

2023-2024 Michigan Regional Trial Potatoes USA / SNAC International Storage Chip Quality

Michigan State University Montcalm Research Center MPIC Demonstration Storage

Investigators: Chris Long, Potato Extension Specialist, longch@msu.edu
Trina VanAtta, Research Assistant, tvanatta@msu.edu
Azamat Sardarbekov, Research Technician, sardarbe@msu.edu

Objective: To assess the storability of eight chipping varieties by evaluating sugar concentrations, chip color, and visual defects during storage.

Materials and Methods:

The MSU Potato Outreach Program planted seed at Sandyland Farms, LLC, in Howard City, MI on May 17, 2023 at 10" within row spacing and 34" between row spacing. Vine kill occurred on September 4, 2023. We harvested the potatoes on October 10, 2023 (2893 GDD₄₀ from planting to vine kill) and collected storage samples.

Commercial Storage and Processing

A 40-pound sample of each variety was stored at Sandyland Farms, LCC commercial storage and evaluated at Herr Foods, Nottingham, PA on January 22 and April 29, 2024. The pile temperature before processing was 48°F in January and 47.4°F in April.

Demonstration Storage and Monthly Evaluations

Nine samples of 30 tubers per variety were stored at the Michigan Potato Industry Commission's (MPIC) Cargill Potato Demonstrations Storage Facility in Bulk Bin 8. The sample bags from each of the nine varieties were stored at approximately 48°F for monthly evaluations from October 2023 through June 2024. Techmark, Inc. processed these MPIC samples for sucrose and glucose values (percent of fresh weight), SNAC color score, and chip defect rating. Chip defect color rating is scored as a percentage by weight of unacceptable chips due to color, bruise, or stem end defect.

Results:

Commercial Storage and Processing

Herr Foods, Inc. evaluated varieties on January 22nd and April 29th, 2024 (Table 1 and 2). On the first processing date, the top four varieties for chip quality were Snowden, Lamoka, NY174, and MSAFB635-15 (Table 1). On the second processing date the top four varieties were NY174, Lamoka, Snowden, and NY177 (Table 2). NY177 had the highest specific gravity on both dates, 1.092 in January and 1.095 in April. Snowden had the lowest percent chip defects in January with 8.7% unacceptable chips, NY174 had the least chip defects in April with 7.2% unacceptable chips (Table 1 and 2). AF6200-4 was ranked last at both samples with over 35% defects and internal color in both samples (Tables 1 and 2).

Table 1. 2023-2024 SNAC Variety Trial January 22, 2024 ¹							
Merit ²	Variety	Specific Gravity	SNAC Color ³	Percent Chip Defects ⁴			Comments
				Internal	External	Total	
1	Snowden	1.084	2	0.0%	8.7%	8.7%	Some scab, 2.5 to 3.5 inches in size
2	Lamoka	1.081	3	7.7%	11.8%	19.5%	Minor scab and greening
3	NY174	1.078	2	10.5%	19.5%	30.0%	Minor scab, 1.75 to 4.5 inches in size
4	MSAFB635-15	1.085	3	9.9%	11.0%	20.9%	Some bruise, 2 to 3.5 inches in size, minor scab and greening
5	AF6165-9	1.087	3	12.0%	28.9%	40.9%	2 to 4.5 inches in size, a lot of scab and bruise, mostly flat tubers
6	NY177	1.092	3	1.0%	49.6%	50.6%	2.75 to 4 inches in size, some bruise and scab, stem end, a lot of edge defects
7	AF6200-4	1.079	4	35.5%	22.1%	57.6%	A lot of internal color, 2 to 4 inches in size, some scab

¹Samples collected on January 20, 2024 and processed by Herr Foods, Inc., Nottingham, PA on January 22, 2024.

²Merit: ranked by Herr Foods, Inc. 1 = highest chip quality, 7= lowest chip quality

³SNAC Color: 1=lightest, 5=darkest

⁴Percent Chip Defects: percentage based on weight of the total sample; comprised of undesirable color, greening, internal and external defects

Table 2. 2023-2024 SNAC Variety Trial April 29, 2024¹							
Merit ²	Variety	Specific Gravity	SNAC Color ³	Percent Chip Defects ⁴			Comments
				Internal	External	Total	
1	NY174	1.081	3.0	2.0%	5.2%	7.2%	Some bruise, scab, 2.25 to 4.5 inches in size
2	Lamoka	1.082	2.0	9.1%	10.0%	19.1%	Good internal color, some scab, 2.25 to 4 inches in size
3	Snowden	1.084	3.0	0.0%	10.6%	10.6%	Some internal color, deep pitted scab, 2.25 to 4 inches in size
4	NY177	1.095	3.0	0.0%	24.4%	24.4%	Slight bruise and scab, 2.25 to 3.25 inches in size
5	MSAFB635-15	1.085	3.0	16.8%	13.1%	29.9%	Some internal color, scab, 2.25 to 3 inches in size
6	AF6165-9	1.085	4.0	19.8%	20.2%	40.0%	Moderate internal color, scab, 2.25 to 3.75 inches in size.
7	AF6200-4	1.079	4.0	16.0%	20.3%	36.3%	Too much internal color, scab, 2,25 to 3.5 inches in size

¹Samples collected from storage on April 27, 2024 and processed by Herr Foods, Inc., Nottingham, PA on April 29, 2024.

²Merit: ranked by Herr Foods, Inc. 1 = highest chip quality, 7 = lowest chip quality

³SNAC Color: 1 = lightest, 5 = darkest

⁴Percent Chip Defects: percentage based on weight of the total sample; comprised of undesirable color, greening, internal and external defects

Demonstration Storage and Monthly Evaluations

Below, Lamoka and Snowden are compared in the Techmark, Inc. assessments of each variety. These samples were stored at 48°F in the MPIC Demonstration Storage facility and evaluated monthly from October 2023 to June 2024. The varieties are listed alphabetically with the check varieties last. For yield and raw tuber quality data at harvest, please see the 2023 field trial results.

Conclusions:

Based on the processing results from both commercial and demonstration storage, NY174 and NY177 appear to be the most promising lines for commercialization and full season storage. Herr's ranked NY174 3rd in January with a specific gravity of 1.078 and 30% total defects (Table 1). This variety moved into 1st place in April with a specific gravity of 1.081 and 7.2% total defects, the lowest of all entries evaluated (Table 2). During the storage season, the glucose and sucrose concentrations were very similar to that of Lamoka (Figures 13 and 14). Chip defects were more variable and were highest in October and February at 30.4% and 18.5%, respectively. At the end of storage there were 15.6% defects, lower than both Lamoka and Snowden (Figure 15). NY177 was ranked 6th in January and 4th in April by Herr's (Tables 1 and 2). Like NY174, NY177 had similar glucose and sucrose concentrations to Lamoka during storage (Figure 17 and 18). NY177 had the best chip quality in May with 3.2% total defects, and 31.7% defects at the final sample, higher than that of Lamoka and consistent with Snowden (Figure 19). Both varieties had a SFA chip color of 1.0 for all of storage (Figures 16 and 20). These entries had excellent chip quality in April (NY174) and May (NY177), and both had good chip quality in June (Tables 6 and 7).

MSAFB635-15 may have mid-season storage potential in Michigan. Herr's ranked it 4th in January and 5th in April. The specific gravity was 1.085 with some scab noted at both sample dates (Tables 1 and 2). Glucose concentrations in MSABF615-15 were higher than that of Lamoka during storage. Like those of Snowden, concentrations decreased through April but rose in June (Figure 9). Sucrose concentrations were elevated at the end of storage above that of both checks, ending at 2.795% (X10) (Figure 10). This is reflected in chip quality, with higher initial chip defects, good chip quality from January to April, then decreasing chip quality in May and June (Figure 11). MSAFB625-15 may have commercialization potential for late winter to early spring shipping in Michigan as it appears to recondition during storage (Table 5).

AF6165-9 and AF6200-4 do not have commercialization potential in Michigan. Both varieties had higher glucose concentrations than that of Lamoka and Snowden for most of storage. This was especially true in June, when both entries ended the storage season with 0.034% glucose (Figures 1 and 5). This caused elevated sucrose concentrations above those of the checks in March for AF6165-9 and in June for AF6200-4 (Figures 2 and 6). All samples of AF6165-9 had over 16% defects and the final sample had 43% defects (Figure 3). Excluding the November sample, all chip samples of AF6200-4 had over 13% defects. The final sample of AF6200-4 in June has 39.4% total defects (Figure 7). Herr's ranked AF6200-4 last in both

samples, noting internal color and scab. AF6165-9 was ranked fifth in January and sixth in April with internal color, scab, and flat tubers observed (Tables 1 and 2).

Table 3. AF6165-9 monthly chip quality pictures from Techmark Inc.

Month










October	 <p>10/16/23 SMAK AF6165-9 10/16/23 TECHMARK, INC. 1</p>	March	 <p>3/5/23 SMAK AF6165-9 3/5/23 TECHMARK, INC. 29</p>
November	 <p>11/7/23 SMAK AF6165-9 11/6/23 TECHMARK, INC. 30</p>	April	 <p>3/9/23 SMAK AF6165-9 3/8/23 TECHMARK, INC. 6</p>
December	 <p>12/7/23 SMAK AF6165-9 12/7/23 TECHMARK, INC. 3</p>	May	 <p>5/7/23 SMAK AF6165-9 5/6/23 TECHMARK, INC. 15</p>
January	 <p>1/4/24 SMAK AF6165-9 1/3/24 TECHMARK, INC. 5</p>	June	 <p>6/12/23 SMAK AF6165-9 6/8/23 TECHMARK, INC. 11</p>
February	 <p>2/6/24 SMAK AF6165-9 2/5/24 TECHMARK, INC. 38</p>		

Figure 1. AF6165-9 glucose concentrations for the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

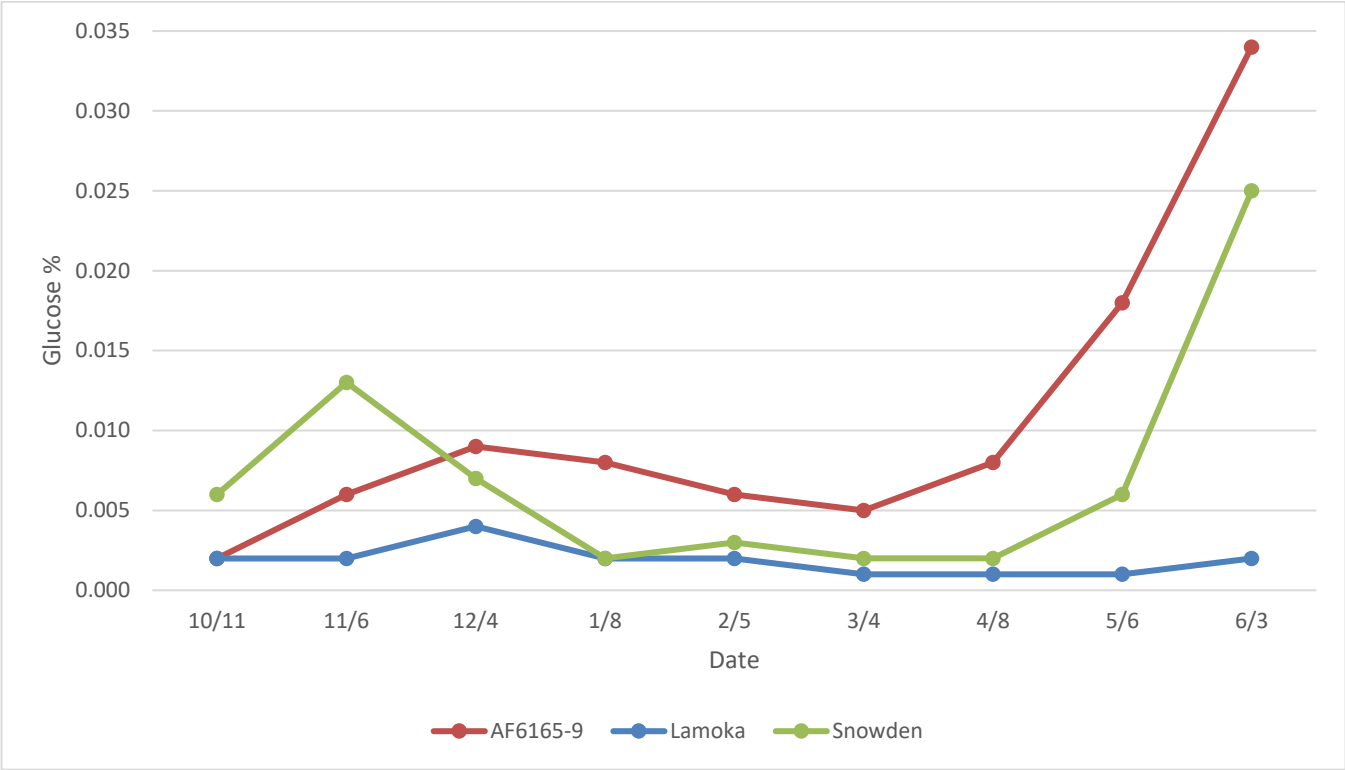


Figure 2. AF6165-9 sucrose concentrations for the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

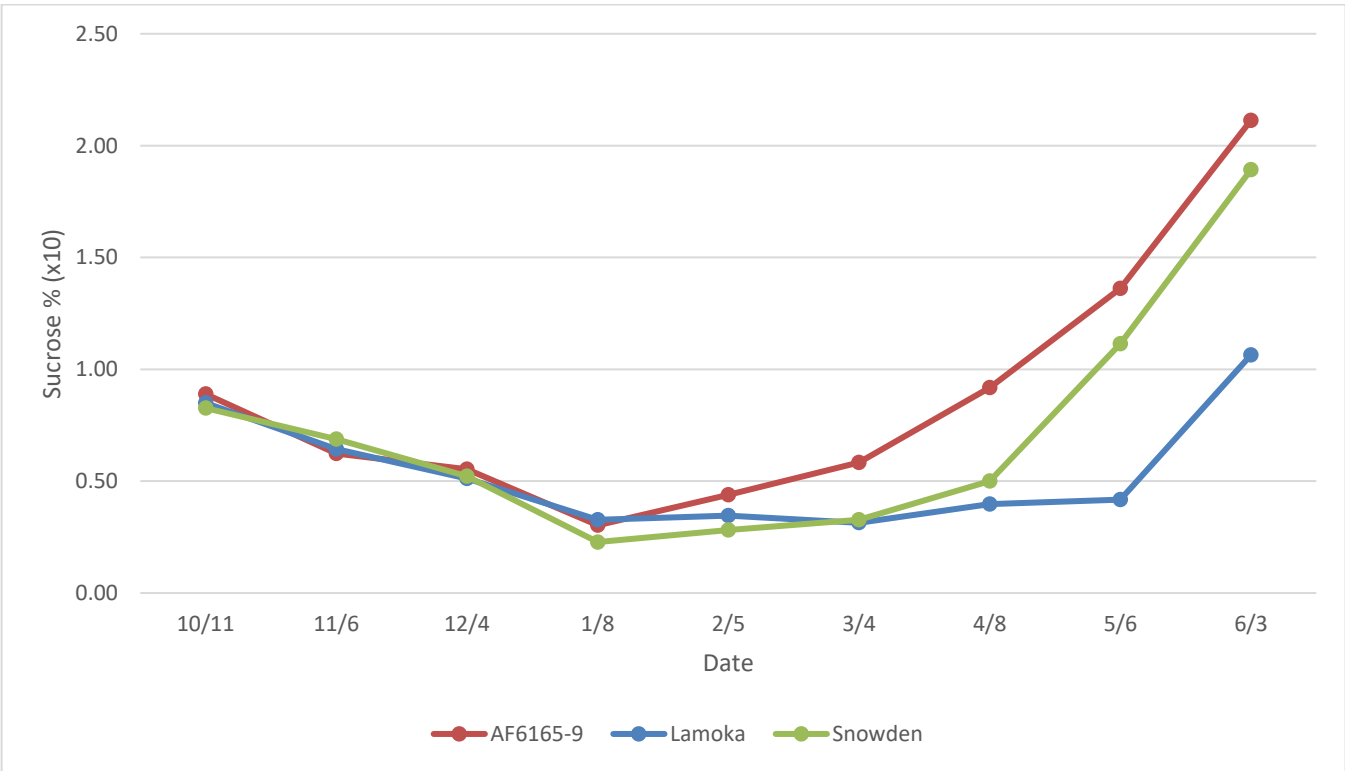


Figure 3. AF6165-9 percent defects for the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

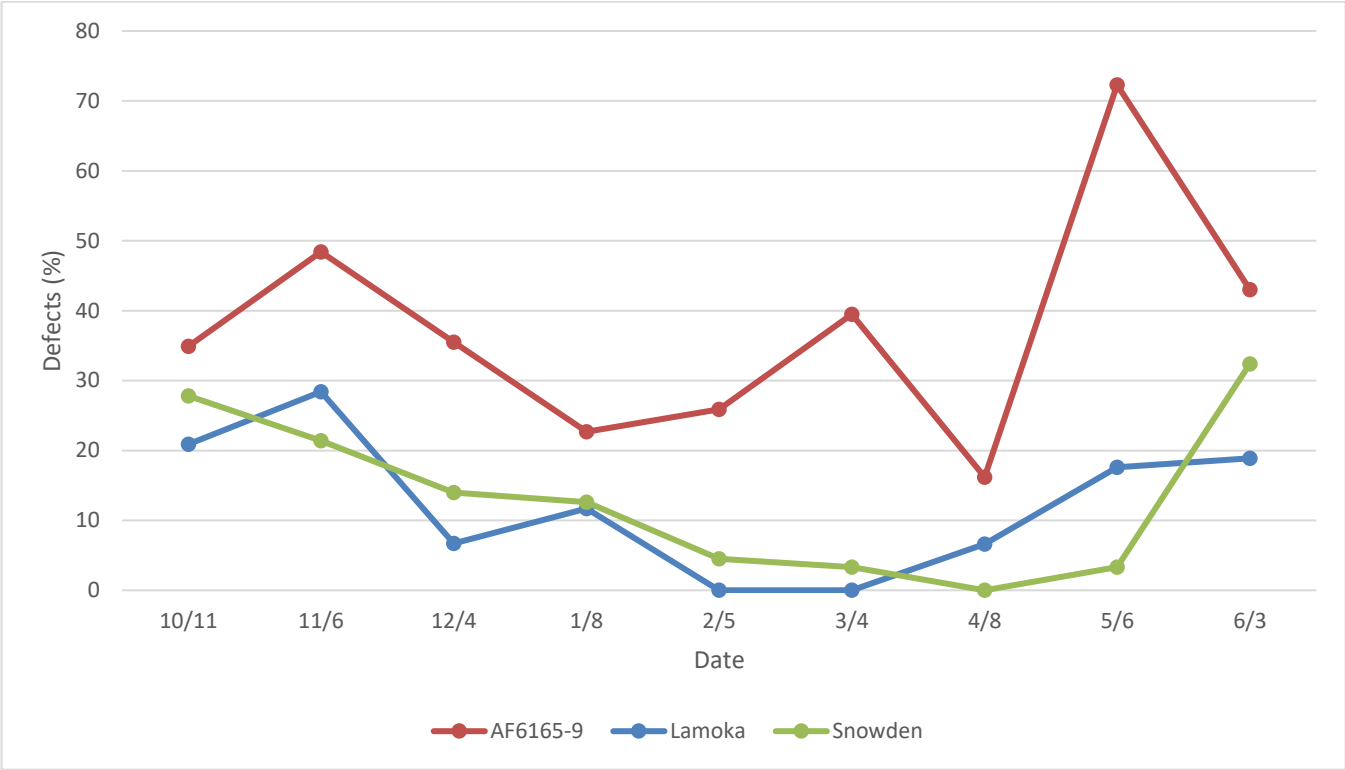


Figure 4. AF6165-9 SNAC Color Score (1 = lightest, 5 = darkest) the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

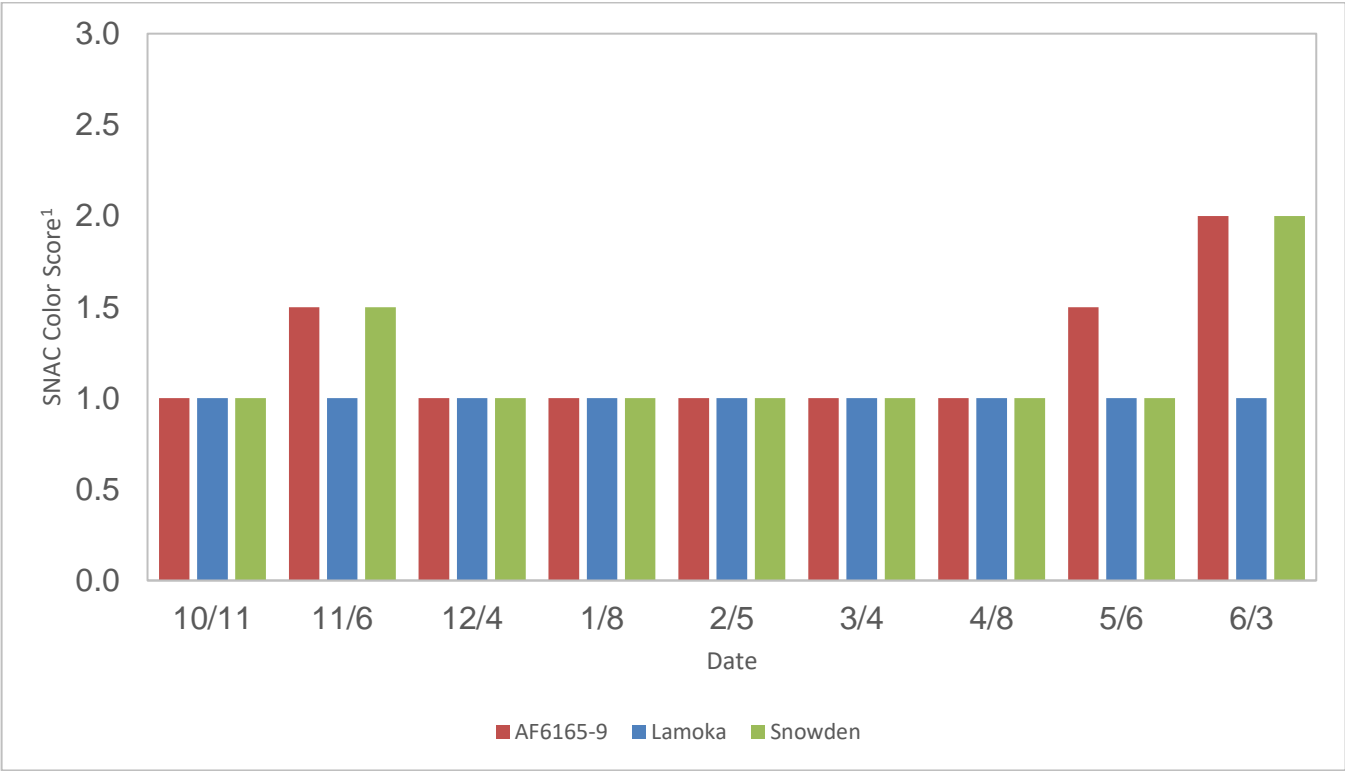


Table 4. AF6200-4 monthly chip quality pictures from Techmark Inc.

Month









October	 <p>Chip quality photo for October. The chips are arranged in a grid on a blue background. A label in the top left corner reads: 8/18/17, SAHC, AF6200-4, 10/18/17, TECHMARK, INC. 7.</p>	March	 <p>Chip quality photo for March. The chips are arranged in a grid on a blue background. A label in the top left corner reads: 5/5/17, SAHC, AF6200-4, 5/5/17, TECHMARK, INC. 24.</p>
November	 <p>Chip quality photo for November. The chips are arranged in a grid on a blue background. A label in the top left corner reads: 11/7/15, SAHC, AF6200-4, 11/7/15, TECHMARK, INC. 35.</p>	April	 <p>Chip quality photo for April. The chips are arranged in a grid on a blue background. A label in the top left corner reads: 4/4/17, SAHC, AF6200-4, 4/8/17, TECHMARK, INC. 5.</p>
December	 <p>Chip quality photo for December. The chips are arranged in a grid on a blue background. A label in the top left corner reads: 12/5/15, SAHC, AF6200-4, 12/5/15, TECHMARK, INC. 11.</p>	May	 <p>Chip quality photo for May. The chips are arranged in a grid on a blue background. A label in the top left corner reads: 5/2/17, SAHC, AF6200-4, 5/8/17, TECHMARK, INC. 13.</p>
January	 <p>Chip quality photo for January. The chips are arranged in a grid on a blue background. A label in the top left corner reads: 1/3/17, SAHC, AF6200-4, 1/8/17, TECHMARK, INC. 6.</p>	June	 <p>Chip quality photo for June. The chips are arranged in a grid on a blue background. A label in the top left corner reads: 6/1/17, SAHC, AF6200-4, 6/2/17, TECHMARK, INC. 10.</p>
February	 <p>Chip quality photo for February. The chips are arranged in a grid on a blue background. A label in the top left corner reads: 2/6/16, SAHC, AF6200-4, 2/5/16, TECHMARK, INC. 30.</p>		

Figure 5. AF6200-4 glucose concentrations for the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

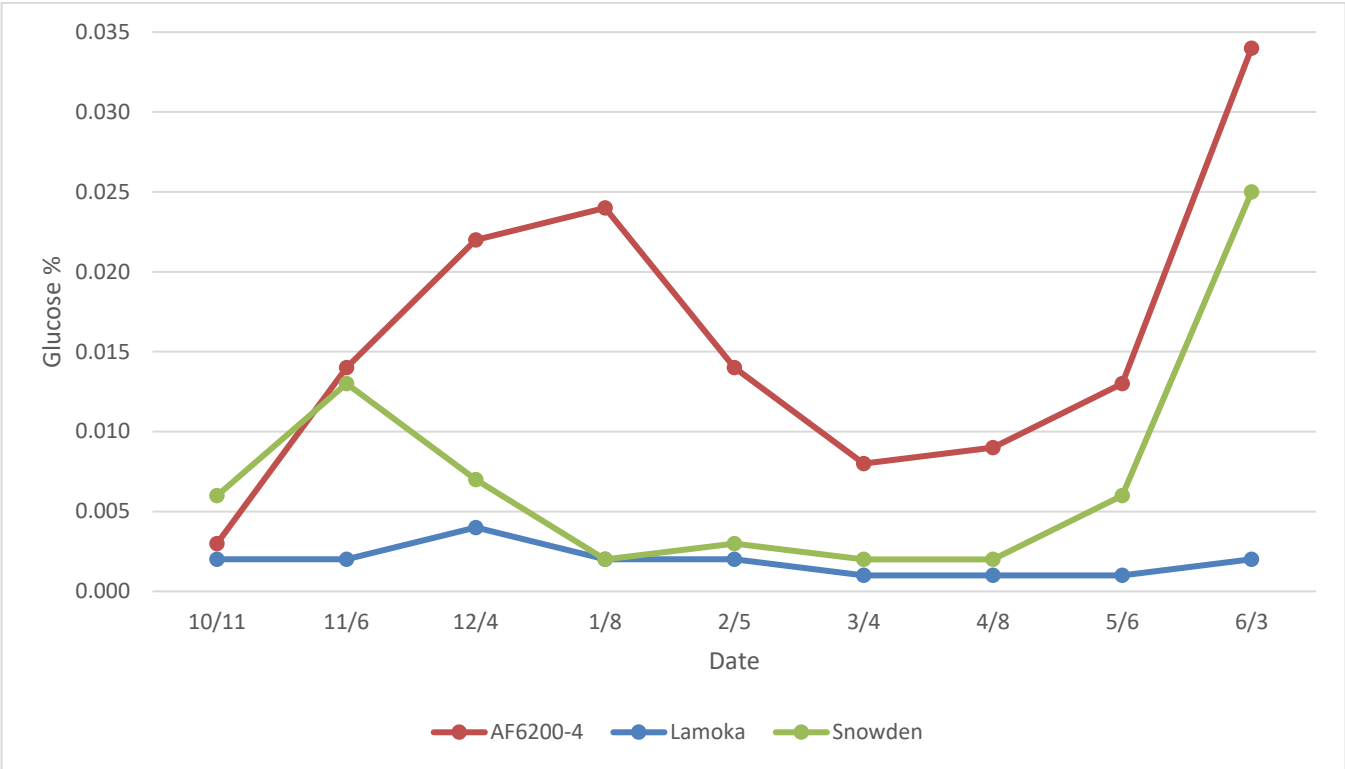


Figure 6. AF6200-4 sucrose concentrations for the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

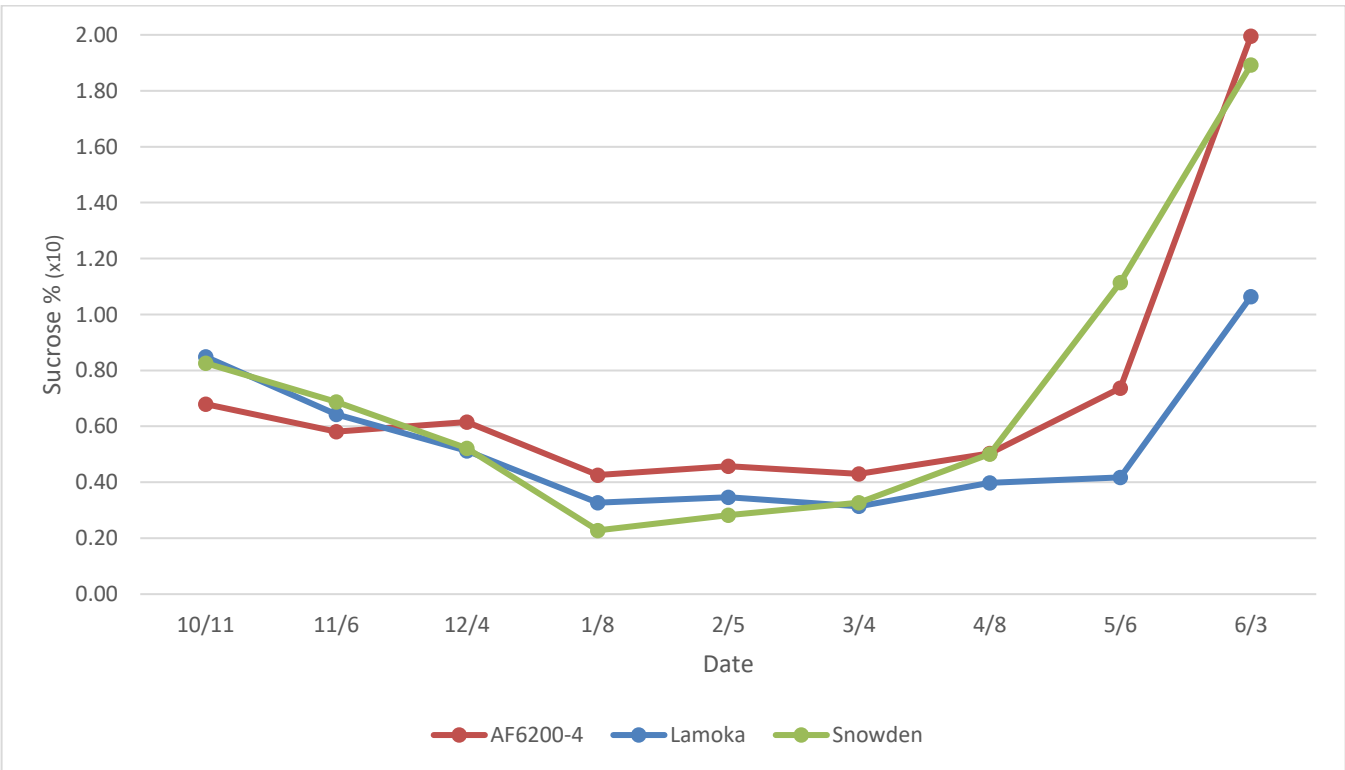


Figure 7. AF6200-4 percent defects for the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

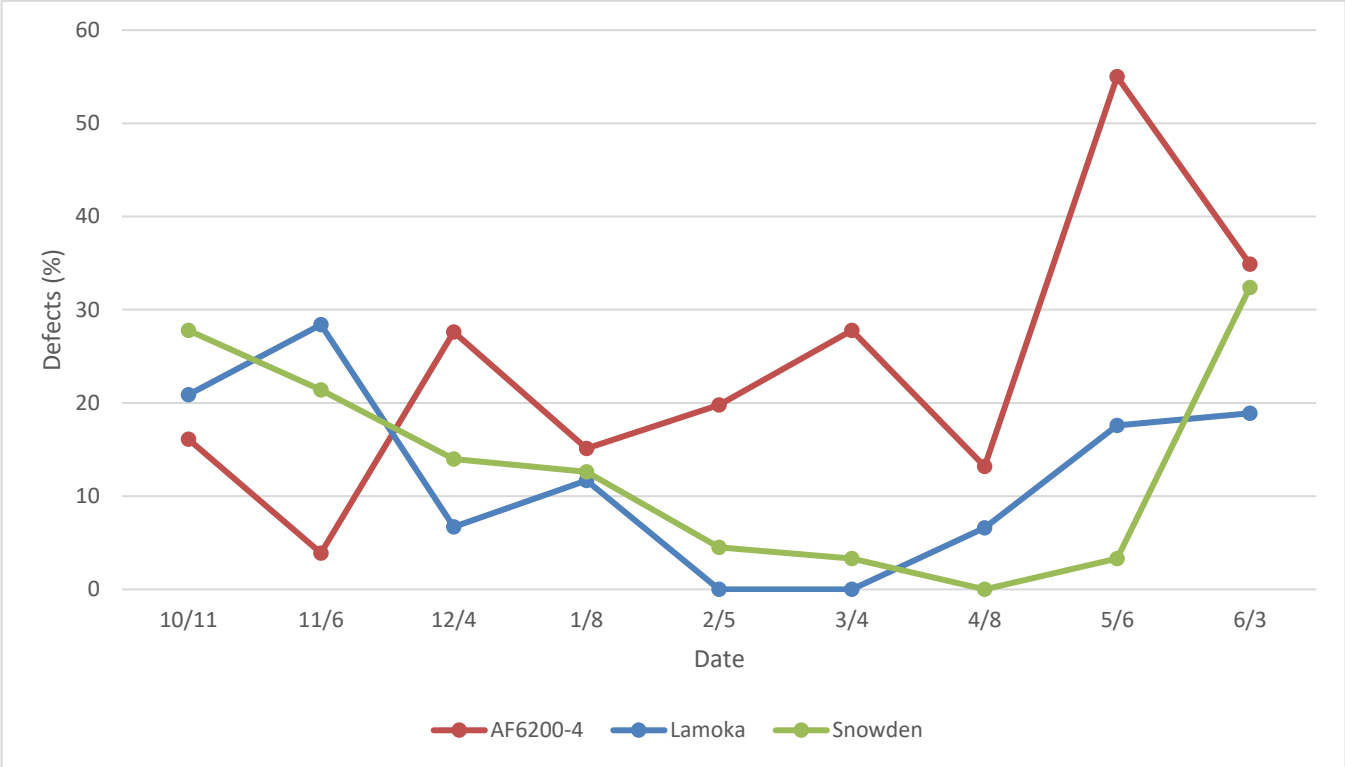


Figure 8. AF6200-4 SNAC Color Score (1 = lightest, 5 = darkest) the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

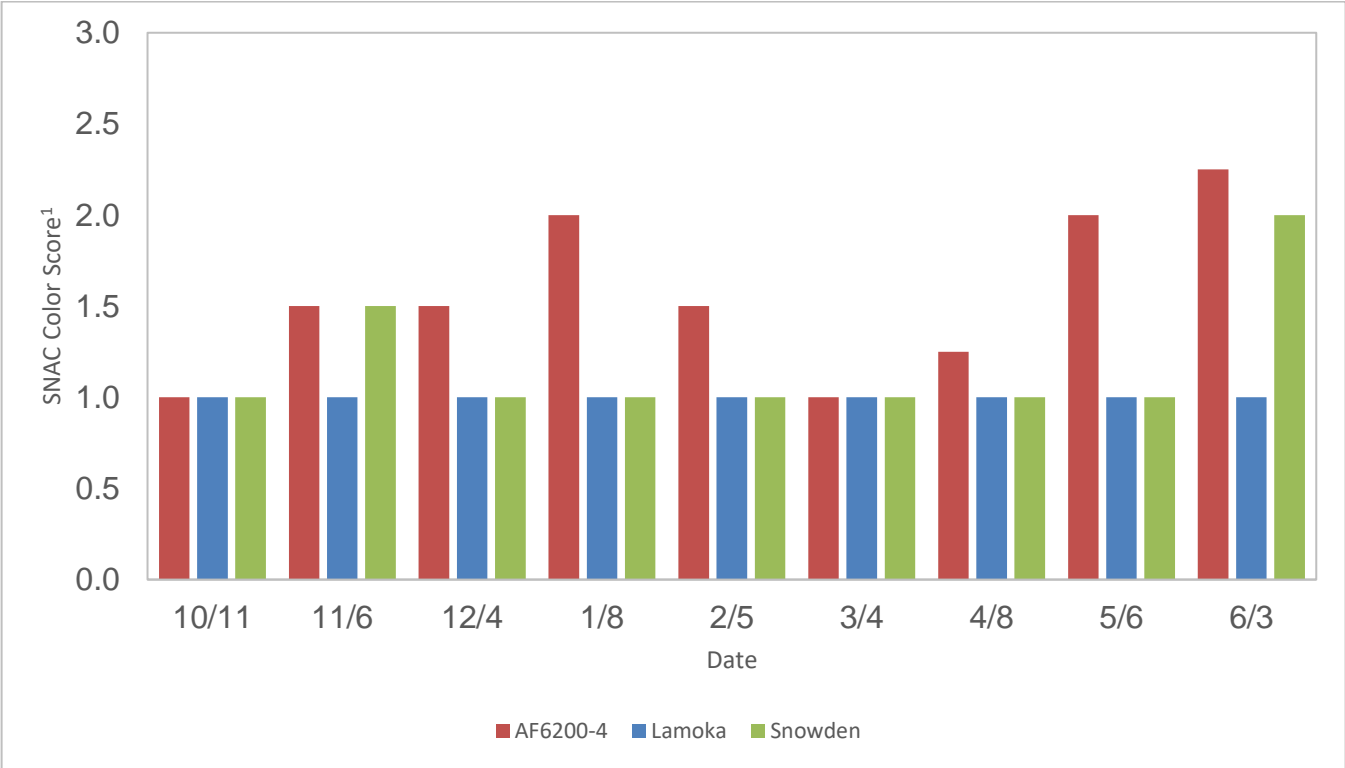


Table 5. MSAFB635-15 monthly chip quality pictures from Techmark Inc.

Month










October	 <p>Photo showing potato chips on a blue background. A label in the top left corner reads: 10/12/23, S.M.A.C., MSAFB635-15, 10/12/23, TECHMARK, INC. 6.</p>	March	 <p>Photo showing potato chips on a blue background. A label in the top left corner reads: 3/5/24, S.M.A.C., MSAFB635-15, 3/5/24, TECHMARK, INC. 28.</p>
November	 <p>Photo showing potato chips on a blue background. A label in the top left corner reads: 11/7/23, S.M.A.C., MSAFB635-15, 11/6/23, TECHMARK, INC. 31.</p>	April	 <p>Photo showing potato chips on a blue background. A label in the top left corner reads: 4/8/24, S.M.A.C., MSAFB635-15, 4/8/24, TECHMARK, INC. 9.</p>
December	 <p>Photo showing potato chips on a blue background. A label in the top left corner reads: 12/4/23, S.M.A.C., MSAFB635-15, 12/4/23, TECHMARK, INC. 12.</p>	May	 <p>Photo showing potato chips on a blue background. A label in the top left corner reads: 5/7/24, S.M.A.C., MSAFB635-15, 5/4/24, TECHMARK, INC. 14.</p>
January	 <p>Photo showing potato chips on a blue background. A label in the top left corner reads: 1/9/24, S.M.A.C., MSAFB635-15, 1/8/24, TECHMARK, INC. 1.</p>	June	 <p>Photo showing potato chips on a blue background. A label in the top left corner reads: 6/18/24, S.M.A.C., MSAFB635-15, 6/3/24, TECHMARK, INC. 19.</p>
February	 <p>Photo showing potato chips on a blue background. A label in the top left corner reads: 2/6/24, S.M.A.C., MSAFB635-15, 2/9/24, TECHMARK, INC. 11.</p>		

Figure 9. MSAFB635-15 glucose concentrations for the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

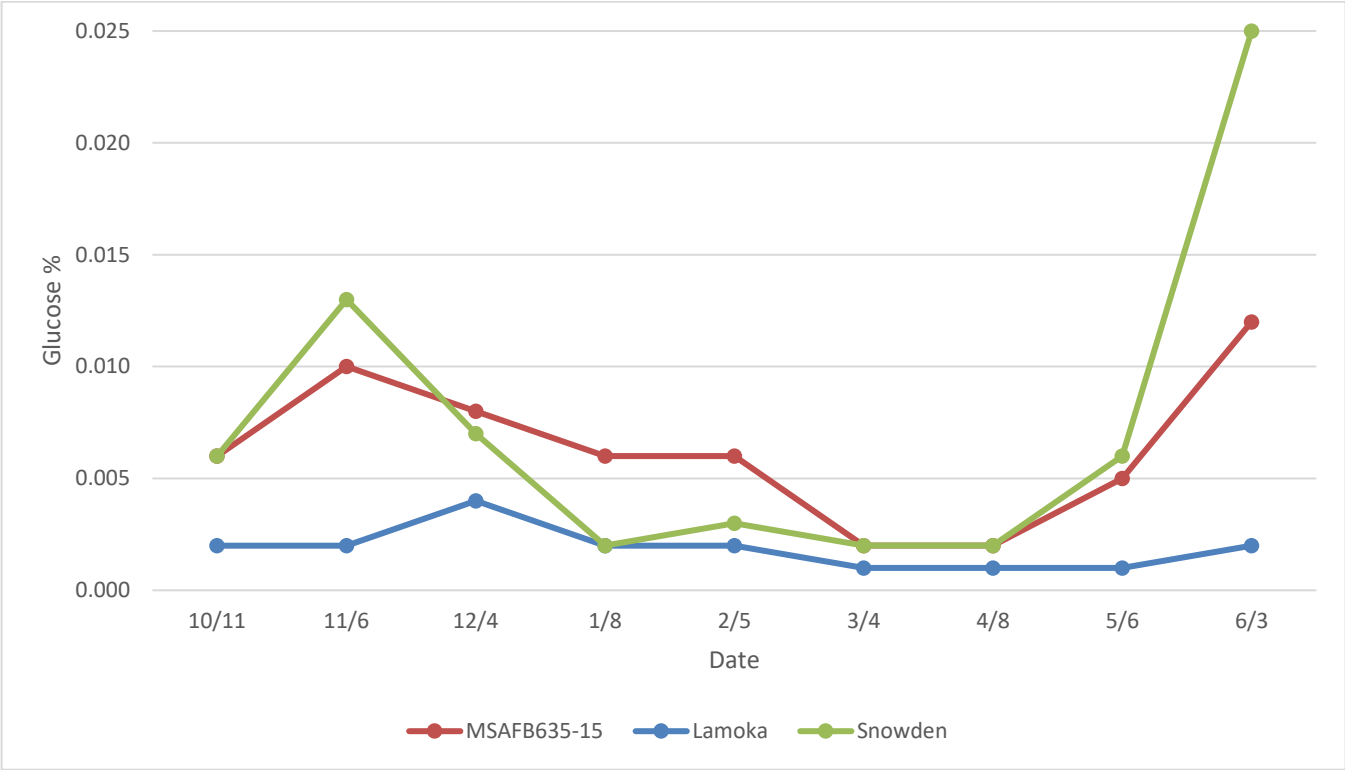


Figure 10. MSAFB635-15 sucrose concentrations for the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

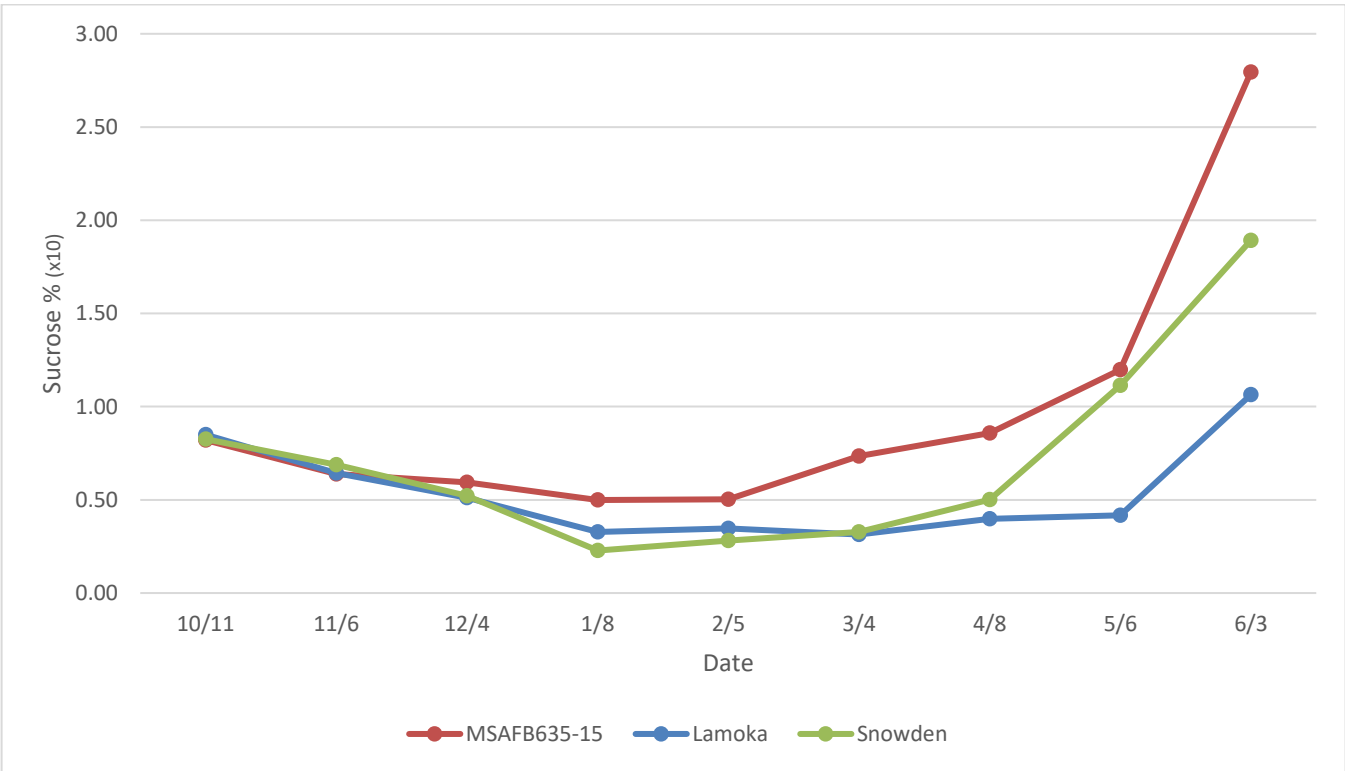


Figure 11. MSAFB635-15 percent defects for the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

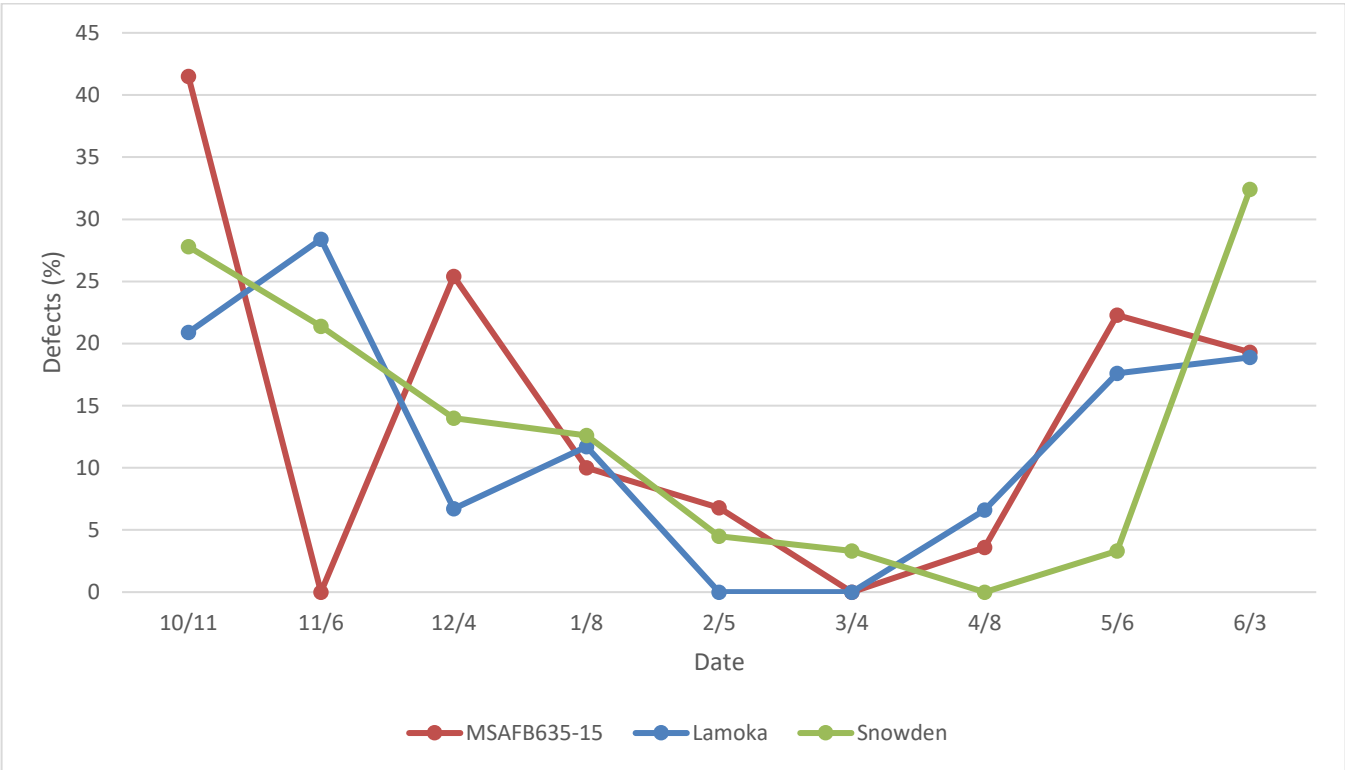


Figure 12. MSAFB635-15 SNAC Color Score (1 = lightest, 5 = darkest) the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

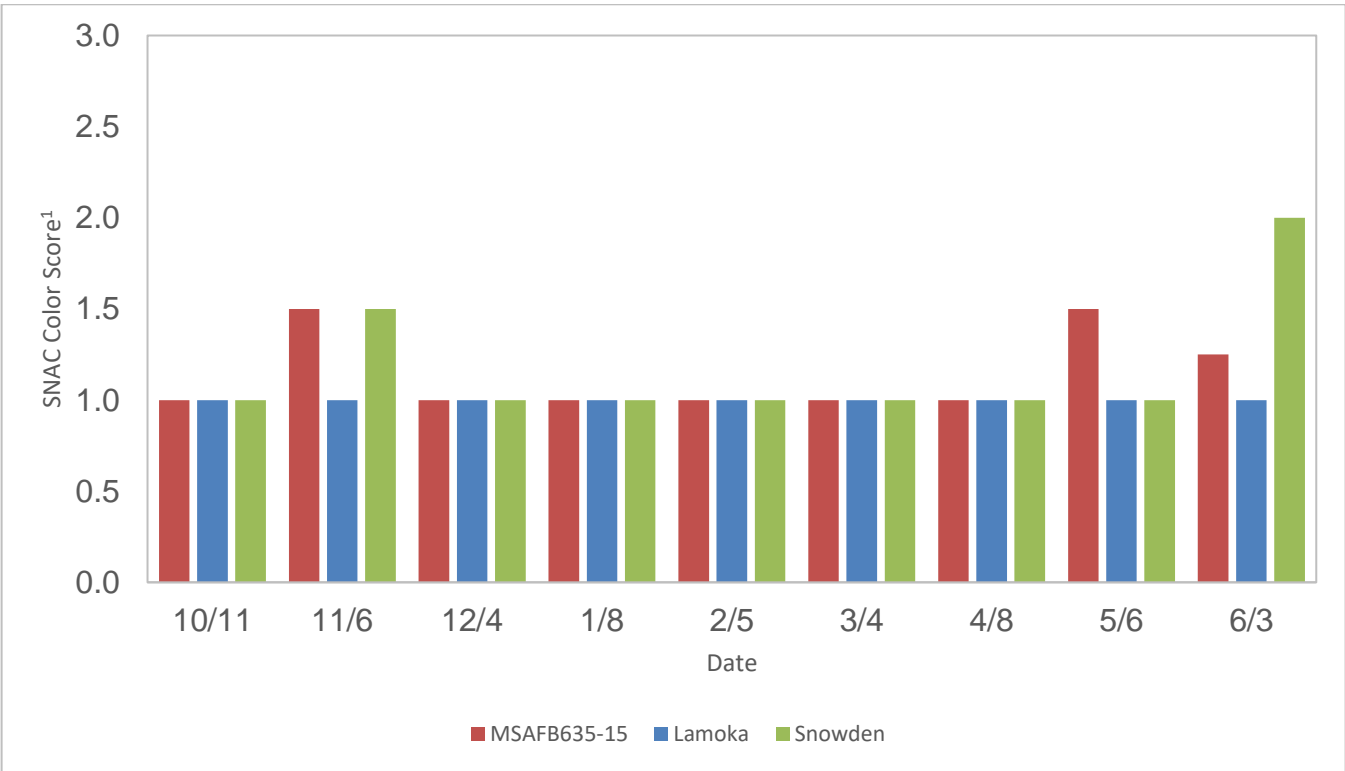


Table 6. NY174 monthly chip quality pictures from Techmark Inc.

Month










October	 <p>10/16/24 SMAK NY174 10/14/24 TECHMARK, INC. 14</p>	March	 <p>3/12/24 SMAK NY174 3/11/24 TECHMARK, INC. 30</p>
November	 <p>11/7/23 SMAK NY174 11/6/23 TECHMARK, INC. 36</p>	April	 <p>4/8/24 SMAK NY174 4/8/24 TECHMARK, INC. 7</p>
December	 <p>12/7/23 SMAK NY174 12/7/23 TECHMARK, INC. 7</p>	May	 <p>5/7/24 SMAK NY174 5/6/24 TECHMARK, INC. 12</p>
January	 <p>1/8/24 SMAK NY174 1/8/24 TECHMARK, INC. 5</p>	June	 <p>6/7/24 SMAK NY174 6/3/24 TECHMARK, INC. 15</p>
February	 <p>2/6/24 SMAK NY174 2/6/24 TECHMARK, INC. 26</p>		

Figure 13. NY174 glucose concentrations for the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

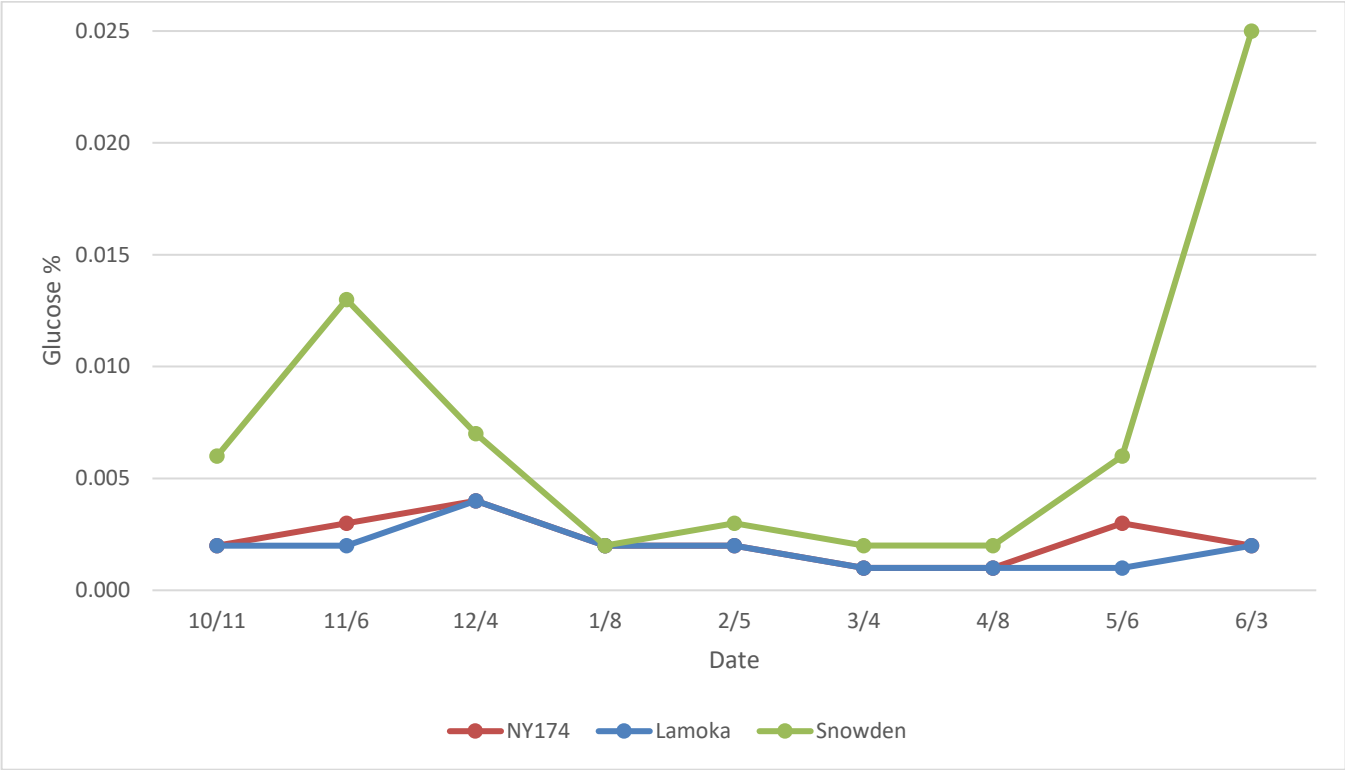


Figure 14. NY174 sucrose concentrations for the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

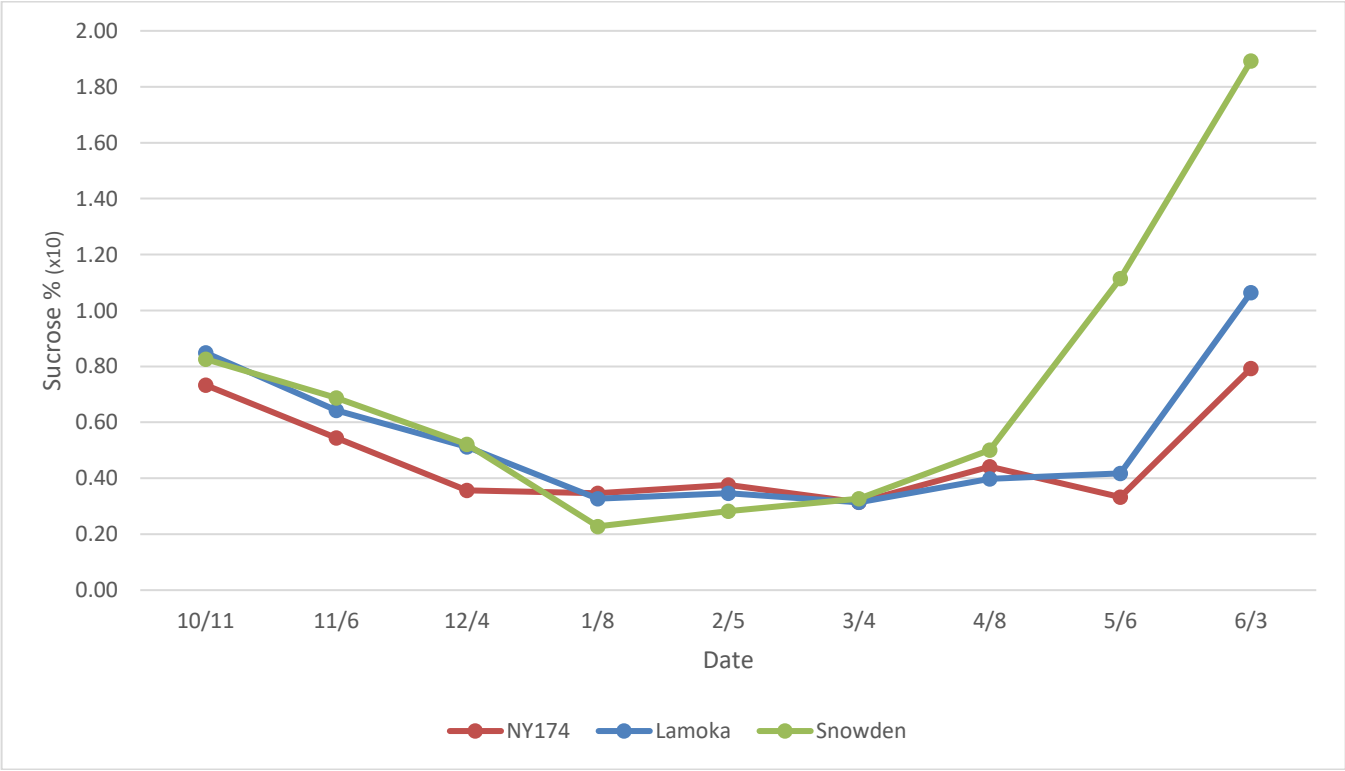


Figure 15. NY174 percent defects for the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

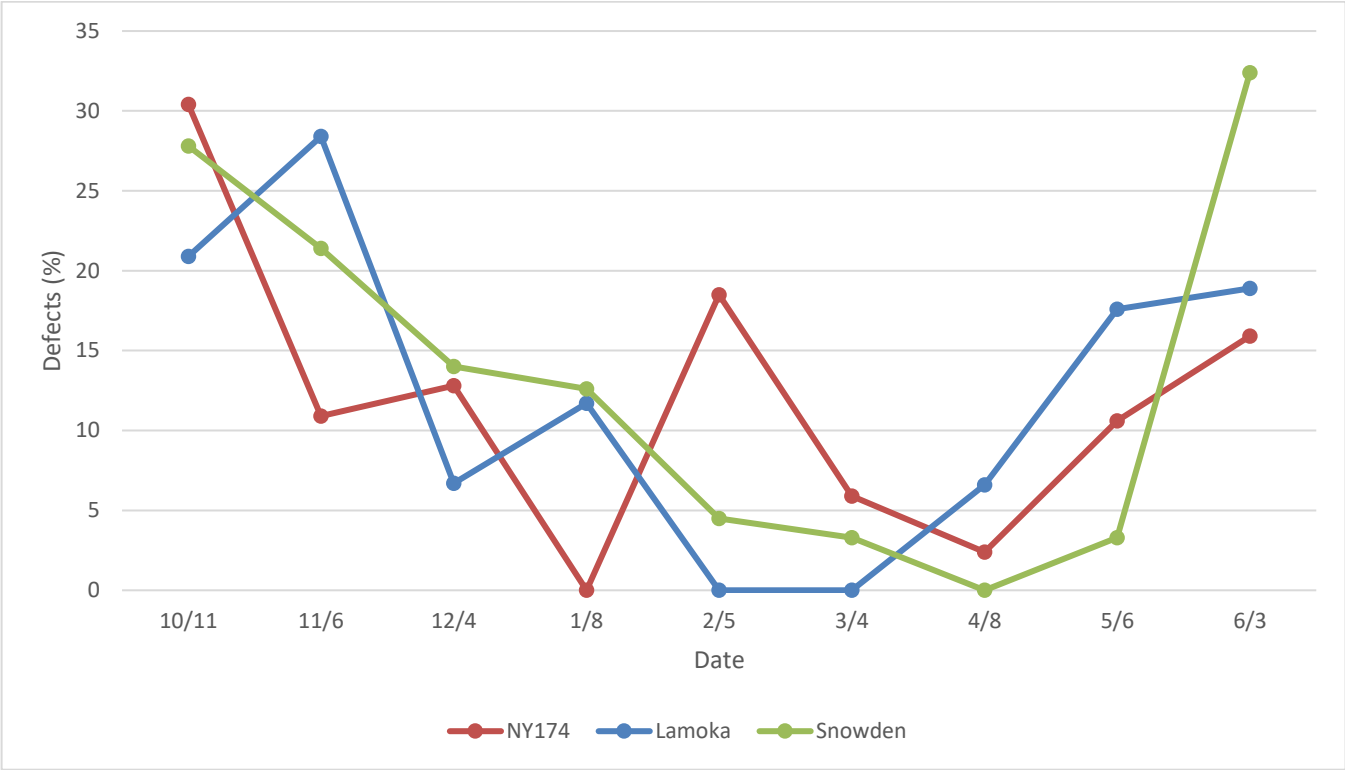


Figure 16. NY174 SNAC color score (1 = lightest, 5 = darkest) the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

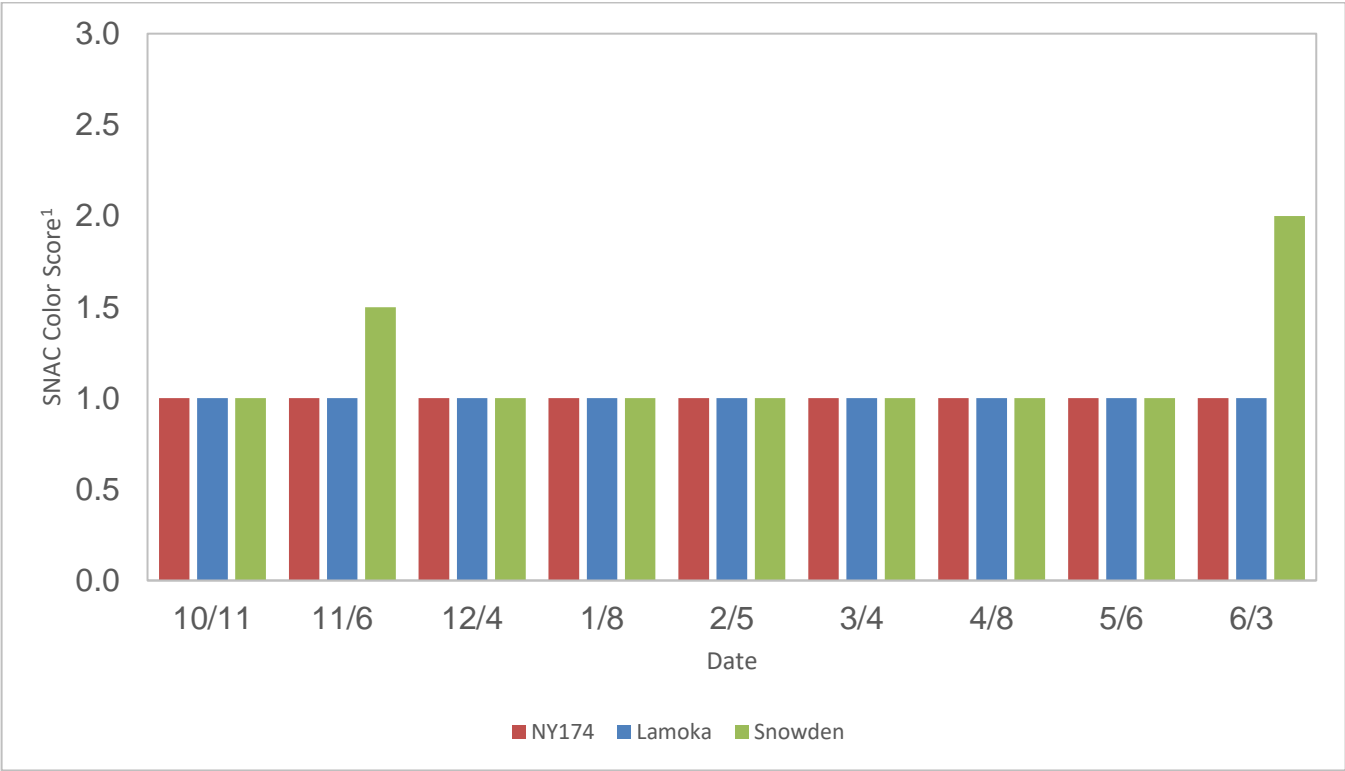


Table 7. NY177 monthly chip quality pictures from Techmark Inc.

Month





October	 <p>10/18/23 SAC NY177 10/18/23 TECHMARK, INC. 5</p>	March	 <p>3/5/24 SAC NY177 3/5/24 TECHMARK, INC. 23</p>
November	 <p>11/2/23 SAC NY177 11/2/23 TECHMARK, INC. 92</p>	April	 <p>4/4/24 SAC NY177 4/4/24 TECHMARK, INC. 9</p>
December	 <p>12/3/23 SAC NY177 12/3/23 TECHMARK, INC. 11</p>	May	 <p>5/7/24 SAC NY177 5/7/24 TECHMARK, INC. 9</p>
January	 <p>1/9/24 SAC NY177 1/9/24 TECHMARK, INC. 8</p>	June	 <p>6/14/24 SAC NY177 6/15/24 TECHMARK, INC. 12</p>
February	 <p>2/6/24 SAC NY177 2/6/24 TECHMARK, INC. 24</p>		

Figure 17. NY177 glucose concentrations for the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

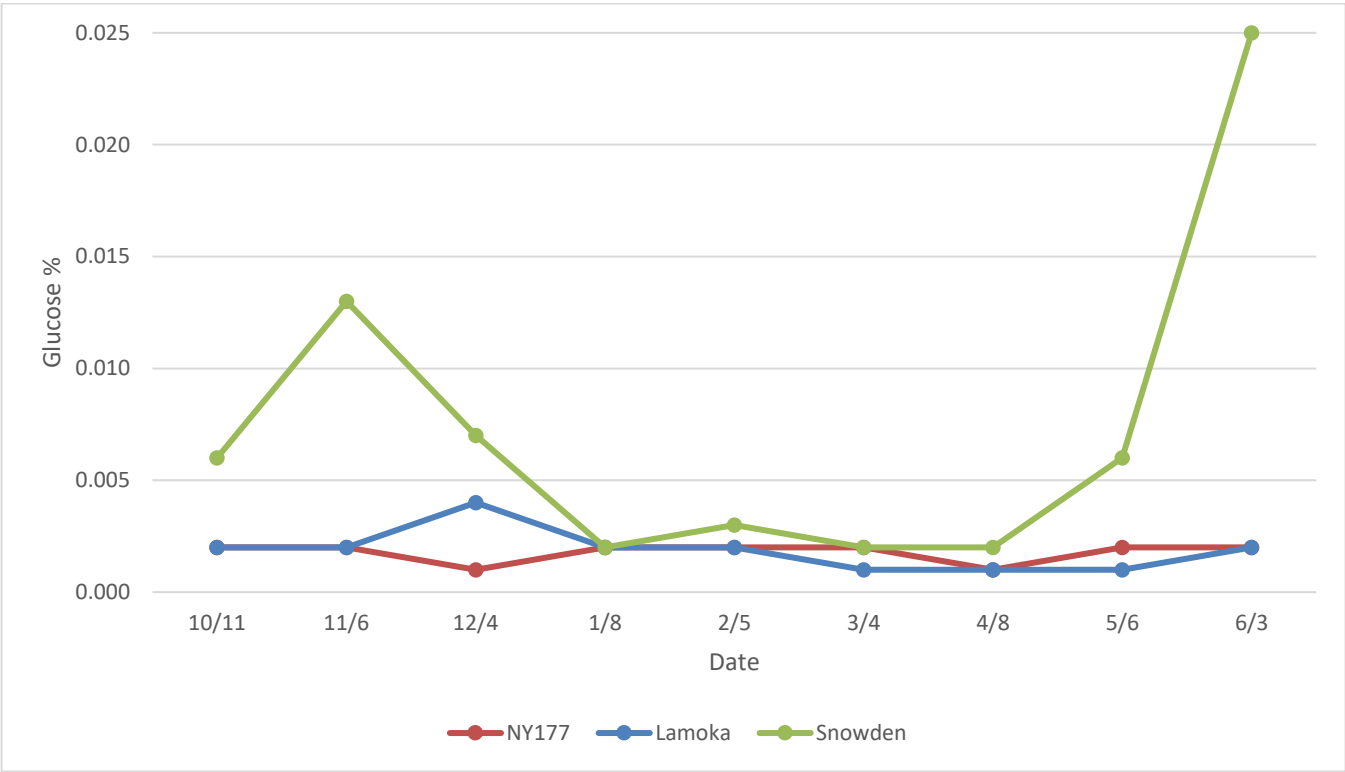


Figure 18. NY177 sucrose concentrations for the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

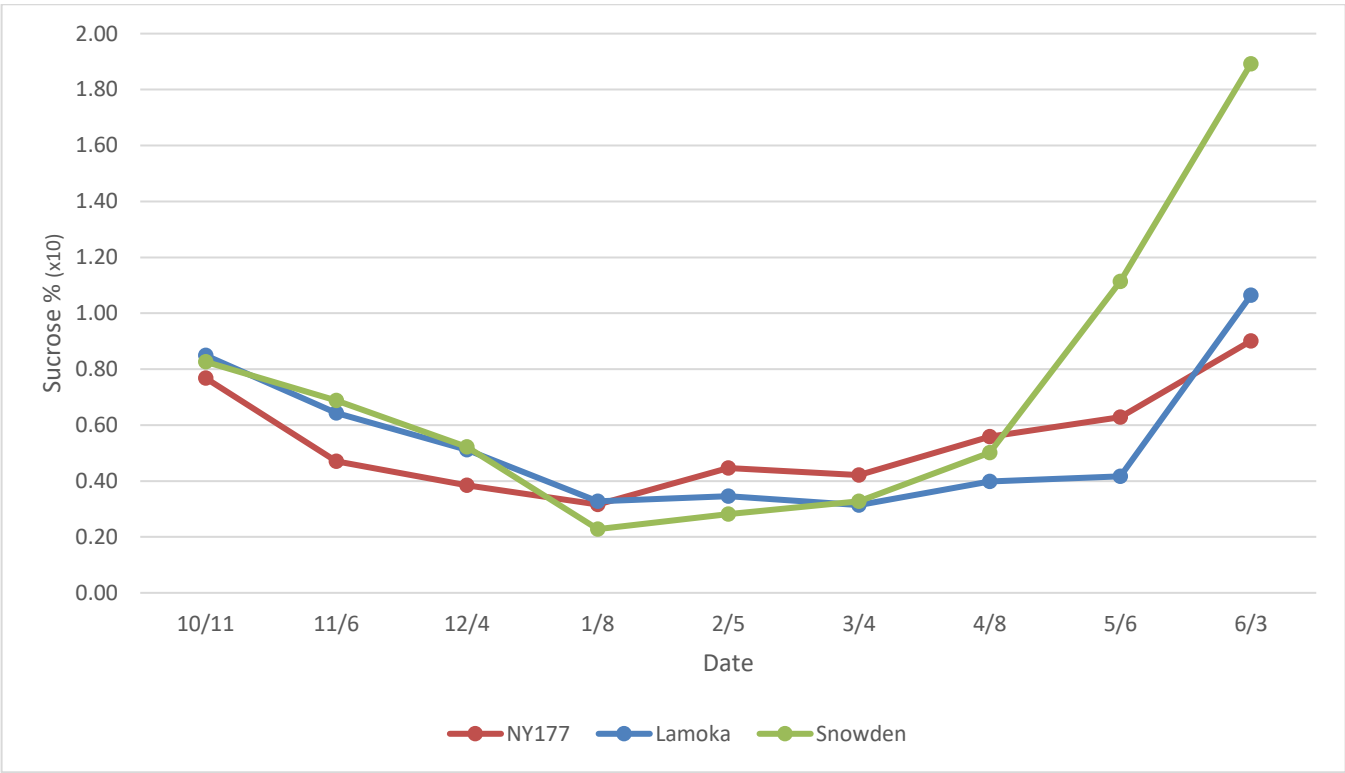


Figure 19. NY177 percent defects for the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

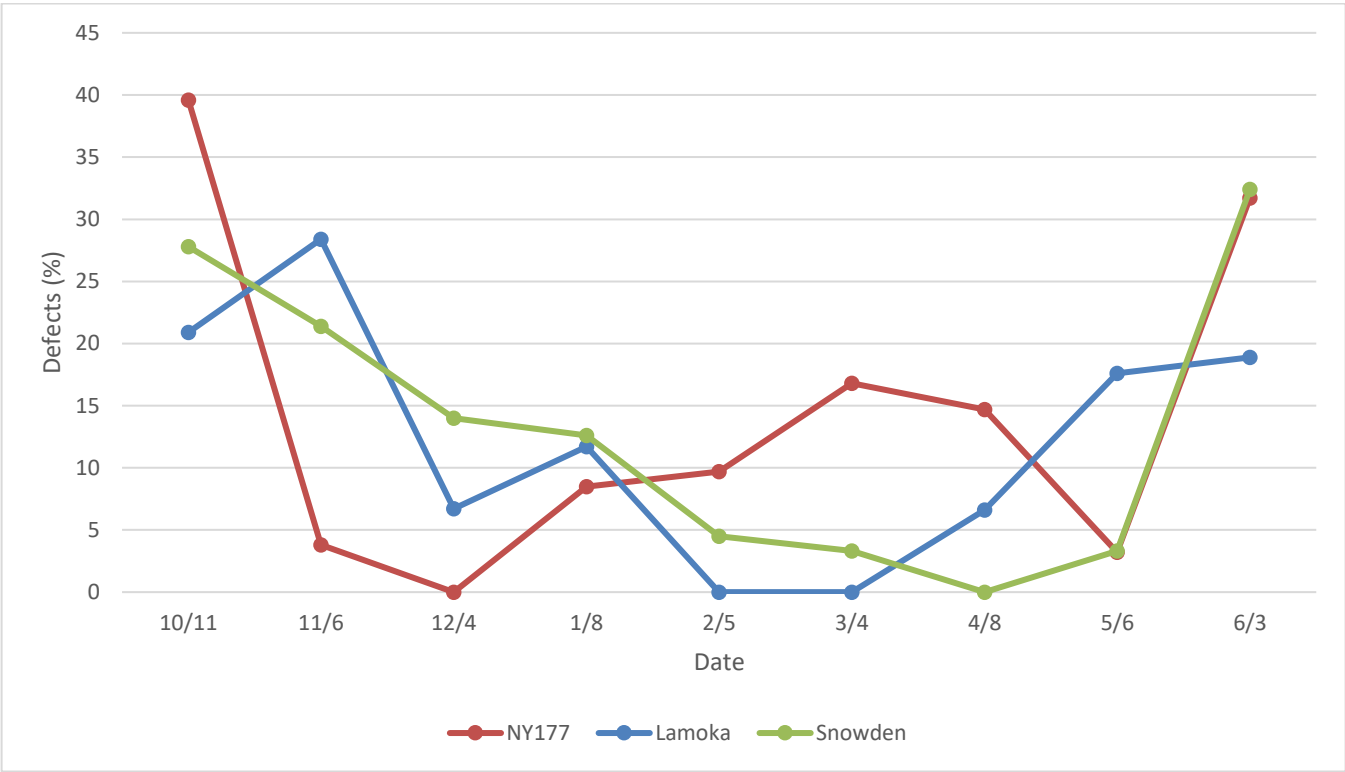


Figure 20. NY177 SNAC Color Score (1 = lightest, 5 = darkest) the 2023-2024 storage season at 48°F compared to Lamoka and Snowden.

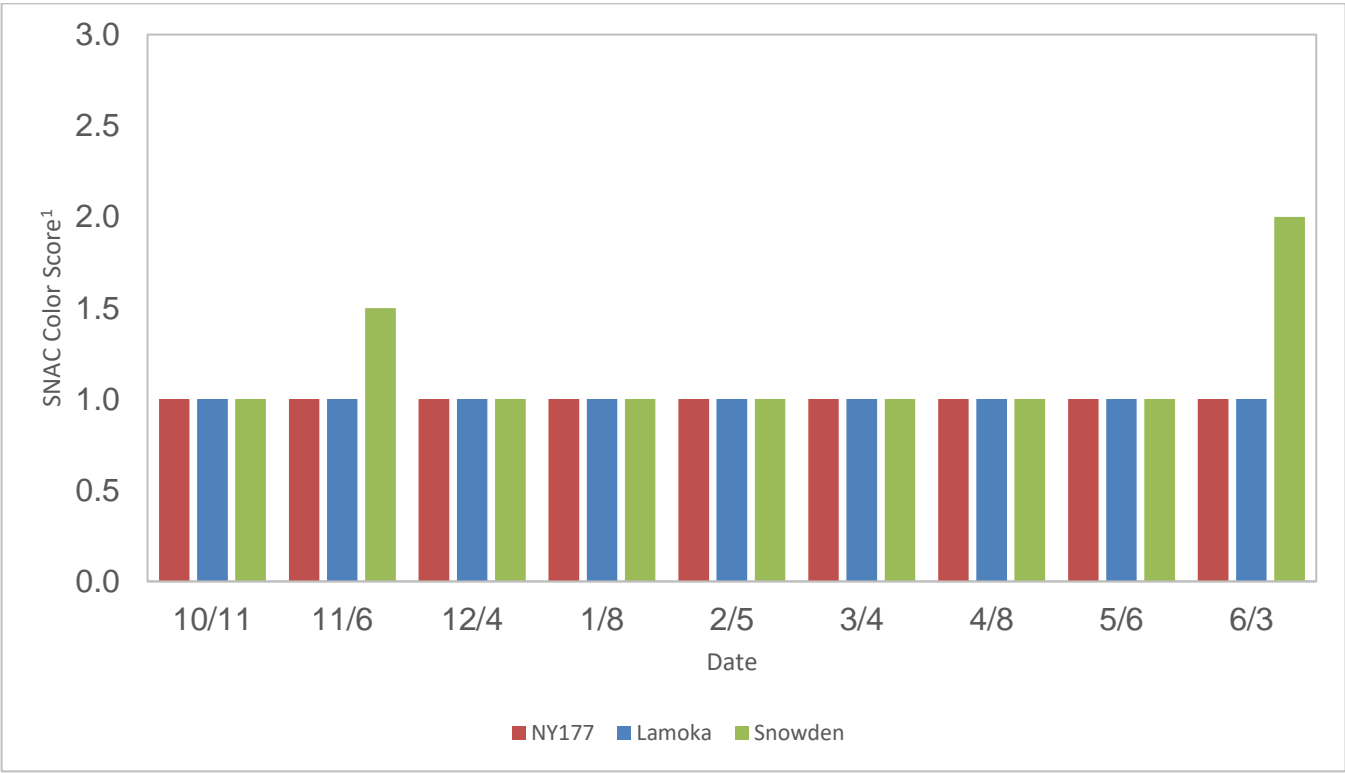


Table 8. Lamoka monthly chip quality pictures from Techmark Inc.

Month



















October	 <p>10/11/23 SMAK Lamoka 10/11/23 TECHMARK, INC. 2</p>	March	 <p>3/5/24 SMAK Lamoka 3/5/24 TECHMARK, INC. 31</p>
November	 <p>11/7/23 SMAK Lamoka 11/7/23 TECHMARK, INC. 20</p>	April	 <p>4/9/24 SMAK Lamoka 4/9/24 TECHMARK, INC. 3</p>
December	 <p>12/1/23 SMAK Lamoka 12/1/23 TECHMARK, INC. 1</p>	May	 <p>5/8/24 SMAK Lamoka 5/8/24 TECHMARK, INC. 14</p>
January	 <p>1/8/24 SMAK Lamoka 1/8/24 TECHMARK, INC. 5</p>	June	 <p>6/8/24 SMAK Lamoka 6/3/24 TECHMARK, INC. 15</p>
February	 <p>2/6/24 SMAK Lamoka 2/6/24 TECHMARK, INC. 11</p>		

Table 9. Snowden monthly chip quality pictures from Techmark Inc.

Month

October	 <p>10/12/22 SNAC Snowden 10/12/22 TECHMARK, INC. 5</p>	March	 <p>3/2/23 SNAC Snowden 3/2/23 TECHMARK, INC. 25</p>
November	 <p>11/7/23 SNAC Snowden 11/6/23 TECHMARK, INC. 29</p>	April	 <p>4/4/24 SNAC Snowden 4/4/24 TECHMARK, INC. 9</p>
December	 <p>12/4/23 SNAC Snowden 12/4/23 TECHMARK, INC. 18</p>	May	 <p>5/7/24 SNAC Snowden 5/6/24 TECHMARK, INC. 18</p>
January	 <p>1/4/24 SNAC Snowden 1/4/24 TECHMARK, INC. 4</p>	June	 <p>6/4/24 SNAC Snowden 6/3/24 TECHMARK, INC. 13</p>
February	 <p>2/6/24 SNAC Snowden 2/6/24 TECHMARK, INC. 22</p>		