2015 Michigan Regional Trial Location

Local Coordinators:	**Cooperating Grower:**	**Cooperating Chip Processor:**
Chris Long, Aaron Yoder & Dave Douches Michigan State University East Lansing, MI	Tim & Todd Young Sandyland Farms LLC Howard City, MI	Herr Foods, Inc., Nottingham, PA & E. K. Bare and Son's, Bird-in-Hand, PA

Trial Information:

Planting Date:	May 26th, 2015
Vine Kill Date:	September 17th, 2015
Harvest Date:	October 21st, 2015 (148 Days, Planting to Harvest)
Between Row & In Row Plant Spacing:	34″ x 10″; irrigated
Plots:	Single rows for each entry, approximately 300′ long
GDD, Base 40	3076 (114 Days, Planting to Vine Kill)

Trial Procedure:

Seed was hand cut on May 8th, 2015, and delivered to the grower's seed storage three days later. Syngenta Crop Protection Cruiser Maxx® Potatoes was applied at the time of seed cutting to aid in Colorado Beetle control.

Two pre-harvest sugar profiles were taken this season. One on August 13th, and the second on September 1st, for each variety, approximately three weeks and one week prior to the vine kill date. The pre-harvest sugar profile protocol was as follows: obtained a minimum of 40 tubers from each variety, taking all the tubers from each hill, even if that required collecting more than 40 tubers. A canopy rating was taken for each variety as a percent rating of green foliage. Canopy uniformity was noted as a percentage of how uniform the foliage health appeared. The number of hills required to obtain 40 tubers was recorded, along with the total number of main stems harvested. From the tubers harvested, the specific gravity, a glucose value (a percent by fresh weight), a sucrose rating (a percent by fresh weight X10) and an average tuber weight (in ounces) was established.

At harvest, three plot areas of 23 feet were harvested from each entry and were used to determine trial yield averages, tuber size distribution, specific gravity and quantity of internal defects present. Two, 40 lb. storage samples were collected from each entry and were placed in the grower's commercial storage for evaluation at later dates (January and April 2016). Sixteen, 40 tuber samples were also collected for each variety at harvest. All sixteen samples were stored at the Michigan Potato Industry Commission's Cargill Demonstration Storage Facility at approximately 48ºF or 54ºF for a monthly sugar profile evaluation at Techmark, Inc. Eight, 40 tuber samples were stored at each temperature for evaluation, November 2015

through June 2016. The storage sugar profiles began October 21st, 2015. Two out-of-the-field chip samples were taken for each variety at harvest. One was sent to Herr Foods, Inc. for processing and the additional sample was processed at Michigan State University.

A plant growth and vine vigor observation was made on June 24th, 2015. AC03433-1W appeared to have the slowest rate of vine growth. The stand also proved to be rather poor for this variety on this date. A00188-3C, CO03243-3W and Lamoka were the most vigorous varieties observed on this date. A vine maturity rating was taken for each variety on August 31st, 2015, approximately 17 days prior to vine kill. W6822-3, Atlantic and Snowden were the most mature varieties and AC01151-5W appeared to be the most immature on this date.

Growing Season Weather:

Weather conditions during the 2015 growing season remained moderate and slightly wetter than the 15 year average. The months of April, June and September experienced above average rainfall. Nineteen and a half inches of total rainfall was recorded April through September, approximately two inches higher than the 15 year average. One day during the growing season experienced daytime high temperatures over 90 °F while twenty-two nights recorded temperatures over 70 °F. These were well below the temperatures recorded during the past six seasons (2010 - 2015). Growing degree days base 40 recorded from May 1st through September 30th, 2015 were 3789. This was very similar to the 12 year average of 3741 GDD for this same time period. The tuber specific gravity, for potato production in Michigan, was above average as a result of the moderate nighttime heat stress. Commercial potato yields overall exceeded yield projections and are reported to have reached all-time high levels.

Results:

Table 1 summarizes the yield, size distribution, and specific gravity data at harvest. NY152 and Snowden topped the yield table in 2015, followed by AF4648-2 which also yielded above the trial average. AF4648-2 and Atlantic had the largest percentages of recorded oversize tubers, followed closely by AC03433-1W. AC03433-1W, CO03243-3W, AC01151-5W and NY152 recorded specific gravity values below the trial average of 1.076. AC01151-5W recorded a disproportionately high amount of undersize potatoes when compared to other varieties in this trial.

Table 1. Yield , Size Distribution*, Specific Gravity

	Yield (cwt/A)		Percent Size Distribution					
Entry	US#1	TOTAL	US#1	Small	Mid-Size	Large	Culls	Specific Gravity
NY152	596	676	88	10	81	7	2	1.074
Snowden	**579**	**634**	**91**	**6**	**79**	**12**	**3**	**1.079**
AF4648-2	457	493	93	4	68	25	3	1.078
Atlantic	**418**	**452**	**93**	**4**	**68**	**25**	**3**	**1.081**
AC01151-5W	400	542	74	24	71	3	2	1.072
CO03243-3W	384	446	86	12	77	9	2	1.070
A00188-3C	384	487	79	13	76	3	8	1.079
W6822-3	356	435	82	12	76	6	6	1.079
Lamoka	**344**	**379**	**91**	**6**	**75**	**16**	**3**	**1.077**
AC03433-1W	320	375	85	7	62	23	8	1.068
MEAN	**424**	**492**	**86**	**10**	**73**	**13**	**4**	**1.076**

*small <1 7/8"; mid-size 1 7/8"-3 1/4"; large >3 1/4"

Table 2 summarizes the at-harvest raw internal tuber quality. The internal quality across the trial was generally acceptable, but the evidence of in-season environmental stress was observed in some lines. A significant level of hollow heart was present in Atlantic and AC03433-1W. Lamoka and W6822-3 displayed a moderate level of internal brown spots. CO03243-3W, Lamoka, Snowden and AC03433-1W recorded above average amounts of vascular discoloration.

Table 2. At-Harvest Tuber Quality. Sandyland Farms, Howard City, Michigan.

	Raw Tuber Quality[1] (%)			
Entry	**HH**	**VD**	**IBS**	**BC**
NY152	0	13	3	0
Snowden	**3**	**23**	**3**	**0**
AF4648-2	0	3	0	0
Atlantic	**30**	**3**	**0**	**0**
AC01151-5W	3	10	3	0
CO03243-3W	0	27	0	0
A00188-3C	0	7	0	0
W6822-3	3	13	10	0
Lamoka	**0**	**27**	**23**	**0**
AC03433-1W	40	20	0	0

[1]Internal Defects. HH = hollow heart, VD = vascular discoloration, IBS = internal brown spot, BC = brown center.

Table 3 shows the post-harvest chip quality based on samples collected on October 21st, 2015, and processed at Herr Foods, Inc. on November 3rd. Chip color was generally acceptable across the trial, with NY152 having the highest Agtron score of the trial at 65.2. AC01151-5W recorded the fewest total chip defects at 13.3 percent. The varieties, listed in ranked order based on quality observations from Herr Foods, Inc., are as follows: A00188-3C, W6822-3, Snowden, AC03433-1W, CO03243-3W, Lamoka, NY152, AF4648-2, AC01151-5W and lastly Atlantic.

Table 3. 2015 Post-Harvest Chip Quality[1]

Entry	Agtron Color	SFA[2] Color	Specific Gravity	Percent Chip Defects[3] Internal	External	Total
NY152	65.2	3.0	1.077	16.5	11.1	27.6
Snowden	**62.8**	**3.0**	**1.075**	**31.1**	**16.4**	**47.5**
AF4648-2	62.0	3.0	1.083	30.3	22.5	52.8
Atlantic	**58.2**	**4.0**	**1.072**	**29.3**	**40.3**	**69.6**
AC01151-5W	53.1	3.0	1.068	9.3	4.0	13.3
CO03243-3W	62.1	2.0	1.074	22.5	30.9	53.4
A00188-3C	62.2	2.0	1.075	9.7	16.4	26.1
W6822-3	61.3	2.0	1.076	14.2	16.4	30.6
Lamoka	**64.9**	**3.0**	**1.075**	**19.8**	**12.9**	**32.7**
AC03433-1W	56.2	3.0	1.067	14.5	23.9	38.4

[1]Samples collected October 21st and processed by Herr Foods, Inc., Nottingham, PA on November 3rd, 2015.

Chip defects are included in Agtron and SFA samples.

[2]SFA Color: 1= lightest, 5 = darkest

[3]Percent Chip Defects are a percentage by weight of the total sample; comprised of undesirable color, greening, internal defects and external defects.

Table 4 summarizes the results of the samples collected for black spot bruise evaluation. Two, 25 tuber samples were collected at harvest. One sample served as a check and the second sample was stored for at least 12 hours at 50 ºF, then placed in a 6 sided plywood drum and rotated 10 times to produce a simulated bruise. Ten days after holding the samples at room temperature, all samples were abrasively peeled and scored for the presence of black spot bruise. Among the "Simulated Bruise" samples, the best entries were AF4648-2, A00188-3C and AC03433-1W. W6822-3, Snowden, Atlantic, NY152 and Lamoka showed the lowest percent bruise free tubers in the trial.

Table 4. Black Spot Bruise Test

	A. Check Samples[1]									B. Simulated Bruise Samples[2]								
	# of Bruises Per Tuber						Total	Percent Bruise	Average Bruises Per	# of Bruises Per Tuber						Total	Percent Bruise	Average Bruises Per
Entry	0	1	2	3	4	5	Tubers	Free	Tuber	0	1	2	3	4	5	Tubers	Free	Tuber
NY152	14	9	1				24	58	0.5	10	9	3	2			24	42	0.9
Snowden	**19**	**5**					**24**	**79**	**0.2**	**9**	**9**	**6**	**1**			**25**	**36**	**1.0**
AF4648-2	20	1					21	95	0.0	19	5					24	79	0.2
Atlantic	**20**	**3**	**1**				**24**	**83**	**0.2**	**10**	**10**	**3**			**1**	**24**	**42**	**0.9**
AC01151-5W	20	4					24	83	0.2	16	7	1				24	67	0.4
CO03243-3W	22	2					24	92	0.1	14	10					24	58	0.4
A00188-3C	21	2	1				24	88	0.2	20	4					24	83	0.2
W6822-3	19	6					25	76	0.2	1	5	9	2	2	5	24	4	2.6
Lamoka	**21**	**3**					**24**	**88**	**0.1**	**10**	**9**	**3**	**1**			**23**	**43**	**0.8**
AC03433-1W	20	4					24	83	0.2	18	6					24	75	0.3

[1]Tuber samples collected at harvest and held at room temperature for later abrasive peeling and scoring.

[2]Tuber samples collected at harvest, held at 50ºF for at least 12 hours, then placed in a 6 sided plywood drum and rotated 10 times to produce simulated bruising. They were then held at room temperature for later abrasive peeling and scoring.

Tables 5A - 5B summarize the results of the pre-harvest panel data collected on August 12th and August 31st, 2015. Lamoka exhibited an elevated sucrose value on August 12th, 2015. A00188-3C and W6822-3 had elevated sucrose readings on the August 31st sample date. Most varieties appeared to be physically immature at both sampling dates. The August 31st samples were collected 17 days prior to vine kill. Based on the out-of-the-field chip quality data, no chemical maturity issues appear to have negatively impacted chip processing quality for any of the varieties tested. AC01151-5W recorded a very low specific gravity on August 31st and Atlantic had the largest average tuber weight in the trial (Table 5B).

Table 5A. Pre-Harvest Panel 8/12/15

Entry	Specific Gravity	Glucose[1] %	Sucrose[2] Rating	Canopy Rating[3]	Canopy Uniform.[4]	Number of Hills	Number of Stems	Average[5] Tuber Weight
NY152	1.077	0.004	0.271	100	100	3	9	2.84
Snowden	1.073	0.004	0.621	100	100	4	20	3.31
AF4648-2	1.076	0.011	0.740	100	100	3	17	2.79
Atlantic	**1.078**	**0.005**	**0.927**	**100**	**100**	**4**	**10**	**3.94**
AC01151-5W	1.073	0.011	0.626	100	100	3	14	1.84
CO03243-3W	1.076	0.004	0.372	100	100	4	13	3.38
A00188-3C	1.072	0.007	0.912	100	100	4	25	3.20
W6822-3	1.079	0.004	0.733	100	100	4	13	4.04
Lamoka	**1.075**	**0.006**	**2.025**	**100**	**100**	**4**	**15**	**4.95**
AC03433-1W	1.070	0.007	0.718	100	100	4	12	3.74

1 Percent Glucose is the percent of glucose by weight in a given amount of fresh tuber tissue.

2 Sucrose Rating is the percent of sucrose by weight in a given amount of fresh tuber tissue X10.

3 The Canopy Rating is a percent rating of green foliage (0 is all brown, dead foliage; 100 is green, vigorous foliage).

4 The Canopy Uniformity is a percentage of how uniform the foliage health is at the date of observation.

5 The Average Tuber Weight is the total tuber weight collected, divided by the number of tubers, reported in ounces.

Table 5B. Pre-Harvest Panel, 8/31/15

Entry	Specific Gravity	Glucose[1] %	Sucrose[2] Rating	Canopy Rating[3]	Canopy Uniform.[4]	Number of Hills	Number of Stems	Average[5] Tuber Weight
NY152	1.074	0.002	0.305	100	100	4	12	3.98
Snowden	1.076	0.002	0.411	100	100	3	14	5.17
AF4648-2	1.070	0.008	0.546	100	100	3	11	4.28
Atlantic	**1.078**	**0.004**	**0.454**	**75**	**100**	**4**	**12**	**6.85**
AC01151-5W	1.067	0.010	0.574	100	100	3	10	2.59
CO03243-3W	1.078	0.003	0.550	100	100	3	14	3.33
A00188-3C	1.075	0.004	1.150	100	100	4	25	2.97
W6822-3	1.079	0.003	1.011	75	100	4	9	3.54
Lamoka	**1.081**	**0.003**	**0.761**	**75**	**100**	**3**	**15**	**4.06**
AC03433-1W	1.087	0.007	0.649	100	75	5	14	3.87

1 Percent Glucose is the percent of glucose by weight in a given amount of fresh tuber tissue.

2 Sucrose Rating is the percent of sucrose by weight in a given amount of fresh tuber tissue X10.

3 The Canopy Rating is a percent rating of green foliage (0 is all brown, dead foliage, 100 is green, vigorous foliage).

4 The Canopy Uniformity is a percentage of how uniform the foliage health is at the date of observation.

5 The Average Tuber Weight is the total tuber weight collected, divided by the number of tubers reported in ounces.

Variety Comments:

NY152: This variety recorded the top overall yield in the 2015 trial with a 596 cwt./A US#1 yield. The specific gravity was below the trial average at 1.074 (Table 1). Raw internal tuber quality was generally acceptable with 13 percent of the tubers expressing vascular discoloration and 3 percent internal brown spot (Table 2). Chip quality at Herr Foods was below average, ranking 7th of 10 for overall appearance, in spite of the fact that this line recorded the highest AGTRON score at 65.2 (Table 3). An above average amount of black spot bruise was observed for NY152, recording 0.9 bruises per tuber on average (Table 4). The tubers appeared to have been chemically mature at the time of harvest (Tables 5A - 5B).

Snowden: Snowden was the second highest yielding variety in the 2015 variety trial with a 579 cwt./A US#1 yield and an above average specific gravity of 1.079 (Table 1). Internal raw tuber quality was moderate at harvest with 3 percent hollow heart, 23 percent vascular discoloration and 3 percent internal brown spot observed (Table 2). This variety was above average in chip performance at Herr Foods out-of-the-field fry test, ranking third in the trial overall. Snowden had an above average susceptibility to black spot bruise with one bruise being observed per tuber on average (Table 4). Pre-harvest panel data for this line appeared acceptable on both sampling dates (Tables 5A - 5B).

AF4648-2: This variety was the third highest yielding line in the 2015 trial. The US#1 yield was 457 cwt./A, with a slightly above average specific gravity at 1.078 (Table 1). The tuber size distribution consisted of 68 percent mid-size and 25 percent oversize tubers. In general, the internal raw tuber quality for this line was very good (Table 2). AF4648-2 ranked 8th of 10 lines tested at Herr Foods for overall chip quality and appearance on November 3rd. It recorded one of the highest levels of total chip defects in the trial at 52.8 percent (Table 3). AF4648-2 appears to be tolerant of black spot bruise, recording only 0.2 bruises per tuber under simulated conditions (Table 4). This line was potentially, moderately physically and chemically immature

when the pre-harvest panels were collected (Tables 5A - 5B). The slightly elevated glucose levels at both pre-harvest panel dates could potentially explain the marginal chip quality performance at Herr Foods on November 3rd.

Atlantic: This variety had an average yield performance in the 2015 trial, yielding 418 cwt./A US#1, 6 cwt./A below the trial average of 424 cwt. (Table 1) The specific gravity was the highest in the trial at 1.081. This variety had twenty-five percent oversize tubers, of which 30 percent of them were hollow (Table 2). Herr's ranked Atlantic least desirable at the out-of-the-field chip quality evaluation on November 3rd, 2015, recording the highest percentage of total chip defects at 69.6 percent (Table 3). From the 2015 black spot bruise test, Atlantic appeared among the most susceptible varieties, recording 0.9 bruises per tuber (Table 4). Pre-harvest panel data showed Atlantic to be both chemically and physically mature prior to harvest.

AC01151-5W: This variety recorded the fifth highest yield in this year's trial (Table 1). AC01151-5W had one of the lowest specific gravity in the trial at 1.072. The tuber size distribution consisted of 74 percent US#1 size tubers and 24 percent undersize tubers. This was the largest percent of undersize in the trial. Internal tuber quality was average, with 3 percent of the oversize tubers expressing hollow heart, 10 percent of tubers expressing vascular discoloration and 3 percent having internal brown spots (Table 2). This clone ranked 9th at Herr's for chip quality and appearance on November 3rd, 2015, in spite of having the least amount of total chip defects of all the varieties (Table 3). AC01151-5W appeared to have an average level of tolerance to black spot bruise (Table 4). The glucose level was elevated at both pre-harvest panel dates, possibly contributing to the poor chip quality performance (Tables 5A - 5B).

CO03243-3W: This variety had a below average yield of 384 cwt./A US#1, tied for 6th highest yield overall. The specific gravity of this line was 1.070 which was recorded as the lowest specific gravity in the trial. Raw internal tuber quality was generally acceptable with 27 percent of cut tubers expressing vascular discoloration (Table 2). CO03243-3W ranked 5th of 10 varieties at Herr's for chip quality out-of-the-field. The variety exhibited an average susceptibility to black spot bruise, with only 0.4 black spot bruises being recorded for each tuber observed (Table 4). This variety appeared to have been chemically mature at the time of harvest (Tables 5A - 5B).

A00188-3C: A00188-3C yielded below the trial average at 384 cwt./A US#1, tying CO03243-3W for the 6th overall highest yield (Table 1). Specific gravity for A00188-3C was above the trial average at 1.079. The tuber size distribution consisted of 79 percent US#1 size tubers and 13 percent undersize tubers, 3 percent large and 8 percent culls. The variety had good internal raw tuber quality (Table 2). Herr's ranked this variety 1st of 10 in chip performance out-of-the-field. A00188-3C appeared to have a low susceptibility to black spot bruising (Table 4). The tubers of this variety appeared to be chemically immature on August 31st, recording 0.003 percent glucose and a sucrose rating of 1.150, but surprisingly, this high level of sucrose did not result in a poor chip quality performance at Herr's (Table 5B).

W6822-3: The yield for W6822-3 was below the trial average at 356 cwt./A US#1 with 12 percent of the total yield being small potatoes (Table 1). The specific gravity was above the trial average at 1.079. Internal tuber quality was acceptable (Table 2). This variety ranked second for overall chip quality at Herr Foods on November 3rd (Table 3). W6822-3 scored poorly in tolerance to black spot bruise, with an average of 2.6 bruises per tuber reported (Table 4). This variety exhibited the most black spot bruise susceptibility in the trial. The sucrose level was

elevated at the second pre-harvest panel date (Tables 5A - 5B). This did not prove to cause any negative effect on finished chip quality at Herr's.

Lamoka: This variety recorded the second lowest US#1 tuber yield of the trial at 344 cwt./A (Table 1). The specific gravity was slightly above the trial average at 1.077. Lamoka's oversize tubers contained 27 percent vascular discoloration and 23 percent internal brown spots which was the highest in the trial for this tuber defect (Table 2). The at-harvest chip fry test ranked this variety 6th out of 10 varieties for overall appearance (Table 3). Lamoka recorded a very good overall AGTRON score at 64.9. This variety expressed slightly above average susceptibility to simulated black spot bruising, averaging 0.8 bruises per tuber (Table 4). The plant vines appeared to be physiologically maturing on August 20th (Table 5A).

AC03433-1W: This variety yielded below the trial average, recording only 320 cwt./A US#1 with a specific gravity of 1.068 (Table 1). The tuber size distribution consisted of 62 percent mid-size, 23 percent large size tubers, 7 percent undersize and 8 percent cull tubers. This variety had the 3rd largest recorded amount of oversize in this year's trial at 23 percent. Raw internal tuber quality was poor with 40 percent of the tubers expressing hollow heart and 20 percent of the tubers having vascular discoloration (Table 2). AC03433-1W ranked 4th of the ten varieties tested at Herr's for chip quality on November 3rd. The variety exhibited a tolerance to black spot bruise, with only 0.3 black spot bruises being recorded per tuber (Table 4). The glucose level for this variety was elevated at both pre-harvest dates, but the variety appeared to be chemically mature based on chip quality results from the processor evaluation (Tables 5A – 5B).