment of a regionally located soybean food processing business (Vermont Soy) could serve as a solid market for organic growers in the area. Northern New York farmers have considerable experience growing grain-type soybeans and could enhance their profit potential by incorporating food-grade soybeans into their crop rotations. If growers are going to be successful with food-grade soybean production, it is essential that we identify food-grade varieties that are well adapted to northern New York growing conditions and meet the quality specifications of requirements of processors.

Methods. Thirteen commercially available food grade soybean varieties were included in the 2009 trial. A randomized complete block experimental design with four replications was employed. Food grade soybeans were grown on tile drained, certified organic fields with a Rhinebeck clay loam soil at the Cornell University E.V. Baker Research Farm. Plots were 10' wide and 20' long, and consisted of four rows with a 30" spacing between the rows. Target planting depth was 1" and all seed was inoculated with the appropriate *Rhizobium* sp. prior to planting. Plots were seeded June 4, 2009 and harvested October 12, 2009. Weed control measures included cultivation with a rotary hoe (two passes in opposite directions) when the plants were approximately 4" tall and had their first set of true leaves, and an additional between row cultivation with sweeps in midsummer (sweeps were mounted on an Allis Chalmers G tractor). Prior to harvest plant heights and the height of the lowest pod were recorded for each plot along with a lodging score.

Results. Twelve of the thirteen entries in the 2009 trial were first year entries that represent the next generation of food-grade varieties. The trial performance as a whole was superior to the 2007 and 2008 trials as the mean yield in 2009 was 52.4 bu/acre compared to 48 bu/acre in 2008 and 41.5 bu/acre in 2007. Relatively high yields in 2009 were observed in spite of a late planting date (June 4). *Acora* and *PR807228* had the highest yields while *IF44* (the lone carryover from previous trials) and *Korus* produced the lowest mean yields (Table 4). *Vinton 81*, the traditional standard food-grade variety also yielded well. No lodging was observed in the plots (Photo 1). Average grain moisture level at harvest was 12.2%.

The height of the lowest pod on the stem is an important issue at harvest time because it can be difficult for combines to pick-up low hanging pods. Average low pod heights ranged from a low of 7.5cm in *IF44* to a high of 11.4cm in *Vinton 81*.

A second year of testing on these food-grade soybean varieties is needed to better establish relative performance. It would also be interesting to see how these varieties yield when they are planted on a more favorable date.

Variety	% H2O	Yields (bu/acre)	Plant Height (cm)	Low Pod Height (cm)	Lodging Scale 0-10
Acora	12.1	66.0	61	9.6	0
PR807228	13.6	63.8	56	10.0	0
10F8	11.4	57.3	54	9.3	0
Naya	12.4	56.7	43	7.7	0
Vinton 81	13.3	56.6	62	11.4	0
Destiny	11.8	54.9	52	9.3	0
PR8072A3	11.2	52.8	50	8.5	0
PR717917	12.8	52.4	48	9.1	0
Nova	12.1	49.4	46	10.5	0
Oria	12.8	47.6	49	8.9	0
Venus	11.9	47.6	51	8.0	0
IF44	11.3	39.0	46	7.5	0
Korus	12.6	37.0	40	8.5	0
Trial Mean:	12.2	52.4	51	9.1	0



Photo 1. 2009 Organic Food-Grade Soybean Variety Trial at Harvest.

Heritage Wheat Variety Trials

Background. As an outgrowth of the local foods movement, there is increased interest on the part of millers, bakers, and consumers in regionally grown and processed “heritage” wheat varieties that may have unique flavors or other defining quality characteristics. In an effort to explore the potential for heritage wheat production in New York, Elizabeth Dyck at NOFA-NY obtained several heritage varieties of winter wheat from Mark Sorrells’ breeding program at Cornell University, and spring Emmer wheat from North Dakota State University. Additionally, seed of *Red Fife*, a land-race that has been established in parts of Canada, was obtained from a grower in Vermont (Jack Lazor at Butterworks Farm). In collaboration with Elizabeth Dyck, heritage winter and spring wheat trials were conducted on the Cornell E.V. Baker Research Farm.

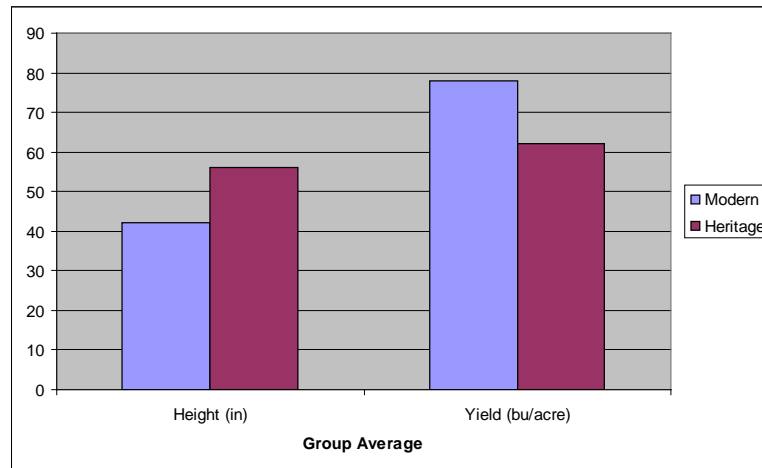
Heritage Winter Wheat

Methods. Eleven heritage varieties and ten modern varieties were included in the 2009 heritage winter wheat trial. Limited quantities of seed restricted the trial size to two replications. All plots were 6’ x 16.5’. Modern varieties were planted at a 2 bu/acre (120 lbs/acre) seeding rate. *Clarks Cream* was an exception as it was planted at 75 lbs/acre. Recommended seeding rates for the heritage varieties was much lower and two seeding rates were evaluated for each heritage variety: 95 lbs/acre (high rate) and 47 lbs/acre (low rate). The trial was conducted on a Rhinebeck clay loam soil with subsurface tile drainage. Organic production practices were followed, but the field was not certified organic. The plots followed three years of alfalfa/timothy sod and one year of spring grains in the rotation. Plant heights, lodging scores, disease incidence, and bird damage data were collected prior to grain harvest. Plots were planted on September 24, 2008, and harvested on July 28, 2009.

Results. The heritage varieties tended to produce taller, larger plants, and lower yields than the modern varieties (Figure 1). *Yorkstar* was a notable exception as it had the highest average yield in the trial. While it was shorter than most of the other heritage varieties, *Yorkstar* was taller than most of the modern entries (Tables 5a & 5b). Many of the heritage varieties yielded better and had less lodging at the lower seeding rate indicating that a 47 lb/acre rate is preferable to a 95 lb/acre rate. Moisture levels at harvest and test weights were very similar for the modern and heritage varieties.

The tall, competitive features of many of the heritage varieties may be advantageous in organic management systems where weed control options are more restricted.

Figure 1. Comparison of average heights and yields between modern and heritage winter wheat varieties in 2009.



Heritage Variety	Seeding Rate	% H2O	Yields (bu/acre)	Test Weight. (lb/bu)	Plant Height (inches)	Lodging Scale 0-10
Honor	High	15.2	57.7	55	60.6	9
Honor	Low	14.6	74.1	56	59.1	2
Yorkstar	High	14.5	94.2	56	50.4	0
Yorkstar	Low	15.2	82.8	56	50.0	0
Grandprize	High	15.8	57.4	58	61.4	6
Grandprize	Low	15.3	66.7	57	53.1	1
Yorkwin	High	14.9	44.8	56	60.6	9
Yorkwin	Low	14.9	37.6	57	60.6	8
Goldcoin	High	15	28.9	56	52.0	9
Goldcoin	Low	15.9	64.5	58	54.3	0
Genesee Giant	High	14.8	60.2	59	51.2	0
Genesee Giant	Low	16	58.1	56	53.5	1
Avon	High	14.7	10.3	Missing	50.0	10
Avon	Low	15.6	74.8	57	58.7	0
Valprize	High	15.1	64.8	58	58.3	3
Valprize	Low	16.1	60.0	58	55.5	2
Forward	High	14.9	56.2	58	59.1	6
Forward	Low	16.5	74.2	58	52.0	0
Pride of Genesee	High	15.8	42.8	58	69.7	9
Pride of Genesee	Low	16.7	61.5	58	65.4	7
Genesee	High	14.2	60.7	57	59.1	7
Genesee	Low	15.3	67.6	56	55.1	6
Trial Mean:		15.3	59.1	57	56.8	4.3

Table 5b. 2009 Heritage Winter Wheat Variety Trial – Modern Variety Results					
Modern Variety	% H2O	Yields (bu/acre)	Test Weight. (lb/bu)	Plant Height (inches)	Lodging Scale 0-10
Jensen	14.6	82.7	57	40.2	0
Purcell	15.2	70.2	57	47.8	3
Geneva	14.3	81.6	57	42.5	0
Houser	14.5	69.4	53	42.5	0
Caledonia	14.9	82.2	55	37.0	0
Caledonia-resel.	15.6	89.7	57	42.3	0
Cayuga	15.5	76.6	59	46.5	0
NY Batavia	15.3	83.8	56	41.1	0
Richland	15.6	63.1	55	39.4	0
Clarks Cream	15.3	68.3	58	48.6	0
Trial Mean:	15.1	76.8	56	42.8	0.3



Photo 2. High seeding rate *Yorkstar* plot in the 2009 Winter Heritage Wheat Trial on the E.V.Baker Research Farm.

Heritage Spring Wheat

Methods. *Red Fife* (hard red spring wheat) and seven emmer wheat varieties were included in the 2009 heritage spring wheat trial. The trial was conducted on a Rhinebeck clay loam soil with subsurface tile drainage. Organic production practices were followed, but the field was not certified organic. The plots followed three years of alfalfa/timothy sod in the rotation and no fertilizer was added. A randomized complete block design was employed with three replications for each entry. Emmer varieties were seeded at 100 lbs/acre, and Red Fife was seeded at 120 lbs/acre. Plots were planted on April 20, 2009 and harvested on August 13, 2009. The trial was scored for lodging, bird damage, disease incidence and plant height prior to harvest.

Results. Note that the yields reported for the emmer varieties include the hulls (Table 6). All the emmer entries had terrible lodging problems, and as a result it is difficult to derive any meaningful conclusions from the yield data. Extensive lodging with the emmer varieties indicates that the seeding rate was too high and/or there was too much fertility associated with the plowed down alfalfa/timothy sod. It will be important to understand the effects of fertility and plant population on emmer wheat production if it is going to be viable for commercial production (Photo 3).

Red Fife yields averaged 34.5 bu/acre. The relatively low yield may be largely due to bird damage in the *Red Fife* plots. *Red Fife* did not have lodging problems, but since it was the only non-hulled entry in the trial, the birds focused on it and did extensive damage. An additional year or two of testing is needed to assess the performance of *Red Fife* in the northern New York region.

Table 6. 2009 Heritage Spring Wheat Trial Results				
Emmer Variety	% H2O	Yields lb/acre (w/hulls)	Plant Height (inches)	Lodging Scale 0-10
Bowman		2147	44.2	9
Red Vernal		2435	45.8	9
Common H		2187	45.7	9
Common R		2304	43.0	9
Lucille		2590	50.5	9
Common M		2120	46.5	8
ND Common		2174	45.8	9
Trial Mean:		2280	45.9	8.8
		Bu/acre		
Red Fife	9.3	34.5	51.3	1.5



Photo 3. *Lucille* emmer wheat plot in the 2009 Spring Heritage Wheat Trial on the E.V.Baker Research Farm.

Outreach. Tabulated trial results are posted on the Northern New York Agricultural Development Program website www.nnyagdev.org and in the variety trial section of the online journal Plant Management Network www.plantmanagementnetwork.org. Results were also presented during research farm field days, regional extension meetings and workshops.

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Person to contact for more information

Michael H. Davis, Cornell E.V. Baker Willsboro Research Farm, 48 Sayward Lane, Willsboro, NY 12996. (518) 963-7492. email: mhd11@cornell.edu