2022 Michigan Regional Trial

2022 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: 5/23/22
Vine killing date: 9/1/22
Harvest date: 10/20/22

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 2022 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 23rd, 2022, on a grower trial site at Sandyland Farms.

Pre-harvest sugar profiles were taken for each variety on August 15th and August 29th, 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. 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 23rd and August 11th respectively. Lines that matured later relative to the trial controls (Snowden and Lamoka) were W15125-4, MSW474-1, and NY168 while lines that matured with or earlier than the controls included MSZ242-13, NY163, and MSAFB635-15.

Growing Season Weather:

	From May 23rd to October 20th	
	Rainfall (inches)	GDD (Base 40)
2017	13.39	3737
2018	20.71	3882
2019	21.43	3685
2020	12.38	3740
2021	21.41	4041
2022	16.87	3643
Average	17.70	3788

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 23rd or the date of planting, to October 20th, the day of

harvest) in 2022 (16.87”) was slightly lower than the previous six-year average (17.70”). The cumulative growing degree days (base 40˚F) during this same period were also slightly lower in 2021 (3643) than the six-year average (3788).

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
W15125-4 [a]	566	610	93	7	92	1	0	1.082
Snowden [b]	**452**	**540**	**84**	**16**	**84**	**0**	**0**	**1.085**
Lamoka [c]	**383**	**450**	**85**	**14**	**85**	**0**	**1**	**1.080**
MSZ242-13 [c]	379	408	93	6	93	0	1	1.093
MSAFB635-15 [cd]	360	477	76	24	76	0	0	1.084
W15NYR11-13 [cd]	357	437	82	17	82	0	1	1.072
MSAFB609-12 [cd]	355	436	82	18	82	0	0	1.080
NY163 [cd]	348	427	81	19	81	0	0	1.080
NY168 [cd]	342	436	78	21	78	0	1	1.086
MSW474-1 [d]	301	388	78	22	78	0	0	1.081
MEAN	**384**	**461**	**83**	**16**	**83**	**0**	**0**	**1.082**
ANOVA p-value	**<.0001**	**<.0001**	**<.0001**	**<.0001**	**<.0001**	**0.4711**	**0.0212**	**<.0001**
LSD	**59.2**	**61.5**	**5.0**	**5.1**	**5.1**	**-**	**0.7**	**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. No internal brown spot or brown center defects were observed in the trial. MSZ242-13 and NY163 had no internal defects observed. W15NYR11-13 had twenty percent vascular discoloration, and W15125-4 had thirteen percent hollow heart, which were each the highest in the trial. 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**
W15125-4	13	0	0	0
Snowden	**10**	**10**	**0**	**0**
Lamoka	**0**	**16**	**0**	**0**
MSZ242-13	0	0	0	0
MSAFB635-15	0	3	0	0
W15NYR11-13	3	20	0	0
MSAFB609-12	0	3	0	0
NY163	0	0	0	0
NY168	3	3	0	0
MSW474-1	0	10	0	0
MEAN	**3**	**7**	**0**	**0**
ANOVA P-value	**0.0094**	**<.0001**	**-**	**-**
LSD	**7.6**	**6.2**	**-**	**-**

[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 20th, 2022, and processed at Herr Foods, Inc. (Herr's) on November 7th, 2022. 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 NY163, MSABF609-12, Lamoka, and NY168. Snowden had the lowest percentage of total defects at 6.6%, while W15125-4 had 100% total defects, the highest in the trial.

Table 3. Post-Harvest Chip Quality[1] for the 2022 SNAC Trial at Sandyland Farms

Rank	Entry	SNAC[2] Color	Specific Gravity	Percent Chip Defects[3] Internal	External	Total
1	**Lamoka**	**3.0**	**1.080**	**5.2**	**6.9**	**12.1**
2	NY163	2.0	1.075	0.0	8.5	8.5
3	**Snowden**	**3.0**	**1.084**	**1.9**	**4.7**	**6.6**
4	MSZ242-13	3.0	1.086	1.1	14.3	15.4
5	MSAFB609-12	2.0	1.077	2.9	10.3	13.2
6	MSAFB635-15	3.0	1.079	2.5	12.3	14.8
7	W15NYR11-13	4.0	1.074	22.5	9.5	32.0
8	NY168	3.0	1.081	2.6	40.0	42.6
9	MSW474-1	4.0	1.077	0.0	18.0	18.0
10	W15125-4	5.0	1.080	60.0	40.0	100.0

[1] Samples collected October 20th and processed by Herr Foods, Inc., Nottingham, PA on November 7th 2022

[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 9 (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 2022 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
W15NYR11-13	19	6	0	0	0	0	25	76	0.2	11	11	3	0	0	0	25	44	0.7
NY163	16	8	1	0	0	0	25	64	0.4	13	6	4	3	0	0	26	50	0.9
MSZ242-13	14	6	3	2	0	0	25	56	0.7	8	8	8	1	0	0	25	32	1.1
MSAFB609-12	10	11	4	0	0	0	25	40	0.8	4	9	9	3	0	0	25	16	1.4
Lamoka	11	9	5	0	0	0	25	44	0.8	6	7	7	3	2	0	25	24	1.5
MSAFB635-15	13	8	3	1	0	0	25	52	0.7	5	9	5	2	1	3	25	20	1.8
NY168	8	13	4	0	0	0	25	32	0.8	3	8	7	6	0	1	25	12	1.8
W15125-4	2	8	8	5	2	0	25	8	1.9	0	7	6	3	5	2	23	0	2.5
MSW474-1	5	4	5	5	0	4	23	22	2.1	1	5	4	8	3	3	24	4	2.7
Snowden	12	4	5	3	1	0	25	48	1.1	1	1	4	6	6	7	25	4	3.4

[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. Data is not available for MSAFB609-12 on August 29th.

Table 5A. Pre-Harvest Panel for the 2022 SNAC Trial at Sandyland Farms, Taken on 8/15/2022

Entry	Specific Gravity	Glucose[1] %	Sucrose[2] Rating	Canopy Rating[3]	Canopy Uniform.[4]	Average[5] Tuber Weight
Lamoka	**1.081**	**0.004**	**0.854**	**75**	**100**	**3.73**
MSAFB609-12	1.075	0.003	0.645	100	100	3.46
MSAFB635-15	1.085	0.002	0.301	100	90	2.80
MSW474-1	1.081	0.003	0.538	100	100	2.33
MSZ242-13	1.088	0.001	0.806	90	90	4.84
NY163	1.085	0.002	0.632	75	75	4.52
NY168	1.093	0.002	0.716	80	90	2.56
Snowden	**1.082**	**0.001**	**0.492**	**100**	**100**	**2.77**
W15125-4	1.081	0.054	1.877	90	90	5.35
W15NYR11-13	1.076	0.054	1.754	100	100	3.40

Table 5B. Pre-Harvest Panel for the 2022 SNAC Trial at Sandyland Farms, Taken on 8/29/2022

Entry	Specific Gravity	Glucose[1] %	Sucrose[2] Rating	Canopy Rating[3]	Canopy Uniform.[4]	Average[5] Tuber Weight
Lamoka	**1.082**	**0.002**	**0.701**	**75**	**75**	**5.48**
MSAFB635-15	1.087	0.001	0.565	75	75	3.33
MSW474-1	1.080	0.003	0.348	75	75	3.12
MSZ242-13	1.087	0.001	1.262	85	75	5.05
NY163	1.085	0.000	0.469	60	50	3.26
NY168	1.089	0.002	0.424	75	100	3.37
Snowden	**1.084**	**0.010**	**0.335**	**75**	**75**	**3.44**
W15125-4	1.080	0.003	0.495	80	75	3.92
W15NYR11-13	1.081	0.003	0.722	90	75	3.94

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)
W15125-4	3.9	13.1	3.4	4.8
Snowden	**4.1**	**14.6**	**3.6**	**3.7**
Lamoka	**3.6**	**10.9**	**3.1**	**3.9**
MSZ242-13	2.8	9.1	3.3	4.6
MSAFB635-15	2.8	15.3	5.4	3.2
W15NYR11-13	3.7	12.4	3.4	3.3
MSAFB609-12	2.3	12.5	5.3	3.5
NY163	2.9	14.8	5.1	3.1
NY168	3.0	13.0	4.4	3.5
MSW474-1	3.1	12.8	4.1	3.4
MEAN	**3.2**	**12.8**	**4.1**	**3.7**

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

Variety Comments:

W15125-4: This University of Wisconsin variety had the highest US#1 yield at 566 cwt/A in 2022 with 93% US#1 tubers. It had an average specific gravity of 1.082, and fewer B-sized tubers than average (Table 1). This variety had thirteen percent hollow heart and no other defects observed in 2022 (Table 2). Herr's ranked this variety last out of ten, noting 60 percent internal defects and 40 percent external defects. Chip color was rated a five, the darkest and least acceptable color (Table 3). W15125-4 was susceptible to black spot bruising, with no bruise free tubers in the simulated bruise treatment, and an average of 2.5 bruises per tuber (Table 4). Between pre-harvest samples, decreasing glucose and sucrose indicate chemical maturity (Table 5). W15125-4 had the largest average tuber weight of 4.8 ounces per tuber (Table 6). At grading, this variety had a few tubers with sticky stolons and an attractive round type.

MSZ242-13: This Michigan State University variety had an average US#1 yield and a slightly below average total yield of 408 cwt/A in 2022. It had 93% A-sized tubers, the highest in the trial, and fewer B-sized tubers than average. MSZ242-13 had the highest specific gravity in the trial, 1.093 (Table 1). It had excellent internal quality with no internal defects observed (Table 2). This variety was ranked 4th by Herr's with a SNAC score of 3.0 and 15.4% total defects (Table 3). With 32% bruise free tubers after simulated bruising, MSZ242-13 was less susceptible to black spot bruising and had only 1.1 average bruises per tuber, the third lowest in the trial (Table 4). Stable glucose and increasing sucrose indicate potential chemical immaturity at harvest (Table 5). MSZ242-13 had the fewest tubers per plant in the trial, with an average of 9.1 tuber per hill (Table 6). At grading, this variety exhibited smooth darker skin, a slightly flattened round type, and a few pointed tubers.

MSAFB635-15: MSAFB635-15 had a slightly below average US#1 yield and an above average total yield of 360 and 477 cwt/A, respectively. It had the highest incidence of B-sized tubers, 24%, and 76% US#1 tubers. The specific gravity of 1.084 was about average for the trial (Table 1). With only three percent vascular discoloration, internal quality was very good (Table 2). Herr's ranked MSAFB635-15 sixth, observing 14.8% chip defects (Table 3). After simulated bruising, this variety had an average of 1.8 bruises per tuber with 20% bruise free tubers (Table 4). Decreasing glucose and increasing sucrose indicate potential chemical immaturity at harvest (Table 5). This variety had 15.3 tubers per plant, the highest in the trial (Table 6). MSAFB635-15 had a blocky round tuber type, surface and pitted scab, and slight black scurf.

W15NYR11-13: This variety had US#1 and total yields slightly below the trial averages, and 82 percent US#1 tubers, just below the average. It also had the lowest specific gravity of 1.072 (Table 1). W15NYR11-13 had the highest vascular discoloration in the trial, 20%, and three percent hollow heart (Table 2). Herr's ranked this variety seventh, noting 32% total defects (Table 3). After simulated bruising, 44% of tubers with bruise free, the second highest in the trial. There was an average of 0.7 bruises per tuber, the lowest and therefore most desirable in the trial (Table 4). Between the two sugar panel samples, glucose and sucrose concentrations decreased, indicating chemical maturity (Table 5). W15NYR11-13 had a round to oval tuber type, and some tubers had slight anthocyanin pigmentation around the eyes.

MSAFB609-12: MSAFB609-12 had a slightly below average total and US#1 yield of 355 cwt/A and 436 cwt/A, respectively. Both the tuber size profile and specific gravity were approximately average for the trial (Table 1). Internal quality was good with only three precent vascular discoloration observed in 2022, below the trial average of seven percent (Table 2). Herr's ranked this variety fifth with only 13.2% total defects (Table 3). While this variety had only 16% bruise free tubers after simulated bruising, there was an average of 1.4 bruises per tuber, the fourth lowest in the trial (Table 4). MSAFB609-12 was chemically mature at harvest, indicated by the decreasing glucose and sucrose concentrations (Table 5).

NY163: This Cornell University variety had a US#1 yield of 348 cwt/A, below the trial average. The specific gravity of 1.080 was also below the trial average (Table 1). NY163 had excellent internal quality with no internal defects (Table 2). Herr's ranked this variety second, with a SNAC color score of 2.0 and 8.5% total defects, all of which were external (Table 3). This variety had 50% bruise free tubers after simulated bruising, the highest and therefore most desirable in the trial. Each tuber had an average of 0.9 bruises per tuber (Table 4). Between the two samples, the glucose concentration fell from 0.002% to undetectable and the sucrose concentration also decreased, indicating chemical maturity at harvest (Table 5). This variety had the smallest tuber size with an average tuber weight of 3.1 ounces (Table 6). NY163 had an attractive round tuber type, shallow eyes, and a few pointed tubers.

NY168: While the US#1 and total yield of this variety were below average (342 cwt/A and 436 cwt/A respectively), it had a size profile and specific gravity consistent with the other entries (Table 1). Internal quality was very good, with three percent hollow heart and vascular discoloration (Table 2). NY168 was ranked eighth by Herr's with a SNAC color score of 3.0 and 42.6% total defects, mostly external defects (Table 3). With 12% bruise free tubers and 1.8 bruises per tuber, this variety was average in terms of simulated bruising outcomes (Table 4). Stable glucose and decreasing sucrose indicate chemical maturity at harvest (Table 5). NY168 had anthocyanin pigmentation around the eyes and a slightly flattened round tuber type at harvest.

MSW474-1: This Michigan State University variety had the lowest yield in the trial with a US#1 yield of 301 cwt/A. The size profile and specific gravity were consistent with the trial average (Table 1). There was 10% vascular discoloration and no other internal defects observed in 2022 (Table 2). MSW474-1 was ranked 9th out of ten entries by Herr's. Chip color was a 4.0 and there were 18% external defects and no internal defects (Table 3). This variety was more susceptible to black spot bruising and had four percent bruise free tubers with an average of 2.7 bruises (Table 4). Stable glucose and decreasing sucrose indicate chemical maturity at harvest (Table 5). MSW474-1 had deeper apical eyes and a few compressed tubers at harvest.

Snowden: This check variety had an above average US#1 yield of 452 cwt/A, higher than the trial average of 384 cwt/A. The specific gravity of 1.085 was also slightly higher than the trial average of 1.082 (Table 1). Internal quality was acceptable, with ten percent of tuber displaying hollow heart and vascular discoloration (Table 2). Snowden was ranked third by Herr's, with a SNAC color score of 3.0 and 6.6% total defects, the lowest in the trial (Table 3). This variety had the most severe response to simulated bruising with only 4% bruise free tubers, and an average of 3.4 bruises per tuber, the highest in the trial (Table 4). Increasing glucose and decreasing sucrose between sugar panel samples indicate potential chemical immaturity at harvest (Table 5).

Lamoka: This check variety had the third highest yield in the trial with 338 cwt/A US#1 tubers. The size profile and specific gravity were consistent with the trial average (Table 1). Internal quality was acceptable with 16% vascular discoloration (Table 2). Lamoka was ranked first by Herr's with a color score of 3.0 and 12.1% defects (Table 3). After simulated bruising, this variety had an average of 1.5 bruises per tuber, consistent with the trial average (Table 4). Decreasing glucose and sucrose indicate chemical maturity at harvest (Table 5). This variety had an oval to oblong tuber type and slight skinning.