2018 Michigan Regional Trial

2018 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: 5/24/2018
Vine killing date: 8/31/2018
Harvest date: 10/16/2018

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 2018 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 cooperator planted the trial on May 24th, 2018.

Pre-harvest sugar profiles were taken for each variety on August 13th and August 27th; 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 18th and August 27th respectively. Lines that matured early relative to the trial controls (Snowden and Lamoka) include NY152, NDA081453CAB-2C, and NDTX081648CB-13W, while lines that matured later than the controls included AF5429-3 and W9968-5. The rest of the lines deviated minimally from the control.

Growing Season Weather:

	From May 24th to October 16th	
	Rainfall (inches)	GDD (Base 40)
2013	14.04	3603
2014	14.77	3428
2015	14.32	3600
2016	15.34	4026
2017	13.22	3666
2018	21.12	3878
Average	15.47	3700

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 24th or the date of planting to October 16th, the day of harvest) in 2018 (21.12”) was higher than the previous six-year average (15.47”). The

cumulative growing degree days (base 40 °F) during this same time period were slightly higher in 2018 (3878) than the six-year average (3700).

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.

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
MSV030-4	500^{a}	613	81	18	81	0	1	1.078
W9968-5	488^{ab}	567	86	11	86	0	3	1.080
AF5429-3	476^{ab}	520	91	8	90	1	1	1.073
Lamoka	**411^{abc}**	**471**	**87**	**10**	**87**	**0**	**3**	**1.077**
AF5040-8	409^{abc}	478	86	12	86	0	2	1.082
NY162	400^{abc}	468	85	12	85	0	3	1.075
Snowden	**395^{abc}**	**446**	**89**	**11**	**89**	**0**	**0**	**1.078**
ND7519-4	394^{abc}	478	82	18	82	0	0	1.082
MSW044-1	367^{abc}	545	67	33	67	0	0	1.085
MSX540-4	354^{bcd}	452	78	21	78	0	1	1.084
NDA081453CAB-2C	298^{cd}	337	89	9	89	0	2	1.076
NDTX081648CB-13W	230^{d}	311	73	25	73	0	2	1.076
MEAN	**394**	**474**	**83**	**16**	**83**	**0**	**2**	**1.079**
ANOVA p-value	**<.0001**	**<.0001**	**<.0001**	**<.0001**	**<.0001**	**0.0023**	**0.0030**	**<.0001**
LSD	**78.0**	**84.7**	**4.3**	**3.9**	**4.3**	**0.5**	**1.7**	**0.004**

*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 minimal hollow heart and internal brown spot observed. Vascular discoloration was present in all varieties, ranging from three to 57 percent. Brown center was present in five varieties, ranging from three to 17 percent. As with table one, mean values are below the chart along with ANOVA p-values and LSD values. Entries are ordered by US #1 yield as in Table 1.

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

	Raw Tuber Quality[1] (%)			
Entry	**HH**	**VD**	**IBS**	**BC**
MSV030-4	0	23	0	0
W9968-5	0	27	0	3
AF5429-3	7	10	0	3
Lamoka	**0**	**57**	**0**	**0**
AF5040-8	0	10	0	0
NY162	0	3	0	0
Snowden	**0**	**20**	**0**	**0**
ND7519-4	0	23	0	0
MSW044-1	0	10	0	3
MSX540-4	0	17	0	0
NDA081453CAB-2C	0	10	3	17
NDTX081648CB-13W	3	23	0	3
MEAN	**1**	**19**	**0**	**3**
ANOVA P-value	**0.0412**	**0.0004**	0.4744	**0.0006**
LSD	**4.0**	**17.8**	-	**6.3**

[1]Internal 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 16th, 2018, and processed at Herr Foods, Inc. on October 29th, 2018. 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. Chip color was lowest and therefore most acceptable for ND7519-1, Lamoka, and MSX540-4. NDTX0981648CAB-13W had the highest SFA score.

Table 3. Post-Harvest Chip Quality[1] for the 2018 SNAC Trial at Sandyland Farms

Rank	Entry	SFA[2] Color	Specific Gravity	Percent Chip Defects[3] Internal	External	Total
1	ND7519-1	2.0	1.072	10.8	5.1	15.9
2	**Lamoka**	**3.0**	**1.072**	**13.1**	**6.8**	**19.9**
3	MSX540-4	3.0	1.083	17.7	16.1	33.8
4	MSV030-4	3.0	1.077	13.8	10.1	23.9
5	**Snowden**	**3.5**	**1.072**	**20.2**	**17.1**	**37.3**
6	NDA081453CAB-2C	3.5	1.082	21.8	15.1	36.9
7	MSW044-1	3.5	1.085	24.4	4.2	28.6
8	W9968-5	4.0	1.077	54.9	4.3	59.2
9	NY162	4.0	1.077	34.9	19.4	54.3
10	AF5429-3	3.5	1.074	38.0	24.1	62.1
11	AF5040-8	4.0	1.082	43.4	17.8	61.2
12	NDTX081648CB-13W	4.5	1.076	54.9	7.8	62.7

[1] Samples collected October 16th and processed by Herr Foods, Inc., Nottingham, PA on October 29th, 2017.

[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.

Lines are sorted by Herr's ratings, with the higest 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 was a check while the second sample was stored for 12 hours at 50ºF 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 sorted by percent bruise free tubers.

Table 4. Black Spot Bruise Test for the 2018 SNAC Trial at Sandyland Farms

	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
AF4529-3	14	7	1	2	1	0	25	56	0.8	9	14	1	1	0	0	25	36	0.8
NDTX0981648CB-13W	18	5	1	0	0	0	24	75	0.3	8	11	1	2	2	0	24	33	1.1
W9968-5	15	6	4	0	0	0	25	60	0.6	6	9	7	3	0	0	25	24	1.3
NDA081453CAB-2C	15	9	1	0	0	0	25	60	0.4	7	11	3	2	1	1	25	28	1.3
ND7519-4	17	8	0	0	0	0	25	68	0.3	4	9	6	5	0	0	24	17	1.5
MSX540-4	18	7	0	0	0	0	25	72	0.3	3	8	7	4	2	1	25	12	1.9
Snowden	**10**	**15**	**0**	**0**	**0**	**0**	**25**	**40**	**0.6**	**0**	**5**	**7**	**8**	**3**	**1**	24	**0**	**2.5**
Lamoka	**11**	**11**	**3**	**0**	**0**	**0**	**25**	**44**	**0.7**	**2**	**4**	**4**	**9**	**4**	**2**	25	**8**	**2.6**
MSW044-1	9	9	5	2	0	0	25	36	1.0	0	4	7	6	6	2	25	0	2.8
NY162	2	5	12	5	0	0	24	8	1.8	2	0	5	8	5	5	25	8	3.2
MSV030-4	3	6	10	4	2	0	25	12	1.8	0	1	2	6	9	8	26	0	3.8
AF5040-8	2	7	5	6	4	1	25	8	2.2	1	0	3	2	3	16	25	4	4.2

[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 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 13th and August 27th, 2018. Entries are sorted by US #1 yield.

Table 5A. Pre-Harvest Panel for the 2018 SNAC Trial at Sandyland Farms, Taken on 8/13/2018

Entry	Specific Gravity	Glucose[1] %	Sucrose[2] Rating	Canopy Rating[3]	Canopy Uniform.[4]	Number of Hills	Number of Stems	Average[5] Tuber Weight
MSV030-4	1.081	0.008	0.548	100	100	2	10	2.68
W9968-5	1.084	0.006	0.578	100	100	3	12	2.74
AF5429-3	1.073	0.003	1.580	100	100	4	19	2.53
Lamoka	**1.077**	**0.002**	**0.694**	**100**	**100**	**4**	**18**	**3.93**
AF5040-8	1.079	0.002	0.705	100	100	4	16	2.44
NY162	1.075	0.002	0.346	100	100	4	14	3.36
Snowden	**1.080**	**0.002**	**0.525**	**100**	**100**	**4**	**15**	**3.48**
ND7519-4	1.090	0.004	0.796	100	100	3	14	3.00
MSW044-1	1.080	0.005	3.483	100	100	4	22	2.61
MSX540-4	1.088	0.002	0.454	100	100	4	18	2.52
NDA081453CAB-2C	1.076	0.004	1.873	75	100	4	15	3.27
NDTX081648CB-13W	1.081	0.032	0.918	100	100	6	25	3.10

Table 5B. Pre-Harvest Panel for the 2018 SNAC Trial at Sandyland Farms, Taken on 8/27/2018

Entry	Specific Gravity	Glucose[1] %	Sucrose[2] Rating	Canopy Rating[3]	Canopy Uniform.[4]	Number of Hills	Number of Stems	Average[5] Tuber Weight
MSV030-4	1.084	0.002	0.505	75	100	3	17	4.33
W9968-5	1.079	0.003	0.823	75	100	5	17	2.72
AF5429-3	1.077	0.002	1.204	75	100	3	14	3.36
Lamoka	**1.081**	**0.002**	**0.667**	**75**	**100**	**4**	**12**	**5.21**
AF5040-8	1.080	0.002	0.484	100	100	4	14	3.97
NY162	1.064	0.002	0.357	75	100	4	10	3.87
Snowden	**1.081**	**0.002**	**0.617**	**75**	**100**	**4**	**18**	**3.62**
ND7519-4	1.082	0.002	0.821	50	100	4	21	3.17
MSW044-1	1.089	0.003	1.759	75	100	3	12	3.13
MSX540-4	1.093	0.003	0.490	75	100	3	18	3.59
NDA081453CAB-2C	1.076	0.003	1.180	75	100	5	28	4.16
NDTX081648CB-13W	1.073	0.014	0.772	75	100	8	33	2.97

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:

MSV030-4: This line had the highest US#1 yield at 500 cwt/A, and overall yield of 613 cwt/A. It had an average size profile compared to the trial mean with 17 percent B sized potatoes. The specific gravity was 1.078, slightly below the trial average (Table1). Internal quality was average, with 23 percent vascular discoloration reported (Table 2). Herr's ranked this variety fourth, and noted its attractive size profile (Table 3). This variety displayed an average of 4.2 bruises per tuber with only four percent of tubers bruise free (Table 4).

W9968-5: This variety had the second highest yield of 488 cwt/A US#1 potatoes, and a total yield of 567 cwt/A. It had an average specific gravity of 1.080, and 86 percent A size tubers (Table 1). While 27 percent vascular discoloration was observed, higher than the trial mean, other internal defects were average (Table 2). Herr's ranked this variety eighth, giving it a chip score of 4 and 59 percent internal defects (Table 3). W9968-5 had 24 percent bruise free tubers and an average of 1.1 bruises per tuber (Table 4).

AF5429-3: This Maine variety had both a high US#1 and total yield of 476 cwt/A and 520 cwt/A, respectively. It had the highest percentage of A sized tubers (90 percent), well above the trial average of 83 percent. It had a lower than average specific gravity of 1.073, and lower than average internal defects except for seven percent hollow heart (Table 1 and 2). This variety was ranked tenth with a poor chip color and 63 percent internal defects (Table 3). AF5429-3 had the highest percent bruise free tubers at 36 percent, and an average of 0.8 bruises per tuber (Table 4).

Lamoka: Lamoka was the second check variety, and yielded slightly above the trial average at 411 cwt/A US#1, and was slightly below the trial average for specific gravity at 1.077 (Table 1). Internal tuber quality was poor with 57 percent vascular discoloration and no other internal defects observed (Table 2). Lamoka was ranked second by Herr's with an SFA score of 3.0 (Table 3). This variety was susceptible to bruising, with an average of 2.6 bruises per tuber (Table 4).

AF5040-8: This line had an above average yield of 409 cwt./A US#1 tubers and a slightly higher than average specific gravity of 1.082 (Table 1). Internal quality was good with 10 percent vascular discoloration observed (Table 2). Herr's ranked this variety in eleventh place with an SFA color of 4.0 and 61 percent chip defects (Table 3). This variety displayed the most bruise, with four percent bruise free tubers and an average of 4.2 bruises per tuber (Table 4).

NY162: This Cornell variety had an average US#1 yield of 400 cwt/A and total yield of 486 cwt/A. While the specific gravity was slightly lower than the trial average at 1.075, it had an average percent size distribution (Table 1). The internal quality of NY162 was very good, with only three percent vascular discoloration observed, the lowest in the trial (Table 2). This variety was the most mature at the time of rating in August. With an SFA score of 4.0 and 54 percent internal defects, Herr's ranked NY162 ninth (Table 3). This variety had eight percent bruise free tubers with an average of 3.2 bruises per tuber (Table 4).

Snowden: Snowden, a trial check variety yielded approximately the trial average at 395 cwt./A US#1 and had an average specific gravity at 1.078 (Table 1). 20 percent of tubers displayed vascular discoloration, but no other internal tuber defects were observed (Table 2). Herr's

ranked Snowden fifth with an SFA color of 3.5 (Table 3). Snowden was susceptible to simulated bruising, with no bruise free tubers and 2.5 average bruises per tuber (Table 4).

ND7519-4: This variety had an average US#1 yield of 394 cwt/A and total yield of 478 cwt/A, as well as an average percent size distribution. The specific gravity of 1.082 was slightly higher than the trial mean (Table 1). This variety had a higher than average incidence of vascular discoloration of 23 percent, with no other internal defects (Table 2). Herr's ranked this variety first, with an SFA color of 2.0 and sixteen percent internal defects (Table 3). After simulated bruising, each tuber had an average of 1.5 bruises, 17 percent of tubers were bruise free (Table 4).

MSW044-1: This line had a below average yield of 367 cwt/A US#1 potatoes, and an above average total yield of 545 cwt/A. MSW044-1 had the highest percentage of B-sized tubers (33 percent), contributing to its low US#1 yield. The specific gravity was 1.085, higher than the trial average (Table 1). Internal quality was good, with lower than average vascular discoloration (Table 2). This variety was ranked seventh by Herr's, which noted some oblong tubers (Table 3). All tubers had bruising after evaluation, with an average of 2.8 bruises per tuber (Table 4).

MSX540-4: This line had a lower yield of US#1 potatoes at 354 cwt/A, and a slightly lower than average overall yield of 452 cwt/A. The specific gravity was 1.084, higher than the trial average of 1.079. This variety had a smaller tuber size profile, with 20 percent B size tubers. (Table 1). Raw internal tuber quality was acceptable with 17 percent of the tubers expressing vascular discoloration (Table 2). Herr's ranked this variety third, noting minor bruising and scab, with most tubers in the two to four inch size range (Table 3). MSX540-4 had twelve percent bruise free tubers after simulated bruising, and an average of 1.9 bruises per tuber (Table 4).

NDA081453CAB-2C: This line had a lower than average yield of 298 cwt. /A US#1 and a specific gravity of 1.076, slightly below the trial average (Table 1). Internal tuber quality was moderate in this line with 10 percent vascular discoloration and 17 percent brown center (Table 2). This variety was ranked sixth, with an SFA score of 3.5 (Table 3). It was moderately susceptible to bruising, with 28 percent bruise free tubers and 1.3 bruises per tuber (Table 4).

NDTX081648CB-13W: This line had the lowest yield of 230 cwt. /A US#1 with a below average specific gravity of 1.076 (Table 1). Internal quality was moderate with 23 percent vascular discoloration noted (Table 2). Herr's ranked this variety in last place, with a chip color of 4.5 and 63 percent chip defects (Table 3). This variety was less susceptible to bruising, with only 1.1 average bruises per tuber and 36 percent of tubers bruise free (Table 4).