2021 Michigan Regional Trial

2021 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: 5/17/21
Vine killing date: 9/8/21
Harvest date: 10/13/21

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 2021 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, 2021 on a grower trial site at Sandyland Farms.

Pre-harvest sugar profiles were taken for each variety on August 18th and September 1st, 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 29th and September 1st respectively. Lines that matured later relative to the trial controls (Snowden and Lamoka) were MSW474-1 and NYOR14Q9-9 while lines that matured with or earlier than the controls included NY163 and W12078-76.

Growing Season Weather:

	From May 17th to October 13th	
	Rainfall (inches)	GDD (Base 40)
2016	14.55	4107
2017	11.77	3731
2018	22.72	3874
2019	21.79	3688
2020	14.92	3799
2021	21.63	4087
Average	17.90	3881

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 13th, the day of

harvest) in 2021 (21.63”) was higher than the previous six-year average (17.90”). The cumulative growing degree days (base 40 ˚F) during this same period were slightly higher in 2021 (4087) than the six-year average (3881).

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
NY165	600[a]	662	91	8	91	0	1	1.078
MSAFB605-4	600[a]	652	92	8	92	0	0	1.073
MSW474-1	532[b]	621	86	13	86	0	1	1.080
MSZ242-13	519[bc]	557	93	5	92	1	2	1.093
NY163	511[bc]	563	91	8	91	0	1	1.083
W12078-76	503[bc]	571	89	10	89	0	1	1.086
NYOR14Q9-9	495[bc]	554	90	10	89	1	0	1.080
Snowden	**480[c]**	**536**	**90**	**10**	**90**	**0**	**0**	**1.079**
Lamoka	**438[d]**	**494**	**89**	**9**	**89**	**0**	**2**	**1.079**
MEAN	**520**	**579**	**90**	**9**	**90**	**0**	**1**	**1.081**
ANOVA p-value	**<.0001**	**<.0001**	**<.0001**	**<.0001**	**<.0001**	**0.0184**	**0.0364**	**<.0001**
LSD	**38.8**	**42.3**	**1.7**	**1.4**	**1.7**	**0.6**	**1.2**	**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 excluding W12078-76, which had 27 percent hollow heart, three percent vascular discoloration, and 17 percent brown center. No internal brown spot was observed in the trial. NYOR14Q9-9 had ten percent hollow heart, and three percent each of vascular discoloration and brown center. 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**
NY165	0	0	0	0
MSAFB605-4	0	0	0	0
MSW474-1	3	0	0	0
MSZ242-13	0	0	0	0
NY163	**0**	**0**	**0**	**0**
W12078-76	27	3	0	17
NYOR14Q9-9	10	3	0	3
Snowden	**0**	**3**	**0**	**3**
Lamoka	0	0	0	0
MEAN	**4**	**1**	**0**	**3**
ANOVA P-value	**<0.0001**	0.6488	-	0.1888
LSD	**4.7**	-	-	-

[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 13th, 2021, and processed at Herr Foods, Inc. (Herr's) on October 18th, 2021. 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, W12078-76, Snowden, and Lamoka. NY163 had the lowest percentage of total defects, while MSW474-1 had the highest percentage of defects.

Table 3. Post-Harvest Chip Quality[1] for the 2021 SNAC Trial at Sandyland Farms

Rank	Entry	SNAC[2] Color	Specific Gravity	Percent Chip Defects[3] Internal	External	Total
1	NY163	2.0	1.080	3.4	0.0	3.4
2	W12078-76	2.0	1.086	0.9	5.1	6.0
3	MSZ242-13	3.0	1.092	14.5	7.3	21.8
4	NY165	3.0	1.076	21.2	12.7	33.9
5	**Snowden**	**2.0**	**1.084**	**10.4**	**0.8**	**11.2**
6	MSAFB605-4	3.0	1.075	19.3	9.4	28.7
7	**Lamoka**	**2.0**	**1.079**	**18.0**	**13.8**	**31.8**
8	MSW474-1	3.0	1.080	21.6	20.9	42.5
9	NYOR14Q9-9	3.0	1.082	18.6	16.4	35.0

[1] Samples collected October 13th and processed by Herr Foods, Inc., Nottingham, PA on October 18th 2021

[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 2021 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
NY163	19	5	1	0	0	0		76	0.3	2	5	9	3	5	1		8	2.3
W12078-76	17	7	1	0	0	0		68	0.4	0	7	6	5	6	1		0	2.5
MSZ242-13	15	6	3	1	0	0		60	0.6	2	3	5	7	5	3		8	2.8
NYOR14Q9-9	20	4	0	1	0	0		80	0.3	1	5	3	6	8	2		4	2.8
Lamoka	**13**	**9**	**3**	**0**	**0**	**0**		**52**	**0.6**	**1**	**2**	**5**	**7**	**6**	**4**		**4**	**3.1**
MSAFB605-4	12	11	1	1	0	0		48	0.6	1	1	4	10	5	4		4	3.2
MSW474-1	14	7	3	1	0	0		56	0.6	0	1	3	3	4	14		0	4.1
NY165	8	9	6	2	0	0		32	1.1	0	1	1	1	3	19		0	4.5
Snowden	**13**	**7**	**3**	**1**	**1**	**0**		**52**	**0.8**	**0**	**0**	**0**	**1**	**3**	**21**		**0**	**4.8**

[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 18th and September 1st, 2021. Entries are sorted by US #1 yield.

Table 5A. Pre-Harvest Panel for the 2021 SNAC Trial at Sandyland Farms, Taken on 8/18/2021

Entry	Specific Gravity	Glucose[1] %	Sucrose[2] Rating	Canopy Rating[3]	Canopy Uniform.[4]	Average[5] Tuber Weight
NY165	1.089	0.002	0.684	100	100	3.18
MSAFB605-4	1.079	0.009	0.125	100	100	3.77
MSW474-1	1.083	0.004	0.471	75	100	2.45
MSZ242-13	1.092	0.002	1.471	100	100	4.54
NY163	1.082	0.009	0.882	75	100	3.30
W12078-76	1.085	0.000	2.279	50	100	3.05
NYOR14Q9-9	1.081	0.008	1.690	75	100	4.12
Snowden	**1.083**	**0.005**	**0.907**	**75**	**100**	**3.62**
Lamoka	**1.089**	**0.001**	**0.828**	**75**	**75**	**4.59**

Table 5B. Pre-Harvest Panel for the 2021 SNAC Trial at Sandyland Farms, Taken on 9/1/2021

Entry	Specific Gravity	Glucose[1] %	Sucrose[2] Rating	Canopy Rating[3]	Canopy Uniform.[4]	Average[5] Tuber Weight
NY165	1.081	0.004	0.520	75	100	4.73
MSAFB605-4	1.078	0.003	0.181	75	100	4.71
MSW474-1	1.081	0.004	0.366	75	100	5.19
MSZ242-13	1.094	0.008	0.628	100	75	5.51
NY163	1.083	0.003	0.374	75	75	4.13
W12078-76	1.092	0.005	0.993	50	75	4.51
NYOR14Q9-9	1.080	0.003	0.677	75	75	3.45
Snowden	**1.079**	**0.002**	**0.516**	**50**	**75**	**4.63**
Lamoka	**1.082**	**0.001**	**0.546**	**75**	**75**	**4.28**

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:

NY165: This Cornell University variety had the highest US#1 yield at 600 cwt/A in 2021 with 91% US#1 tubers. It had a below average specific gravity of 1.078 compared to the trial average of 1.081 (Table 1). This variety had excellent internal quality, with no defects observed in 2021 (Table 2). Herr's ranked this variety fourth, noting 33.9 percent total defects (Table 3). NY165 was susceptible to black spot bruising, with no bruise free tubers in the simulated bruise treatment, and an average of 4.5 bruises per tuber (Table 4). Between pre-harvest samples, increasing glucose and decreasing sucrose indicate potential chemical immaturity (Table 5). At grading, the variety displayed a slightly flattened oval type, darker netted skin, and slightly recessed eyes.

MSAFB605-4: This University of Maine variety also had the highest US#1 yield and the second highest total yield of 652 cwt/A in 2021. It had 92% A-sized tubers and a lower specific gravity of 1.073 (Table 1). Internal quality was excellent with no defects observed in 2021 (Table 2). It was ranked 6th by Herr's with a SNAC score of 3.0 and 28.7% total defects (Table 3). With four percent bruise free tubers, MSAFB605-4 was susceptible to black spot bruising and had 3.2 average bruises per tuber (Table 4). Glucose decreased and sucrose increased between sugar panel samples (Table 5). At grading, this variety exhibited an attractive blocky round type.

MSW474-1: MSW474-1 had slightly above average US#1 and total yields of 532 and 621 cwt/A, respectively. It had the highest incidence of B-sized tubers, 13 percent, and 86 percent US#1 tubers. The specific gravity of 1.080 was about average for the trial (Table 1). With only three percent hollow heart, internal quality was very good (Table 2). Herr's ranked MSW474-1 eighth, observing 42.5 percent chip defects, the highest in the trial (Table 3). After simulated bruising, this variety had an average of 4.1 bruises per tuber with no bruise free tubers (Table 4). Glucose concentration remained stable between samples while sucrose decreased, indicating chemical maturity at harvest (Table 5). MSW474-1 had a darker heavy netted skin and deeper apical eyes at grading.

MSZ242-13: This variety had US#1 and total yields consistent with the trial averages, and 93 percent US#1 tubers, the highest in the trial. It also had the highest specific gravity of 1.093 (Table 1). MSZ242-13 had excellent internal quality with no internal defects in 2021 (Table 2). Herr's ranked this Michigan State University variety third, noting 21.8 percent total defects (Table 3). After simulated bruising, eight percent of tubers with bruise free, and there was an average of 2.8 bruises per tuber, slightly below the trial average (Table 4). Between the two sugar panel samples, glucose concentrations increased and sucrose concentrations decreased (Table 5). MSZ242-13 had a larger round and blocky tuber type.

NY163: NY163 had a slightly below average total and US#1 yield but an above average specific gravity of 1.083. The tuber size profile was consistent with the trial averages (Table 1). No internal defects were observed in 2021 (Table 2). Herr's ranked this variety the best in the trial with only 3.4 percent internal defects and no external defects (Table 3). This variety was the least susceptible to simulated black spot bruising, with eight percent of tubers bruise free and only 2.3 bruises per tuber (Table 4). NY163 was chemically mature at harvest, indicated by the decreasing glucose and sucrose concentrations (Table 5).

W12078-76: This Wisconsin variety had a US#1 yield of 503 cwt/A, slightly below the trial average. The specific gravity of 1.086 was above average and the second highest in the trial

(Table 1). W12078-76 displayed the most internal defects, with 27 percent hollow heart, three percent vascular discoloration, and 17 percent brown center (Table 2). Herr's ranked this variety second, with a SNAC color score of 2.0 and 6 percent total defects, of which 5.1 percent were external (Table 3). This variety was less susceptible to simulated bruising than average, with only 2.5 bruises per tuber but no bruise free tubers (Table 4). At the first sugar panel sample, glucose concentrations were undetectable by Techmark, Inc. Between the two samples, the glucose concentration rose while the sucrose concentration fell, indicating chemical maturity at harvest (Table 5). W12078-76 had some pointed tubers, a medium netted skin, and an attractive uniform type.

NYOR14Q9-9: While the US#1 and total yield of this variety were below average (495 cwt/A and 554 cwt/A respectively), it had a size profile and specific gravity consistent with the other entries (Table 1). Internal quality was acceptable, with ten percent hollow heart, three percent vascular discoloration, and three percent brown center (Table 2). NYOR14Q9-9 was ranked last by Herr's with a SNAC color score of 3.0 and 35 percent total defects (Table 3). With four percent bruise free tubers and an average of 2.8 bruises per tuber, this variety had less bruising than average (Table 4). Both glucose and sucrose decreased between the sugar panel samples, indicating chemical maturity at harvest (Table 5). Some pitted scab lesions were observed at grading, along with an oval type and medium netted skin.

Snowden: This check variety had a below average US#1 yield of 480 cwt/A, lower than the trial average of 520 cwt/A. The specific gravity of 1.079 was also slightly lower than the trial average of 1.081 (Table 1). Internal quality was good, with three percent vascular discoloration and three percent brown center observed in 2021 (Table 2). Snowden was ranked fifth by Herr's, with a SNAC color score of 2.0 and 11.2 percent total defects (Table 3). This variety had the most severe response to simulated bruising with no bruise free tubers, and an average of 4.8 bruises per tuber (Table 4). Decreasing glucose and sucrose between sugar panel samples indicate chemical maturity at harvest (Table 5).

Lamoka: This check variety had the lowest yield in the trial with 438 cwt/A US#1 tubers. The size profile and specific gravity were consistent with the trial average (Table 1). Internal quality was excellent with no defects observed in 2021 (Table 2). Lamoka was ranked seventh by Herr's with a color score of 2.0 and 31.8 percent defects (Table 3). After simulated bruising, this variety had an average of 3.1 bruises per tuber, consistent with the trial average (Table 4). Between sugar panel samples the glucose was stable and the sucrose decreased (Table 5). This variety had an oval to oblong tuber type and a trace sticky stolons.