2023 Michigan Regional Trial

2023 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: 5/17/23
Vine killing date: 9/4/23
Harvest date: 10/10/23

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 2023 where it was cut, treated (Syngenta Cruiser Maxx® Vibrance Potato) and allowed to suberize at 50°F prior to being planted by the Michigan State University Potato Outreach Program on May 17th, 2023, on a grower trial site at Sandyland Farms.

Pre-harvest sugar profiles were taken for each variety on August 14th and August 28th, approximately three weeks and one week prior to vine-kill, respectively. 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 and canopy uniformity was noted as a percentage of how uniform the foliage coloration appeared. At least 40 tubers were harvested and placed into labeled bags. 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 by 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. Mean separation tests were not performed when ANOVA p-values were above the commonly established threshold of 0.05.

To better assess vine vigor and maturity characteristics, vine growth ratings were made on June 26th and August 28th respectively. The controls (Lamoka and Snowden) matured earlier than the other five entries. NY174 and NY177 displayed later maturity relative to the other varieties.

Growing Season Weather:

	From May 17th to October 10th	
	Rainfall (inches)	GDD (Base 40)
2018	22.75	3950
2019	21.16	3694
2020	13.30	3758
2021	21.13	4003
2022	15.77	3685
2023	17.26	3623
Average	18.56	3785

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

Table A displays precipitation and growing degree day (GDD) 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 growing season (described here as May 17th or the date of planting, to October 10th, the day of harvest) in 2023 (17.26”) was slightly lower than the previous six-year average (18.56”). The cumulative growing degree days (base 40°F) during this same period were also slightly lower in 2023 (3623) than the six-year average (3785).

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 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
AF6200-4	594^{a}	627^{a}	95^{a}	5^{c}	94^{a}	1	0	1.080^{cd}
MSAFB635-15	544^{ab}	624^{a}	87^{c}	13^{b}	87^{b}	0	0	1.087^{b}
Snowden	**521^{ab}**	**588^{a}**	**89^{bc}**	**11^{b}**	**88^{b}**	**0**	**1**	**1.085^{b}**
NY174	497^{abc}	577^{a}	86^{c}	13^{b}	86^{b}	0	1	1.079^{d}
Lamoka	**488^{bc}**	**527^{ab}**	**93^{ab}**	**6^{c}**	**93^{a}**	**0**	**1**	**1.083^{bc}**
NY177	481^{bc}	602^{a}	80^{d}	20^{a}	80^{c}	0	0	1.095^{a}
AF6165-9	402^{c}	466^{b}	86^{c}	14^{b}	86^{b}	0	0	1.085^{b}
MEAN	**504**	**573**	**88**	**12**	**88**	**0**	**0**	**1.085**
ANOVA p-value	**0.0308**	**0.0493**	**<.0001**	**<.0001**	**<.0001**	**0.6389**	**0.1052**	**<.0001**
LSD	**99.5**	**104.4**	**4.3**	**3.8**	**4.00**	**-**	**-**	**0.003**

*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. Lamoka had 17% internal brown spots, unusual for the variety. Four varieties had vascular discoloration, all at 20% or lower. 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.

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

	Raw Tuber Quality[1] (%)			
Entry	**HH**	**VD**	**IBS**	**BC**
AF6200-4	3[b]	0	0[b]	0[b]
MSAFB635-15	7[b]	13	0[b]	0[b]
Snowden	**0[b]**	**20**	**0[b]**	**0[b]**
NY174	0[b]	0	0[b]	0[b]
Lamoka	**3[b]**	**10**	**17[a]**	**0[b]**
NY177	0[b]	7	0[b]	0[b]
AF6165-9	27[a]	0	3[b]	7[a]
MEAN	**6**	**7**	**3**	**1**
ANOVA P-value	**0.0102**	**0.0565**	**0.0405**	**0.0153**
LSD	**13.8**	**-**	**10.8**	**3.8**

[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 10th, 2023 and processed at Herr Foods, Inc. (Herr's) on October 16th, 2023. Entries are organized based on processor rank, with the highest-ranking chip lines at the top of the chart and the lowest ranked lines at the bottom. Chip color was rated using the SNAC scale, with scores between 1.0 and 5.0 in 0.5 increments. A score of 1.0 is the lightest and most acceptable, while a score of 5.0 is the darkest and least acceptable chip color. Chip color was lowest and therefore most acceptable for NY174, Snowden, and NY177. Lamoka had the lowest percent defects, 17%, while AF6200-4 had the 52.9% percent defects, the highest in the trial.

Table 3. Post-Harvest Chip Quality[1] for the 2023 SNAC Trial at Sandyland Farms

		SNAC[2]	Percent Chip Defects[3]			
Rank	**Entry**	**Color**	**Internal**	**External**	**Total**	**Comments**
1	NY174	2.0	7.0	10.1	17.1	some scab, 2.5 to 4.75 inches
2	**Snowden**	**3.0**	**12.2**	**7.2**	**19.4**	**minor scab, 2.5 to 4.5 inches**
3	NY177	3.0	14.9	15.0	29.9	scab, 2.25 to 3.5 inches
4	**Lamoka**	**3.0**	**10.3**	**6.7**	**17.0**	**some rot, 2.75 to 4 inches**
5	MSAFB635-15	3.5	17.0	8.6	25.6	scab, stem end defect, 1.75 to 4.5 inches
6	AF6165-9	3.0	21.8	24.1	45.9	hollow heart, heavy scab, rot, 2.5 to 4.75 inches
7	AF6200-4	3.0	17.5	35.4	52.9	scab, bruise, 2.5 to 4.5 inches

[1] Samples collected October 10th and processed by Herr Foods, Inc., Nottingham, PA on October 16th

[2] SNAC 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 ranking: 1(best) to 7 (worst)

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 eight 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.

Table 4. Black Spot Bruise Test for the 2023 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
MSAFB635-15	11	9	2	3	0	0	25	44	0.9	8	7	3	2	3	2	25	32	1.6
NY174	7	11	6	0	1	0	25	28	1.1	5	7	9	3	0	1	25	20	1.6
Lamoka	**15**	**7**	**2**	**1**	**0**	**0**	**25**	**60**	**0.6**	**2**	**8**	**6**	**7**	**1**	**1**	**25**	**8**	**2.0**
Snowden	**11**	**10**	**2**	**2**	**0**	**0**	**25**	**44**	**0.8**	**3**	**6**	**7**	**3**	**3**	**3**	**25**	**12**	**2.2**
AF6165-9	11	10	4	0	0	0	25	44	0.7	2	7	6	4	5	1	25	8	2.2
NY177	1	8	7	7	0	2	25	4	2.1	1	3	6	4	9	2	25	4	2.9
AF6200-4	5	9	5	3	2	1	25	20	1.6	1	4	2	3	2	13	25	4	3.6

[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 and 5B. Summary of the results from pre-harvest panel data collected on August 15th and August 29th, 2022. Entries are sorted by US #1 yield. Canopy data was not available for Snowden on August 28th.

Table 5A. Pre-Harvest Panel for the 2023 SNAC Trial at Sandyland Farms, Taken on 8/14/2023

Entry	Specific Gravity	Glucose[1] %	Sucrose[2] Rating	Canopy Rating[3]	Canopy Uniform.[4]	Average[5] Tuber Weight
AF6165-9	1.094	0.002	1.041	100	75	3.36
AF6200-4	1.089	0.003	0.565	50	75	4.96
Lamoka	**1.089**	**0.002**	**0.716**	**50**	**100**	**4.83**
MSAFB635-15	1.093	0.002	0.415	100	100	3.45
NY174	1.083	0.002	0.385	75	100	4.14
NY177	1.089	0.002	0.714	100	100	2.75
Snowden	**1.086**	**0.002**	**0.692**	**75**	**75**	**3.03**

Table 5B. Pre-Harvest Panel for the 2023 SNAC Trial at Sandyland Farms, Taken on 8/28/2023

Entry	Specific Gravity	Glucose[1] %	Sucrose[2] Rating	Canopy Rating[3]	Canopy Uniform.[4]	Average[5] Tuber Weight
AF6165-9	1.080	0.002	0.735	100	100	4.62
AF6200-4	1.082	0.004	0.581	75	75	5.22
Lamoka	**1.080**	**0.003**	**1.011**	**50**	**75**	**5.89**
MSAFB635-15	1.093	0.003	0.765	75	75	3.71
NY174	1.083	0.002	0.295	75	75	4.26
NY177	1.096	0.002	0.505	75	100	6.24
Snowden	**1.089**	**0.003**	**0.854**	**-**	**-**	**3.55**

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 6. Summary of tuber characteristics based on stem and hill count conducted during harvest on a 23-foot plot. Entries are sorted by US #1 yield.

Table 6. At-Harvest Tuber Characteristics.[1] Sandyland Farms, Howard City, Michigan.				
Entry	Stems per Plant	Tubers per Plant	Tubers per Stem	Average Tuber Weight (oz)
AF6200-4	3.9	9.7	2.5	6.8
MSAFB635-15	3.7	15.0	4.0	4.4
Snowden	**5.0**	**12.5**	**2.5**	**4.9**
NY174	3.5	12.3	3.5	4.9
Lamoka	**2.7**	**10.2**	**3.8**	**6.3**
NY177	3.3	17.0	5.2	3.8
AF6165-9	5.1	11.3	2.2	4.9
MEAN	**3.9**	**12.6**	**3.4**	**5.1**

[1]Stand and hill counts were colllected during harvest on the first yield dig. Tuber counts were conducted during grading.

Variety Comments:

AF6200-4: This University of Maine variety had the highest US#1 yield at 594 cwt/A in 2023 with 95% US#1 tubers. It had an average specific gravity of 1.080, and fewer B-sized tubers than average (Table 1). This variety had three percent hollow heart and no other defects observed in 2023 (Table 2). Herr's ranked this variety last out of seven, noting defects. Chip color was rated a three, when a score of two or lower is preferable for commercial processing (Table 3). AF6200-4 was susceptible to black spot bruising with only four percent bruise free tubers in the simulated bruise treatment and an average of 3.6 bruises per tuber (Table 4). Between pre-harvest samples, increasing glucose and sucrose indicated chemical immaturity (Table 5). AF6200-4 had the largest average tuber weight of 6.8 ounces per tuber (Table 6). At grading, this variety had flat round to oval tubers, medium netted skin, and a variable tuber type.

MSAFB635-15: This Michigan State University selection had an above average US#1 yield of 544 cwt/A and the highest total yield of 624 cwt/A in 2023. It had 87% A-sized tubers, average for the trial, and an above average specific gravity of 1.087 (Table 1). Seven percent hollow heart and thirteen percent vascular discoloration were observed in 2023 (Table 2). This variety was ranked 5th by Herr's with a SNAC score of 3.5 and 25.6% total defects (Table 3). With 32% bruise free tubers after simulated bruising, MSAFB635-15 was less susceptible to black spot bruising and had only 1.6 average bruises per tuber, the second lowest in the trial (Table 4). Increasing glucose and sucrose indicate chemical immaturity at harvest (Table 5). MSAFB635-15 has an average of fifteen tubers per plant, the second highest in the trial (Table 6). At grading, this variety had medium netted skin.

NY174: This Cornell selection had a slightly below average US#1 yield and an above average total yield of 497 and 577 cwt/A, respectively. It had an average size profile for the trial but the lowest specific gravity of 1.079 (Table 1). Internal quality was excellent with no defects observed in 2023 (Table 2). Herr's ranked NY174 first, observing 17.1% chip defects, the lowest in the trial (Table 3). NY174 was tied as the most resistant to simulated bruising. It had 20 percent

bruise free tubers and an average of 1.6 bruises per tuber (Table 4). Stable glucose and decreasing sucrose indicate chemical maturity at harvest (Table 5). Tuber characteristics were consistent with the trial average with 12.3 tubers per plant and an average tuber weight of 4.9 ounces (Table 6). NY174 had a flat round to oval type with medium to heavy netted skin.

NY177: This variety had a below average US#1 yield but above average total yield. NY177 had a smaller size profile with 20% B-sized tubers, the most in the trial. The specific gravity was the highest in the trial at 1.095 (Table 1). This Cornell selection had good internal quality with seven percent vascular discoloration observed, average for the trial (Table 2). Herr's ranked this variety third, noting 29.9% total defects (Table 3). After simulated bruising only four percent of tubers were bruise free, tying for most susceptible to blackspot bruising. There was an average of 2.9 bruises per tuber, the second highest in the trial (Table 4). Between the two sugar panel samples, stable glucose and decreasing sucrose indicated chemical maturity (Table 5). NY177 had 17 tubers per plant and 5.2 tubers per stem, both the highest in the trial (Table 6). This variety had a flat round to oval type with light netted skin.

AF6165-9: This University of Maine selection had the lowest US#1 and total yield of the trial, 402 cwt/A and 466 cwt/A, respectively. The size profile and specific gravity were both average for the trial (Table 1). This variety was susceptible to hollow heart, with 27% observed during grading, the highest in the trial and well above the trial average of six percent. There were also three percent internal brown spot and seven percent brown center observed (Table 2). Herr's ranked this variety sixth with 45.9% total defects, hollow heart, and heavy scab (Table 3). AF6165-9 was susceptible to black spot bruising and had eight percent bruise free tubers with 2.2 average bruises per tuber (Table 4). MSAFB609-12 was chemically mature at harvest, indicated by the stable glucose and decreasing sucrose concentrations (Table 5). At grading, a blocky round type with light to medium netted skin was observed.

Snowden: This check variety had an above average US#1 yield of 521 cwt/A, slightly higher than the trial average of 504 cwt/A. The size profile and specific gravity of 1.085 were both at the trial average (Table 1). Twenty percent of tubers had vascular discoloration, the highest in the trial, but no other defects were observed (Table 2). Snowden was ranked second by Herr's, with a SNAC color score of 3.0 and 19.4% total defects (Table 3). This variety was susceptible to bruising, with twelve percent bruise free tubers and an average of 2.2 bruises per tuber (Table 4). Increasing glucose and sucrose indicated potential chemical immaturity at harvest (Table 5). Snowden had five stems per plant, higher than the trial average of 3.9 stems per plant in 2023 (Table 6). This variety had a flat round tuber type, medium netted skin, and deeper apical eyes.

Lamoka: This check variety had a below average yield of 488 cwt/A US#1 tubers. There were 93% A-sized tubers, slightly above the trial average. (Table 1). Internal quality was variable, with 17% internal brown spot, the highest in the trial, ten percent vascular discoloration, and three percent hollow heart (Table 2). Lamoka was ranked fourth by Herr's with a color score of 3.0 and 17% defects (Table 3). After simulated bruising, this variety had an average of 2.0 bruises per tuber, slightly below the trial average (Table 4). Increasing glucose and sucrose indicated chemical immaturity at harvest (Table 5). Lamoka had fewer stems per plant and a higher tuber weight than the trial average (Table 6). This variety had an oval to oblong tuber type and light netted skin.