2019 Michigan Regional Trial

2019 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: 5/13/2019
Vine killing date: 8/29/2019
Harvest date: 10/17/2019

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 2019 where it was cut, treated (Syngenta Cruiser Maxx® Potato Extreme) and allowed to suberize at 50ºF prior to being planted by the Michigan State University Potato Outreach Program on May 13th, 2019 on grower trial site.

Pre-harvest sugar profiles were taken for each variety on August 20th, approximately one week prior to vine-kill. In previous years, two pre-harvest panels were taken, but the plot was vine killed soon after the first pre-harvest panel this year. 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 19th and September 3trd respectively. Lines that matured early relative to the trial controls (Snowden and Lamoka) include MSV030-4 and ND7519-1, while lines that matured later than the controls included AOR09034-3 and Mackinaw. The rest of the lines deviated minimally from the control.

Growing Season Weather:

	From May 13th to October 17th	
	Rainfall (inches)	GDD (Base 40)
2014	17.47	3611
2015	14.64	3771
2016	16.04	4202
2017	14.46	3885
2018	23.63	4078
2019	22.27	3808
Average	18.09	3893

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 13th or the date of planting to October 17th, the day of harvest) in 2019 (22.27”) was higher than the previous six-year average (18.09”). The

cumulative growing degree days (base 40 ˚F) during this same time period were slightly lower in 2019 (3808) than the six-year average (3893).

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
AOR09034-3	461[a]	536	86	12	86	0	2	1.086
MSV030-4	443[ab]	552	80	19	80	0	1	1.092
Lamoka	**440[ab]**	**541**	**81**	**18**	**81**	**0**	**1**	**1.088**
Mackinaw	433[ab]	600	72	27	72	0	1	1.090
MSZ219-14	426[ab]	503	85	15	85	0	0	1.084
Snowden	**374[b]**	**488**	**77**	**23**	**77**	**0**	**0**	**1.086**
ND7519-1	294[c]	445	66	32	66	0	2	1.086
MSW075-2	256[c]	414	62	38	62	0	0	1.082
MEAN	**391**	**510**	**76**	**23**	**76**	**0**	**1**	**1.087**
ANOVA p-value	**<.0001**	**0.0023**	**<.0001**	**<.0001**	**<.0001**	-	**0.0593**	**0.0442**
LSD	**75.0**	**77.2**	**5.3**	**5.6**	**5.3**	-	-	**0.006**

*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 no hollow heart or internal brown spot observed. Vascular discoloration was present in all varieties, ranging from three to 17 percent. Brown center was present in only AOR09034-3, at seven. 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**
AOR09034-3	0	13	0	7
MSV030-4	0	3	0	0
Lamoka	0	17	0	0
Mackinaw	**0**	**3**	**0**	**0**
MSZ219-14	0	7	0	0
Snowden	0	13	0	0
ND7519-1	**0**	**7**	**0**	**0**
MSW075-2	0	7	0	0
MEAN	**0**	**9**	**0**	**1**
ANOVA P-value	-	0.5251	-	**0.0103**
LSD	-	-	-	**3.5**

[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 17th, 2019, and processed at Herr Foods, Inc. on October 22nd, 2019. Entries are organized based on processor merit scores, with the highest-ranking chip lines at the top of the chart and the lowest ranked lines at the bottom. Entries with the same merit score are further ranked by percent total defects. Chip color was rating 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 ND7519-1, MSV030-4, and Lamoka. MSZ219-14 and AOR09034-3 had the highest and least acceptable SNAC score.

Table 3. Post-Harvest Chip Quality[1] for the 2019 SNAC Trial at Sandyland Farms

Merit Score	Entry	SNAC[2] Color	Specific Gravity	Percent Chip Defects[3]		
				Internal	External	Total
2.0	ND7519-1	2.0	1.079	0.4	9.5	9.9
2.0	MSV030-4	2.0	1.085	13.4	6.3	19.7
2.5	**Lamoka**	**3.0**	**1.080**	**22.0**	**5.0**	**27.0**
3.0	MSW075-2	2.0	1.073	1.7	8.2	9.9
3.5	**Snowden**	**4.0**	**1.085**	**16.1**	**15.6**	**31.7**
4.0	Mackinaw	4.0	1.084	23.7	5.4	29.1
4.0	MSZ219-14	4.0	1.079	43.2	4.3	47.5
4.0	AOR09034-3	4.0	1.085	40.1	14.6	54.7

[1] Samples collected October 16th and processed by Herr Foods, Inc., Nottingham, PA on October 22nd, 2019.

[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 merit score: excellent (1.0), good (2.0), marginal (3.0), drop (4.0).

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 2019 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
ND7519-1	19	6	0	0	0	0	25	76	0.2	12	7	4	1	1	0	25	48	0.9
AOR09034-3	20	4	1	0	0	0	25	80	0.2	6	12	5	2	0	0	25	24	1.1
MSW075-2	14	8	2	1	0	0	25	56	0.6	4	10	7	3	1	0	25	16	1.5
MSV030-4	14	8	2	0	1	0	25	56	0.6	7	3	5	6	3	1	25	28	1.9
MSZ219-14	14	5	5	1	0	0	25	56	0.7	5	4	7	4	5	0	25	20	2.0
Lamoka	**11**	**10**	**4**	**0**	**0**	**0**	**25**	**44**	**0.7**	**5**	**4**	**7**	**3**	**6**	**0**	**25**	**20**	**2.0**
Mackinaw	15	6	3	1	0	0	25	60	0.6	1	2	4	11	6	1	25	4	2.9
Snowden	**10**	**10**	**5**	**0**	**0**	**0**	**25**	**40**	**0.8**	**1**	**2**	**3**	**14**	**3**	**2**	**25**	**4**	**2.9**

[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.

Table 5. Summary of the results from pre-harvest panel data collected on August 20th, 2019. Entries are sorted by US #1 yield.

Table 5. Pre-Harvest Panel for the 2019 SNAC Trial at Sandyland Farms, Taken on 8/20/2019

Entry	Specific Gravity	Glucose[1] %	Sucrose[2] Rating	Canopy Rating[3]	Canopy Uniform.[4]	Number of Hills	Number of Stems	Average[5] Tuber Weight
AOR09034-3	1.087	0.003	0.920	40	95	4	18	3.81
MSV030-4	1.093	0.003	0.611	45	95	6	20	3.81
Lamoka	**1.086**	**0.002**	**0.643**	**50**	**90**	**5**	**11**	**3.44**
Mackinaw	1.092	0.007	0.462	80	95	3	8	3.20
MSZ219-14	1.082	0.003	0.361	80	95	4	12	3.00
Snowden	**1.088**	**0.004**	**0.630**	**75**	**95**	**4**	**17**	**3.39**
ND7519-1	1.083	0.002	0.737	5	95	3	16	3.91
MSW075-2	1.083	0.003	0.439	45	75	5	17	2.90

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:

AOR09034-3: This variety had the highest US#1 yield at 461 cwt/A, and an overall yield of 536 cwt/A. It had 86 percent mid-sized (1 7/8 to 3/1/4 inch) tubers, the highest in the trial, and a specific gravity slightly lower than the trial average of 1.087 (Table 1). AOR09034-3 had slightly more vascular discoloration than average, and was the only variety with brown center (Table 2). Herr's rated this variety unfavorably, noting abundant internal color, scab, and stem end defects, as well as 54.7 percent total defects (Table 3). This variety had 24 percent bruise free tubers and an average of 1.1 bruises per tubers, the second lowest in the trial (Table 4). At pre-harvest sampling, this variety had the highest sucrose rating of 0.920 (Table 5).

MSV030-4: This line had a high US#1 yield at 443 cwt/A, and overall yield of 552 cwt/A. It had an average size profile compared to the trial mean with 19 percent B sized potatoes. The specific gravity was 1.092, higher than the trial average (Table1). Internal quality was very good, with only 3 percent vascular discoloration reported (Table 2). Herr's ranked this variety second and noted minor scab and stem end. It had 19.7 percent total chip defects. (Table 3). This variety displayed 1.9 bruises per tuber, the trial average, with 28 percent bruise free tubers (Table 4).

Lamoka: Lamoka was a check variety for the SNAC trial. It yielded above the trial average at 440 cwt/A US#1, and was slightly above the trial average for specific gravity at 1.088 (Table 1). Internal tuber quality was poorer with 17 percent vascular discoloration observed, the highest in the trial (Table 2). Lamoka had a good to marginal merit score at Herr Foods, with stem end defect and bruising visible. It had 27 percent chip defects, average for the trial (Table 3). This variety was susceptible to bruising, with an average of 2.0 bruises per tuber and 20 percent bruise free tubers (Table 4).

Mackinaw: This variety had an above average yield of 433 cwt/A US#1 potatoes, and a total yield of 600 cwt/A, the highest total yield in the trial. It had an above average specific gravity of 1.090, and 72 percent A size tubers (Table 1). This variety had very good internal quality, with only three percent vascular discoloration observed, the lowest in the trial (Table 2). At pre-harvest sampling, Mackinaw had 0.007 percent glucose, the highest in the trial (Table 5). Herr's ranked this variety sixth, giving it a chip score of 4.0 and 29.1 percent internal defects. Finished chips had some internal color and greening (Table 3). Mackinaw had only 4 percent bruise free tubers and an average of 2.9 bruises per tuber, the highest in the trial (Table 4).

MSZ219-14: This Michigan variety had an above average US#1 and average total yield of 426 cwt/A and 503 cwt/A, respectively. It had the highest percentage of A sized tubers (85 percent), above the trial average of 76 percent. It had a lower than average specific gravity of 1.084, and lower than average internal defects (Table 1 and 2). This variety was ranked seventh with a SNAC score of 4.0 and 47.5 percent internal defects, mainly internal color, greening, and bruising (Table 3). MSZ219-14 had 20 percent bruise free tubers and an average of 2.0 bruises per tuber, average for the trial (Table 4).

Snowden: Snowden, a trial check variety yielded slightly below the trial average at 374 cwt./A US#1 yield. It had an average specific gravity of 1.086 (Table 1). 13 percent of tubers displayed vascular discoloration, but no other internal tuber defects were observed (Table 2). Herr's ranked Snowden fifth with a SNAC color of 4.0, and observed many green tubers (Table 3). Snowden was susceptible to simulated bruising, with 4 percent bruise free tubers and 2.9 average bruises per tuber (Table 4).

ND7519-1: This North Dakota line had a below average yield of 294 cwt./A US#1 tubers and an average specific gravity of 1.086. It had a smaller tuber size profile, with 32 percent B sized tubers compared to the trial average of 23 percent (Table 1). Internal quality was good with 7 percent vascular discoloration observed (Table 2). Herr's ranked this variety favorably, with a good merit score and 9.9 percent total defects. Minor hollow heart and stem end defects were observed (Table 3). This variety displayed the least bruise, with 48 percent bruise free tubers and average of 0.9 bruises per tuber (Table 4).

MSW075-2: This variety had the lowest US#1 yield of 256 cwt/A and total yield of 414 cwt/A. The specific gravity was lower than the trial average at 1.082. It had a smaller tuber size profile with 38 percent B sized tubers (Table 1). This is consistent with the per-harvest sampling data, in which MSW075-2 had the smallest average tuber weight (Table 5). The internal quality of MSW075-2 was good, with only seven percent vascular discoloration observed (Table 2). With a SNAC score of 2.0 and 9.9 percent internal defects, Herr's rated this variety as marginal, noting stem end defect and a smaller size profile (Table 3). This variety had 16 percent bruise free tubers with an average of 1.5 bruises per tuber (Table 4).