

Potato Breeding Program Research Update 2009

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Introduction

The Wisconsin breeding program has emphasized the evaluation of clones of different year of evaluation. Special effort has been made to evaluate field performance including plant vigor, maturity, disease resistance and tuber quality traits early enough in the selection process to make efficient selection decisions. Disease resistance has received important attention; specifically we have identified three locations under high disease stress. To better characterize and confirm the resistance of breeding lines, we have participated in national *Verticillium* wilt and late blight trials; in addition, we have screened breeding lines for early and late blight, powdery scab, common scab and PVY in collaboration with researchers from UW-Madison, Oregon State University and Pennsylvania State University. Lines from advanced to elite lines have been evaluated for agronomic and storage and processing quality by AJ Bussan and C.J. Kostichka in UW-Madison and also by Vanessa Currie at the University of Guelph and Janet McLaughlin at the New Brunswick Department of Agriculture.

This report covers the 2008 results from ongoing projects carried out by our program staff and a review some of the results of experiments collaborated by researchers from WI, and outside our borders. Every year the breeding program contribute clones for evaluation to a network of more than thirty researchers in the US and Canada which greatly contribute to the understanding of the

cultivar potential of breeding lines. Our formal collaboration with our WI clientele occurs via the SpudPro initiative; the SpudPro committee, formed by growers, industry and research personnel and the WI Seed Certification Program. This organ serves as an advisory board to our program providing important input, especially on variety development. The main SpudPro project includes the virus cleaning and multiplication of lines presented and selected by the SpudPro committee. The seed (160 bags) is produced in the WI Seed Certification Farm and is made available to growers for large scale on-farm experiences. Before seed is available through this channel, our breeding program produces seed for smaller scale on farm tests available to growers wanting to have a first look at breeding lines. This report will focus on lines that are from advanced to elite stages in the breeding process.

1. Elite Line Trials

1.1. North Central Potato Variety Trial

1.2. Summary from the Snack Food Evaluation Trial

1.3. Storage Evaluation of Elite Chipping Lines

1.4. Agronomic and Storage Evaluations (See reports by Bussan)

2. Advanced Breeding Lines

2.1. SpudPro Agronomic Trial (collaboration with C. Kostichka)

2.2. Replicated Advanced Breeding Lines Trial of Year 4 and 5.

3. General Evaluation Methods

1.1. Performance of North Central and Wisconsin Potato Clones in 2007-08

The North Central Variety Trial includes breeding lines that have performed well as advanced lines; an objective of this trial is to understand the breeding lines performance on several locations in the United States. In 2008 we included W2683-2rus, W2133-1, W2310-3 and W5716-1rus. The results from the WI locations are given in Table 1. The most relevant comments regarding the performance of these lines are as follows:

W2683-2rus: this line continues to exhibit good tuber type and excellent scab resistance in 2008 as it will be seen in the scab trials. Yield was similar to Russet Burbank, confirming the 2007 regional results. Specific gravity tends to be smaller than Russet Burbank (Table 1 and 2), but chip color is consistently better than Burbank. Specific gravity may limit the processing potential of this line. Early Blight tolerance is similar or better compared to Burbank and results from Shelley Jansky's Verticillium wilt evaluation indicated tolerance to early dying. A proportion of off-shape tubers are observed in this line. According to 2008 results from Barbara Christ (PSU), this line may be resistant to Powdery Scab (*Spongiospora subterranea*).

W5716-1rus: this line was selected due to its excellent tuber shape, uniformity and yield. Exhibits similar or higher total yield and higher No. 1 yield compared to Russet Burbank. Besides excellent reviews in experiments at harvest, researchers and growers have indicated that this line's tuber quality tends to deteriorate in storage presenting symptoms similar to internal brown spot that are not apparent at harvest time.

Table 1. Results from the 2008 North Central Variety Trial, Hancock WI harvested 130 days after planting

Clone	Vine Senescense	Total Yield (cwt/a)	A Yield (cwt/a)	Undersize (<2 oz)	% No. 1 Yield	Culls Yield (cwt/a)	% Hollow Heart	% Internal Necrosis	%Vascular Discoloration	%Brown Center	% Internal Defect Free	% Growth Cracks	% Secondary Growth	% Greening	% Rot	% External Defect Free	Fry color 47°F Dec 1	Specific Gravity	Early Blight AUDPC	No. Tubers/Plant	Plant Vigor 1-5	1-5 Tuber Skinning	1-5 Tuber Uniformity	1-5 Tuber Size	1-5 Tuber Shape	1-5 Tuber Preference
RED																										
AND00272-1R	114	459	430	18	91.7	14	0.7	0.0	0.4	0.4	98.5	0.0	0.3	2.1	0.4	97.2	9.7	1.070	876	8.7	1.6	2.53	2.48	2.24	2.63	2.81
ATND98459-1RY	115	494	460	23	89.8	14	0.7	1.8	0.4	0.3	96.8	0.2	0.3	1.5	0.4	97.5	9.2	1.077	931	8.4	1.2	2.22	2.57	2.24	2.52	2.89
ND7132-1R	118	495	462	17	91.2	18	1.1	1.3	0.4	0.3	97.0	0.1	0.3	1.6	0.3	97.7	8.7	1.067	474	8.8	1.6	2.46	2.18	2.10	2.52	2.89
Red Norland	107	413	384	10	92.1	23	1.1	0.0	0.6	0.3	97.9	0.0	0.3	2.8	0.3	96.6	9.0	1.067	1051	6.8	1.4	2.59	2.77	1.87	2.84	2.97
Red Pontiac	122	511	478	9	88.5	27	1.1	1.3	2.5	0.8	94.3	0.6	1.0	1.3	1.1	96.0	9.7	1.066	572	7.5	1.7	2.46	2.67	1.95	2.94	3.12
LSD	4.1	58	54	5.5		9	2.7		1.4	0.5			1	1.1	0.5		1.3	0.050	246	1.1	0.3	0.26	0.3	0.29	0.26	0.26
RUSSET / LONG																										
W2683-2rus	126	468	427	18	84.9	21	1.1	6.7	0.4	0.4	91.4	0.3	0.7	1.3	0.3	97.5	5.9	1.068	435	7.6	2.5	2.46	2.48	1.95	2.81	2.30
W5716-1rus	124	475	447	19	86.4	11	1.3	5.8	0.4	0.3	92.2	0.2	0.0	0.9	0.6	98.3	7.4	1.077	613	8.5	2.3	2.28	1.99	1.95	2.28	2.07
AOND95292-3Russ	125	413	374	17	87.6	17	1.8	1.8	1.9	0.7	93.8	0.2	0.3	1.3	0.4	97.7	7.4	1.079	487	7.5	2.7	2.16	2.38	2.24	2.50	2.27
Russet Burbank	121	488	439	16	75.0	31	5.0	9.0	2.2	0.3	83.4	0.1	3.0	1.7	0.3	94.8	7.6	1.071	626	7.5	1.7	2.21	2.57	1.95	2.81	2.22
Russet Norkotah	112	419	388	13	91.1	19	0.7	0.8	1.5	0.3	96.7	0.4	0.0	1.5	0.5	97.6	7.7	1.071	981	6.9	2.1	2.28	2.09	2.02	2.38	2.07
LSD	4	59	54	5.5		9	2.7		1.4	0.5			1	1.1	0.5		1.2	0.050	258	1.1	0.3	0.26	0.3	0.29	0.28	0.26
ROUND WHITE																										
MSJ316-A	130	462	427	15	86.6	16	1.1	5.9	0.6	0.3	92.0	0.1	0.4	1.3	0.4	97.8	6.6	1.076	304	9.1	2.0	2.11	2.24	2.03	2.44	2.05
MSJ461-1	125	542	504	17	90.4	15	0.7	1.6	1.3	0.3	96.2	0.2	0.3	1.8	0.3	97.4	7.1	1.070	636	8.9	1.6	1.91	1.89	1.80	2.29	2.58
MSM171-A	114	498	449	12	90.0	29	1.3	0.8	1.0	0.6	96.2	0.2	0.3	2.9	0.5	96.1	8.7	1.056	817	8.5	1.3	2.04	2.35	2.03	2.71	2.41
ND8304-2	101	313	277	19	88.3	11	0.9	0.8	1.2	0.4	96.7	0.3	0.5	1.1	0.4	97.7	3.6	1.062	945	6.6	1.6	1.97	2.67	2.46	3.03	2.43
ND8307C-3	116	364	333	13	90.9	14	0.7	2.1	0.4	0.3	96.6	0.5	0.3	0.9	0.4	97.9	5.6	1.081	895	7.1	1.4	1.91	2.38	2.24	2.61	2.35
W2133-1	125	534	500	15	84.6	15	0.7	8.6	0.9	0.3	89.5	0.2	0.5	1.1	0.4	97.9	5.5	1.074	607	8.3	1.5	2.25	2.09	1.94	2.44	2.14
W2310-3	120	349	316	16	89.0	13	0.7	2.5	0.4	0.3	96.1	0.2	0.3	1.7	0.3	97.5	3.9	1.079	659	6.6	1.4	2.22	2.57	2.17	2.71	2.27
MSI005-20Y	118	509	478	15	91.0	12	0.9	1.9	0.4	0.4	96.5	0.7	0.3	1.0	0.4	97.6	8.1	1.064	898	8.2	1.3	1.97	2.28	1.95	2.40	2.12
Atlantic	121	402	358	10	77.5	27	6.1	4.5	3.9	0.7	84.7	0.0	1.2	3.1	0.3	95.4	6.5	1.078	653	6.0	1.5	2.05	2.78	2.14	2.88	2.50
NorValley	114	434	395	14	86.5	19	0.9	4.5	0.8	0.4	93.5	0.1	1.1	2.2	0.3	96.3	5.9	1.064	1119	7.5	1.5	2.04	2.22	2.03	2.58	2.23
Snowden	131	500	474	9	87.0	15	1.8	5.4	0.9	0.5	91.3	0.0	0.5	1.4	0.7	97.5	4.4	1.071	408	8.0	1.6	2.05	2.60	1.82	2.88	2.28
LSD	4.1	52	50	5.5		9	2.7		1.4	0.5			0.9	1.1	0.5		0.9	0.050	201	1.1	0.2	0.26	0.3	0.29	0.23	0.26

Fry color was measured using a 1-10 scale where 1 = very clear chip color and 10 is very dark. This scale consistently rank varieties for chip color

Early Blight was measured and transformed to percentage from which the area under the disease curve progress (AUDPC) was calculated. Smaller AUDPC values indicate resistance or tolerance, a value that is double compared to another value implies double amount of disease present for the breeding line indicated

Plant Vigor was evaluated using a 1-5 scale, 1 = very vigorous and 5 = very weak plant architecture.

Tuber skinning was measured using a 1-5 scale, 1 is skinning and 5 = most of the tuber skin was lost during the harvest and grading.

Tuber uniformity was measured using a 1-5 scale, 1 = very uniform and 5 = extremely variable tubers.

Tuber size, shape and preference were evaluated using a 1-5 scale, 1 = best size (larger), shape (smooth) and preference (overall tuber traits) 5 = smallest, roughest or least preferred tubers.

Table 2. Specific gravity and total yield of Wisconsin lines evaluated in the North Central Potato Variety Trial in 2007

	Specific Gravity						Total Yield					
	MB	MI	MN	WI	ON	AVG	MB	MI	MN	WI	ON	AVG
W2683-2rus	1.078	1.067	1.071	1.069	1.087	1.074	254	359	510	468	246	367.4
Russet Burbank	1.080	1.071	1.071	1.071	1.085	1.076	406	324	521	-	268	379.8
W2133-1	1.085	1.075	1.079	-	1.091	1.083	475	383	599	-	187	411
Snowden	1.089	1.074	1.075	1.080	1.092	1.082	401	433	586	568	208	439.2

1.2. Summary of the Snack Food Evaluation Trial: WI Elite Lines Evaluated.

W2133-1: Good yield, similar to Snowden, good internal traits, fry quality. This line has been evaluated with success in USPB Snack Food Trial as well. This line has been evaluated in the USPB Snack Foot trial where it has received good reviews. Yield and gravity of this line have been consistently better than Snowden in the USPB Snack Food Trial and chip color has been similar or better than Snowden in the two years and six locations tested. W2133-1 tested susceptible to Powdery Scab (*Spongiospora subterranea*).

W2310-3: line with excellent chipping quality and significantly higher specific gravity compared with Snowden. Several growers in WI have shown interest in the potential of this line. It exhibits tolerance to common scab. In addition to the evaluation in the North Central Potato Variety Trial of 2008, this breeding line was also included in the USPB Snack Food Trial.

W2324-1: results from the Snack Food trials from 2006-2008 indicates that W2324-1 has been the highest yielder of that trial during that three year period (Table 3). In addition, its specific gravity is similar to the gravity of Atlantic (Table 4). This line also exhibits good chip quality. A limitation for this line is its susceptibility to common scab which renders it unsuitable for areas with potentially high common scab incidence. This line is tolerant to Verticillium wilt as confirmed by Shelley Jansky this year.

W2717-5: this line was promoted to SpudPro status in 2008 due to its excellent chip color. Results from earlier breeding trials indicate that its chip color holds well in storage. During 2008, this line exhibited specific gravity similar or higher than Atlantic. Yields are lower than Snowden (Table 3). Recent results from Jansky confirm that this line is susceptible to Verticillium wilt. Similarly, Barbara Christ's results indicated that it is susceptible to

1.3. Out of the Storage Processing Evaluation of WI Chipping Lines

In collaboration with Janet MacLaughlin of the New Brunswick Department of Agriculture, six elite chipping lines were evaluated for out of storage performance in the storage period of November of 2006- December of 2007. Sugar and fried chip color were determined and compared to expected target values. Glucose levels were under the target 0.035 % Fresh weight for W2133-1 and W2310-3 stored at 45°F until August (Fig. 1). W2324-1 was under this threshold until April and W2309-7 until July (Fig. 1). Each one of these lines and W2982-1 were stored also at 50°F and stayed under 0.035 % Fresh wt for glucose levels until August.

Table 3. US No. 1 Yield of Wisconsin Lines included in the Snack Food Variety Trial 2006-08

	WI	CA	NC	ID			MI	PA			FLA	ND	TX	
	2008	2008	2008	2008	2007	2006	2008	2008	2007	2006	2008	2007	2007	2006
W2310-3	328	281	256	477			401	188						
W2324-1	577	287	333	482	667	601	555	306	258	351	365	334	150	242
W2717-5	352	143	229	242			318	106						
W2133-1					559	488		327	253			281	92	
Atlantic	486		324	489	527	442	414	287		216	298	319	156	270
Snowden	498		261	333	506	432	569	291	283	249	337	298	132	217
Beacon Chipper	461	352	263	373	459	376	333	237	178	262	254	248		239
CO95051-7W	287	251	232	357	460		177	168	277		298	189	145	176
CO96141-4W	437	353	315	379	436		410	147	165		312	245	123	
MSJ147-1	354	99	83	285	403	306	254	149	142	233	185	210	9	221

Table 4. Specific Gravity of Wisconsin lines included in the Snack Food Variety Trial 2006-08

Variety	WI	CA	NC	ID			MI	PA			FLA	ND	TX	
	2008	2008	2008	2008	2007	2006	2008	2008	2007	2006	2007	2007	2007	2006
W2310-3	1.084	1.092	1.094	1.096			1.080	1.099						
W2324-1	1.083	1.084	1.090	1.095	1.092		1.078	1.099	1.082	1.093	1.082	1.099	1.083	1.095
W2717-5	1.087	1.090	1.095	1.091			1.085	1.099						
W2133-1					1.091	1.095			1.075	1.089	1.078	1.101	1.071	1.095
Atlantic	1.086		1.097	1.096	1.095	1.097	1.077	1.096	1.083	1.081	1.086	1.104	1.078	1.097
Snowden	1.080		1.094	1.092	1.089	1.090	1.081	1.099	1.077	1.094	1.078	1.097	1.067	1.090
Beacon Chipper	1.072	1.081	1.093	1.086	1.089	1.087	1.072	1.091	1.072		1.081	1.092	1.064	1.087
CO95051-7W	1.079	1.078	1.082	1.100	1.101	1.105	1.072	1.090	1.068	1.089	1.070	1.107	1.066	
CO96141-4W	1.069	1.072	1.080	1.086	1.084		1.061	1.089	1.068		1.080	1.096	1.062	
MSJ147-1	1.091	1.092	1.098	1.104	1.099	1.095	1.089	1.092	1.078	1.077	1.083	1.102	1.069	1.095

Table 5. Chip color of breeding lines evaluated in the Snack Food Variety Trial 2006-08

Variety	WI Nov 4, 2008	NC	Idaho (ID) Six weeks after harvest								FLA 2007	PA		ND Sept17 2007
			40°F		50°F		40°F (recond)		% Sugar End			Sep14	Apr14	
			2007	2006	2007	2006	2007	2006	2007	2006		2007	2007	
W2310-3	2.5	65.3										39		
W2324-1	3.1	64.5	3.9		1.5	1.4	3	-	30	0	4		61	58
W2717-5	2.0	70.8										49		
W2133-1			4.2	3.0	1.4	1.0	1.7	1.0	3	0	5	42	54	67
Atlantic	3.9	65.3	3.7	3.6	1.8	1.7	2.8	1.7	50	4	2	49	55	61
Snowden	3.7	64.5	4.4	3.5	1.5	1.1	2	1.1	48	17	3		62	64
Beacon Chipper	3.8	70.4	3.3	2.8	1	1.0	2.5	1.0	18	4	2	41	61	68
CO95051-7W	2.5	67.7	3.3	3.0	1.1	1.1	1.9	1.1	15	0	4	45	57	69
CO96141-4W	3.3	70.1	4.1		1.3		3.9		30		4			67
MSJ147-1	2.6	60.9	2.9	2.0	1.1	1.1	1.4	1.1	3	0	2		54	69

Idaho (ID) Samples harvested September 25 and gradually cooled to 50° and stored for 6 additional weeks at 40 and 50° F.

A subset of ID Samples from 40°F was reconditioned at 60°F for 3 weeks.

North Carolina (NC) ratings conducted by the UTZ Quality Foods Inc. in Hanover PA with in 24 hrs of harvest. Visual Rating Score: 1 = no defects, exceptionally bright; 2 = excellent, bright; 3 = good, light or golden; 4 = dark defects, marginal; 5 = not acceptable. *= brightest chip in visual observation

MI chip samples collected at harvest and evaluated 5 days later by Herr Foods Inc

Fla 2007 Chip Rating: Chips were prepared and rated following the procedures outlined in the Snack Food Association Chipping Potato Handbook (1995). A sub-sample of potatoes from the Chipping Trial was shipped to Wise Foods, chipped and rated on a 1-5 scale: 1 = outstanding, no blemishes and color variations; 2 = very good, minimal blemishes and color variations; 3 = good, acceptable blemishes and color variations; 4 = marginal acceptance, high levels of blemishes and color variations; 5 = not acceptable, high blemish and color variations.

WI samples were processed chip samples were evaluated visually and scored on a scale of 1-10. A score of 1 represents the lightest color and 10 the darkest color. Scores of 4 or less are considered acceptable color.

Fig. 1

Storage Glucose Levels from 45F Storage,
New Brunswick 2006-07 (Goal <0.035)

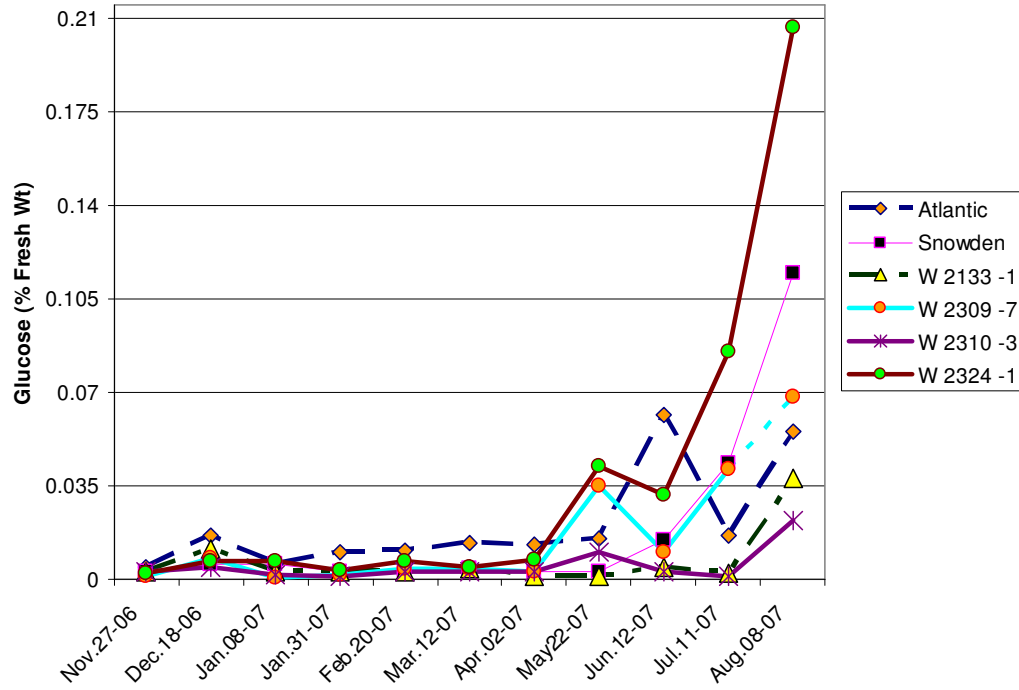


Fig. 2

Storage Glucose Levels from 50F Storage 2006-07,
New Brunswick, Canada (Goal <0.035)

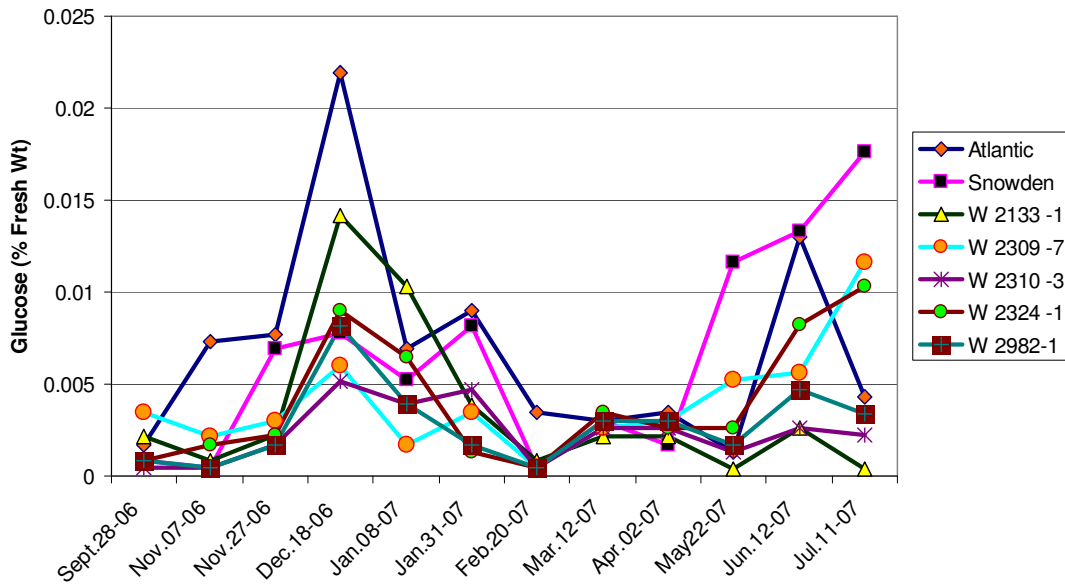


Fig. 3

**Storage Sucrose Levels from 50F Storage,
New Brunswick, Canada 2006-07 (Goal <0.6)**

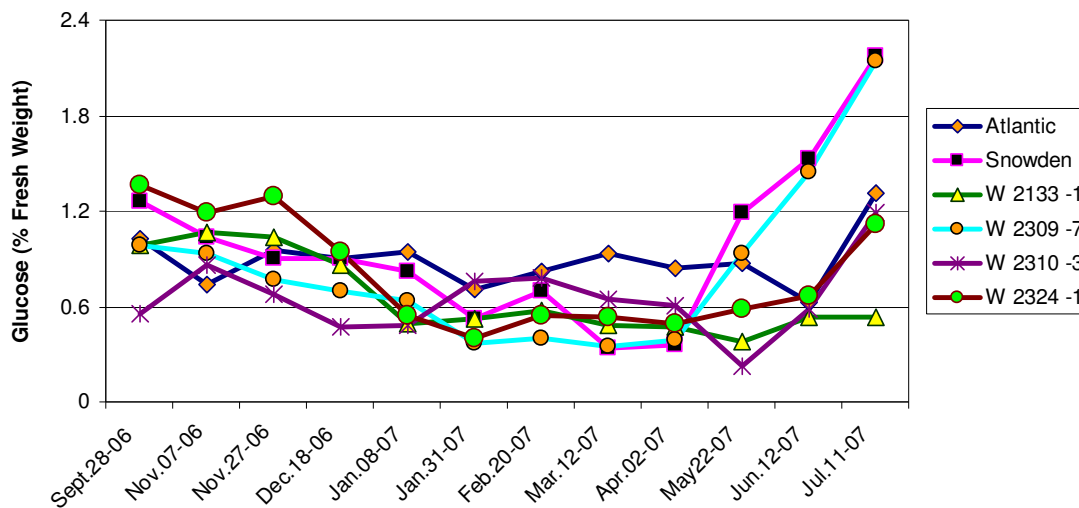
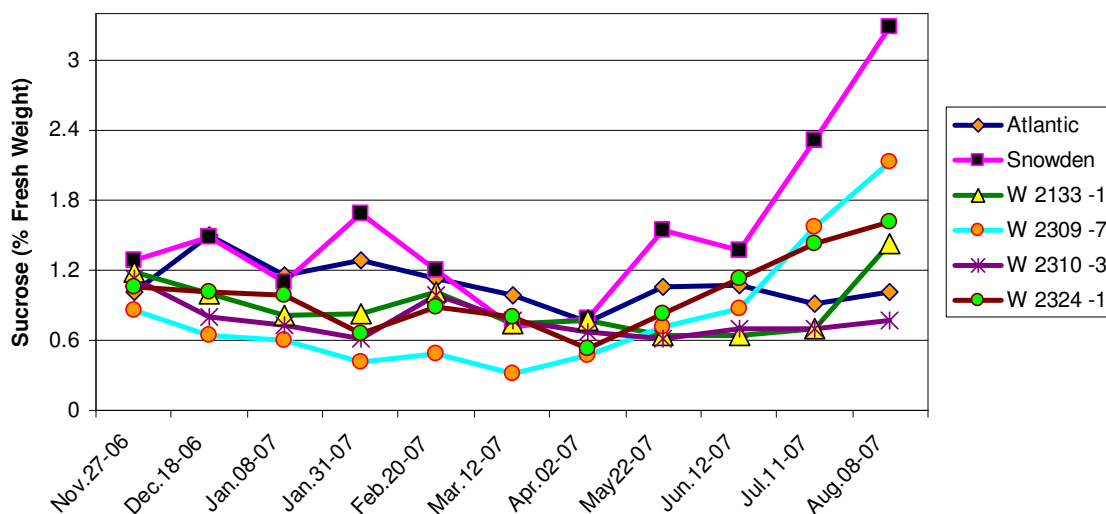


Fig. 4

**Storage Sucrose Levels from 45F Storage, New Brunswick, Canada
2006-07 (Goal <0.6)**



The lowest sucrose concentration were kept by W2133-1, maintained under 0.6% Fresh weight until August at 50°F and after it fell 0.6% Fresh wt, it stayed under that threshold until June.

Fig. 5

Chip Evaluation from 45F Storage (Agtron Values), New Brunswick, Canada (target >60)

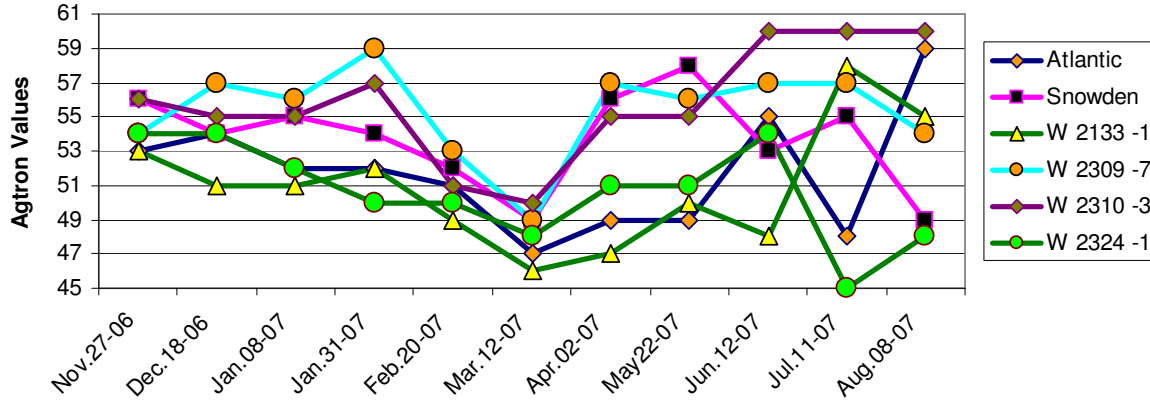
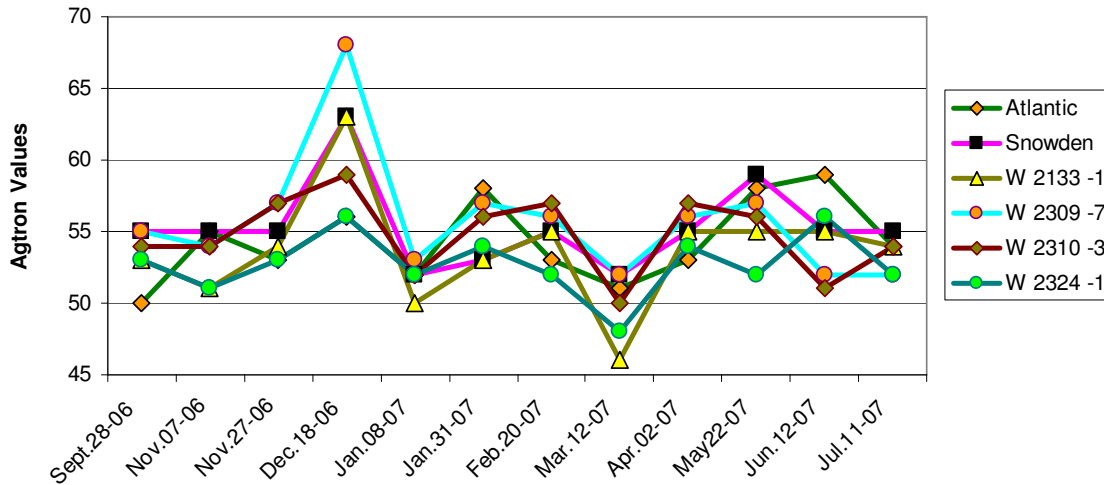


Fig.6

Chip Evaluation from 50F Storage (Agtron Values) New Brunswick, Canada (target >60)

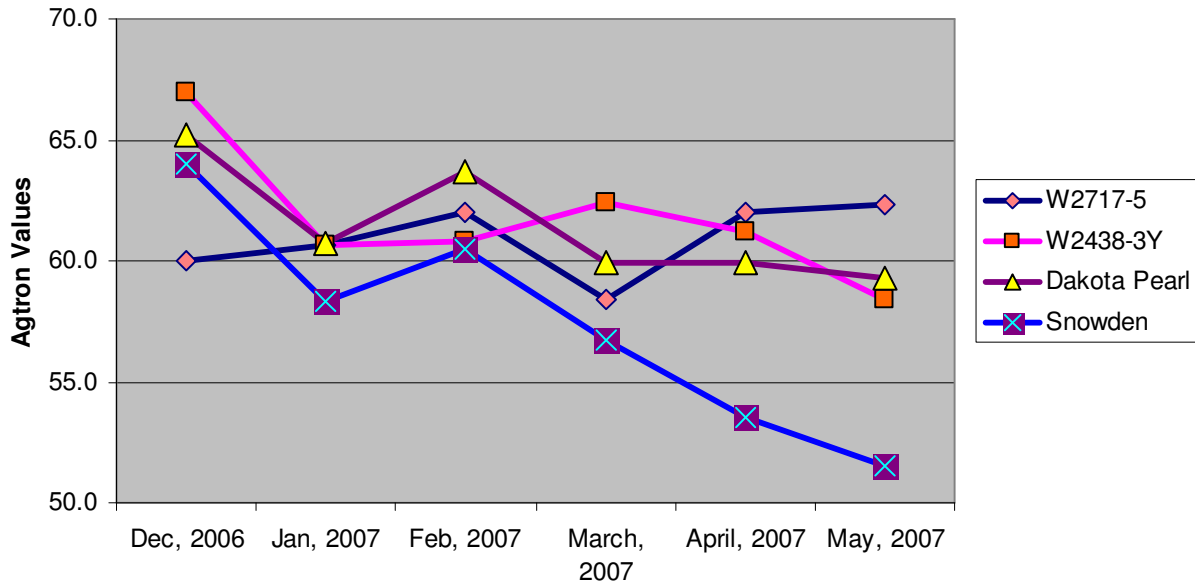


W2310-3, W2133-1 and W2309-7 chips had better color than those of Snowden coming out of 45°F from June to August, exhibiting potential for colder storage chipping. Chip fry color for these WI lines coming out of 50°F was similar to the Snowden chip color.

A similar study was conducted in collaboration with Vanessa Currie at the University of Guelph, ON. This included W2717-5 and W2438-3Y stored at 45°F (Fig. 7). Both lines and the cold chipping line Dakota Pearl had better chip color compared to Snowden after January when Snowden chips started to exhibit darker and darker colors. W2717-5 chip samples were frying well until May when the study ended. Chip samples of W2438-3Y exhibited color most similar to Snowden.

Fig.7

Agtron Values of Chips for W2717-5 and W2438-3Y



2. Evaluation of Advanced Breeding Lines:

2.1. SpudPro Candidates Variety Trial: Fifteen advanced clones were included in this trial established in cooperation with **Charles Kostichka** at the Hancock Experimental Station. They represent elite lines evaluated previously that may be presented to the SpudPro variety promotion committee. Six were chipping lines, one red and eight russets. The methods of evaluations are explained for at the end of this document. Fried materials for the russets consist of slabs whose color is read with the help of a photovolt and the values are not comparable to chips obtained from round white clones. Highlights of the 2007 SpudPro trial are as follows:

Round White and Chipping Lines

W3186: In 2007, this line was among the best chipping ability in the group. Similar yield and percentage of US#1 compared to Snowden. Better solids compared to Dakota Pearl, but lower than Atlantic. It has somewhat variable tuber shape, similar to Snowden which includes some flat tubers. In 2008, this line was rated tolerant to Verticillium wilt in the National Verticillium wilt trial.

W4013-1: Lowest yield in the chipping group. Smaller tuber size compared to Snowden and other chipping lines. It has smooth, shallow eyes. It has shown good chipping ability with good potential as a cold chipper in previous trials.

W4016-4: Good chipping ability and yield. It has a similar specific gravity compared to Snowden and variable shape.

Table 6. Results of the 2008 SpudPro Variety Trial- Early Harvest (100 days after planting), Hancock ARS, WI.

	Total Yield	Yield A (cwt/a)	No1 Yield (cwt/a)	B Size Yield (cwt/a)	Cull Yield (cwt/a)	% 2-4Oz Yield	% 4-6Oz Yield	% 6-10Oz Yield	% 10-13Oz Yield	% 13-16Oz Yield	% More than 16Oz	Tuber/pt	Tuber Shape	Tuber Size	Skin Set	Common Scab 1-5 Severity	Preference	% Internal Defects
Chipping																		
Atlantic	413	394	384	<u>12.5</u>	14.2	24	37	29	8	2	0	7.1	2.2	1.84	2.19	1.30	2.17	3.44
Dakota Pearl	417	371	348	22.0	23.0	34	35	24	5	1	0	6.8	2.0	2.33	1.86	1.22	2.25	5.90
Snowden	466	433	420	18.9	16.5	37	34	22	5	1	0	8.3	2.6	2.33	2.05	1.36	2.50	3.68
W3186-2	445	407	390	23.0	18.3	30	35	27	7	2	0	7.9	2.4	1.83	1.95	1.90	2.25	4.42
W4013-1	<u>334</u>	<u>264</u>	<u>252</u>	<u>58.3</u>	14.5	38	34	22	4	2	0	6.2	2.3	<u>2.70</u>	1.76	1.22	2.63	4.53
W4016-4	387	340	322	29.0	18.8	39	35	20	4	1	0	6.9	2.5	2.46	2.35	1.90	2.75	5.09
W4282-2	383	337	316	24.6	21.6	36	32	25	5	2	0	6.6	2.3	2.33	1.95	1.90	2.63	5.88
W4980-1	346	303	290	27.0	16.5	39	33	22	5	2	0	6.5	2.4	2.46	2.45	1.77	2.50	4.56
W5015-12	428	359	336	<u>45.7</u>	22.9	37	32	24	5	2	0	7.5	<u>2.7</u>	2.46	<u>2.55</u>	1.22	2.75	6.22
Reds																		
Dark Red Norland	385	353	336	16.6	18.2	31	36	26	5	1	0	7.0	2.7	2.20	2.35	1.22	2.75	4.95
W2609-1R	377	345	335	22.0	13.1	37	35	22	4	1	0	7.3	2.2	2.32	2.35	1.63	2.38	3.33
Russets																		
Goldrush	430	406	388	15.6	18.6	32	30	27	9	2	1	7.7	2.7	2.30	2.05	1.08	2.75	4.48
Russet Burbank	466	384	357	52.9	26.1	33	36	25	4	1	0	7.8	2.8	2.30	2.25	1.08	2.75	6.49
Russet Norkotah	439	401	387	26.1	18.1	33	34	25	6	2	1	8.1	2.2	2.17	2.15	1.49	2.13	3.77
W2253-5rus	<u>254</u>	<u>224</u>	<u>213</u>	14.8	13.4	38	34	22	3	1	0	<u>4.9</u>	2.1	2.17	1.95	<u>3.00</u>	<u>3.25</u>	4.78
W3160-5rus	<u>290</u>	<u>223</u>	<u>213</u>	<u>55.6</u>	13.4	37	34	22	5	2	0	<u>5.5</u>	2.3	<u>2.67</u>	2.25	1.08	2.75	4.14
W3666-2rus	<u>338</u>	315	303	18.3	15.5	34	30	26	8	2	1	6.0	2.3	2.05	1.76	1.08	2.13	4.04
W3743-5rus	487	435	421	36.0	18.8	29	35	27	7	2	0	8.3	2.1	1.92	1.95	1.90	2.38	3.69
W3952-3rus	405	299	267	72.3	29.5	35	38	22	4	1	0	6.5	2.6	2.30	2.25	1.36	2.63	9.26
W4697-2rus	<u>295</u>	<u>238</u>	<u>224</u>	<u>38.1</u>	19.0	36	33	24	5	2	0	<u>5.0</u>	2.1	2.17	2.15	1.08	2.38	5.67
W5716-1rus	394	349	338	33.6	12.8	36	36	22	4	1	0	8.0	2.1	2.30	2.05	1.08	2.01	3.32
W7012-1rus	<u>329</u>	299	287	14.3	16.4	34	34	25	5	1	0	6.3	2.3	2.30	2.25	1.22	2.50	3.93
LSD																		
Chips	47	48	46	12.1	6.8							0.96	0.34	0.30	0.36	0.46	0.36	1.87
Reds	47	48	46	14.1	6.8							1.13	0.38	0.35	0.36	0.46	0.36	1.87
Russet	47	48	46	11.8	6.8							0.94	0.33	0.29	0.36	0.46	0.36	1.87

Note: underlined values identify values significantly worse than the corresponding standard variety Snowden for chips, Dark Red Norland for reds and Russet Burbank for russets). LSD values are least significant differences or minimum difference that is statistically significant when comparing one breeding line with another from the same type (chips, reds and russets).

Table 7. Results of the 2008 SpudPro Variety Trial- Late Harvest (130 days after planting), Hancock ARS WI.

Chipping	Total Yield	Yield A (cwt/a)	No1 Yield (cwt/a)	B Size Yield (cwt/a)	Cull Yield (cwt/a)	% 2-4Oz Yield	% 4-6Oz Yield	% 6-10Oz Yield	% 10-13Oz	% 13-16Oz	% More than 16Oz	Specific Gravity	Tuber Shape	Tuber Size	Skin Set	Common Scab 1-5 Severity	Preference	% Internal Defects	1-5 Uniformity	% Brown Center	% Hollow Heart
Atlantic	469	431	387	2.46	27.5	11.1	28.7	44.5	7.8	3.3	4.6	1.074	2.3	1.86	2.09	2.50	2.5	9.08	2.16	<u>3.61</u>	2.66
Dakota Pearl	369	330	294	6.11	20.9	41.1	33.1	20.5	3.4	0.9	0.9	1.065	2.0	2.25	1.94	1.97	2.0	10.91	2.07	<u>2.17</u>	4.58
Snowden	556	518	494	3.59	21.4	32.3	36.9	25.6	3.6	0.9	0.7	1.071	2.4	2.12	2.09	3.02	3.0	4.76	2.32	0.00	0.71
W3186-2	497	448	401	4.63	26.5	24.9	28.4	36.3	6.4	2.6	1.4	1.074	2.5	2.25	2.17	2.89	2.9	9.45	2.49	0.00	1.87
W4013-1	303	<u>242</u>	242	12.27	23.0	56.6	25.4	12.2	3.9	1.2	0.7	1.070	2.2	2.76	2.08	2.76	2.8	4.03	2.24	0.00	1.47
W4016-4	488	444	380	5.60	20.0	32.5	41.0	22.9	2.0	0.8	0.7	1.070	2.2	2.12	2.30	2.63	2.6	12.34	2.40	<u>4.56</u>	4.58
W4282-2	446	395	275	5.22	27.4	28.5	33.5	27.9	5.4	1.6	3.1	<u>1.064</u>	2.0	1.86	2.09	2.37	2.4	<u>25.37</u>	2.16	0.00	3.42
W4980-1	395	349	318	7.15	20.4	46.0	33.0	17.0	2.4	0.8	0.7	1.070	2.2	<u>2.63</u>	2.23	<u>3.15</u>	<u>3.2</u>	8.74	2.32	0.00	3.05
W5015-12	489	425	414	7.38	27.2	35.1	35.0	24.5	3.6	0.9	1.0	1.072	2.4	2.25	2.23	2.37	2.4	4.03	2.40	0.00	0.71
Reds																					
Dark Red Norland	424	373	366	4.48	29.8	30.3	36.8	27.4	3.8	0.9	0.8	1.065	<u>2.7</u>	2.25	2.18	2.72	2.7	3.68	2.57	0.67	1.10
W2609-1R	<u>360</u>	323	<u>319</u>	7.53	14.8	42.6	33.2	19.0	3.5	0.8	0.8	1.071	2.2	2.38	2.18	2.85	2.8	3.66	2.32	0.18	0.71
Russets																					
Goldrush	461	419	399	3.08	27.5	24.8	24.8	29.2	8.0	2.4	10.8	<u>1.062</u>	2.4	2.16	2.13	2.76	2.8	5.48	2.40	0.34	1.10
Russet Burbank	541	474	453	7.09	27.2	29.7	35.9	28.4	3.3	0.5	2.2	1.075	2.3	2.15	2.23	2.74	2.7	4.74	2.48	0.83	0.71
Russet Norkotah	402	358	339	4.74	25.1	37.7	29.8	26.9	1.3	0.0	4.4	1.065	2.4	2.41	2.13	3.02	3.0	6.20	2.49	0.34	1.87
W2253-5rus	<u>268</u>	<u>248</u>	236	2.02	17.0	30.0	18.1	26.9	9.5	5.1	10.4	<u>1.062</u>	2.1	1.90	2.13	3.02	3.0	8.00	2.16	0.34	6.11
W3160-5rus	<u>354</u>	<u>292</u>	242	<u>9.52</u>	27.1	44.3	35.9	15.9	0.0	0.4	3.5	1.069	2.1	2.41	2.13	2.63	2.6	15.97	2.24	0.83	1.10
W3666-2rus	407	376	353	3.17	19.8	27.3	24.7	29.4	7.1	2.6	8.9	1.069	2.2	2.03	2.20	2.36	2.4	6.94	2.24	0.83	1.87
W3743-5rus	588	508	433	3.97	<u>47.1</u>	17.5	21.4	32.6	8.5	7.0	12.9	<u>1.063</u>	2.2	1.77	2.27	<u>2.36</u>	2.4	11.97	2.24	0.83	0.71
W3952-3rus	492	407	387	<u>9.04</u>	34.9	33.5	34.1	24.9	3.4	0.0	4.1	1.071	2.0	2.16	2.06	2.23	2.2	5.46	2.24	0.34	1.10
W4697-2rus	<u>237</u>	<u>198</u>	181	<u>8.27</u>	20.5	40.6	27.5	26.1	2.6	0.4	2.9	1.084	2.2	2.16	2.20	2.50	2.5	12.69	2.32	0.83	<u>8.06</u>
W5716-1rus	446	406	380	4.03	23.1	33.3	33.0	29.0	1.8	0.6	2.2	1.077	2.3	<u>2.54</u>	2.13	2.63	2.6	6.94	2.40	0.34	3.03
W7012-1rus	<u>363</u>	327	<u>316</u>	2.67	25.9	31.6	27.1	32.6	4.5	1.4	2.9	1.072	2.1	2.16	2.06	2.23	2.2	5.11	2.16	0.34	0.71
LSD																					
Chipping Lines	60	55	64	2.13	10.6							0.005	0.3	0.31	0.20	0.45	0.4	7.62	0.27	1.20	2.7
Reds	60	55	64	2.13	10.6							0.008	0.3	0.37	0.22	0.65	0.5	7.62	0.27	1.39	2.7
Russets	60	55	64	2.13	10.6							0.004	0.3	0.31	0.20	0.44	0.4	7.62	0.27	1.17	2.7

Note: underlined values identify values significantly worse than the corresponding standard variety Snowden for chips, Dark Red Norland for reds and Russet Burbank for russets). LSD values are least significant differences or minimum difference that is statistically significant when comparing one breeding line with another from the same type (chips, reds and russets).

W4282-2: Average yield, lower specific gravity compared to Snowden, which may decrease its potential as a processing variety.

W4980-1: It entered the SpudPro trial because it exhibited excellent chipping quality out of 47°F until in the 2007-08 storage season. Average yield with smaller tuber size compared to Snowden.

W5015-12: Higher than average yield among the chipping lines. Small tuber with rougher than average tuber size and high proportion of undersize tubers.

Red Clones:

W2609-1R: Lower than average yield among the reds, and color similar to Dark Red Norland.

Russets Clones:

W2253-5rs: It was among the lowest yield among the russets for second consecutive year. It has a low gravity of 1.060, which limits its potential for processing.

W3160-rus: Low total yield and low US #1 yield for a second consecutive year. It has the potential to develop internal brown spot. Small tuber size profile but of attractive appearance.

W3666-2rus: Yield similar to Russet Burbank with significantly smaller proportion of tubers with external and internal defects. Gravity is lower than Burbank. Fresh market russet.

W3743-5rus: Attractive large size tubers and high yield. Specific gravity is similar to Goldrush. Fresh market light russet.

W3952-3rus: Uniform mid size russet. Total yield is comparable to Russet Burbank. Specific gravity is significantly lower than Burbank with darker fried products.

W4697-2rus: High specific gravity, low yield; high percentage of hollow heart (8%).

W5716-1rus: Small tuber size profile with shallow eyes and smooth appearance. Specific gravity is similar to Burbank; in addition, fried products in October and January was similar in color to Russet Burbank in 2007.

W7012-1rus: Relative low yield and nice tuber shape.

2.2. Replicated Advanced Breeding Lines Trial of Year 4 and 5:

Replicated Yield and Adaptation Trials: The replicated trial 2 (Table 8) was composed of 30 round white, 17 russets, 6 reds and 2 yellow flesh advanced breeding lines from year 5 were conducted at the Rhinelander and Hancock A.R.S. locations. Three replications were used, with a plot size of one 20 ft rows, separation between rows was 3 feet. Breeding lines were selected for fresh market potential (reds, a portion of the russets and round white and the yellow flesh). A number of lines were selected for their processing traits (chips and French fries). Appropriate standard varieties were included in each group. The main objective of this trial is to gather data on the field performance, adaptation and tuber qualities of 5th year selections. At the same time, diseases such as common scab, early blight, early and early dying are evaluated at the same or separate trials. The replicated trial 1 included 64 round white, 5 red and 31 russet lines (Table 9). Chipping evaluations are being performed directly from 42 and 47°F storages at 3, 5 and 9 months after harvest. As in previous years, tuber quality is being stressed for selection; especial interest have being given to have large enough sample size (30 to 100 tubers per replication) to estimate the proportion of tubers with internal defects. **This year we initiated evaluation of steamed potatoes in an effort to better assess the fresh market potential of breeding lines starting at the fourth year of selection.** Breeding lines are advanced selection scheme due to their tuber merit or combined tuber quality, field performance and disease resistance.

Table 8. Results from Advanced Selections of Year 5 evaluated for processing traits, common scab (at Heartland Farms and Alliston, ON, Canada), in season evaluation, tuber internal defects and cooking evaluations.

		Processing		Yield				Common Scab		In Season Evaluation				Tuber Internal Traits				Cooked Tuber Evaluation					
		Dec 1 Fry Color	Specific Grav	Total Yield	A Yield	B Yield	Culls	Alliston Scab	HF Scab	Foliage Color	Plant Vigor	Eblight AUDPC	Days to Senesc	Hollow Heart	Vascular Disc	IBSpc	Raw Fleshco	Cooked Fleshco	Cooked Disco(1 h)	Cooked Disco(24h)	Consistency	Granular Structure	Dry Mouth Sensation
Atlantic	chip	5.2	1.084	285	274	8	3	3.5	<u>2.9</u>	2.0	1.7	471	120	2.1	3.4	12.1	1.9	2.4		5.5	5.9	4.7	4.1
DakotaPe	chip	4.0	<u>1.070</u>	413	399	12	2			1.9	1.7	<u>842</u>	114	2.6	6.0	8.6	1.8	2.3		5.1	5.0	4.5	4.1
Snowden	chip	4.8	1.081	384	363	19	1	3.3	3.5	2.0	1.7	362	120	1.1	3.6	<u>26.1</u>	1.9	2.3	7.0	5.7	5.2	4.6	4.4
W1201	chip	5.0	1.082	322	300	18	3	3.1	1.4	2.1	2.0	440	122	4.4	5.0	8.9	1.9	2.3	6.8	5.3	5.7	4.5	4.0
W5800-5	chip	4.4	<u>1.072</u>	385	331	42	13	2.8	1.8	2.1	2.0	415	121	15.0	5.9	17.7	1.9	2.4	6.7	5.7	5.2	4.5	4.5
W5840-4	chip	4.2	1.077	336	320	14	2	3.1	2.1	2.0	1.9	679	116	11.3	3.1	<u>18.4</u>	1.9	2.3	5.9	5.1	4.8	4.7	4.3
W5948-2	chip	4.8	<u>1.073</u>	381	366	13	3	2.9	1.7	2.1	<u>2.8</u>	422	124	1.1	4.2	<u>20.8</u>	1.9	2.3	6.2	5.1	5.2	4.7	4.2
W5955-1	chip	4.4	1.081	423	408	14	1	2.2	1.7	1.9	1.7	<u>689</u>	122	3.5	3.8	10.2	1.9	2.3	6.8	5.5	4.4	4.5	4.0
W5963-2	chip	4.5	1.083	338	325	10	3	2.2	1.5	1.8	1.9	<u>704</u>	121	1.8	3.9	<u>16.8</u>	1.9	2.3	6.2	5.1	4.1	4.7	4.4
W6040-6	chip	4.9	<u>1.072</u>	374	355	17	2	2.3	1.8	1.9	2.1	<u>803</u>	119	1.1	2.7	7.9	1.9	2.3	5.5	5.3	5.7	4.7	4.0
W6387-3	chip	3.7	<u>1.072</u>	328	317	7	4	4.0	3.3	1.9	2.1	<u>835</u>	116	1.1	7.1	9.1	1.9	2.4	5.9	5.0	5.7	4.2	4.0
W6444-2	chip	4.9	1.078	366	348	15	3	2.5	2.3	2.2	2.1	471	121	1.5	2.6	12.2	1.8	2.1	6.5	5.3	5.2	4.4	4.2
W6483-4	chip	3.8	1.081	366	351	9	3	1.9	1.4	1.9	2.3	464	122	2.5	4.9	11.5	1.9	2.3	6.5	5.5	5.0	4.5	4.2
W6483-5	chip	4.0	<u>1.068</u>	329	320	9	9	2.8	2.5	1.9	1.6	<u>744</u>	115	1.9	2.1	7.5	1.9	2.3	6.5	5.3	4.8	4.5	4.1
W6484-2	chip	4.9	<u>1.075</u>	367	340	20	8	3.5	2.2	2.1	2.3	508	120	2.9	4.0	13.0	1.8	2.3	5.8	5.1	4.6	4.4	4.3
W6484-5	chip	4.6	1.079	320	296	22	2	2.8	1.6	2.1	2.3	319	121	3.7	4.1	18.2	1.9	2.4	5.8	5.1	4.1	4.7	4.5
W6529-1	chip	5.3	1.083	311	294	16	1	2.5	2.1	2.0	1.6	558	118	8.4	4.2	12.1	1.9	2.3	5.5	4.6	4.6	4.4	4.1
W6591-1	chip	5.3	1.077	316	295	20	1	2.3	1.8	1.8	1.6	505	122	1.7	2.3	8.3	1.8	2.1	7.4	6.1	5.7	4.7	4.0
W6598-2	chip	4.2	<u>1.074</u>	304	272	29	4	2.6	2.4	2.1	2.0	<u>640</u>	120	1.5	2.2	<u>16.3</u>	2.0	2.7	6.4	5.3	5.0	4.2	4.2
W6609-3	chip	4.5	1.078	325	288	26	3	2.5	1.6	1.8	1.9	<u>561</u>	122	1.4	<u>11.9</u>	15.8	1.9	3.0	6.1	5.3	4.8	5.0	4.4
W6803-2	chip	4.6	1.081	324	306	11	7	2.7	2.0	2.1	1.7	486	121	3.7	3.7	11.2	1.9	2.3	6.1	5.3	4.6	4.7	3.9
W6803-3	chip	4.6	1.079	333	314	14	6	2.5	1.7	2.2	2.0	377	119	5.0	4.2	13.0	1.8	2.3	6.4	5.5	5.5	4.4	4.2
W6822-2	chip	4.2	1.079	357	322	35	0	3.2	3.3	2.0	1.7	428	119	1.8	3.2	<u>18.5</u>	1.8	3.2	7.0	5.7	4.6	4.4	4.1
W6822-3	chip	4.5	1.083	401	383	16	1	2.6	2.1	2.1	2.0	474	117	1.4	4.5	12.0	1.9	2.4	5.8	5.1	5.0	4.6	4.3
W6822-4	chip	4.2	<u>1.076</u>	359	337	20	1	3.0	2.4	1.9	1.5	<u>727</u>	117	1.6	3.7	9.7	1.9	2.3	6.4	5.5	5.0	4.4	4.0
W6929-3	chip	4.8	1.079	238	217	18	3	2.8	2.1	2.2	<u>2.5</u>	<u>716</u>	118	1.4	2.2	15.0	1.9	2.4	6.4	5.1	4.6	4.2	4.3
W7080-2	chip	4.2	<u>1.072</u>	334	304	29	1	3.3	2.1	2.2	2.1	515	121	1.1	2.6	10.0	1.9	2.3	6.8	5.1	5.2	4.4	4.0
W7279-8	chip	4.3	<u>1.076</u>	306	298	7	1	2.7	2.2	2.1	2.0	745	116	1.6	3.9	9.2	1.9	2.4	6.7	5.1	4.1	4.9	4.2
W7312-1	chip	4.6	1.077	240	196	34	9	2.2	2.1	2.0	1.9	491	118	1.1	7.0	10.2	1.9	2.6	6.7	5.5	5.2	4.5	4.3
WhitePearl	chip	4.4	1.084	392	370	24	5			1.9	1.9	483	122	2.0	3.9	11.6	1.9	2.3	6.7	5.7	4.8	4.7	4.2

Note See procedures for cooking evaluation at the end of this report. Underlined and boldfaced values as explained for Table 7.

Table 8. (cont'd) Results from Advanced Selections of Year 5 evaluated for processing trials, common scab (at Heartland Farms and Alliston, ON, Canada, in season evaluation, tuber internal defects and cooking evaluations.

		Processing		Yield				Common		In Season Evaluation				Tuber Internal Traits				Cooked Tuber Evaluation					
		Dec 1 Fry Color	Specific Grav	Total Yield	A Yield	B Yield	Culls	Alliston Scab	HF Scab	Foliage Color	Plant Vigor	Eblight AUDPC	Days to Senesc	Hollow Heart	Vascular Disc	IBSpc	Raw Fleshco	Cooked Fleshco	Cooked Disco(1h)	Cooked Disco(24h)	Consistency	Granular Structure	Dry Mouth Sensation
Dark Red Norland	red	7.7	1.061	313	247	47	4	2.4	1.6	1.7	1.6	525	116	1.3	2.1	8.4	1.6	2.1	5.7	4.9	5.0	2.8	2.2
W6002-1R	red	7.6	1.057	513	454	56	3	2.2	2.2	2.0	2.1	525	117	1.3	2.1	8.4	1.7	2.1	6.4	5.3	5.0	3.0	2.4
W6511-1R	red	7.6	1.072	388	359	27	3	3.4	2.9	1.3	2.0	264	124	1.1	1.9	24.8	1.7	2.1	6.4	5.3	5.0	3.0	2.4
W6515-1R	red	7.6	1.059	369	329	32	8	2.5	2.0	1.4	2.4	551	120	1.1	4.6	8.4	1.7	2.1	6.4	5.3	5.0	3.0	2.4
W8130-1R	red	7.6	1.062	374	329	45	0	3.5	2.2	1.7	2.0	530	120	11.1	6.0	9.1	1.7	2.1	7.0	5.8	5.6	3.0	2.3
W8131-1R	red	7.6	1.067	381	350	23	3	3.1	2.0	1.5	2.3	934	113	1.7	4.4	10.9	1.7	2.1	6.4	5.3	5.0	3.0	2.4
Russet Burbank	rus	6.4	1.081	322	290	32	0	2.5	1.6	1.9	1.9	332	120	1.1	1.6	13.6	1.7	2.1	7.4	6.2	4.8	4.5	5.1
Russet Norkotah	rus	6.3	1.076	382	367	14	1			1.7	1.4	1003	115	1.1	2.0	9.8	1.7	2.1	6.1	4.7	5.0	4.5	4.8
W1348rus	rus	5.1	1.074	413	379	22	5	2.0	1.4	2.2	2.0	737	119	1.3	2.4	12.4	1.6	2.1	6.4	5.3	5.9	4.3	5.0
W1836-3rus	rus	6.1	1.079	384	365	17	2	1.7	1.3	1.6	1.6	435	122	1.1	2.6	11.3	1.7	2.1	6.4	5.5	5.5	4.6	4.9
W6294-3rus	rus	5.2	1.077	415	388	22	5	3.1	1.7	1.9	2.7	377	123	2.3	3.0	10.1	1.8	2.1	7.0	5.9	5.7	4.0	4.7
W6306-2rus	rus	5.7	1.085	317	302	17	1	2.8	2.5	2.0	2.3	367	118	1.6	1.3	14.2	1.9	2.1	6.7	5.5	5.0	4.5	5.1
W6312-1rus	rus	6.3	1.081	282	260	18	4	2.1	2.1	2.2	2.3	259	119	1.9	3.5	20.5	1.8	2.0	6.8	6.0	4.6	4.8	5.3
W6312-4rus	rus	5.9	1.075	327	295	30	3	4.0	2.8	2.4	2.4	472	120	2.8	3.9	12.1	1.6	2.0	6.2	4.9	4.8	4.3	4.7
W6313-1rus	rus	5.6	1.086	363	325	34	4	1.9	2.1	2.1	2.1	278	122	5.6	2.2	12.9	1.7	2.0	6.2	4.7	4.6	4.8	5.4
W6313-2rus	rus	5.4	1.085	303	257	42	4	3.2	1.4	2.1	2.3	631	119	4.6	3.2	12.9	1.7	2.9	5.3	4.7	4.8	4.8	5.3
W6360-1rus	rus	5.6	1.082	240	206	33	0	3.0	2.2	1.7	1.6	172	120	2.3	2.3	10.8	1.9	2.1	5.0	4.5	4.8	4.6	4.9
W6905-4rus	rus	5.2	1.082	376	344	30	2	2.8	3.4	1.8	1.9	249	119	5.9	1.2	11.5	1.7	2.0	5.9	5.5	4.8	4.5	5.0
W8152-1rus	rus	4.8	1.080	282	254	26	2	3.1	2.8	1.9	1.7	597	119	2.7	1.8	12.1	1.8	2.1	6.2	5.7	5.0	4.6	5.2
W8181-1rus	rus	6.1	1.073	263	229	30	4	2.9	1.9	2.3	2.4	488	117	5.4	1.5	8.5	1.7	3.1	7.1	4.9	5.0	4.1	4.7
W8206-1rus	rus	6.6	1.079	285	236	39	4	2.4	1.5	2.0	2.4	435	121	1.3	2.5	21.6	1.8	2.1	5.3	5.1	5.9	4.1	4.7
W8208-2rus	rus	5.4	1.077	374	363	16	1	2.2	1.5	2.1	2.1	494	118	3.3	2.6	15.9	1.8	2.0	7.4	5.8	5.5	4.5	5.0
W8250-1rus	rus	6.3	1.077	358	346	8	4	1.8	1.7	1.8	1.7	897	113	1.1	2.7	12.5	1.8	2.1	5.0	4.9	4.4	4.5	5.0
W6703-1	yf	8.1	1.068	371	340	22	10	2.6	1.6	2.0	2.0	272	120	1.1	1.5	10.1	7.1	7.5	7.1	6.0	5.5	3.7	3.1
W6703-5	yf	8.6	1.068	283	267	12	3	2.6	1.2	1.9	1.7	365	121	1.5	4.3	17.9	6.9	7.7	6.8	5.5	5.7	3.4	2.8
LSD	Chip	0.8	0.005						0.7	0.3	0.3	185	4	4.7	4.6	10	0.2	0.8	1.0	1.0	1.4	0.6	0.8
	red	1.2	0.006						0.7	0.3	0.3	192	4	4.7	4.6	10	0.3	0.8	1.0	1.0	1.4	0.8	0.9
	rus	0.8	0.005						0.7	0.3	0.3	188	4	4.7	4.6	10	0.2	0.8	1.0	1.0	1.4	0.6	0.8
	yf	1.0	0.007						0.7	0.3	0.3	192	4	4.7	4.6	10	0.3	0.8	1.0	1.0	1.4	0.7	0.9

Table 9. Results of advanced breeding lines of Year 4 evaluated for processing traits, common scab (at Heartland Farms and Alliston, ON, Canada), in season evaluation, tuber internal defects, Hancock ARS, WI, 2008.

Breeding Line	Type	Plant	Growth	Total	A	B	C. Scab	C. Scab	Early Blight	Vine	Hollow	Vascular	IBS	IBS	Chip	Specific
		Vigor	Habit	Yield	Yield	Yield	Ontario	H Farms	AUDCP	Senesc	Heart	Discolor	Percent	Scale	Color	Gravity
Atlantic	chip	1.68	1.5	434	419	10.8	3.5	2.9	403	122	3	3.4	19.8	2.2	5.76	1.078
DakotaPe	chip	1.54	1.4	413	392	15.7			<u>769</u>	114	3.6	<u>8</u>	27.3	2.2	4.79	<u>1.072</u>
Megachip	chip	1.66	1.2	459	422	30	3.1	1.4	471	121	1.7	2.9	22.1	2.2	5.04	1.080
Pike	chip	1.78	1.7	401	381	11.6			519	122	2.3	2.8	11.8	2.3	5.50	1.077
Snowden	chip	1.9	1.6	467	437	16.2	3.3	<u>3.5</u>	475	122	1.7	3.8	17.8	2.3	5.08	1.077
Superior								2.2								
W1355-1	chip	2.02	1.8	345	307	32			492	121	2	3.9	28.0	2.3	4.47	1.077
W7411-1	chip	<u>2.39</u>	2.1	297	<u>263</u>	24.8	2.7	1.8	495	121	1.7	6.7	14.2	2.2	4.35	1.074
W7424-1	chip	1.78	1.9	417	380	<u>32</u>	3.6	2.1	294	125	4	2.7	21.1	2.2	5.12	1.083
W7430-2	chip	1.9	1.2	417	394	10.1	2.9	2.8	795	119	1.7	4.1	31.1	2.2	4.74	1.072
W7431-2	chip	2.02	2.5	366	346	12.5	2.7	2.1	414	124	1.7	2.6	11.3	2.3	5.14	1.076
W7444-2	chip	2.14	1.9	<u>332</u>	<u>299</u>	26.7	2.7	<u>3.0</u>	<u>805</u>	114	<u>9.9</u>	5.3	18.8	2.3	4.90	1.077
W7444-4	chip	2.14	2.2	<u>273</u>	246	20	2.9	2.4	<u>881</u>	117	1.7	4.8	23.5	2.2	5.33	1.076
W7445-1	chip	2.02	2.1	404	372	26	2.2	1.4	641	120	2.3	3.9	14.8	2.3	5.96	1.076
W7464-1	chip	1.9	2.2	427	403	13.7	2.3	1.8	525	122	3.5	3	19.9	2.2	4.70	1.079
W7464-3	chip	1.9	1.5	<u>388</u>	<u>362</u>	18.3	3.1	1.8	<u>808</u>	121	2.3	3.5	24.8	2.1	4.87	1.078
W7480-1	chip	1.78	1.9	370	<u>350</u>	9.8	3.6	2.1	639	118	1.7	3.3	8.0	2.3	6.16	1.070
W7483-2	chip	2.27	2.3	306	<u>277</u>	17.4	4.0	2.8	663	122	2	2.9	20.5	2.2	5.17	1.078
W7631-1	chip	<u>2.52</u>	2.1	<u>295</u>	<u>271</u>	16	2.6	1.9	<u>733</u>	121	3.8	4.4	10.5	2.4	4.69	1.083
W7631-2	chip	2.15	1.9	361	<u>323</u>	24.4	2.6	2.6	548	114	3.4	3.7	23.2	2.3	<u>6.15</u>	1.079
W7639-1	chip	2.15	2.1	296	<u>262</u>	20.5	3.6	<u>3.0</u>	696	116	5.6	6.4	0.1	2.3	5.65	1.075
W7678-2	chip	<u>2.52</u>	2.8	<u>267</u>	<u>244</u>	10.2	2.7	<u>3.0</u>	<u>1090</u>	111	1.7	3.3	10.9	2.3	4.96	1.073
W7679-1	chip	2.03	1.9	<u>334</u>	<u>309</u>	15.3	2.4	2.6	<u>880</u>	113	2.4	3.4	20.7	2.3	5.52	<u>1.070</u>
W7680-1	chip	<u>2.51</u>	2.6	<u>309</u>	<u>281</u>	17.2	2.7	2.6	<u>804</u>	114	2	3.2	26.6	2.4	5.29	<u>1.069</u>
W7680-4	chip	2.76	2.4	400	379	14.8	3.0	1.7	343	121	2.2	4	1.2	2.4	4.56	1.081
W7680-5	chip	<u>2.39</u>	2.4	<u>342</u>	<u>318</u>	18.8	2.7	1.9	548	122	1.7	3.2	17.7	2.2	4.79	<u>1.072</u>
W7683-2	chip	2.03	1.9	313	<u>282</u>	12.7	2.7	2.9	410	121	14.5	5.1	16.2	2.4	4.98	1.075
W7697-2	chip	2.27	2.3	379	347	26.4	2.4	2.4	310	<u>128</u>	14.7	9	10.1	2.3	5.46	1.076
W7712-1	chip	2.27	2.3	317	<u>276</u>	30.3	3.6	<u>2.9</u>	<u>710</u>	119	2.6	4.4	25.2	2.2	4.79	1.076
W7718-2	chip	<u>2.63</u>	2.2	<u>334</u>	291	30.1	2.8	<u>3.5</u>	679	119	4.6	4.2	21.6	2.2	4.91	1.081
W7724-3	chip	2.05	1.8	431	404	13.7	2.9	1.6	416	123	3.5	2.4	12.4	2.3	5.60	1.075
W7725-2	chip	1.94	2	331	<u>315</u>	9.1	3.4	<u>3.7</u>	434	120	2	2.8	5.7	2.3	4.73	1.081
W7726-2	chip	2.02	1.7	<u>330</u>	<u>308</u>	16.9	2.9	<u>3.9</u>	626	117	1.7	3.1	13.5	2.3	5.04	1.080
W7733-1	chip	1.93	1.6	411	378	22	3.3	2.2	406	123	2.6	2.7	18.2	2.3	5.85	1.077
W7734-4	chip	2.18	2.4	<u>309</u>	<u>280</u>	23.9	2.5	1.9	<u>903</u>	115	2.6	6.4	25.4	2.3	5.53	1.074

Note: underlined values identify values significantly worse than the corresponding standard variety Snowden for chips, Dark Red Norland for reds and Russet Burbank for russets). LSD values are least significant differences or minimum difference that is statistically significant when comparing one breeding line with another from the same type (chips, reds and russets).

Table 9 (cont.). Results of advanced breeding lines of Year 4 evaluated for processing traits, common scab (at Heartland Farms and Alliston, ON, Canada), in season evaluation, tuber internal defects, Hancock, WI, 2008.

Breeding Line	Type	Plant	Growth	Total	A	B	C. Scab	C. Scab	Early Blight	Vine	Hollow	Vascular	IBS	IBS	Chip	Specific
		Vigor	Habit	Yield	Yield	Yield	Ontario	H Farms	AUDCP	Senesc	Heart	Discolor	Percent	Scale	Color	Gravity
W7737-2	chip	<u>2.39</u>	2.6	<u>305</u>	<u>279</u>	15.6	2.6	2.2	413	120	4.3	5.4	11.9	2.3	<u>6.15</u>	1.077
W7897-1	chip	2.17	1.4	<u>328</u>	<u>301</u>	18.4	3.0	<u>3.3</u>	<u>654</u>	117	3	5.2	28.0	2.2	5.22	1.077
W7918-2	chip	2.27	1.9	<u>261</u>	<u>224</u>	<u>29</u>	3.1	<u>3.0</u>	<u>776</u>	118	2	3.7	27.0	2.2	5.00	1.073
W7918-4	chip	<u>2.52</u>	2	<u>330</u>	<u>284</u>	<u>36.3</u>	2.9	1.9	<u>774</u>	116	1.9	2.7	28.7	2.2	4.00	1.075
W7918-8	chip	1.66	1.3	463	435	15.1	3.2	1.6	<u>716</u>	119	2.7	3.4	16.6	2.3	4.25	1.076
W7941-1	chip	2.27	2.8	376	<u>359</u>	12.6	3.1	1.4	<u>753</u>	120	1.7	2.4	22.5	2.1	5.30	1.078
W7941-2	chip	2.15	1.8	<u>370</u>	<u>338</u>	22.7	3.2	1.6	384	124	2	3.8	22.9	2.3	5.59	1.079
W7956-2	chip	1.93	2.6	<u>326</u>	<u>306</u>	15.9	2.7	1.8	578	121	1.7	3.3	13.2	2.2	4.84	1.072
W7986-1	chip	1.81	2	396	<u>366</u>	17.8	2.4	2.0	279	126	1.7	3.3	9.9	2.2	5.47	1.076
W7986-2	chip	1.93	1.9	<u>365</u>	<u>344</u>	14.2	2.4	<u>3.1</u>	<u>547</u>	123	<u>10.8</u>	3.9	8.2	2.3	4.70	1.071
W8010-1	chip	1.54	1.2	397	<u>363</u>	17.5	2.7	2.0	<u>674</u>	117	7.8	3.2	26.5	2.1	5.25	1.073
W8603-1	chip	2.18	1.3	457	436	14.5	3.2	2.4	512	121	2	4.6	23.7	2.2	4.90	1.074
W8979-1	chip	2.54	1.6	375	<u>329</u>	<u>36.9</u>	4.0	3.4	360	125	2.2	3.5	20.9	2.3	4.22	1.078
W8979-3	chip	<u>2.42</u>	1.8	420	395	13.1	3.7	<u>3.2</u>	<u>477</u>	121	2	5.9	23.1	2.3	4.68	1.075
W8986-2	chip	2.02	1.6	<u>389</u>	<u>339</u>	<u>45.3</u>	2.7	2.3	<u>771</u>	116	1.7	2.4	28.1	2.2	<u>6.13</u>	<u>1.068</u>
W8990-1	chip	2.27	2.1	335	<u>287</u>	<u>37</u>	3.5	3.1	450	122	2.5	6.2	23.2	2.3	4.62	1.071
W8994-1	chip	<u>2.64</u>	2.6	<u>236</u>	<u>217</u>	11.9	3.2	<u>3.4</u>	<u>649</u>	118	1.7	2.4	16.4	2.2	5.25	1.072
W8999-1	chip	<u>2.4</u>	2.8	<u>214</u>	<u>187</u>	9.7	2.5	1.4	<u>825</u>	115	<u>15.6</u>	6	2.3	2.4	5.23	<u>1.069</u>
W9006-1	chip	<u>3.25</u>	2.6	<u>223</u>	<u>189</u>	22.2	2.6	2.3	<u>1114</u>	109	2.9	2.8	30.0	2.1	5.61	<u>1.065</u>
W9029-2	chip	1.9	1.2	409	385	17.6	3.7	3.1	488	124	4.8	2.4	14.0	2.3	6.76	1.073
W9033-2	chip	2.02	2.9	<u>280</u>	<u>250</u>	20.7	2.9	<u>2.8</u>	510	122	<u>13</u>	3.9	2.2	2.4	6.05	1.073
W9042-2	chip	<u>2.39</u>	1.5	348	<u>321</u>	17.7	3.2	<u>3.0</u>	548	124	4.6	3.8	28.9	2.2	5.41	<u>1.066</u>
W9042-3	chip	1.9	2.1	379	<u>351</u>	15.4	3.5	2.4	479	123	7.4	2.8	14.7	2.4	5.08	1.075
W9053-1	chip	2.14	1.5	351	<u>325</u>	17.2	3.6	2.2	542	125	3.7	3.1	27.4	2.2	4.86	1.077
W9061-1	chip	<u>2.51</u>	1.9	<u>292</u>	<u>264</u>	19.1	3.9	<u>3.8</u>	<u>898</u>	115	2	2.8	20.3	2.2	<u>6.24</u>	1.076
W9062-3	chip	<u>2.39</u>	2.3	<u>289</u>	<u>264</u>	14	2.9	2.0	<u>901</u>	118	3.2	4.6	1.3	2.2	4.96	1.074
W9075-1	chip	1.81	1.7	415	397	8.8	3.5	2.7	<u>743</u>	117	1.7	2.7	27.3	2.3	5.26	1.072
W9090-1	chip	1.78	1.4	402	376	12.4	2.9	<u>3.0</u>	<u>1102</u>	106	2.4	5.3	29.6	2.3	<u>7.28</u>	<u>1.071</u>
YukonGol	chip	1.78	1.3	<u>390</u>	<u>365</u>	11.4			854	114	2	3.3	7.2	2.1	5.95	1.071
Dark Red Norland	red	1.49	1.5	454	426	23.6	2.4	1.6	1097	104	2	4.1	31.8	1.8		1.052
W7458-1R	red	1.86	1.9	354	<u>328</u>	16	3.7	<u>2.6</u>	665	<u>117</u>	1.7	5.7	32.0	1.9		1.063
W7699-2R	red	1.49	1.9	<u>316</u>	<u>290</u>	23.8	2.9	<u>2.9</u>	895	<u>112</u>	1.7	4.3	31.7	1.8		1.052
W8610-1R	red	1.86	2.2	<u>323</u>	<u>264</u>	54.1	2.7	2.0	960	106	1.7	2.9	31.4	1.9		1.061
W8610-2R	red	1.86	2	<u>366</u>	<u>323</u>	<u>36.5</u>	4.0	<u>2.9</u>	957	108	2	7.5	10.8	1.8		1.060

Note: underlined values identify values significantly worse than the corresponding standard variety Snowden for chips, Dark Red Norland for reds and Russet Burbank for russets). LSD values are least significant differences or minimum difference that is statistically significant when comparing one breeding line with another from the same type (chips, reds and russets).

Table 9 (cont.). Results of advanced breeding lines of Year 4 evaluated for processing traits, common scab (at Heartland Farms and Alliston, ON, Canada), in season evaluation, tuber internal defects, Hancock ARS, WI, 2008

Breeding Line	Type	Plant	Growth	Total	A	B	C. Scab	C. Scab	Early Blight	Vine	Hollow	Vascular	IBS	IBS	Chip	Specific
		Vigor	Habit	Yield	Yield	Yield	Ontario	H Farms	AUDCP	Senesc	Heart	Discolor	Percent	Scale	Color	Gravity
Bannock Russet	rus	1.85	2.5	413	390	17.3			208	131	11.7	4	24.0	2.1	7.26	1.075
Goldrush	rus	1.51	1.6	458	425	22.8			866	117	2	3.3	35.1	2.1	7.58	1.066
Russet Burbank	rus	1.48	1.3	440	415	22.5	2.5	1.6	469	121	2.5	5.4	23.6	2.3	7.52	1.075
Russet Norkotah	rus	1.85	1.6	409	379	27.1			864	112	1.7	2.4	31.6	2.0	7.88	1.068
W1836-3rus	rus	1.51	1.7	487	461	26.9	1.7	1.3	457	122	1.7	2.8	26.5	2.1	6.72	1.076
W7385-1rus	rus	1.97	2.3	318	275	32.8	2.7	2.5	279	128	3.7	3.6	26.0	2.1	7.88	1.080
W7402-7rus	rus	1.85	1.7	313	266	43.9	2.0	1.6	663	111	4.3	2.8	23.9	2.2	6.84	1.071
W7427-1rus	rus	2.1	2.5	282	254	26.2	1.7	1.2	669	120	3	6	22.5	2.2	6.59	1.073
W7449-1rus	rus	1.61	1.6	461	418	24.3	3.1	2.9	420	126	4.3	3.5	31.9	2.1	6.71	1.075
W7459-1rus	rus	1.85	1.8	372	300	63.1	2.6	1.9	448	121	1.9	3.8	24.8	2.1	6.55	1.075
W7520-1rus	rus	1.85	2.4	364	327	33.4	3.6	3.4	534	117	1.7	2.4	17.1	2.2	6.88	1.073
W7521-1rus	rus	2.58	1.7	369	334	25.1	3.3	2.1	881	115	2.9	3.3	25.9	2.1	6.71	1.068
W7656-4rus	rus	1.85	2	344	313	23	2.3	1.8	409	122	2.7	4.1	24.3	2.2	7.68	1.073
W7670-1rus	rus	1.85	2.3	323	308	12.5	3.0	1.8	453	127	1.7	3	32.9	2.1	6.30	1.070
W7693-2rus	rus	1.97	2.4	231	206	15.9	3.9	3.3	884	110	8.7	3.7	5.9	2.2	5.96	1.059
W7693-3rus	rus	1.85	2.4	321	287	17.7	2.6	1.7	253	127	7.2	5	28.9	2.1	7.01	1.071
W7803-1rus	rus	2.22	2.2	376	328	33.3	3.1	3.4	618	119	1.7	3.5	21.1	2.3	7.43	1.067
W7804-1rus	rus	1.73	1.7	366	321	40.1	3.9	3.5	927	114	4.4	4.5	25.2	2.0	5.96	1.073
W7808-2rus	rus	2.1	2.2	370	332	32.7	2.6	2.1	448	122	11.4	5.1	30.2	2.0	7.22	1.072
W7861-1rus	rus	2.21	2.1	327	302	18.3	3.6	2.2	792	116	6.2	5.2	37.5	2.2	7.38	1.077
W8019-1rus	rus	1.85	2.3	263	204	52.9	3.1	2.2	862	114	2	2.8	30.1	2.1	7.97	1.062
W8593-2rus	rus	1.6	1.6	372	322	46.1	1.9	1.5	906	118	1.7	3.7	32.7	2.0	6.21	1.065
W8903-1rus	rus	1.85	2.1	375	311	57.3	4.4	3.4	531	122	1.7	3.2	31.4	2.1	7.30	1.080
W8904-1rus	rus	2.34	2.2	281	239	33.9	4.4	4.2	732	118	2	2.8	0.1	2.2	7.84	1.068
W8907-1rus	rus	1.36	1.3	494	440	42.9	4.2	3.1	524	122	1.7	4.1	27.1	2.2	7.22	1.074
W8920-1rus	rus	1.36	1.3	529	489	26.1	4.4	3.9	383	126	3.3	3.1	29.3	2.2	6.88	1.069
W8924-1rus	rus	1.97	1.8	328	286	17.9	3.7	3.4	552	114	2.1	5.3	25.1	2.2	7.31	1.067
W8930-1rus	rus	2.59	2.1	309	241	56.7	3.9	3.5	521	122	1.7	3.6	22.0	2.2	7.38	1.069
W8937-1rus	rus	1.48	1.4	324	283	31.7	3.1	2.2	593	120	17.8	3.7	17.3	2.3	6.00	1.077
W8946-1rus	rus	1.97	1.9	433	391	36.5	2.9	1.6	268	120	2	3	15.5	2.2	5.50	1.084
W8950-1rus	rus	2.71	2.6	305	266	36.3	3.7	3.0	388	123	2	4.9	13.1	2.2	6.51	1.080
W8973-2rus	rus	2.09	2	330	310	15.6	2.5	1.5	881	116	2	3.8	20.9	2.2	7.59	1.060
LSD	Chip	0.4	0.4	72	71	12	0.7	0.3	177	4.7	6.3	3.3	17.2	0.3	0.98	0.007
	Red	0.4	0.4	72	71	13.8	0.7	0.3	229	5.8	6.3	3.3	17.6	0.3		0.006
	rus	0.4	0.4	72	71	12.2	0.7	0.3	183	4.8	6.3	3.3	17.2	0.3	0.99	0.005

Additionally, samples of each advanced lines trial plots are being analyzed for tuber calcium content and data will be analyzed to study the relation between tuber calcium and tuber attributes which include internal and external defects.

The results and the selections made using information from replicated trial 1 and 2 will yield the lines to be evaluated in 2008 and also will be important information to initiate the first year of breeder's seed multiplication. This seed multiplication makes possible future on-farm grower exposure within WI and further research in selected clones in WI throughout a series of locations in the US and Canada. All of these efforts are important to estimate the value and adaptation of WI lines to several production areas and also serve as initial promotion of future potato varieties.

3. General Evaluation Methods

Grading Data at Harvest: Tuber External Evaluations: Shape: 1 = perfectly round, to 9 = very elongated. Size: 1 = extremely small to 9 = extremely large. Skinning at harvest: 1 totally skinned, to 9 = no skin detached. Scab: 1 = 100% of potatoes with deep pitted scab, to 9 = no scab symptoms observed. Preference: tuber appeal 1 = very smooth, nice looking tubers to 5 = very rough ugly tubers with external defects. Evaluation of culled potatoes in cwt/a: rot, greening, growth cracks, secondary growth, and off-shape. Specific gravity was evaluated using the weight in the air / weight in the water method. Tuber internal defects were measured as percentage in 60 cut tubers: hollow heart, brown center, vascular discoloration, internal brown spot and stem end discoloration

Chip Color data: a 15 tuber sample of each plot was stored at 55°F until they were sprout inhibited and located in two storage room that were ramped down to 47 and 42°F. Potatoes were chipped directly out of the storage. Chips were fried at 350°C for three minutes using a Hotpoint™ HK3 model (General Electric, Chicago Heights, IL). Chip color scores were estimate using a visual 1-10 scoring scale was used where 1=very light chip color and 10=very dark chip color. Several collaborators evaluated fry products using a Agtron scale.

Evaluation of Common Scab Resistance to Scab in Advanced Clones (Year 4, 5 and older): Experiments including 160 advanced lines were planted under heavy disease pressure at Heartland Farms in collaboration with Dr. Charlie Higgins, Alliston, ON in collaboration with Dr. Eugenia Banks, and Rhinelander WI. The experimental plots consisted of three replicates of 4 feet each. Tubers were evaluated at harvest for their incidence and severity of common scab. Severity, reported here was evaluated on a 1-5 scale, discussed earlier in this report. Consistency in response to scab was observed for many lines across the three locations. Lines that did not exhibited high incidence of scab will be selected and advanced. For a line to be considered with good scab performance, it needed to exhibit scab resistance between what is observed for between Superior and Pike for round white, or Goldrush for the russets. According to the analyses of variance for each of the locations Heartland Farms at Hancock was the best site to compare clones for scab resistance with minimum unexplained variation. Alliston, ON and Rhinelander, WI followed closely. Overall, 2007 was a very successful year for selection for resistance to common scab. Seventy five of the 160 clones tested had consistent performance as resistant or susceptible in all three locations (Table 5). Susceptible lines were those with

susceptibility to common scab which equal or greater to the susceptibility exhibited by Atlantic or Snowden. Lines that are not presented in Table 5 were those included in the Year 4 and Year 5 replicated trials that did not differ in scab resistance from the mean of their market type.

Cooking Evaluation: This year an important effort was initiated to evaluate culinary traits in steamed potatoes as follows: Three to five medium sized tubers are for each cooking sample (two reps). Tubers were washed and placed into a steamer with a strainer and steamed for 25 minutes on the stove. At the end of the boiling period, the tubers are moved to plates already laid on plates on a table and immediately peeled and scored as follows:

After Cooking Darkening: This characteristic is scored on a 1-9 scale with 1 being darkest and 9 brightest or most clear. This is a very revealing test and vital to understanding the presentation of the fresh cooked potato. The score is taken again 24 hrs later.

Flesh Color after cooking: Apart from the measure of darkening, the cooked flesh color is scored using a 1-9 scale where 1 is white and 9 is yellow.

Firm Cooking Types: This is the most sought after quality for salad potatoes and those served as boiled, peeled and quartered on a restaurant plate. A slice of cooked potato was evaluated by applying pressure to the tuber flesh with the thumb, potentially rubbing and finally slicing if firmness is present. Slices should be thin and remain unbroken, even bending but not breaking. Consistency: 1 = very loose, 3 = loose, 5 = middle 7 = firm and 9 = very firm.

Starch Granules Structure: 3 = fine, 5 = middle, 7 = large.

Dryness: evaluation of how dry feels the potato in the mouth. 1 = wet, 3 = little dry, 5 = middle, 7 = mealy 9 = very mealy.

Moisture: visual assessment of free moisture observed in a cut potato 1 = none, 3 = slight, 5 = medium, 7 = very wet, 9 = extremely wet.

Defect in Taste: 1 = none, 3 = slight, 5 = middle, 7 = strong, 9 = very strong.

Statistical Analyses: data were analyzed using a PROC MIXED procedure, each line is compared within its market type. An underlined number implies that the standard variety (Snowden for chips, Russet Burbank for russets and Dark Red Norland for reds) is better than the tested line. Boldfaced lines indicate lines with better performance than the corresponding standard variety for its market type. In the case of the common scab trial the standard variety was Superior.