

2017 Michigan Regional Trial

2017 Potatoes USA – SNAC International Trial Yield Trial Report

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Trial Site Data:

Location: Howard City, Michigan
Soil type: Loamy Sand
Planting date: 5/26/2017
Vine killing date: 9/12/2017
Harvest date: 10/17/2017

Experimental Design:

Bed width (inches): 34 Within row spacing (inches): 10
Data plot length (feet): 23 Number of Replications: 3

Trial Procedure:

Trial seed arrived at the MSU Agronomy Farm in Lansing, MI during the spring of 2017 where it was cut, treated (Syngenta Cruiser Maxx® Potato Extreme) and allowed to suberize at 50°F prior to being sent to Sandyland Farms, LLC. The grower cooperater planted the trial on May 26th, 2017.

Pre-harvest sugar profiles were taken for each variety on August 17th and August 30th; approximately one week and immediately prior to vine-kill. The pre-harvest sugar profile sampling protocol was conducted as follows: 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 coloration appeared, the number of hills required to obtain 40 tubers was recorded, along with the total number of main stems harvested. Lastly, from the 40 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) were recorded using the services of Techmark, Inc., Lansing, MI.

At harvest, three replicate plots of 23 feet were harvested from each entry and were used to determine trial yield averages, tuber size distribution, specific gravity and prevalence of internal defects. Analysis of Variance and mean separation were performed using JMP software. When ANOVA p-values were above the commonly established threshold of 0.05, mean separation tests were not performed.

To better assess vine vigor and maturity characteristics, vine growth ratings were made on June 16th and September 9th respectively. Lines that matured early relative to the trial controls (Snowden and Lamoka) include MSV358-3 and AF5040-8, while lines that matured later than the controls included MSW485-2, MSR127-2, and B2727-2. The rest of the lines deviated minimally from the control.

Growing Season Weather:

	From May 26th to October 17th	
	Rainfall (inches)	GDD (Base 40)
2012	11.82	3433
2013	14.52	3584
2014	14.77	3397
2015	14.29	3552
2016	15.35	3996
2017	13.15	3640
Average	13.98	3600

Table A. Rainfall and GDD (Base 40) from the Entrican, MI weather station from the past six years (enviroweather.msu.edu).

Table A above displays precipitation and growing degree day information from the past six years at the Montcalm Research Center weather station (enviroweather.msu.edu) located in Entrican, MI, which is proximate to the SNAC Trial plot. The total precipitation during the course of the growing season (described here as May 26th or the date of planting to October 17th, the day of

harvest) in 2017 (13.55") was slightly lower than the previous six-year average (13.98"). The cumulative growing degree days (base 40 °F) during this same time period were slightly higher in 2017 (3640) than the six-year average (3600).

Results:

Table 1. Summary of yield, size distribution, and specific gravity data at harvest. Entries are ordered by US#1 yield, with the highest yielding lines are at the top of the chart and lowest at the bottom. Mean values are expressed below the chart along with ANOVA p-values and LSD values. Superscripts in the US#1 yield column indicate a statistically significant difference in yield (p<0.05) between entries with different letters.

Entry	Yield (cwt/A)		Percent Size Distribution				Specific Gravity	
	US#1	TOTAL	US#1	Small	Mid-Size	Large		Culls
MSX540-4	500 ^a	570	88	9	86	2	3	1.087
MSW485-2	495 ^a	575	86	13	83	3	1	1.086
Snowden	493^a	570	87	11	84	3	2	1.085
MSR127-2	469 ^{ab}	523	90	5	85	5	5	1.086
NY152	461 ^{abc}	551	84	12	82	2	4	1.080
Lamoka	419^{bcd}	489	87	10	84	3	3	1.082
MSV358-3	396 ^{cd}	477	83	12	79	4	5	1.074
NDA081453CAB-2C	388 ^{de}	450	88	10	84	4	2	1.079
NDTX081648CB-13W	320 ^{ef}	405	79	19	78	1	2	1.083
AF5040-8	276 ^{fg}	375	76	22	72	4	2	1.081
B2727-2	262 ^{gh}	294	89	6	82	7	5	1.081
AC01144-1W	222 ^h	318	71	23	68	3	6	1.067
MEAN	467	467	84	13	81	3	3	1.081
ANOVA p-value	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.2216	0.0552	<0.0001
LSD	60.3	63.3	5.9	3.8	5.9	-	-	0.002

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

Table 2. Summary of internal tuber quality at harvest. The internal quality across the trial was generally acceptable, with no internal brown spot or brown center observed. Vascular discoloration was present in all varieties, ranging from 10 to 47 percent. Hollow heart prevalence was very low, excluding B2727-2 at 10 percent. As with table one, mean values are below the chart along with ANOVA p-values and LSD values.

Entry	Raw Tuber Quality ¹ (%)			
	HH	VD	IBS	BC
MSX540-4	0	10	0	0
MSW485-2	3	37	0	0
Snowden	0	47	0	0
MSR127-2	3	33	0	0
NY152	0	37	0	0
Lamoka	0	30	0	0
MSV358-3	0	40	0	0
NDA081453CAB-2C	0	33	0	0
NDTX081648CB-13W	0	40	0	0
AF5040-8	0	47	0	0
B2727-2	10	17	0	0
AC01144-1W	3	43	0	0
MEAN	2	35	0	0
ANOVA P-value	0.2710	<0.0001	-	-
LSD	-	13.5	-	-

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

Table 3. Post-harvest chip quality from samples collected at harvest on October 17th, 2017, and processed at Herr Foods, Inc. on October 23rd, 2017. Entries are organized based on processor ranking, with the highest-ranking chip lines at the top of the chart and the lowest ranked lines at the bottom. AGTRON scores were taken using an AGTRON M Series II. Chip color was lowest and therefore most acceptable for NY152, Lamoka, and MSV358-3. NY152 had the highest AGTRON score of the trial at 63.2.

Entry	Agtron Color	SFA ² Color	Specific Gravity	Percent Chip Defects ³		
				Internal	External	Total
NY152	63.2	2.0	1.084	11.4	7.6	19.0
Lamoka	59.0	2.0	1.081	19.6	3.2	22.8
MSX540-4	61.3	3.0	1.084	6.5	4.5	11.0
MSV358-3	60.6	2.0	1.071	3.2	15.9	19.1
MSW485-2	57.5	3.0	1.080	16.8	6.6	23.4
NDTX081648CB-13W	60.8	3.0	1.084	7.1	0.5	7.6
Snowden	59.8	3.0	1.078	11.5	14.9	26.4
NDA081453CAB-2C	59.3	3.0	1.075	7.3	1.5	8.8
B2727-2	57.3	3.0	1.076	21.1	29.8	50.9
AF5040-8	60.4	3.0	1.081	7.2	31.1	38.3
MSR127-2	55.7	3.0	1.087	33.4	4.2	37.6
AC01144-1W	57.1	4.0	1.067	19.0	10.0	29.0

¹Samples collected October 17th and processed by Herr Foods, Inc., Nottingham, PA on October 23th, 2017.
Chip defects are included in Agtron and SNAC samples.
²SFA Color: 1= lightest, 5= darkest
³Percent Chip Defects are a percentage by weight of the total sample; comprised of undesirable color, greening, internal defects and external defects.
Lines are sorted by Herr's ratings, with the highest ranking line at the top of the table

Table 4. Black spot bruise evaluation summary. Results below are from two sets of 25 tuber samples that were collected at harvest. One sample served as a check while the second sample was stored for 12 hours at 50°F and then placed in a plywood drum and rotated 10 times to simulate conditions conducive to bruising. After 10 days of storage at room temperature, all samples were abrasively peeled and scored for bruising. The chip lines are organized by ‘average bruises per tuber’ in treatment B, with the lowest (most desirable) at the top and highest (least desirable) at the bottom. When two entries have the same average bruises per tuber in the simulated bruise treatment, they are listed alphabetically.

Table 4. Black Spot Bruise Test																		
Entry	A. Check Samples ¹									B. Simulated Bruise Samples ²								
	# of Bruises Per Tuber						Total Tubers	Percent Bruise Free	Average Bruises Per Tuber	# of Bruises Per Tuber						Total Tubers	Percent Bruise Free	Average Bruises Per Tuber
	0	1	2	3	4	5				0	1	2	3	4	5			
MSV358-3	19	3	3	0	0	0	25	76	0.4	18	6	1	0	0	0	25	72	0.3
NDTX0981648CB-13W	15	9	0	0	0	0	24	63	0.4	17	8	0	0	0	0	25	68	0.3
NY152	15	10	0	0	0	0	25	60	0.4	17	6	2	0	0	0	25	68	0.4
AC01144-1W	21	4	0	0	0	0	25	84	0.2	15	5	2	1	0	0	23	65	0.5
NDA081453CAB-2C	21	3	1	0	0	0	25	84	0.2	15	8	1	1	0	0	25	60	0.5
AF5040-8	17	8	2	0	0	0	27	63	0.4	16	5	2	2	0	0	25	64	0.6
Lamoka	14	10	1	0	0	0	25	56	0.5	13	7	5	0	0	0	25	52	0.7
MSW485-2	18	5	2	0	0	0	25	72	0.4	11	9	3	2	0	0	25	44	0.8
MSR127-1	13	7	5	0	0	0	25	52	0.7	7	14	2	1	1	0	25	28	1.0
Snowden	14	9	2	0	0	0	25	56	0.5	6	8	7	4	0	0	25	24	1.4
B2727-2	17	5	3	0	0	0	25	68	0.4	2	13	5	4	1	0	25	8	1.6
MSX540-4	12	11	2	0	0	0	25	48	0.6	5	3	8	5	2	1	24	21	2.0

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

²Tuber samples collected at harvest, held at 50°F for 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-B. Summary of the results from pre-harvest panel data collected on August 17th and August 30th, 2017.

Entry	Specific Gravity	Glucose ¹ %	Sucrose ² Rating	Canopy		Number of		Average ⁵ Tuber Weight
				Rating ³	Uniform. ⁴	Hills	Stems	
MSX540-4	1.083	0.013	0.804	100	100	3	13	2.58
MSW485-2	1.076	0.006	1.853	100	100	3	10	1.79
Snowden	1.082	0.004	0.415	100	100	2	13	2.97
MSR127-2	1.071	0.023	1.122	100	100	3	11	2.52
NY152	1.082	0.005	0.129	100	100	3	10	2.70
Lamoka	1.078	0.003	0.656	100	100	3	14	2.29
MSV358-3	1.077	0.004	0.462	100	100	3	9	3.21
NDA081453CAB-2C	1.073	0.003	1.073	100	100	4	17	2.73
NDTX081648CB-13W	1.075	0.013	0.660	100	100	3	23	1.89
AF5040-8	1.076	0.007	1.279	100	100	3	16	2.20
B2727-2	1.081	0.003	1.217	100	100	5	13	3.90
AC01144-1W	1.062	0.041	0.720	100	100	4	17	1.71

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.

Entry	Specific Gravity	Glucose ¹ %	Sucrose ² Rating	Canopy		Number of		Average ⁵ Tuber Weight
				Rating ³	Uniform. ⁴	Hills	Stems	
MSX540-4	1.085	0.003	0.505	100	100	4	16	4.45
MSW485-2	1.080	0.004	2.193	100	100	3	8	2.92
Snowden	1.083	0.002	0.505	100	100	3	16	3.50
MSR127-2	1.080	0.004	1.501	100	100	3	14	3.57
NY152	1.076	0.002	0.23	100	100	2	10	3.40
Lamoka	1.080	0.002	0.832	75	75	5	15	3.52
MSV358-3	1.070	0.001	0.529	100	100	3	13	2.78
NDA081453CAB-2C	1.075	0.002	1.021	100	100	3	13	4.43
NDTX081648CB-13W	1.073	0.005	0.791	100	100	3	16	2.05
AF5040-8	1.072	0.001	0.587	100	100	3	12	2.17
B2727-2	1.079	0.002	0.649	100	100	4	9	4.60
AC01144-1W	1.066	0.018	0.46	100	100	3	12	2.42

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:

MSX540-4: This line had the highest yield of US#1 potatoes at 500 cwt/A, and the second highest overall yield of 570 cwt/A. The specific gravity was 1.087, higher than the trial average of 1.081 (Table 1). Raw internal tuber quality was acceptable with 10 percent of the tubers expressing vascular discoloration (Table 2). Chip quality at Herr Foods was above average,

ranking third out of 12 varieties for overall appearance and with the second highest AGTRON score of 61.3. Other comments include the minor presence of common scab and edge defects, as well as some flat and oblong tubers (Table 3). MSX540-4 had the highest level of black spot bruising with an average of 2.0 bruises per tuber (Table 4). Additionally, it has multiple disease resistances (Late Blight, PVY, and Common Scab).

MSW485-2: This line had the highest total yield of 575 cwt/A, and the second highest US#1 yield of 495 cwt/A. It has a higher than average specific gravity of 1.086 (Table 1). Vascular discoloration was slightly higher than average at 37 percent incidence, with some hollow heart (3 percent) and no internal brown spot or brown center observed (Table 2). It was ranked slightly above average with an AGTRON score of 57.7, and ranked fifth out of 12 varieties by Herr Foods for overall chip quality (Table 3). This line performed moderately in the black spot bruise evaluation with 0.8 bruises per tuber recorded (Table 4). MSW485-2 was rated as late for vine maturity one week before vine kill.

Snowden: Snowden, a trial check variety yielded slightly above the trial average at 493 cwt./A US#1 and had an above average specific gravity at 1.085 (Table 1). 47 percent of tubers displayed vascular discoloration, but no other internal tuber defects were observed (Table 2). Herr's ranked Snowden seventh of 12 for chip quality with 26.4 percent total defects and mentioned a good size profile (Table 3). Snowden performed poorly in the black spot bruise evaluation at third to last with an average of 1.4 bruises per tuber (Table 4).

MSR127-2: This line was an above average yielding variety in the 2017 trial with a 469 cwt/A US#1 yield and a 523 cwt/A total yield. It has an above average specific gravity of 1.086 (Table 1). This line exhibited an average level of vascular discoloration at 33 percent (Table 2). It was below average in chip performance at Herr Food's out-of-the-field fry test, ranking 11th out of 12 entries due to stem end defects and bruising. Other comments on the variety include the observations of good gravity and a good size profile (Table 3). Additionally, this line has strong resistance to common scab.

NY152: This line had both a higher than average total yield and US#1 yield, 551 cwt/A and 461 cwt/A. The specific gravity (1.080) was slightly below the trial average (1.081) (Table 1). Raw internal tuber quality was moderate with no internal brown spot, hollow heart, or brown center, but 37 percent of tubers expressed vascular discoloration (Table 2). Chip quality at Herr Foods was the highest of all lines, ranking first out of the 12 lines for overall appearance and size, with an AGTRON score of 63.2 (Table 3). NY152 had a lower than average level of black spot bruising with an average of 0.4 bruises per tuber (Table 4). This line appeared to be chemically mature based on pre-harvest panel data. The specific gravity increased between the first and second sampling date, while the sucrose levels plateaued (Table 5).

Lamoka: Lamoka was the second check variety, and yielded slightly above the trial average at 489 cwt/A US#1, and was slightly above the trial average for specific gravity at 1.085 (Table 1). Internal tuber quality was moderate with 30 percent vascular discoloration and no other internal defects observed (Table 2). Herr's ranked this line second of 12, mentioning the oblong tuber shape and minor bruising (Table 3). Lamoka performed moderately in the black spot bruise evaluation with an average of 0.7 bruises per tuber (Table 4).

MSV358-3: This line had a slightly above average yield of 396 cwt/A US#1, and a lower than average specific gravity of 1.074 (Table 1). It had a higher than average incidence of vascular discoloration at 40 percent, with no other internal defects reported (Table 2). Chip quality at Herr

Foods was fourth overall, with a slightly higher than average AGTRON score of 60.6. Comments included the presence of some common scab and edge defects and a good color (Table 3). This line performed well in black spot bruise evaluations with an average of 0.3 bruises per tuber, the lowest in the trial (Table 4). MSV358-3 was rated as very early for vine maturity one week before vine kill, and the specific gravity increased between the two pre-harvest sampling dates, indicating chemical maturity (Table 5).

NDA081453CAB-2C: This line had a lower than average yield of 388 cwt. /A US#1 and a specific gravity of 1.079, slightly below the trial average (Table 1). Internal tuber quality was moderate in this line with 33 percent vascular discoloration (Table 2). Herr's ranked this line eighth of 12 for chip quality with 8.8 percent total defects and noted the presence of common scab (Table 3). In black spot bruise evaluation, this line performed slightly above average with 0.5 bruises per tuber (Table 4).

NDTX081648CB-13W: This line had a lower than average yield of 320 cwt. /A US#1 with an above average specific gravity of 1.083 (Table 1). Internal quality was moderate with 40 percent vascular discoloration noted (Table 2). Herr's ranked this line sixth of 12 for chip quality with 7.6 percent total defects observed and mentioned a good size profile (Table 3). In black spot bruise evaluations this line performed very well with an average of 0.3 bruises per tuber noted, the lowest in the trial (Table 4).

AF5040-8: This line had a below average yield of 276 cwt. /A US#1 and an average specific gravity of 1.081 (Table 1). Internal quality was fair with 47 percent vascular discoloration observed, the highest in the trial (Table 2). Herr's ranked this line 10th of 12 for chip quality with 38.3 percent total defects and noted a high prevalence of common scab and edge defects (Table 3). In the black spot bruise evaluation, this line performed slightly above average with 0.6 bruises per tuber (Table 4). AF5040-8 was rated as early for vine maturity one week before vine kill.

B2727-2: This line had a lower than average yield of 262 cwt. /A US#1 and an average specific gravity of 1.081 (Table 1). Internal quality was moderate with 10 percent hollow heart and 17 percent vascular discoloration noted (Table 2). Herr's ranked this line ninth of 12 for chip quality and commented that many of the tubers were too large (Table 3). In black spot bruise evaluations this line had a higher than average bruising incidence of 1.6 bruises per tuber (Table 4).

ACO1144-1W: This line had the lowest yield of all varieties at 222 cwt/A US#1 and a below average specific gravity of 1.067 (Table 1). Internal quality was moderate with three percent hollow heart and 43 percent vascular discoloration noted (Table 2). Herr's rated this line last with an AGTRON score of 57.1 and 29 percent total defects. Comments include poor gravity and many tubers with greening (Table 3). It performed well in blackspot bruise evaluations with an average of 0.5 bruises per tuber (Table 4).