2020 Michigan Regional Trial

2020 Potatoes USA – SNAC International Trial
Yield Trial Report

Local Trial Coordinator:

Chris Long, Potato Specialist
Katrina Zavislan, Research Assistant
Damen Kurzer, Research Technician
Michigan State University
East Lansing, MI
Office: (517) 353-0277
Mobile: (517) 256-6529
E-mail: longch@msu.edu

Cooperating Grower:

Tim, Todd and Chase Young
Sandyland Farms, LLC
Howard City, MI
Office: (989) 352-6708
E-mail: info@sandylandfarms.com

Cooperating Processor and Lab Evaluator:

Gene Herr
Herr Foods, Inc.
Nottingham, PA
Office: (610) 932-6539
Email: gene.herr@herrs.com

Bradley Halladay
Medius
Bird-in-Hand, PA
Office: (717) 397-8635
Email: brad@mediusag.com

Trial Site Data:

Location: Howard City, Michigan
Soil type: Loamy Sand
Planting date: 5/22/2020
Vine killing date: 9/4/2020 and 9/11/2020
Harvest date: 10/6/2020

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 2020 where it was cut, treated (Syngenta Cruiser Maxx® Potato Extreme) and allowed to suberize at 50°F prior to being planted by the Michigan State University Potato Outreach Program on May 22nd, 2020 on a grower trial site at Sandyland Farms.

Pre-harvest sugar profiles were taken for each variety on August 14th or August 20th and August 31st, 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, 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 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 24th and August 21st respectively. Lines that matured later relative to the trial controls (Snowden and Lamoka) were Petoskey and CO11023-2W while lines that matured earlier than the controls included MSZ063-2 and MSW474-1.

Growing Season Weather:

	From May 22nd to October 6th	
	Rainfall (inches)	GDD (Base 40)
2015	14.08	3491
2016	14.37	3896
2017	9.89	3514
2018	19.83	3764
2019	20.38	3558
2020	11.38	3606
Average	14.99	3638

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 course of the growing season (described here as May 22nd or the date of planting, to October 6th, the day of harvest) in 2020 (11.38”) was lower than the previous six-year average (14.99”). The cumulative growing degree days (base 40 °F) during this same time period were slightly lower in 2020 (3606) than the six-year average (3638).

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
MSZ242-13	485[a]	534	90	8	90	0	2	1.096
NY163	481[a]	560	86	13	86	0	1	1.081
Petoskey	460[ab]	516	89	9	89	0	2	1.090
CO11023-9W	447[ab]	520	86	13	86	0	1	1.066
Snowden	**419[bc]**	**515**	**81**	**18**	**81**	**0**	**1**	**1.081**
CO11023-2W	404[bcd]	510	79	19	79	0	2	1.088
MSW474-1	379[cd]	546	69	30	69	0	1	1.083
Lamoka	**372[cd]**	**478**	**78**	**21**	**78**	**0**	**1**	**1.082**
ND7519-1	361[cd]	460	78	18	78	0	4	1.085
MSZ063-2	350[d]	512	68	31	68	0	1	1.080
B2869-29	263[e]	495	53	45	53	0	2	1.083
MEAN	**402**	**513**	**78**	**20**	**78**	**0**	**2**	**1.083**
ANOVA p-value	**<.0001**	0.5240	**<.0001**	**<.0001**	**<.0001**	**-**	**0.0002**	**<.0001**
LSD	**60.1**	**-**	**5.0**	**5.1**	**5.0**	**-**	**1.2**	**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 the exception of CO11023-9W, CO11023-2W, and B2869-29, which all displayed over ten percent of at least one defect type. Hollow heart was observed in five varieties and had the widest range from three to 50 percent. Three varieties (NY163, Snowden, and MSW474-1) had no internal defects. 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**
MSZ242-13	3	0	0	0
NY163	0	0	0	0
Petoskey	10	0	0	0
CO11023-9W	50	10	17	3
Snowden	**0**	**0**	**0**	**0**
CO11023-2W	17	13	0	0
MSW474-1	0	0	0	0
Lamoka	**0**	**7**	**3**	**0**
ND7519-1	0	7	0	0
MSZ063-2	0	0	7	3
B2869-29	3	0	0	17
MEAN	**8**	**3**	**2**	**2**
ANOVA P-value	**<0.0001**	0.0255	0.0575	**0.0026**
LSD	**11.4**	-	-	**7.2**

[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 6th, 2020, and processed at Herr Foods, Inc. on October 14th, 2020. 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, CO11023-2W, MSZ063-2, MSZ242-13, MSW474-1, and ND7519-1. MSZ242-13 had the lowest percentage of total defects, while CO11023-9W had the most chip defects.

Table 3. Post-Harvest Chip Quality[1] for the 2020 SNAC Trial at Sandyland Farms

Rank	Entry	SNAC[2] Color	Specific Gravity	Percent Chip Defects[3]		
				Internal	External	Total
1	NY163	2.0	1.075	0.0	15.6	15.6
2	CO11023-2W	2.0	1.075	1.3	14.9	16.2
3	**Snowden**	**2.5**	**1.074**	**4.3**	**6.9**	**11.2**
4	MSZ063-2	2.0	1.076	4.1	8.2	12.3
5	**Lamoka**	**3.0**	**1.068**	**20.6**	**0.0**	**20.6**
6	MSZ242-13	2.0	1.085	0.0	7.2	7.2
7	MSW474-1	2.0	1.074	0.0	15.4	15.4
8	Petoskey	3.0	1.077	11.0	1.4	12.4
9	ND7519-1	2.0	1.073	8.4	12.2	20.6
10	CO11023-9W	3.0	1.060	15.2	18.4	33.6
11	B2869-29	3.0	1.068	8.4	19.4	27.8

[1] Samples collected October 6th and processed by Herr Foods, Inc., Nottingham, PA on October 14th, 2020.

[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 11 (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 2020 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
MSZ063-2	21	3	1	0	0	0	25	84	0.2	5	11	8	1	0	0	25	20	1.2
ND7519-1	**6**	**13**	**6**	**0**	**0**	**0**	**25**	**24**	**1.0**	**3**	**13**	**6**	**3**	**0**	**0**	**25**	**12**	**1.4**
Lamoka	14	10	1	0	0	0	25	56	0.5	3	8	6	8	0	0	25	12	1.8
NY163	7	5	10	2	1	0	25	28	1.4	3	4	8	6	4	0	25	12	2.2
CO11023-9W	15	7	2	1	0	0	25	60	0.6	5	1	8	4	4	3	25	20	2.4
CO11023-2W	10	10	3	2	0	0	25	40	0.9	0	5	8	6	5	1	25	0	2.6
B2869-29	**8**	**11**	**4**	**2**	**0**	**0**	**25**	**32**	**1.0**	**2**	**3**	**7**	**3**	**4**	**6**	**25**	**8**	**2.9**
Snowden	10	12	2	1	0	0	25	40	0.8	0	1	5	9	6	4	25	0	3.3
Petoskey	13	7	5	0	0	0	25	52	0.7	0	4	4	3	8	6	25	0	3.3
MSW474-1	10	5	6	4	0	0	25	40	1.2	0	0	3	9	7	6	25	0	3.6
MSZ242-13	10	7	7	1	0	0	25	40	1.0	0	0	5	5	7	8	25	0	3.7

[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 14th and August 31st, 2020. Entries are sorted by US #1 yield.

Table 5A. Pre-Harvest Panel for the 2020 SNAC Trial at Sandyland Farms, Taken on 8/14 and 8/20/2020

Entry	Specific Gravity	Glucose[1] %	Sucrose[2] Rating	Canopy Rating[3]	Canopy Uniform.[4]	Number of Hills	Number of Stems	Average[5] Tuber Weight
MSZ242-13	1.101	0.048	1.522	100	100	3	17	2.82
NY163	1.100	0.006	0.636	75	75	5	12	3.32
Petoskey	1.112	0.011	1.511	100	100	5	20	2.43
CO11023-9W*	1.071	0.005	0.372	75	100	4	6	2.78
Snowden	**1.100**	**0.006**	**0.555**	**75**	**75**	**3**	**16**	**3.20**
CO11023-2W	1.102	0.007	1.135	100	100	3	16	2.61
MSW474-1*	1.085	0.004	0.557	100	100	3	18	2.70
Lamoka*	**1.085**	**0.003**	**0.780**	**100**	**100**	**4**	**11**	**3.74**
ND7519-1*	1.090	0.004	1.026	75	100	4	18	3.23
MSZ063-2	1.096	0.009	0.894	100	100	3	15	2.60
B2869-29	1.093	0.019	1.361	75	75	4	16	1.74

Table 5B. Pre-Harvest Panel for the 2020 SNAC Trial at Sandyland Farms, Taken on 8/31/2020

Entry	Specific Gravity	Glucose[1] %	Sucrose[2] Rating	Canopy Rating[3]	Canopy Uniform.[4]	Number of Hills	Number of Stems	Average[5] Tuber Weight
MSZ242-13	1.091	0.005	0.499	75	75	6	15	4.26
NY163	1.091	0.005	0.172	75	100	4	11	4.08
Petoskey	1.086	0.012	0.679	75	75	5	16	4.26
CO11023-9W	1.078	0.008	0.273	50	75	4	10	2.99
Snowden	**1.090**	**0.008**	**0.370**	**75**	**75**	**4**	**19**	**4.26**
CO11023-2W	1.092	0.005	0.578	75	100	4	21	2.60
MSW474-1	1.088	0.006	0.443	75	75	4	29	2.50
Lamoka	**1.087**	**0.005**	**0.495**	**75**	**75**	**4**	**11**	**3.31**
ND7519-1	1.090	0.009	0.725	75	75	4	17	3.50
MSZ063-2	1.085	0.007	0.791	75	75	3	9	2.63
B2869-29	1.092	0.009	0.641	75	75	3	24	2.47

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.

* These varieties were sampled on 8/20/20, not 8/14/20

Variety Comments:

MSZ242-13: This Michigan State University variety had the highest US#1 yield at 485 cwt/A in 2020 with 90% US#1 tubers. It also had the highest specific gravity in the trial, 1.096 (Table 1). It had very good internal quality, with only three percent hollow heart and no other defects (Table 2). MSZ242-13 had the lowest total defects when ranked by Herr's, with 7.2% internal defects and no external defects (Table 4). This variety was very susceptible to black spot bruising in 2020. In the simulated bruise treatment, there were an average of 3.7 bruises per tuber with no bruise free tubers (Table 4). Between pre-harvest samples the glucose and sucrose concentrations both decreased, indicating chemical maturity (Table 5). At grading, the tubers had lightly netted skin and some growth cracks in larger tubers.

NY163: This Cornell variety had the second highest US#1 yield of 481 cwt/A and the highest total yield of 560 cwt/A. It has 86% US#1 tubers, above the trial average of 78%. The specific gravity was 1.081, slightly below average (Table 1). Internal quality was excellent, with no internal defects observed during grading (Table 2). NY163 was ranked first by Herr's, and had a chip color of 2.0 and 15.6% total defects (Table 3). It was less susceptible than average to black spot bruising, with 2.2 bruises per tuber and twelve percent bruise free tubers (Table 4). Both glucose and sucrose concentrations decreased between pre-harvest samples, indicating chemical maturity (Table 5). At grading, the tubers had some pink pigmentation around the apical eyes. Tuber shape was round with attractive waxy skin.

Petoskey: Petoskey had an above average yield of 460 cwt/A US#1 tubers and an average total yield. It had 89% A-sized tubers, higher than the trial average of 78%. The specific gravity was the second highest in the trial at 1.090 (Table 1). It had good internal quality with only ten percent hollow heart observed (Table 2). Petoskey was ranked 8th by Herr's, which noted some stem end defect and scab during chipping (Table 3). When evaluated for black spot bruise, this variety was more susceptible than average with 3.3 bruises per tuber in the simulated bruising treatment (Table 4). Between pre-harvest panels, the glucose concentration increased while the sucrose concentration decreased (Table 5). These tubers had a slight incidence of sticky stolons at grading.

CO11023-9W: This variety had a slightly above average US#1 yield of 447 cwt/A with 86% A-sized tubers. It had the lowest specific gravity of only 1.066 at grading (Table 1). During pre-harvest sampling the specific gravities were 1.071 (8/20/20) and 1.078 (8/31/20), also the lowest at each sample date (Table 5). CO11023-9W had the highest incidence of hollow heart (50%) and internal brown spot (17%), as well as ten percent vascular discoloration and three percent brown center (Table 2). It was ranked 10th by Herr's, which noted a very low specific gravity of 1.060 and 33.6% chip defects (Table 3). It had an average number of black spot bruises after simulated bruising with 2.4 bruises per tuber and 20% bruise free tubers (Table 4).

Snowden: This check variety was approximately average in yield, size distribution, and specific gravity (Table 1). It had excellent internal quality with no defects observed at grading (Table 2). Herr's ranked this variety third, noting minor scab and 11.2% chip defects (Table 3). It had more bruises than average after simulated bruising with 3.3 bruises per tuber and no bruise free tubers (Table 4). Between pre-harvest samples the glucose concentration increased while the sucrose concentration decreased, indicating chemical maturity (Table 5).

CO11023-2W: This Colorado State University variety had an average yield of 404 cwt/A US#1 tubers and 79% A-sized tubers. It had an above average specific gravity of 1.088 (Table 1). It

had a higher incidence of hollow heart and vascular discoloration than average, but no internal brown spot or brown center (Table 2). This variety was ranked second by Herr's with 16.2% chip defects (table 3). CO11023-2W had an average number of bruises per tuber and no bruise free tubers in the simulated bruise treatment (Table 4). It had a decreasing glucose and sucrose concentration between pre-harvest samples, indicating maturity (Table 5).

MSW474-1: While MSW474-1 had a lower than average US#1 yield of 379 cwt/A, it had the highest total yield of 546 cwt/A due to 30% B-sized tubers, suggesting a high yield potential. It had an average specific gravity of 1.083 (Table 1). This variety had excellent internal quality with no defects observed (Table 2). It had no internal defects and 15.4% external defects when processed by Herr's, and a chip score of 2.0 (Table 3). MSW474-1 was very susceptible to black spot bruising with 3.6 bruises per tuber, the second highest in the trial (Table 4). It displayed increasing glucose and decreasing sucrose concentrations between pre-harvest samples (Table 5). At grading, this variety had flaky skin and an attractive, unform appearance.

Lamoka: This check variety had both a below average total yield and US#1 yield, but an average size distribution and specific gravity (Table 1). It had seven percent vascular discoloration and three percent internal brown spot, both slightly above the trial average (Table 2). This variety was ranked fifth by Herr's with 20.6% internal defects and no external defects (Table 3). Lamoka was less susceptible to black spot bruising and had twelve percent bruise free tubers and 1.8 bruises per tuber in the simulated bruising treatment (Table 4). It was chemically mature at harvest (Table 5).

ND7519-1: This North Dakota variety had a below average yield of 361 cwt/A US#1 potatoes and 460 cwt/A total yield. It had a size profile consistent with the trial average, with 78% A-sized tubers. It had a slightly above average specific gravity of 1.085 (Table 1). ND7519-1 had good internal quality with only seven percent vascular discoloration (Table 2). Herr's observed some potential heat necrosis at chipping and ranked it ninth (Table 3). It was the second highest rated variety after simulated bruising with only 1.4 average bruises per tuber and twelve percent bruise free tubers (Table 4). This variety was chemically mature at harvest (Table 5). At grading, this variety had an oval shape with a few tubers displaying growth crack and points.

MSZ063-2: This Michigan State University variety had the second lowest yield in the 2020 trial, with only 350 cwt/A US#1 potatoes, but had an average yield of 512 cwt/A due to the high percentage of B-sized tubers (31%). It had a specific gravity of 1.080 (Table 1). Internal quality was good with only seven percent internal brown spot and three percent brown center (Table 2). It was ranked fourth by Herr's with 12.3% total defects (Table 3). MSZ063-2 was the least susceptible to black spot bruising, with 20 percent bruise free tubers and 1.2 bruises per tuber (Table 4). Both the glucose and sucrose decreased between pre-harvest samples, indicating chemical maturity (Table 5).

B2869-29: This variety had an almost even split of B-size and A-size tubers, with 53% US#1 potatoes and a US#1 yield of 263 cwt/A (Table 1). It had 17% brown center, the highest in the trial, and three percent hollow heart (Table 2). Herr's ranked this variety last, and observed 27.8% total defects, a chip color of 3.0, and deep scab pitting (Table 3). B2869-29 was slightly more susceptible to black spot bruising than average with eight percent bruise free tubers and 2.9 bruises per tuber (Table 4). Decreasing concentrations of both glucose and sucrose between pre-harvest panels indicate chemical maturity at harvest (Table 5).