POTATOES USA / SNAC-INTERNATIONAL

OUT-OF-STORAGE CHIP QUALITY

2015-2016 MICHIGAN REGIONAL REPORT

Chris Long and Aaron Yoder, Michigan State University

Procedure:

The 2015 Potatoes USA / SNAC-International (SNAC) Chip Trial was harvested on October 21, 2015, at Sandyland Farms LLC, Howard City, MI. The crop experienced 3076 GDD, Base 40, from planting to vine kill. At harvest, several chip storage samples were collected from each variety. Two, 40 pound samples were collected from each entry and placed in the cooperating grower's commercial storage to be evaluated in January 2015 and April 2016 at Herr Foods, Nottingham, PA. (Tables 1-2). The 40 pound tuber samples placed in the grower's commercial storage were removed from storage in early-January 2016 and in early April 2016 with a pile temperature of 56 ºF and 52 ºF respectively. For sprout control, CIPC was applied to the storages in November 2015.

Eighteen, 30 tuber samples were also collected from each trial entry at harvest; nine, 30 tuber samples were stored at each of two temperatures. One sample bag for each month, at each of two temperatures, was stored in two separate bulk storages at the Michigan Potato Industry Commission's (MPIC) Cargill Potato Demonstration Storage Facility. One sample bag from each of the twelve varieties was stored at approximately 50 ºF and 54 ºF for monthly evaluation from November 2015 through June 2016. These samples from the MPIC storage were processed at Techmark, Inc. for sucrose and glucose values (percent of fresh weight), an SNAC color score and an undesirable chip color rating. The undesirable chip color rating was reported as a percentage, by weight, of the total chips that were evaluated. See Figures 1 – 48. For sprout control, CIPC was applied in the MPIC storages in October 2015.

Results:

Tables 1 and 2 summarize the chip quality of the 40 pound samples after being processed at Herr Foods, Inc. on January 4th and April 5th, 2016. Chip lines were ranked relative to each other by Herr Foods and are listed accordingly, the first line perceived as the best finished chip quality. As seen in Table 1, AC03433-1W, CO03243-3W and NY152 exhibited the least amount of total chip defects on the first processing date while NY152, W6822-3 and AF4648-2 exhibited the lowest percentage of defects on the April chip date. NY152 was also recorded as having the highest specific gravity in the trial on Jan 4th, while AF4648-2 had the highest on April 5th. NY152 recorded the highest Agtron score on January 4th at 65.6.

Figures 1-48 summarize the 30 tuber chip quality samples collected at harvest from each entry and stored at the MPIC Demonstration Storage in the fall of 2015 at two temperatures. Two graphs are provided for each line at each temperature, for a total of four graphs per line. The first graph at each temperature is the sugar concentration and average pile temperature curve, showing the relationship of the bin temperature on physiological age and sugar stability of each variety. The second graph shows the change in SNAC chip color and sugar related color defects over time in storage at the given temperature regime. The comments about the varieties below are in alphabetical order. For yield and raw tuber quality data at harvest, please see the 2015 field trial results.

A00188-3C: This line yielded below the trial average in 2013, 2014 and 2015. A00188-3C was reported to have mixed reviews from our processor cooperator. At the January processing date, A00188-3C was ranked fifth for overall chip quality, with a relatively low Agtron color score of 54.8 and high total defects. In April 2016, this clone was ranked last for processing performance exhibiting stem end defect and poor chip color. This same trend was observed in the smaller storage samples (Figures 1-4), where A00188-3C chip processed well in December and January, but exhibited an increase in sugar accumulation, chip color and total defects in February. The storage performance in of A00188-3C in 2015-16 mirrored that observed in the 2014-15 SNAC trial.

AC01151-5W: AC01151-5W performed well below average in several performance criteria in 2015, as in previous years. In January, the line was ranked 9 out of 10, with the lowest Agtron score (53.1), the lowest gravity (1.062) and a high percentage of total defects (54.0). Results from the April processing were poor as well: low gravity, poor color, and ‘major scab’. Although glucose and sucrose levels were maintained at sufficiently low levels throughout the storage season, it is clear that other factors must be contributing to this lines continued poor performance in the SNAC trial. Strong support for the discontinuation of trialing this line by the chip processors was noted.

AC03433-1W: This line was ranked below average for finished chip quality on January and April processing dates, at 7 of 10 and 7 of 9 respectively. Comments included mention of the high occurrence of common scab and hollow heart. Specific gravity for this line was average in relation to the other lines evaluated at 1.066 in January and 1.073 in April. This line performed well in regards to maintaining low simple sugar levels and good chip color, however, evaluation of this line was terminated in March due to the high occurrence of hollow heart in the samples evaluated.

AF4648-2: This clone performed well overall in regards to finished chip quality as it was ranked 4 of 10 in January and 2 of 9 in April. It had above average specific gravities (1.072 and 1.079) on both processing dates. The January chip evaluation indicated coloration in the vascular ring with some bruising, although this was not the case in the April evaluation, where this line had the highest Agtron score of 61.7. Processors noted the ‘nice skin type’ exhibited

by AF4648-2 as well. In addition, this line appeared to exhibit excellent resistance to common scab based on results from the 2015 trial data. Figures 13-16 show a relatively stable simple sugar curve throughout the growing season although some discoloration was present in chips in the months following loading of this line, though it did not seem to significantly impact chip color/quality.

Atlantic: This check variety was the fourth highest yielding line in 2015. Atlantic provided a chip quality reference point for the variety trial directly out-of-the-field. Sugar data was collected for this variety through December 2015 (Figures 17-20).

CO03243-3W: This variety had an average agronomic performance in 2015, ranking 6th overall in yield. Low specific gravity has been reported in the years that this line has been evaluated and was also the case in 2015, reporting 7th (1.069) and 8th (1.066) in January and April respectively. Common scab was also noted as an issue with this variety. Although simple sugars were maintained at sufficiently low levels (Figures 21-24) until May at the MRC storage facility, the multitude of other issues (particularly low specific gravity and susceptibility to common scab) associated with this line will likely limit the commercial adoption in Michigan.

Lamoka: This variety was used as a long-term storage check due to its increased adoption by Michigan growers in recent years. Results from 2015 mirror previous observations of Lamoka: yields are usually below average, with strong resistance to common scab, acceptable specific gravity and the potential to maintain excellent chip color late into the storage season. One potential drawback to this line has been expressed by multiple chip processors, and is the tuber shape which is large and oblong and can create complications with regards to processing.

NY152: This line performed well both agronomically and with regards to chip quality in 2015. It was the highest yielding line (596 US cwt/A compared to 424 cwt/A trial average), exhibiting some moderate resistance to common scab and good out of the field chip quality. It had the highest specific gravity in January (1.075) at processing and an average specific gravity in April (1.073). Comments from the processor were positive overall, where ‘good size’ was noted, although some bruising was also noted in finished chips. Figures 29-32 show that simple sugar accumulation was not an issue with this line up to the last sample date in June, where SNAC color ratings and color defects were maintained at 1.0 and 0.0% throughout the storage season at both storage temperatures. The numerous positive attributes exhibited by this line make it an ideal candidate for further evaluation to determine its commercial potential.

Snowden: Snowden is a commercial standard for chip production in Michigan and is used as a check line in the SNAC trial. It has historically produced good yields, moderate specific

gravity, mid-season storage potential, and a high susceptibility to common scab. Snowden performed as expected with regards to these attributes in 2015, with processors commenting on scab prevalence and poor late season chip quality.

W6822-3: W6822-3 yielded below average in 2015, exhibited moderate resistance to common scab and had above average specific gravity. It was ranked 1 of 10 by the chip processor, likely due to good consistent color, although negative comments were made regarding hollow heart and the presence of starch pockets on this date. It was ranked 4 of 9 in April appearing to exhibit long-term storage potential. MRC storage samples (Figures 37-40) support the notion of long-term storage with this line as simple sugar accumulation and the resulting SNAC color and color defect data were maintained until June and May at 50.0 ^{o}F at 54.0 ^{o}F respectively. While this line exhibited some positive attributes, susceptibility to hollow heart and other internal qualities raise concerns regarding the commercial potential of this line and necessitate further evaluation.

Table 1. 2015 SNAC Variety Trial January 4, 2016[1]

Entry	Agtron Color	SNAC[2] Color	Specific Gravity	Percent Chip Defects[3] Internal	External	Total	Comments
W6822-3	58.8	N/A	1.070	38.0	34.0	72	Hollow heart, starch pockets, minor green. Size is too big.
NY152	65.6	N/A	1.075	13.0	26.0	39	Pressure bruise, minor green and a little scab, good size.
CO03243-3W	58.8	N/A	1.069	16.0	16.0	32	Minor scab, some green, medium to large size: 3" -5".
AF4648-2	62.6	N/A	1.072	29.0	19.0	48	Color in vascular ring and some bruising. Large: above 4".
A00188-3C	54.8	N/A	1.070	20.0	29.0	49	Minor shading, minor external defects. Size: 3.5" -4".
Lamoka	61.1	N/A	1.074	17.0	40.0	57	Minor internal defects, green with minor externals, hollow heart. Large and oblong, not ideal for chipping.
AC03433-1W	54.8	N/A	1.066	4.0	34.0	38	Hollow heart, green with minor stem end, ideal size.
Snowden	63.7	N/A	1.069	7.0	35.0	42.0	Scab and shading on edges with minor edge defects. Medium size: 3" -4".
AC01151-5W	53.1	N/A	1.062	15.0	39.0	54.0	Minor bruising with internal color, a lot of scab, gravity unacceptable.
Atlantic	53.6	N/A	1.073	65.0	31.0	96	Hollow heart, scab, too large, 4" and above.

[1] Samples collected at harvest on October 21st, 2015, and processed by Herr Foods, Inc., Nottingham, PA on January 4th, 2016.

Chip defects are included in Agtron and SNAC samples.

[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.

Table 2. 2015 SNAC Variety Trial April 5, 2016[1]

Entry	Agtron Color	SNAC[2] Color	Specific Gravity	Percent Chip Defects[3] Internal	External	Total	Comments
CO03243-3W	59.2	2	1.069	2.8	23.5	26.3	Moderate amount of scab. Medium to large in size: 3" -5".
AF4648-2	61.7	1.7	1.079	9.7	5.3	15	Minor internals, minor hollow heart. Really nice skin. Medium to large in size with a 4.5" max.
NY152	N/A	3	1.073	4.0	6.7	10.7	Minor green. 3" -4.5" size.
W6822-3	59.8	3	1.074	2.3	9.8	12.1	Minor shading. Small to 4" in size.
Lamoka	59.8	3	1.075	5.9	9.5	15.4	Minor rot, some internal color. Minor scab, minor green. Mostly 3.5" and up, oblong.
AC01151-5W	55.5	3	1.066	3.1	17.3	20.4	Some internal color, major scab. Gravity too low.
AC03433-1W	57.4	3	1.073	1.9	35.1	37	A lot of scab, minor bruising. Large in size: range 4".
Snowden	55.4	4	1.075	10.8	13.5	24.3	A lot of internal color, minor scab, bruising. 3.75". Small to medium in size.
A00188-3C	N/A	3	1.076	9.5	14.0	23.5	Some internal color, minor stem end, minor scab. 2-4" long, some oblong shape.

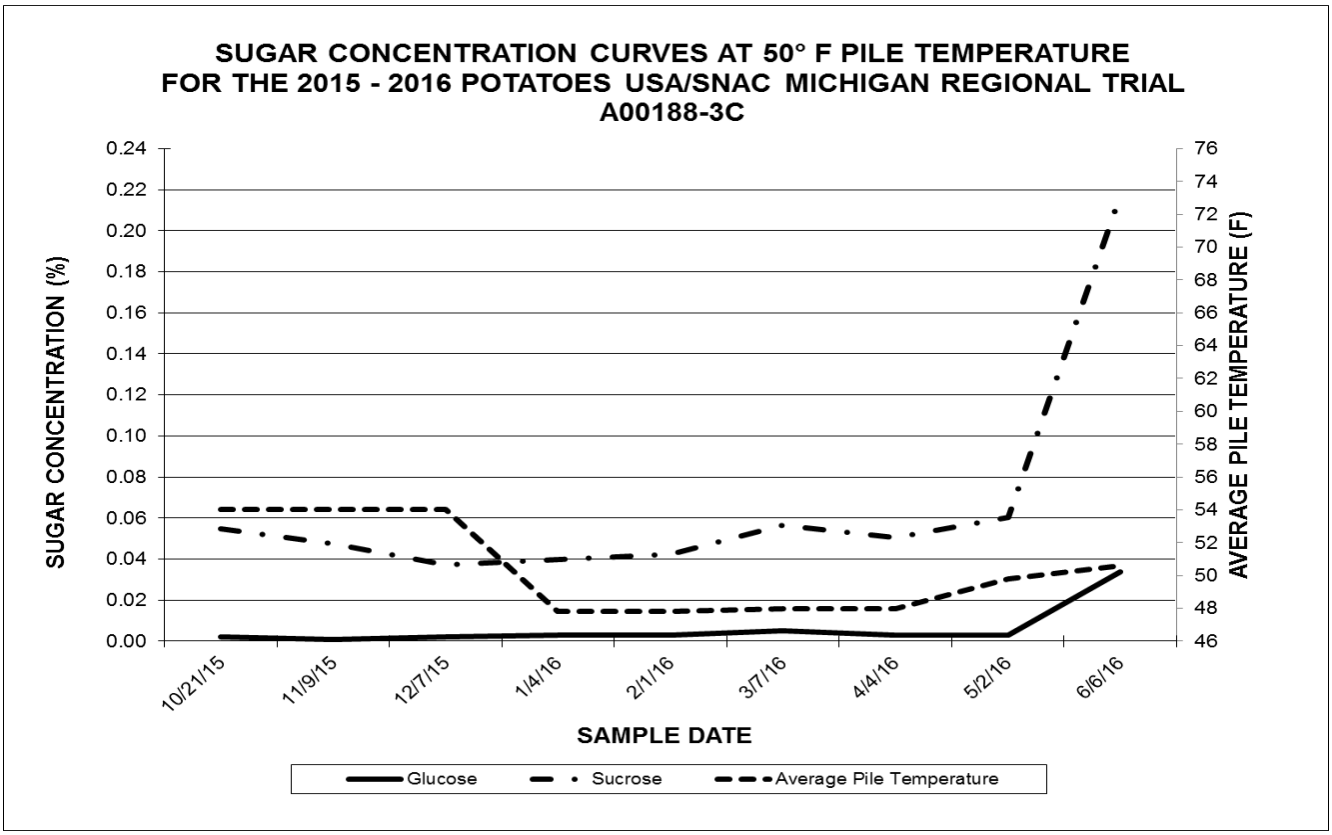
[1]Samples collected at harvest on October 21st, 2015, and processed by Herr Foods, Inc., Nottingham, PA on April 5th, 2016.

Chip defects are included in Agtron and SNAC samples.

[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.

Figure 1.



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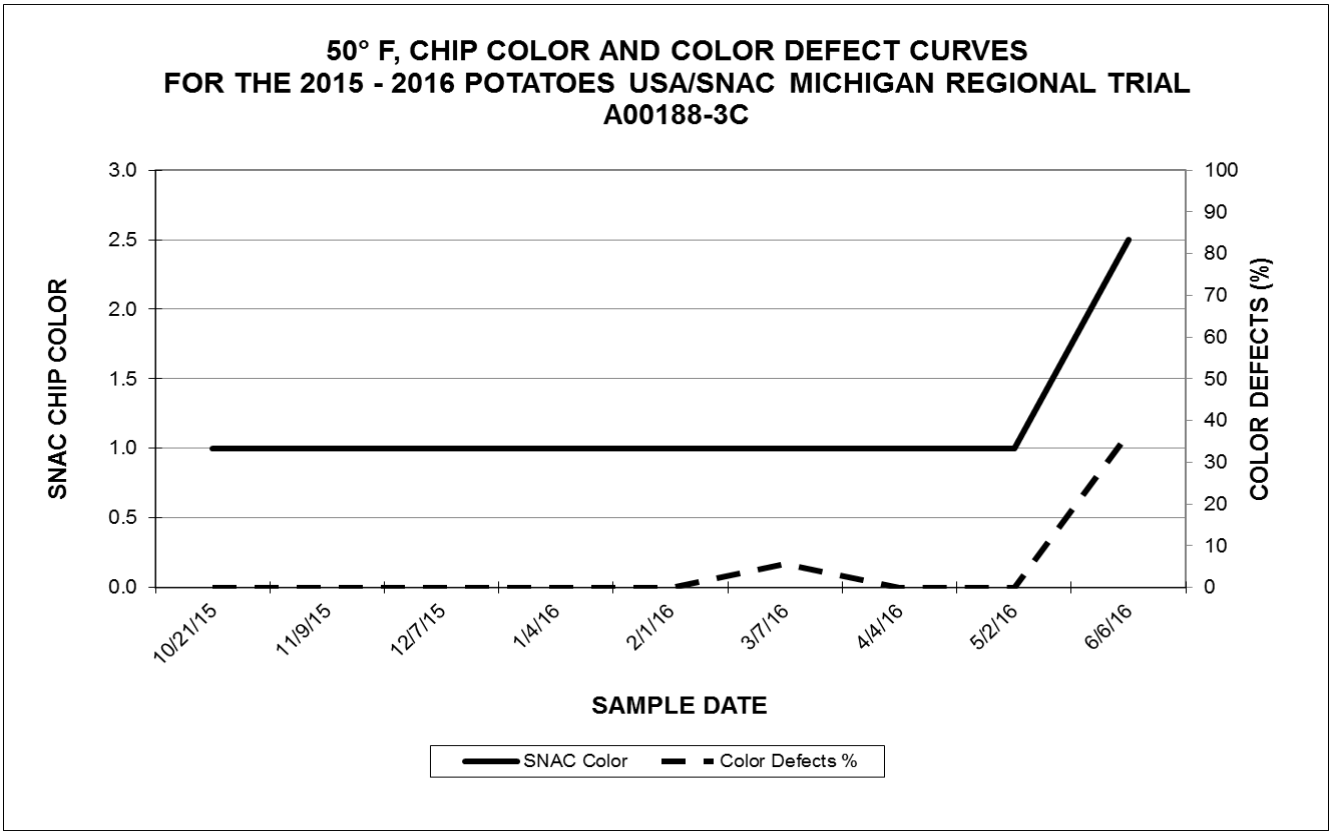

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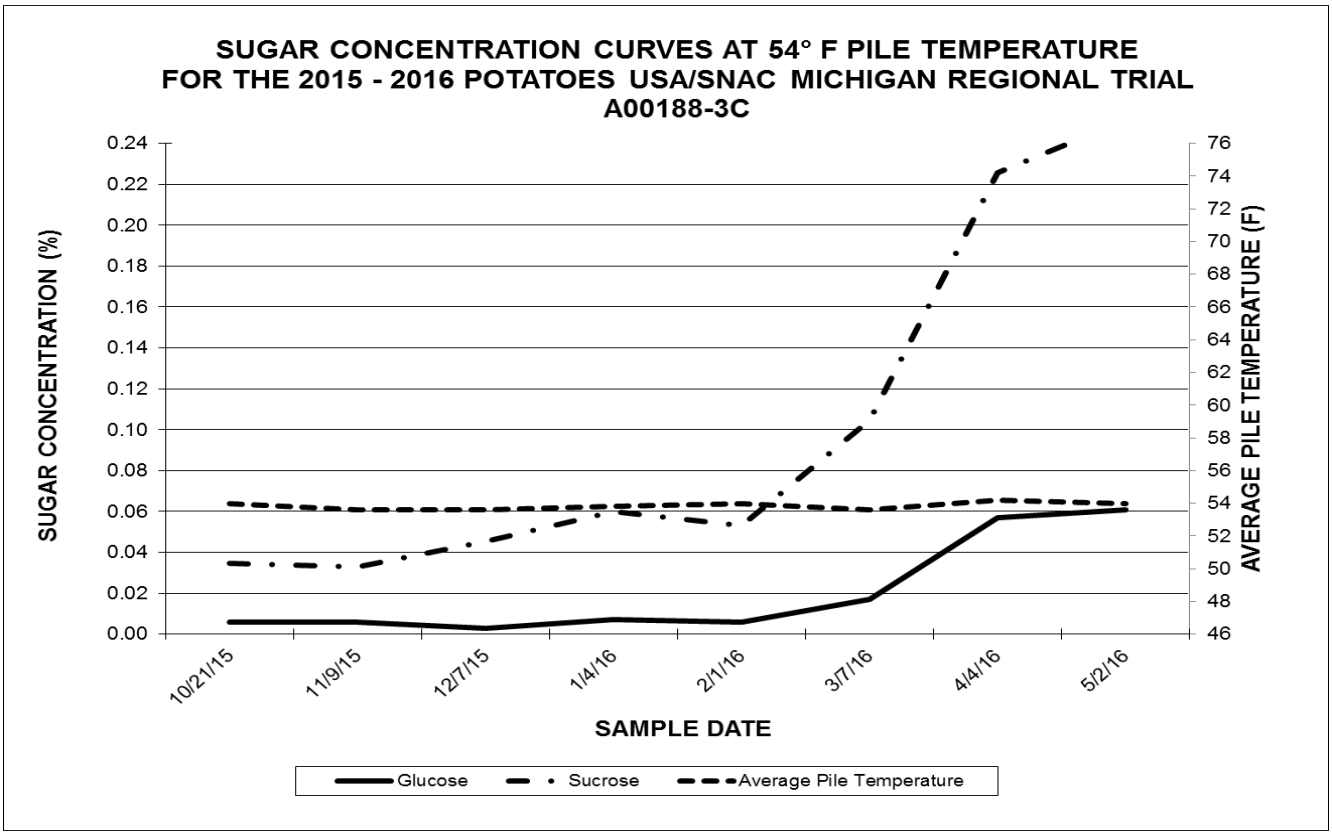

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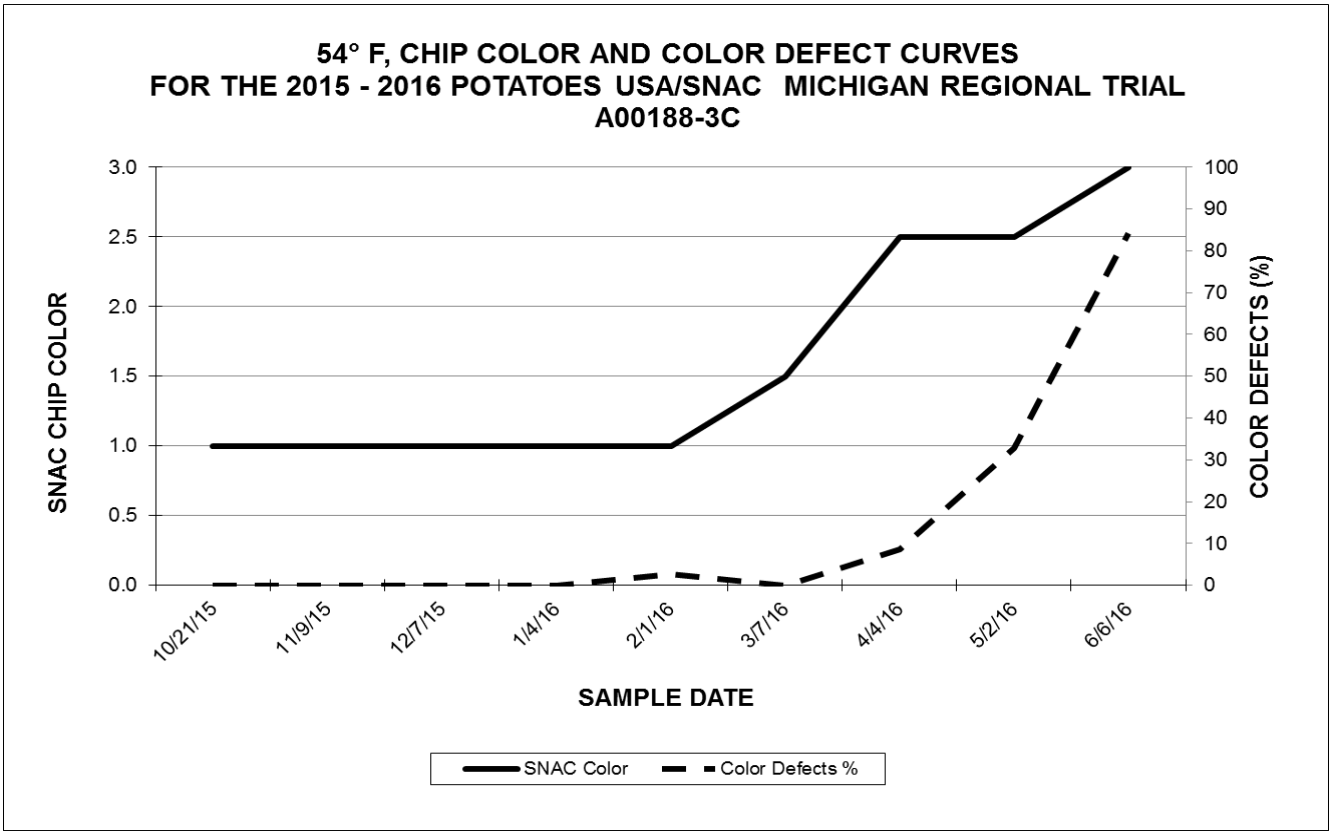

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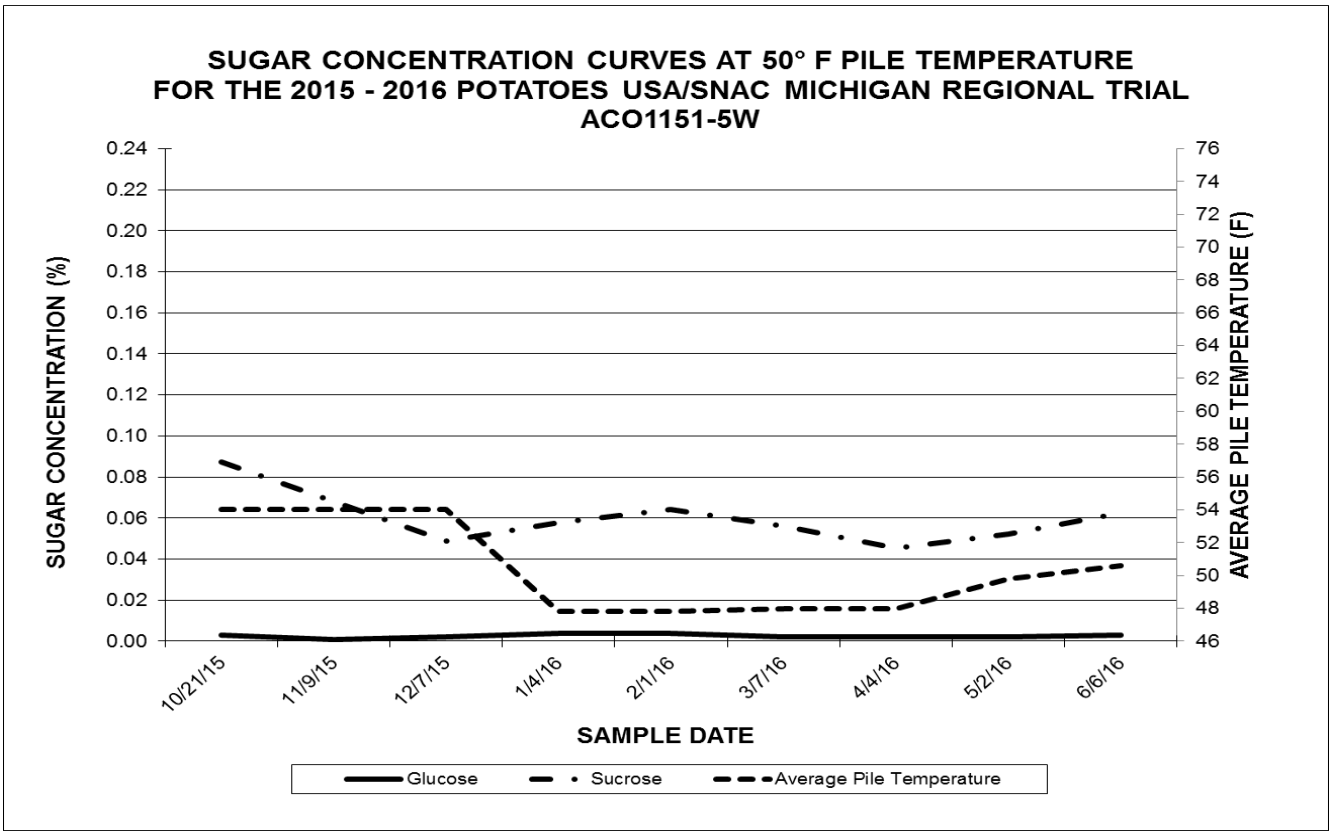

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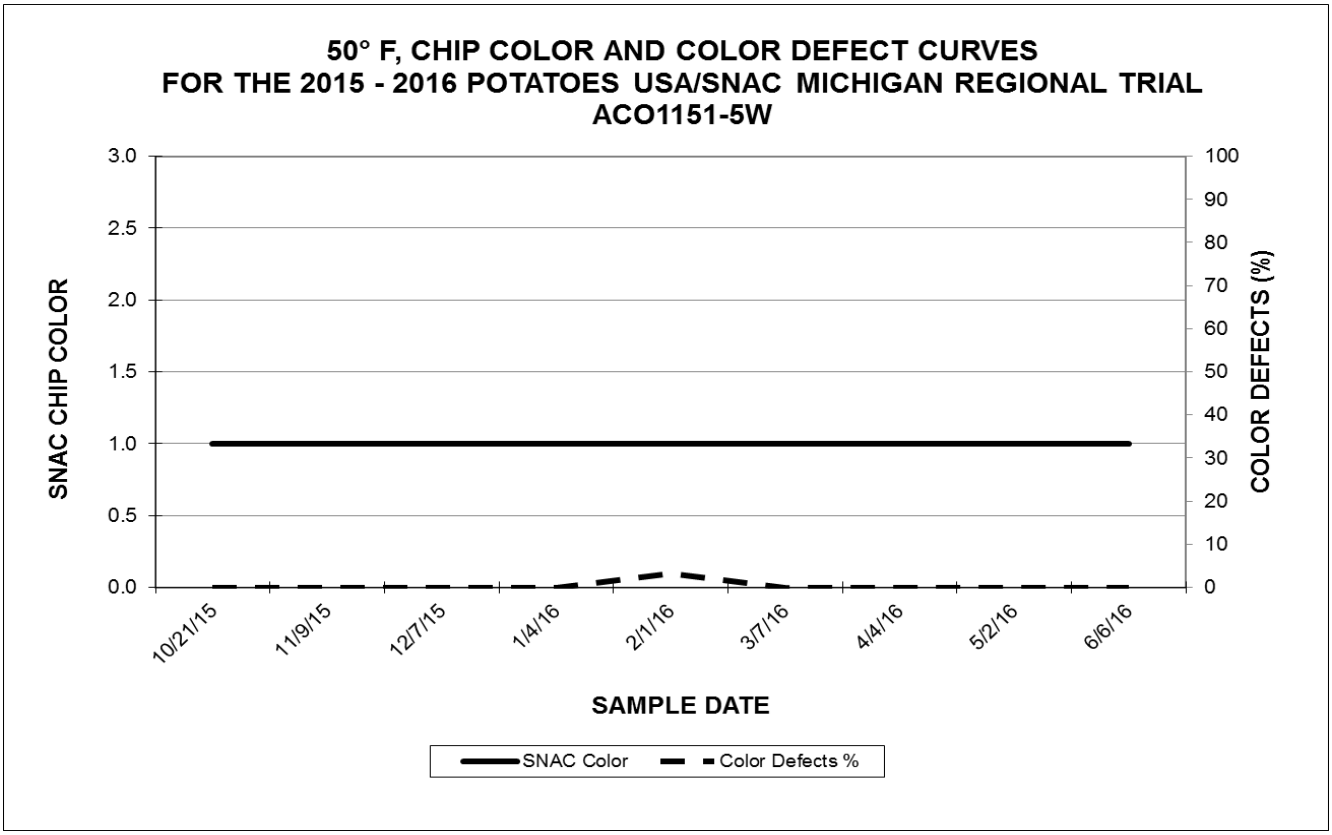

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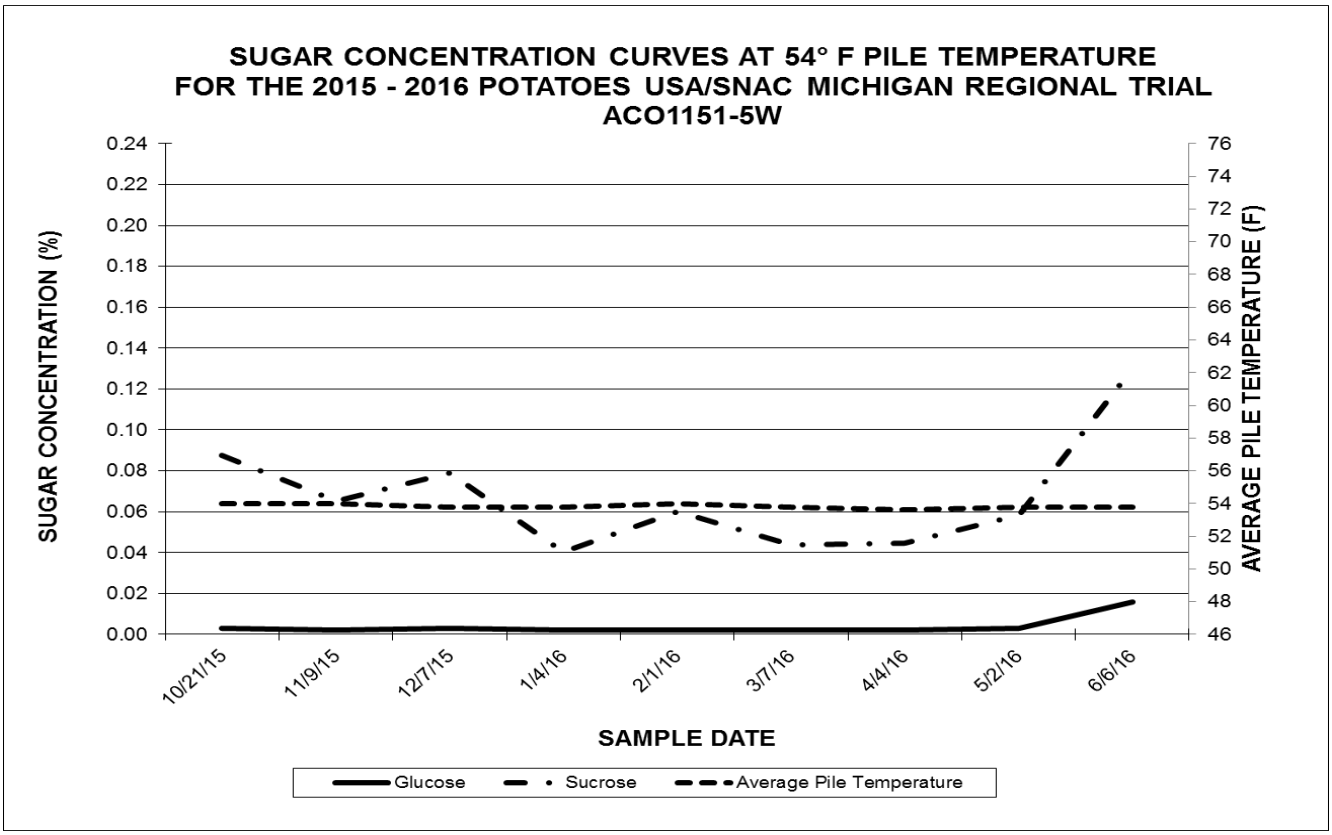

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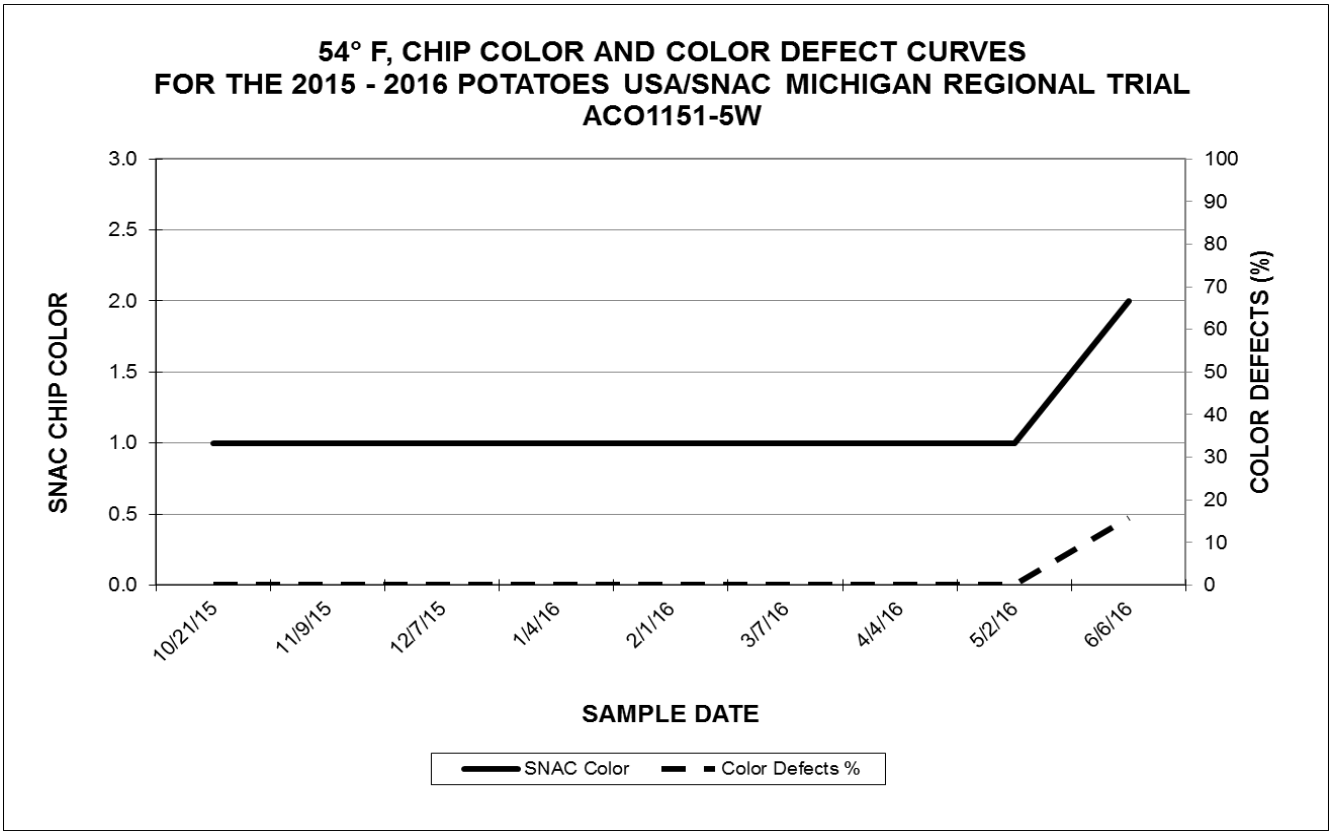

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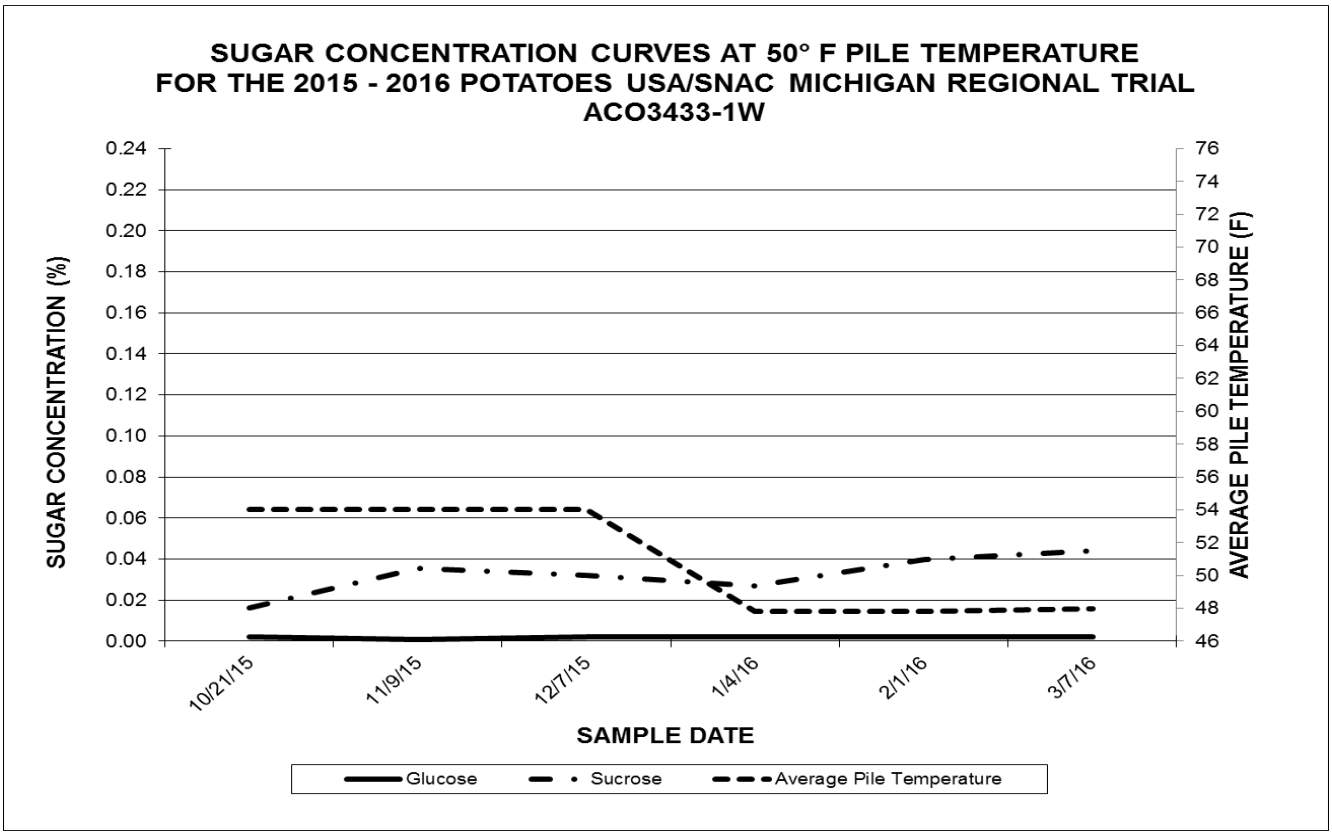

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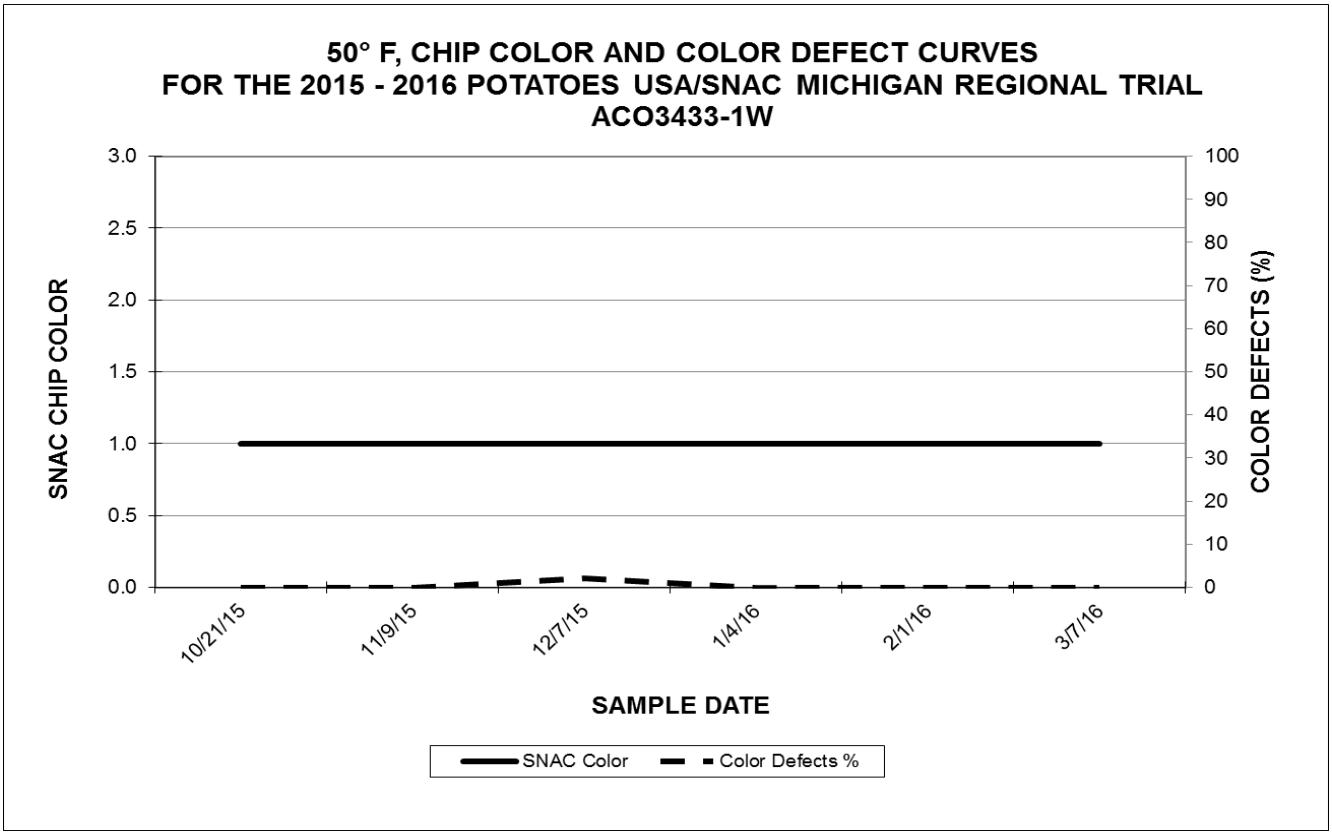

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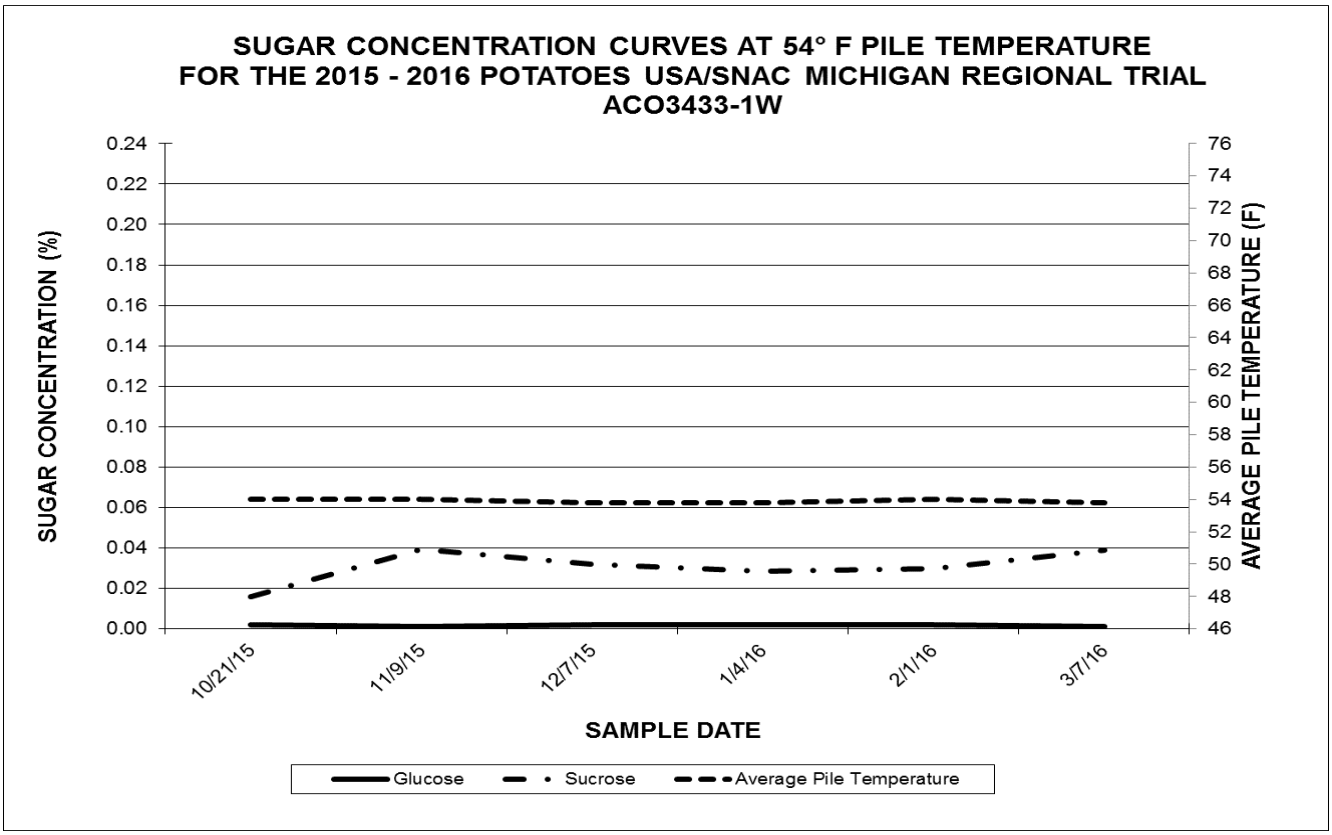

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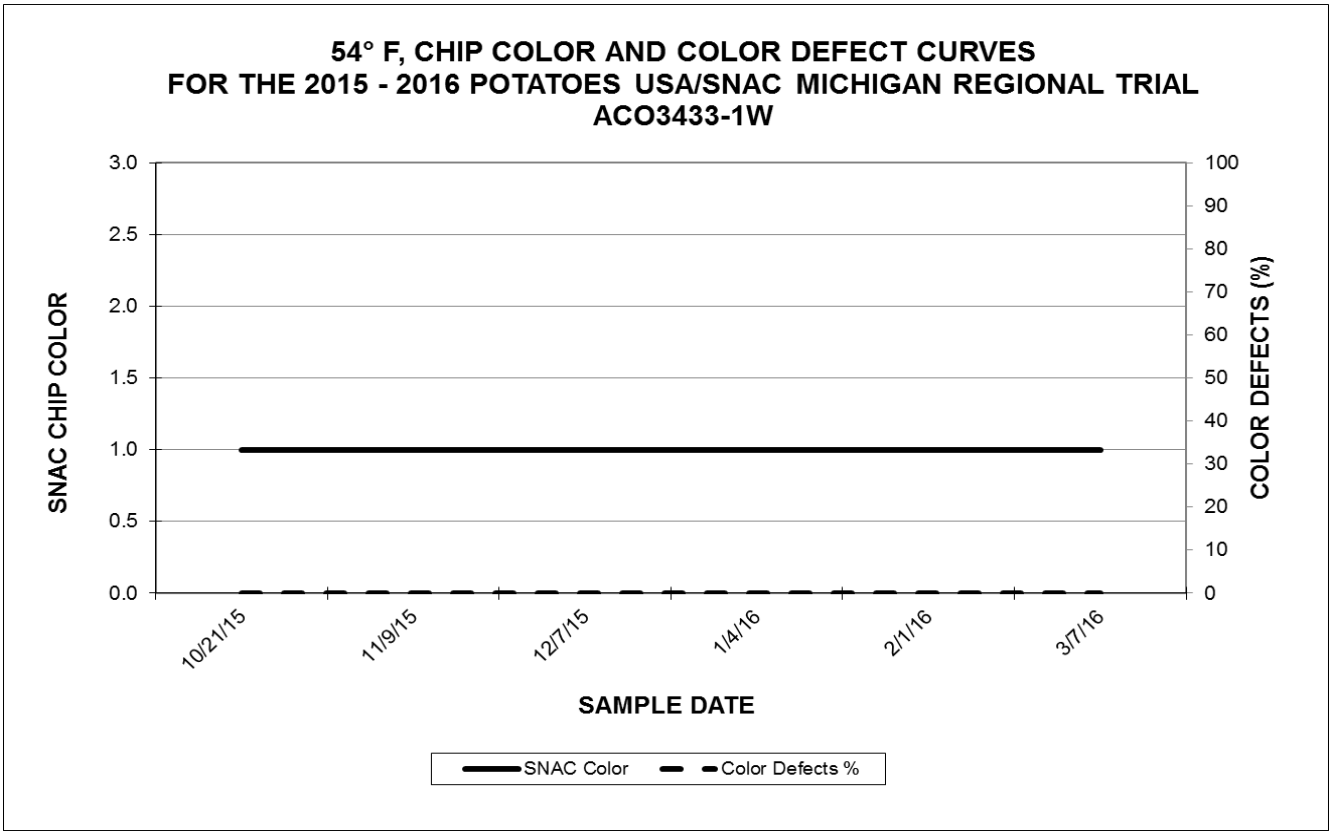

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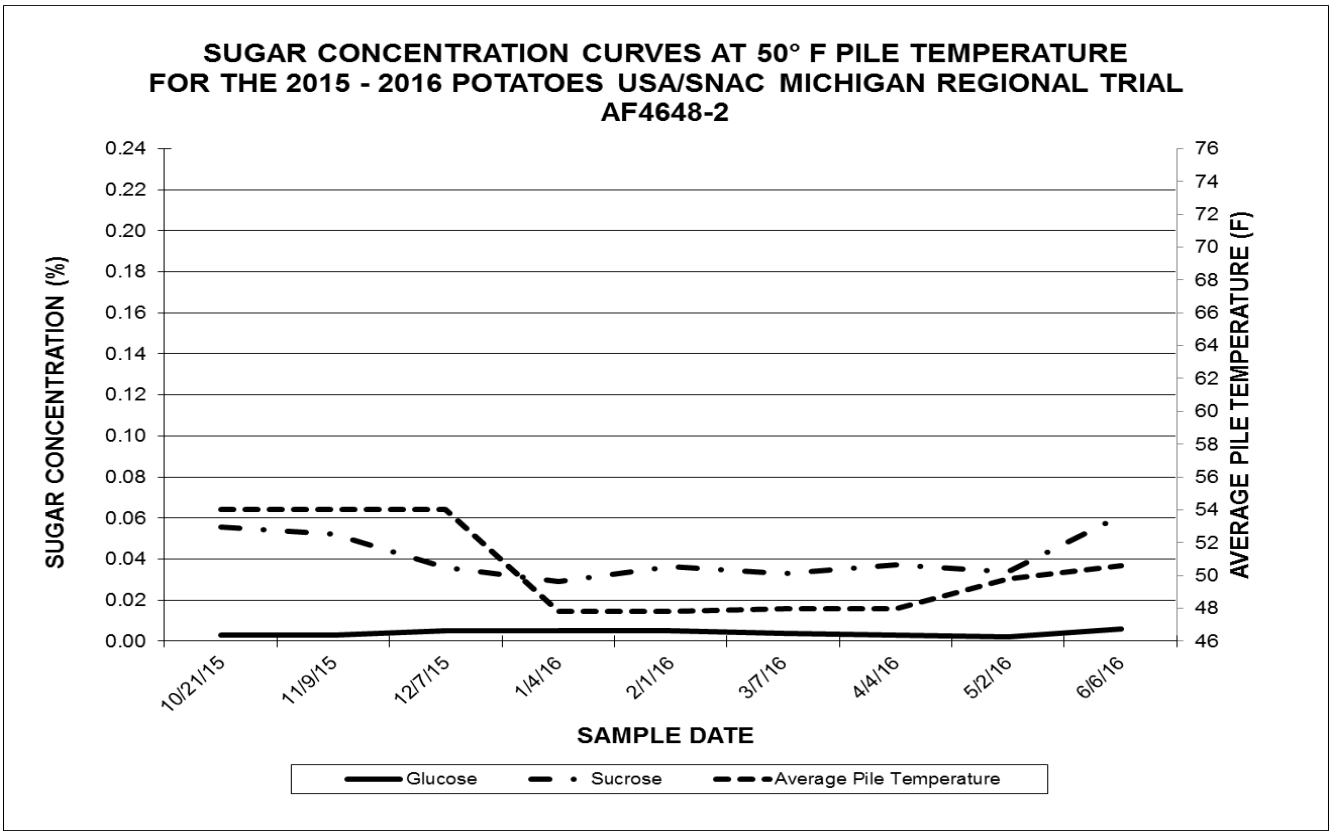

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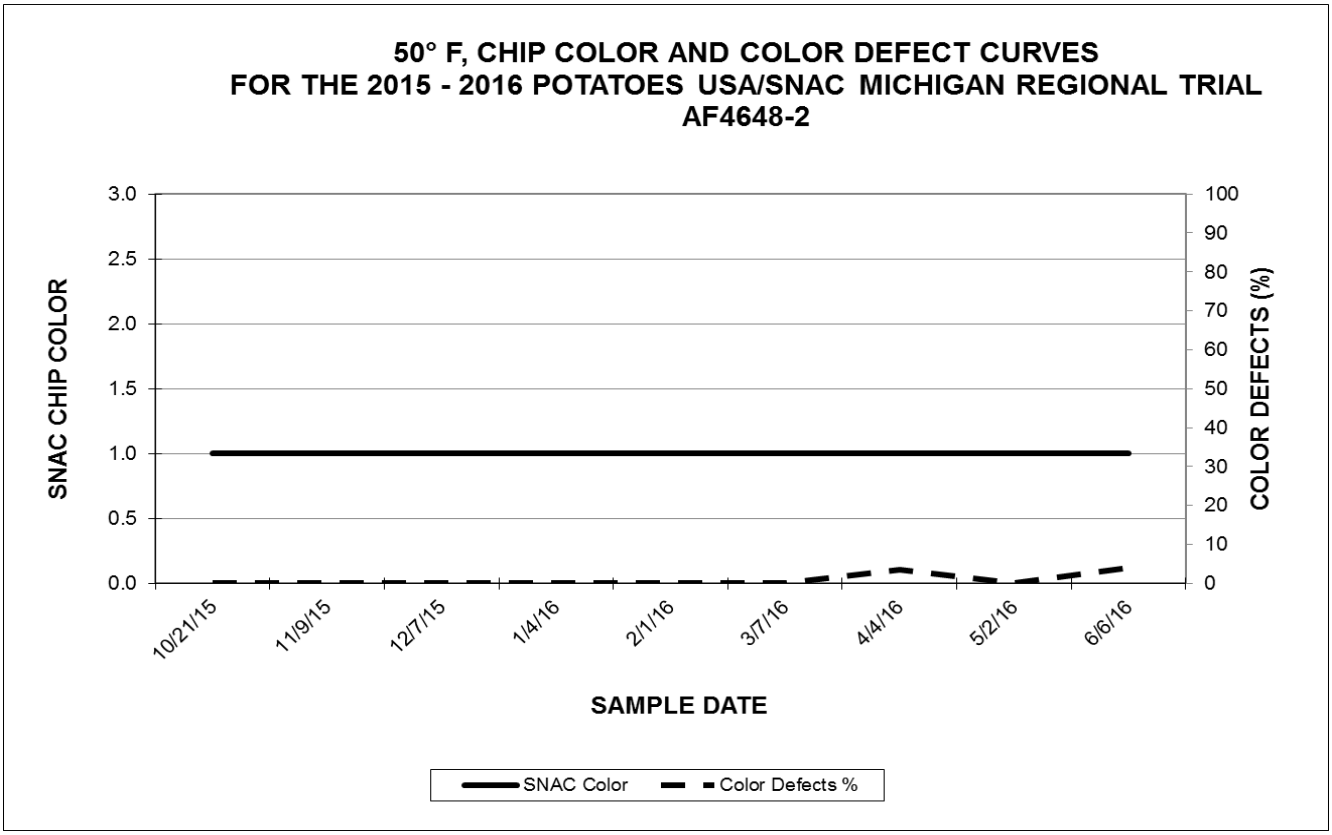

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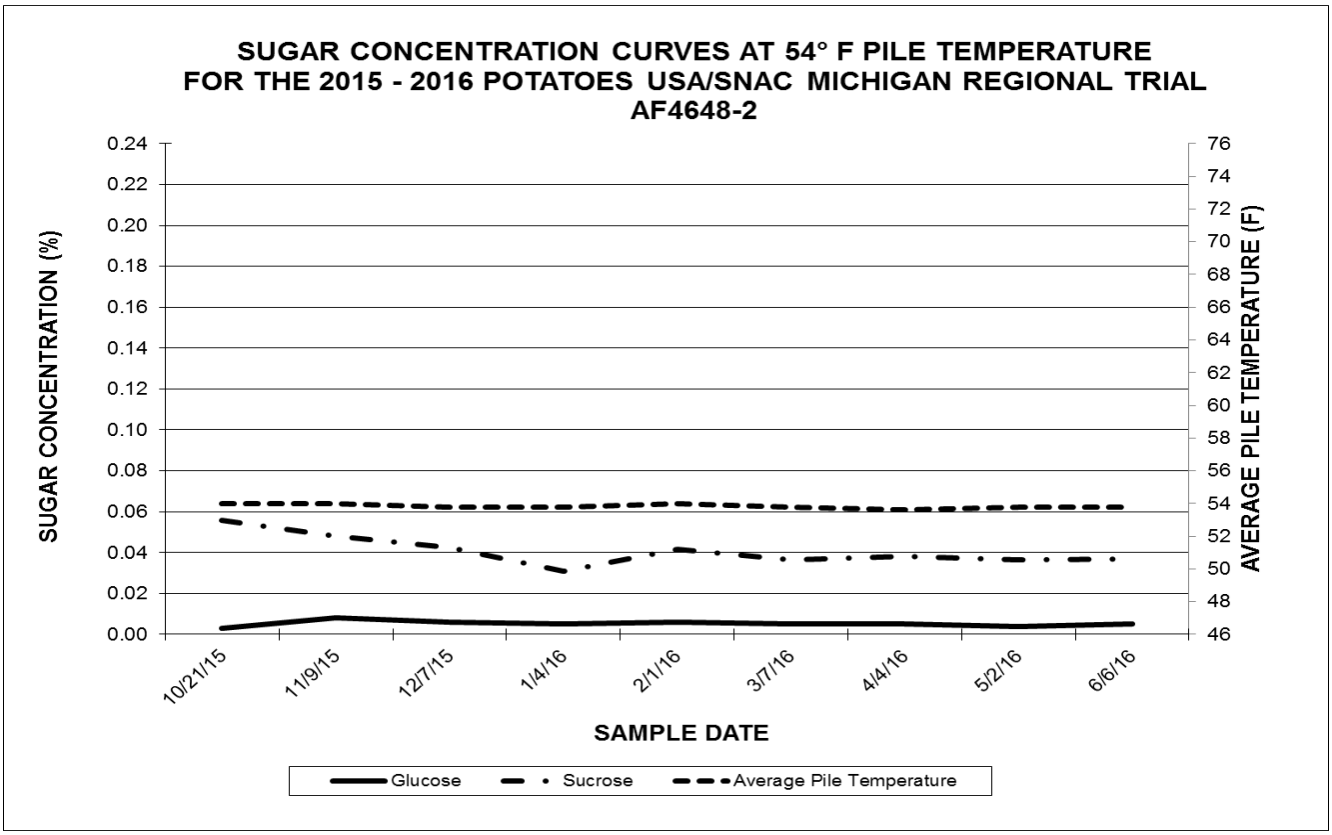

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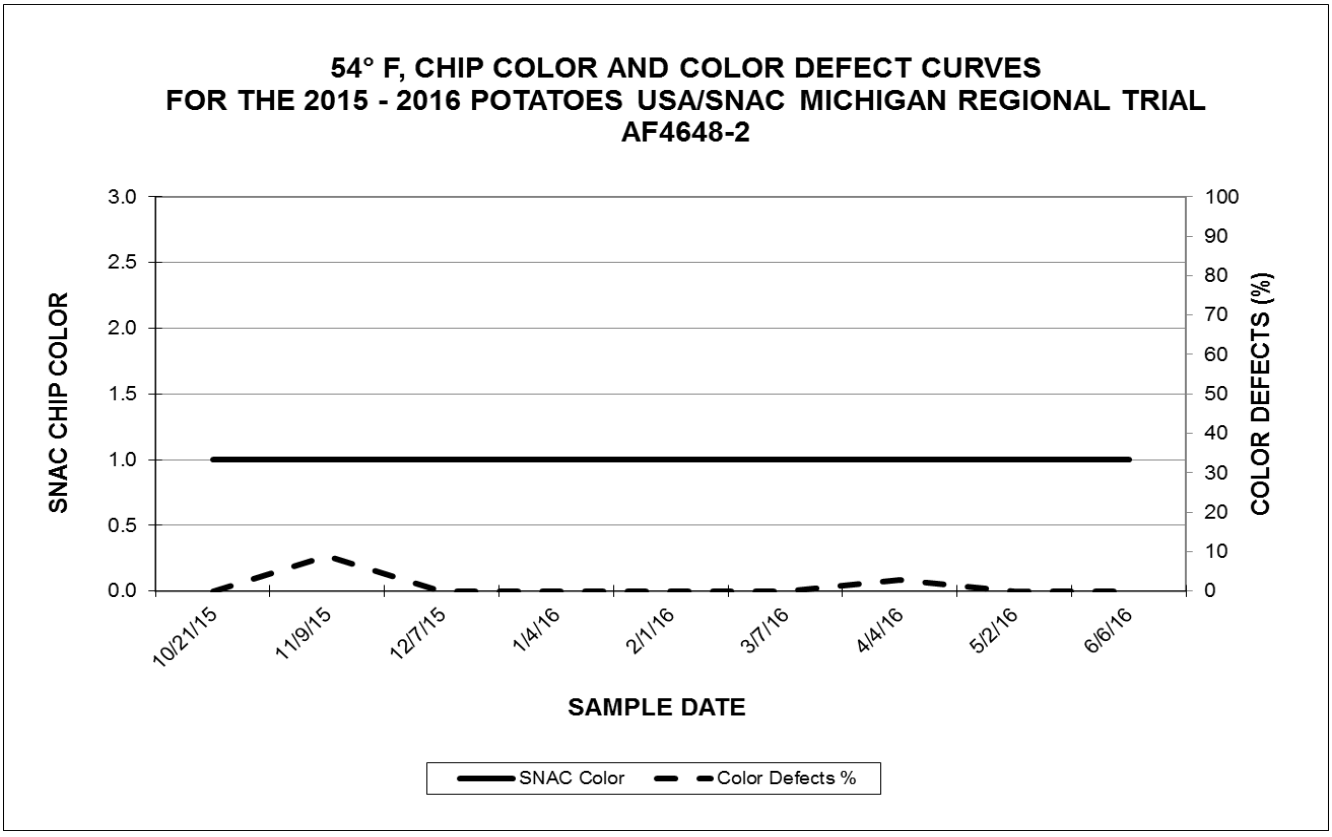

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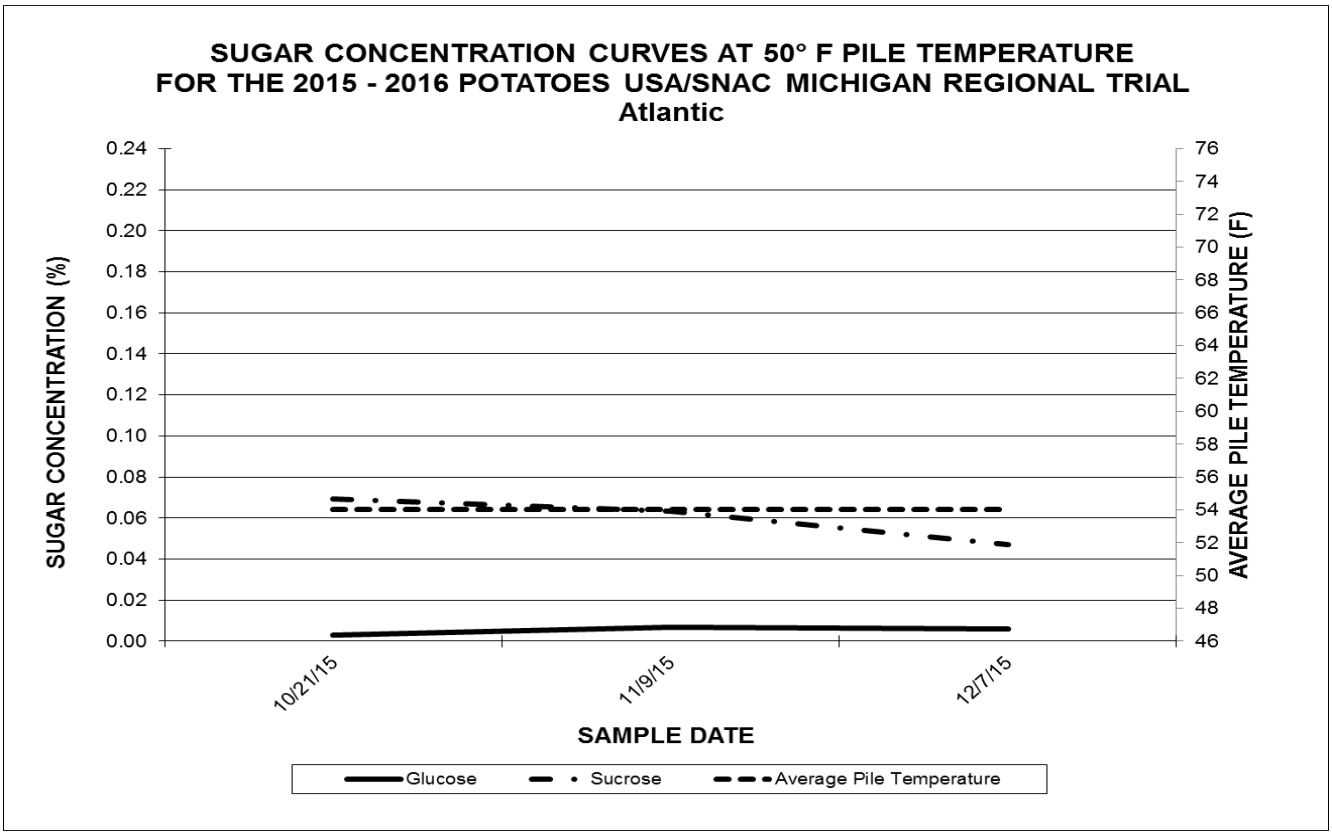

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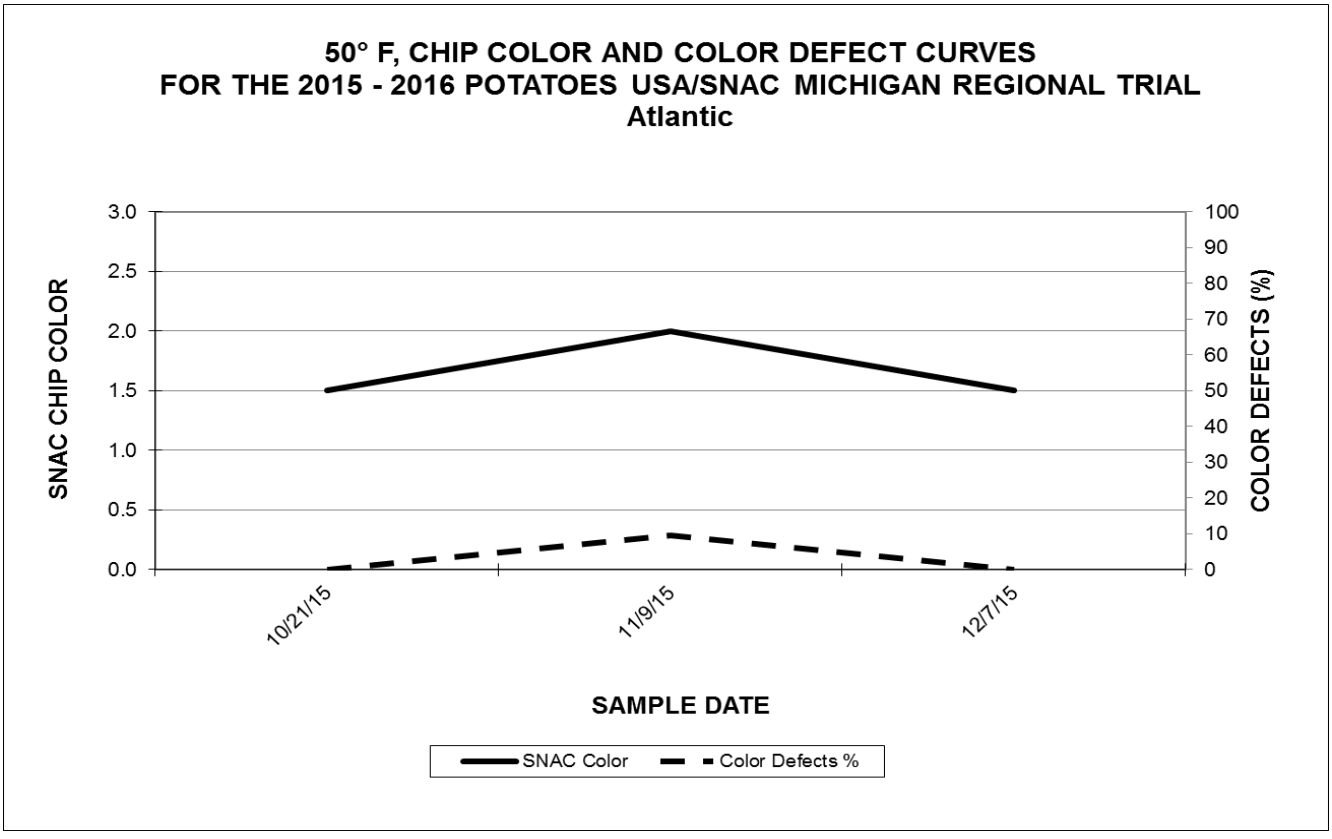

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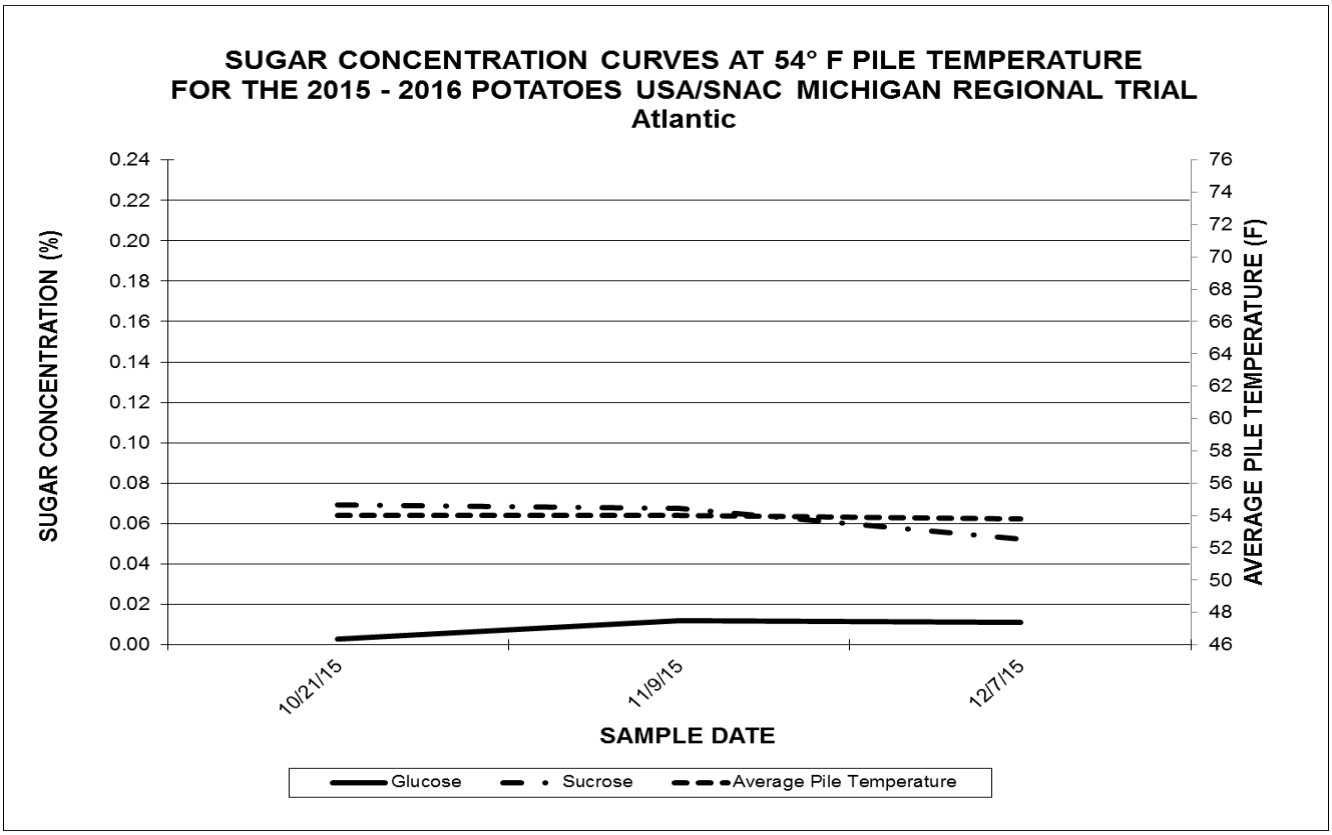

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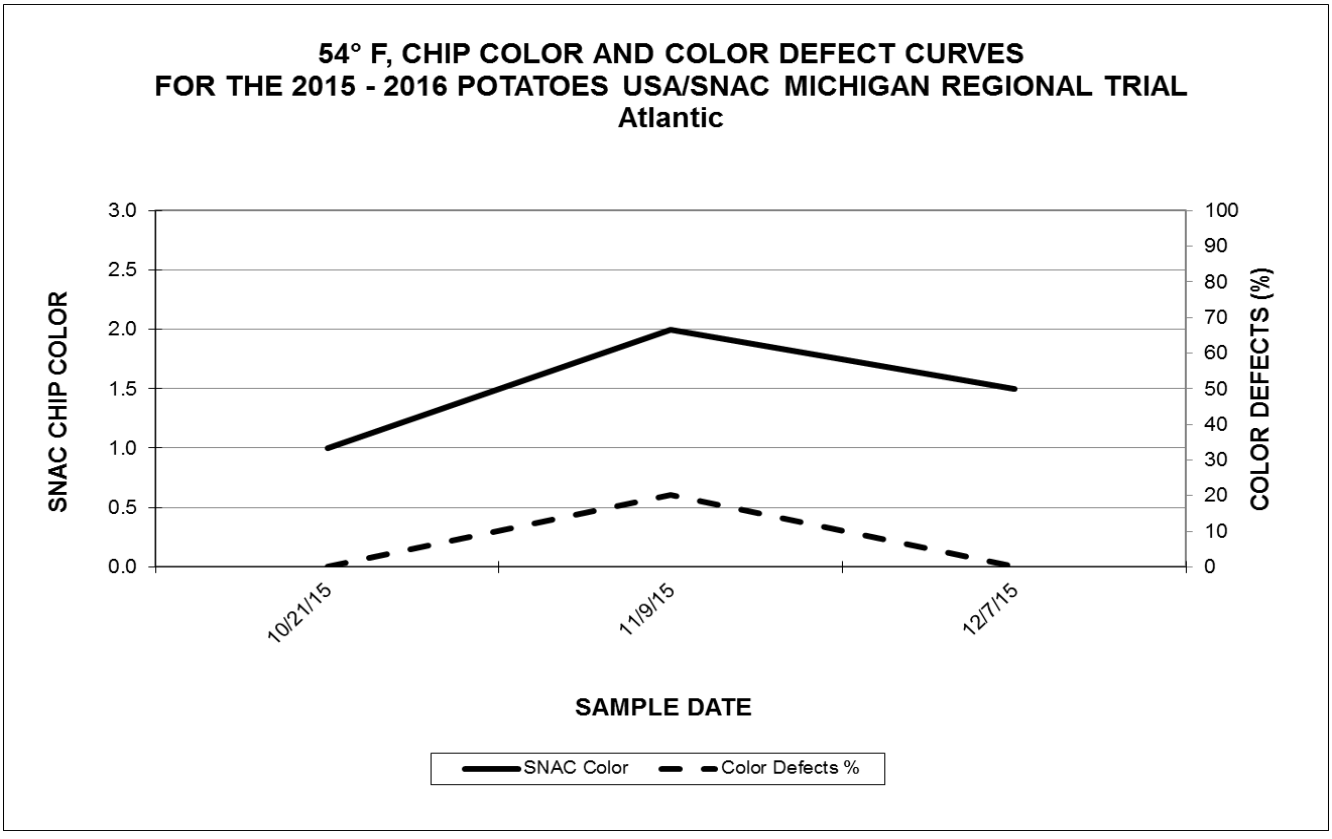

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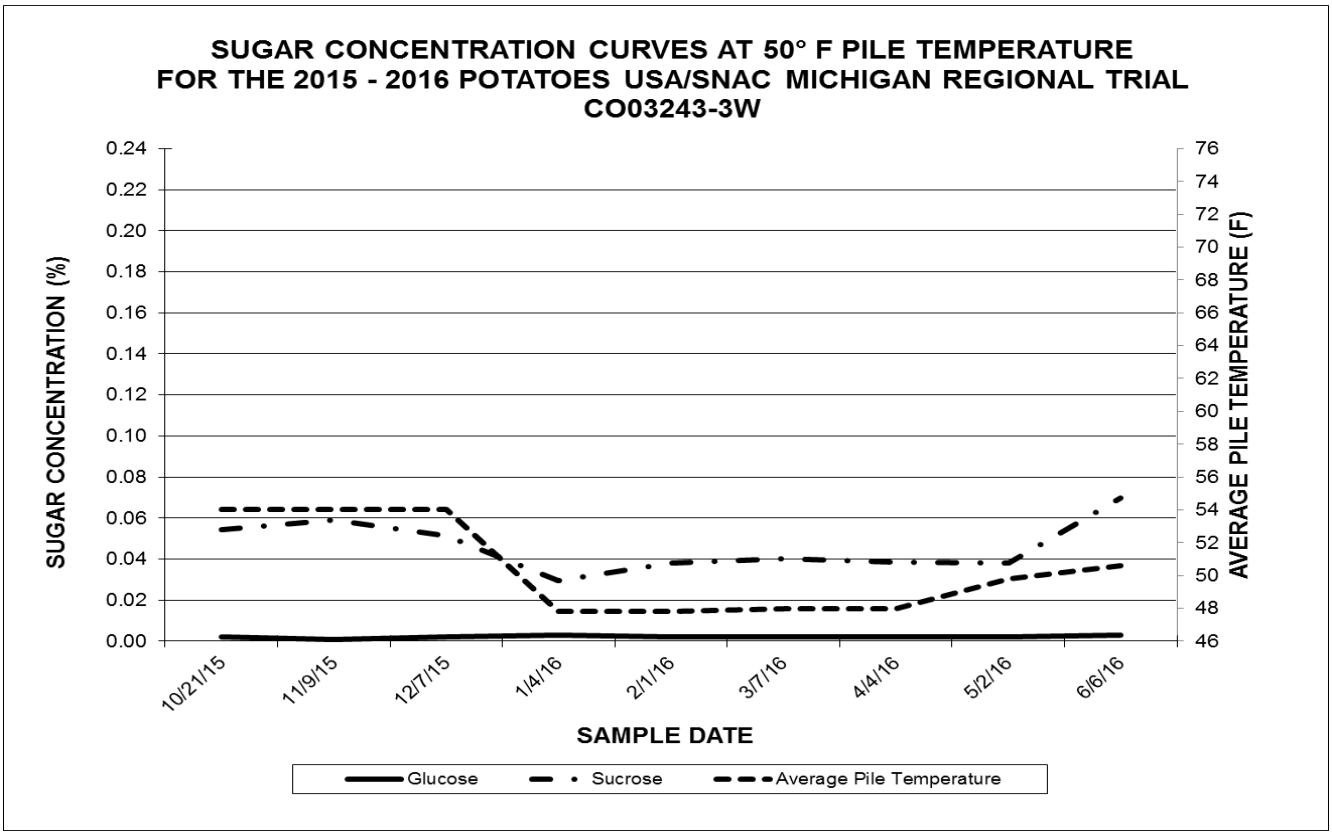

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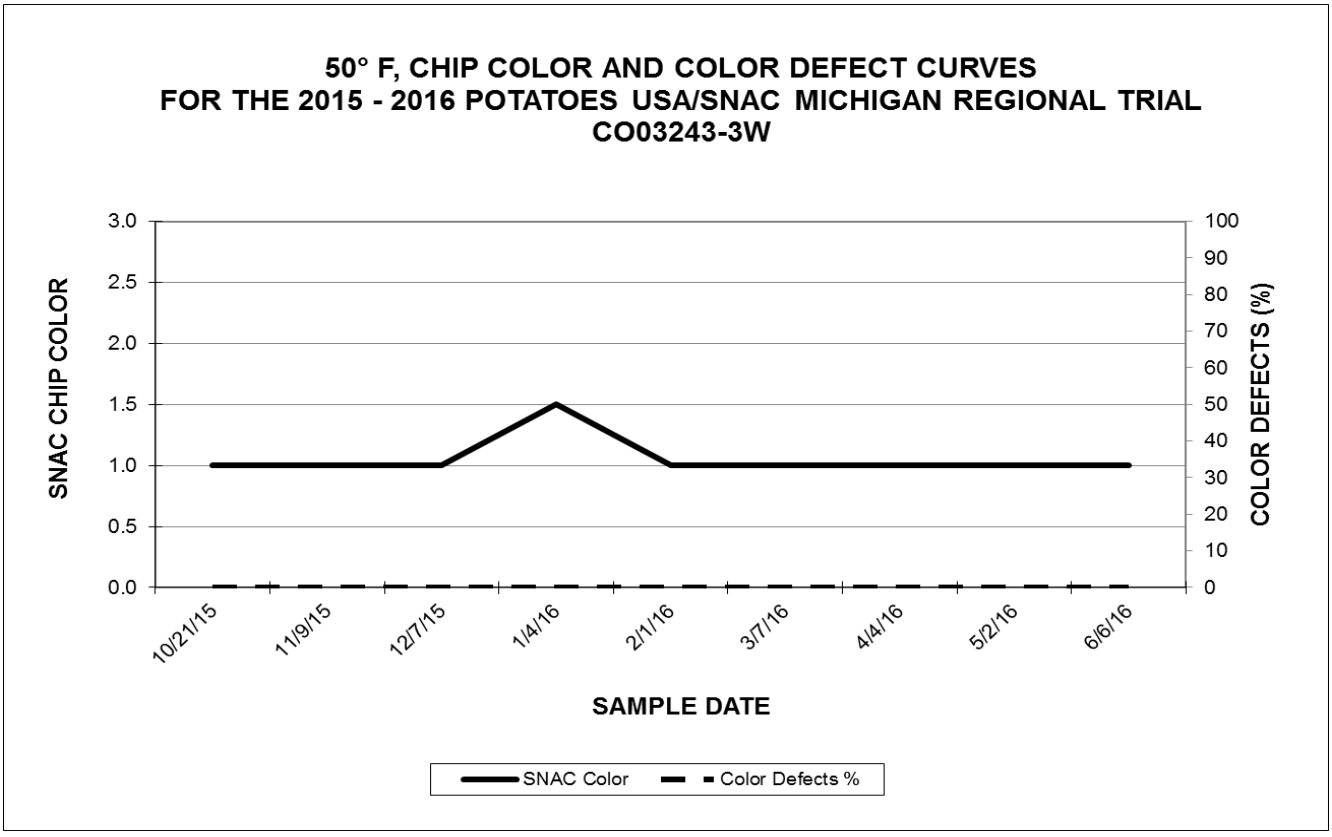

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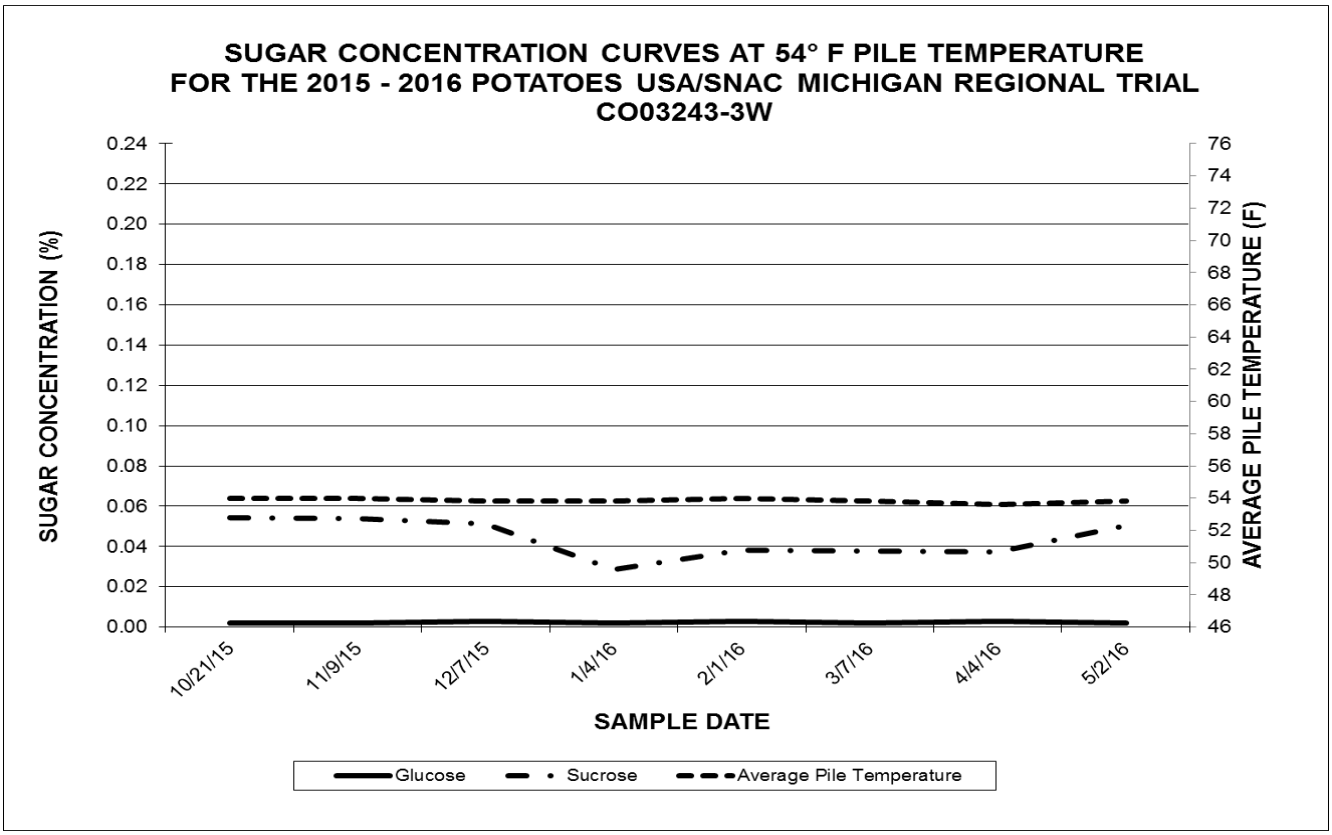

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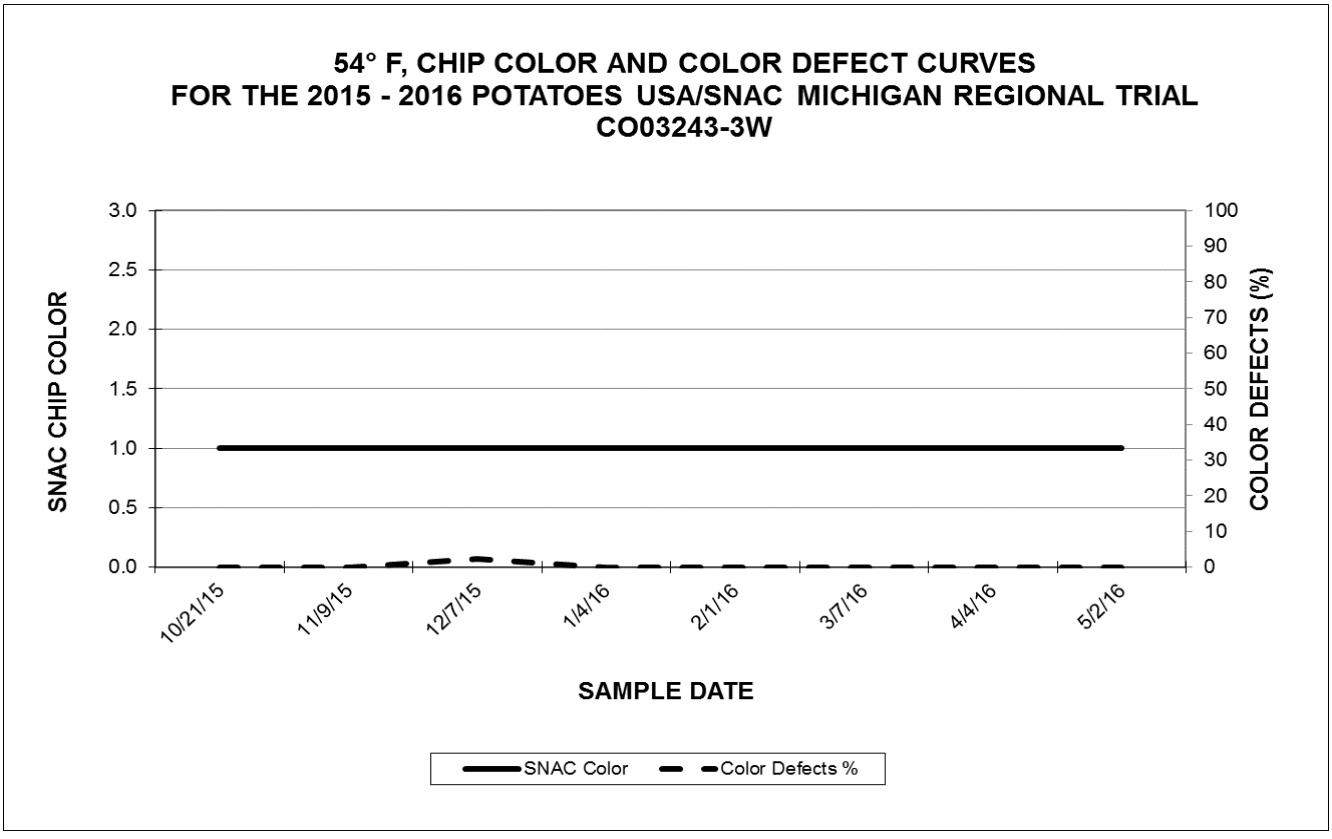

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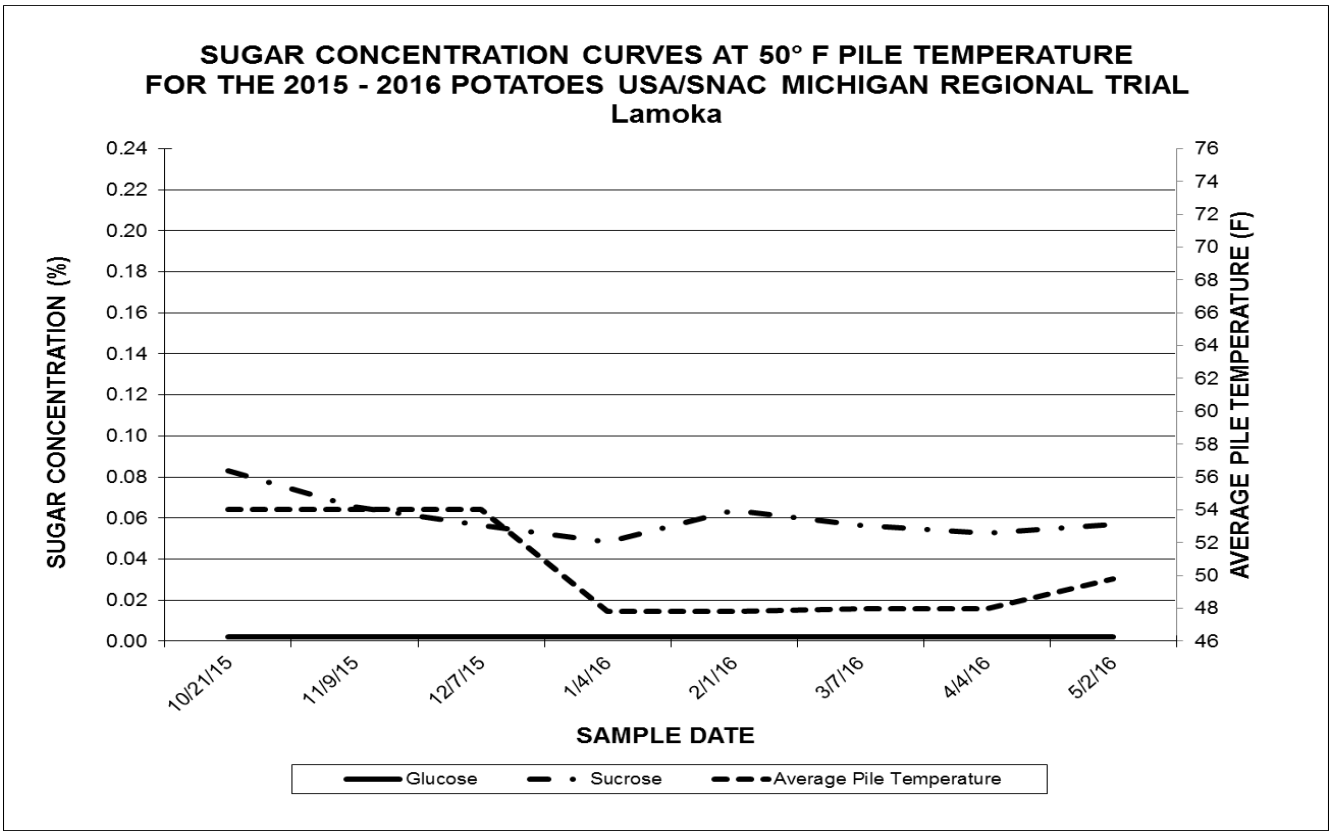

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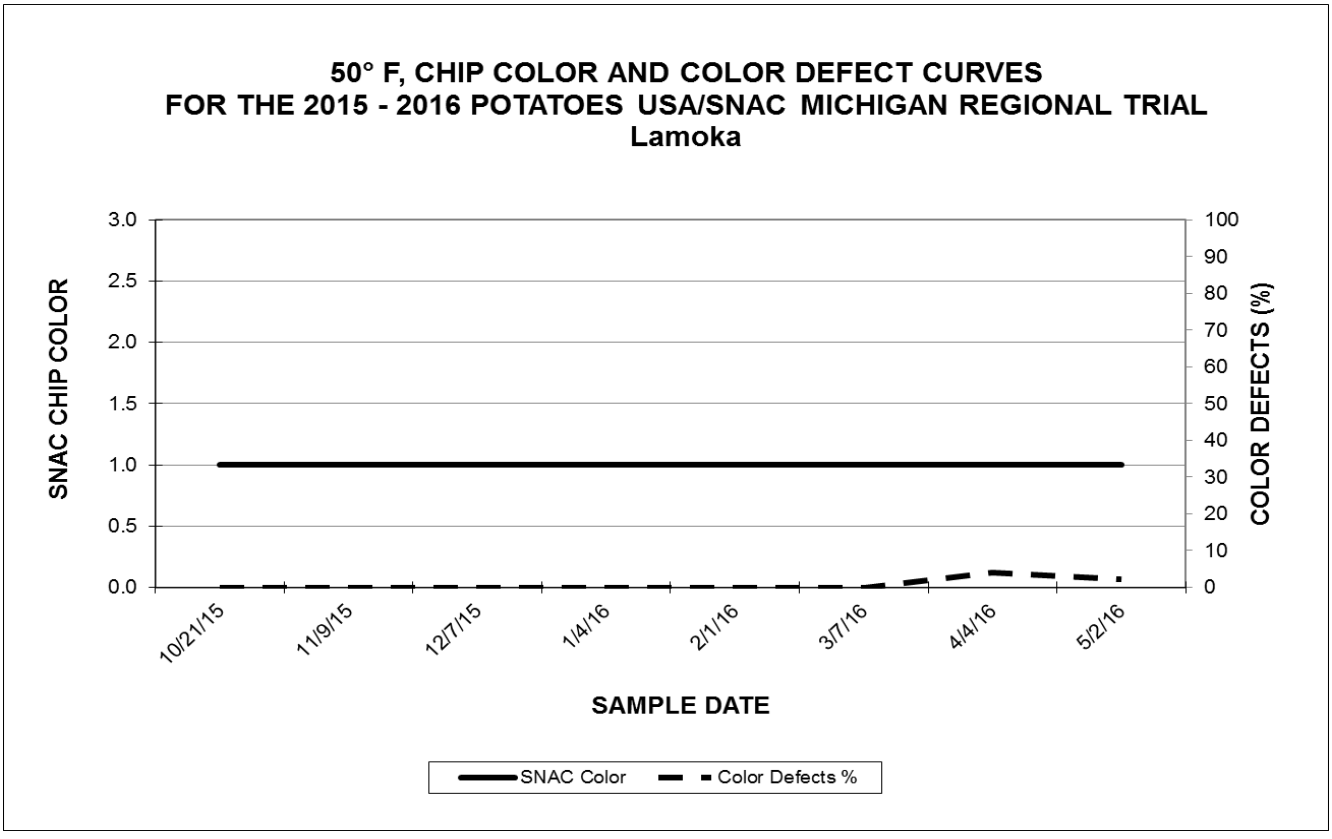

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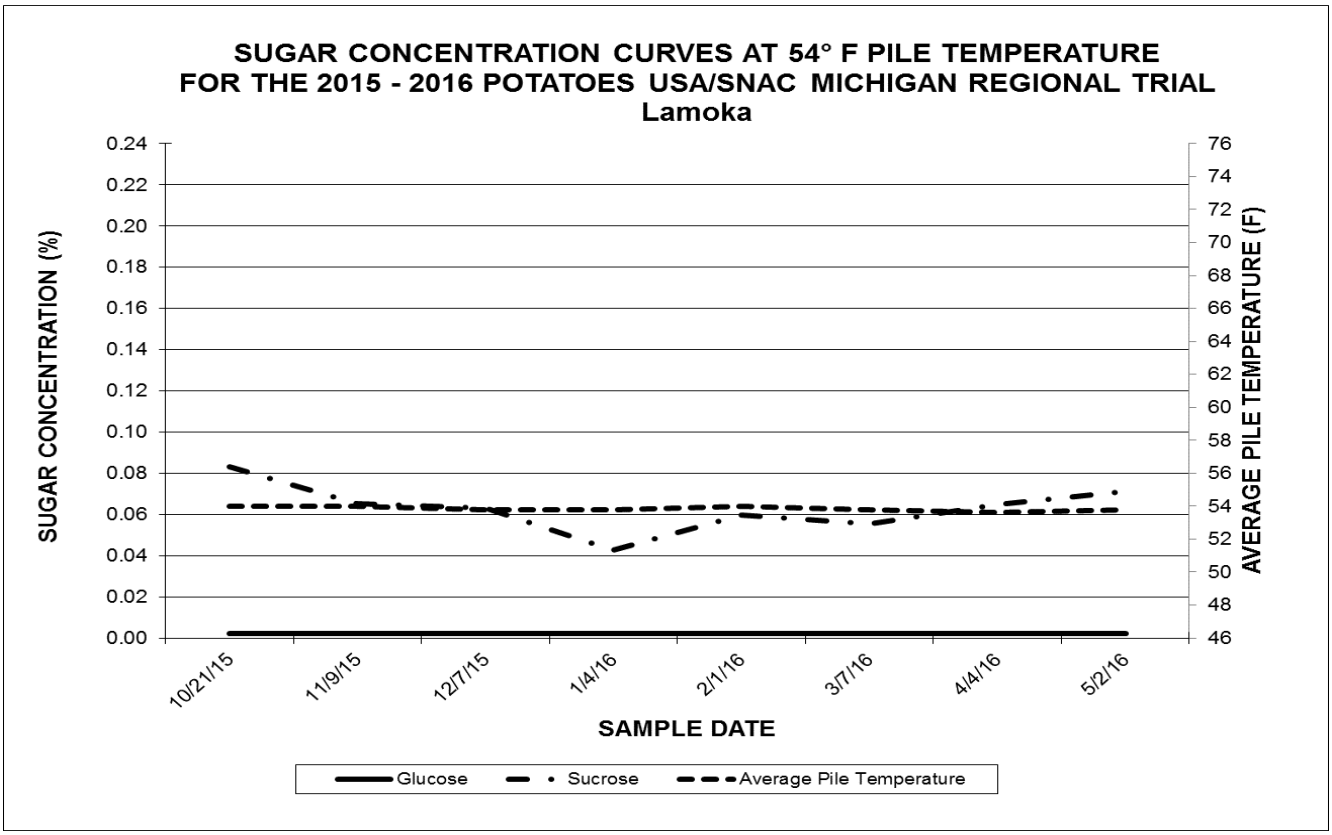

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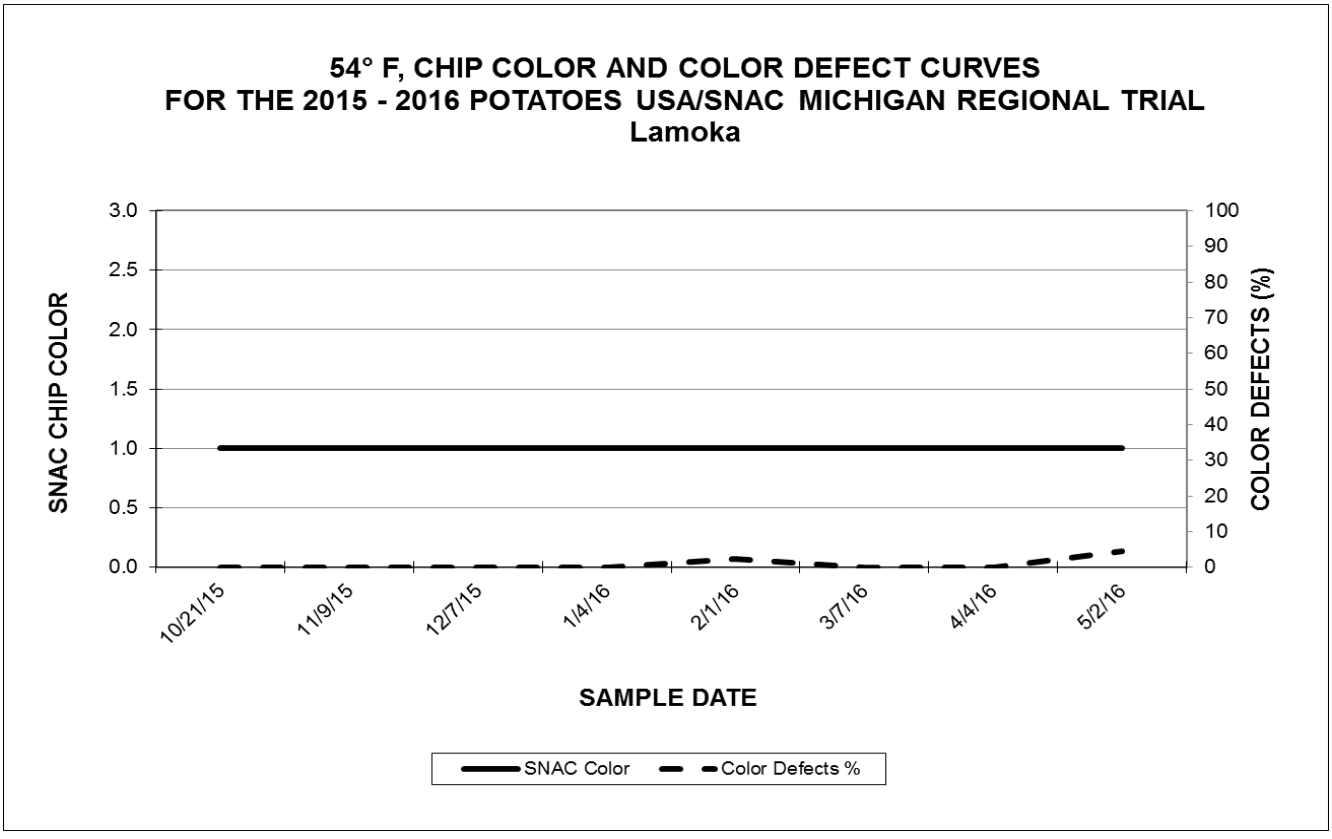

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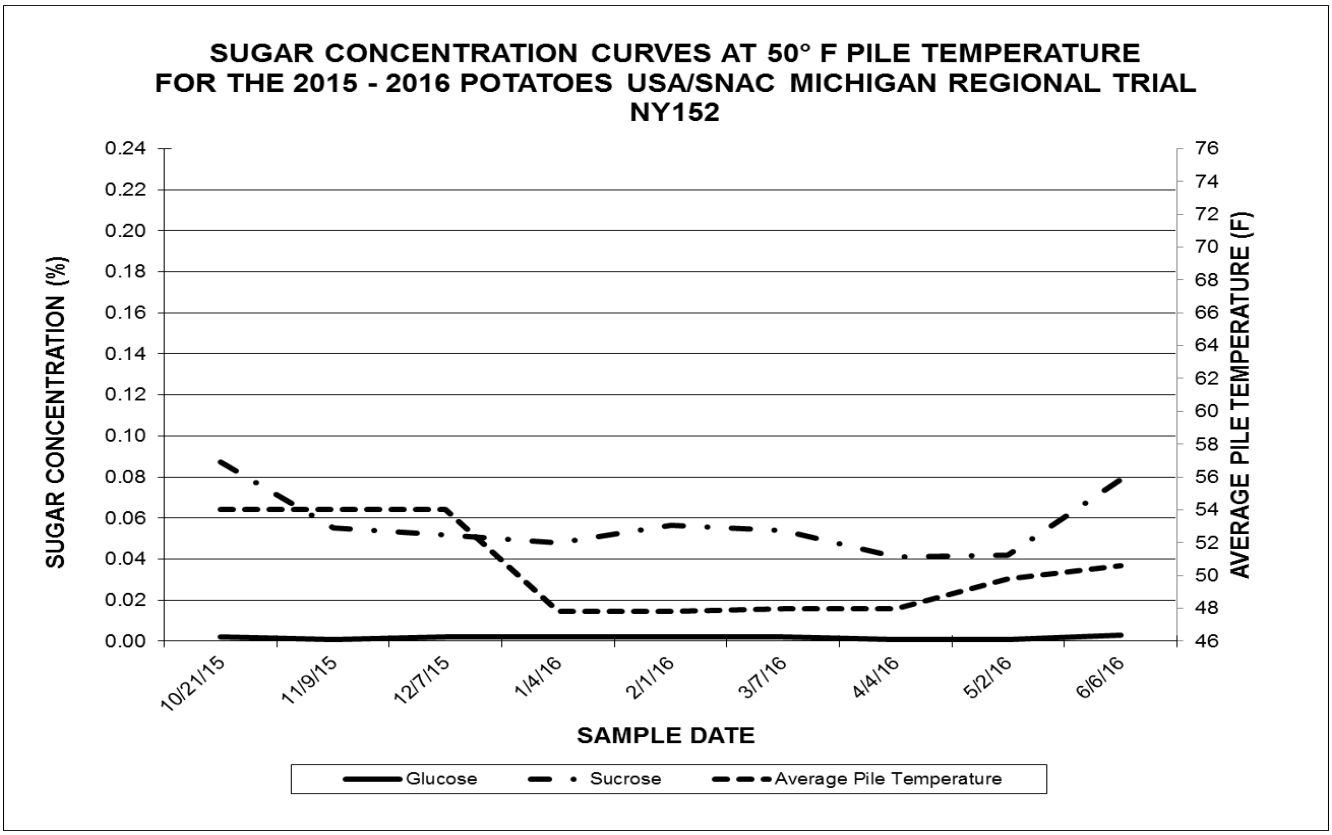

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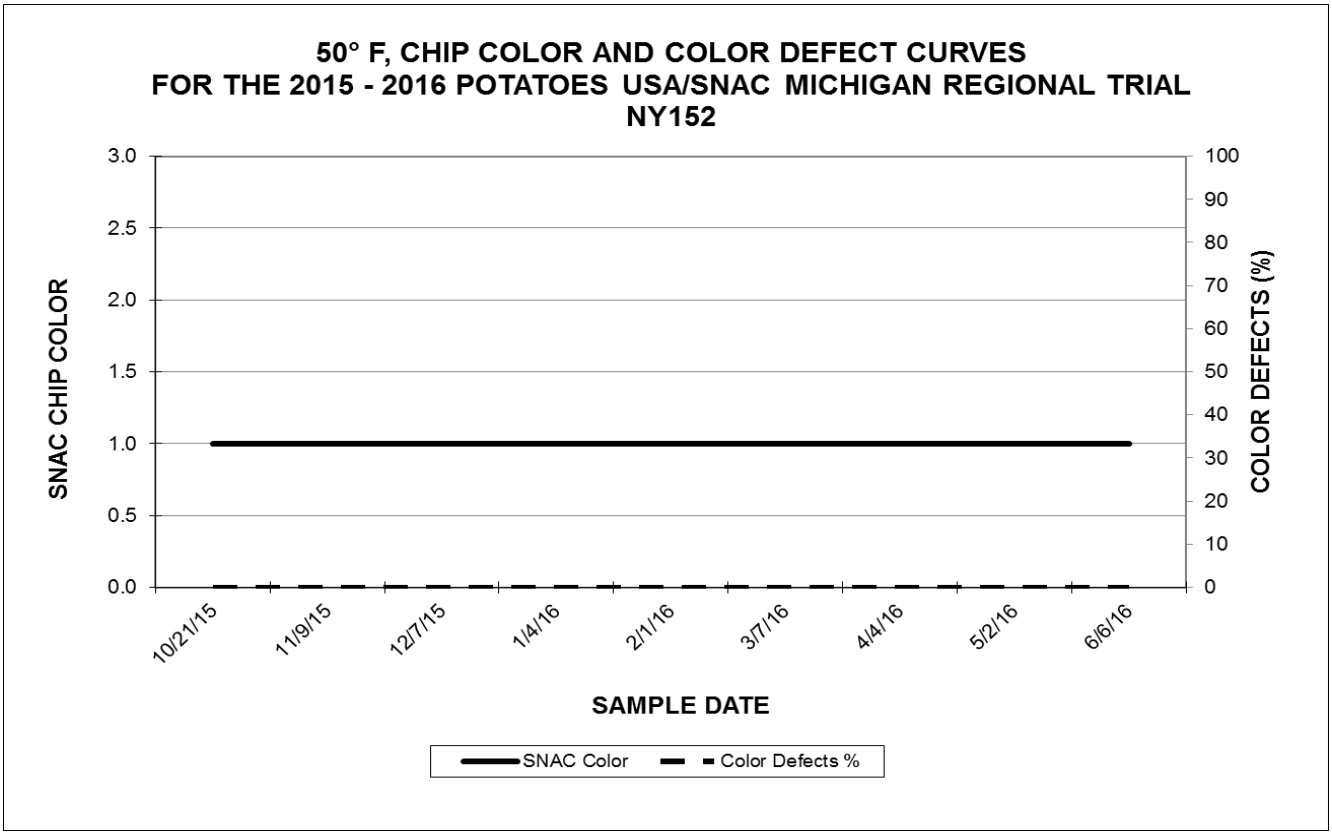

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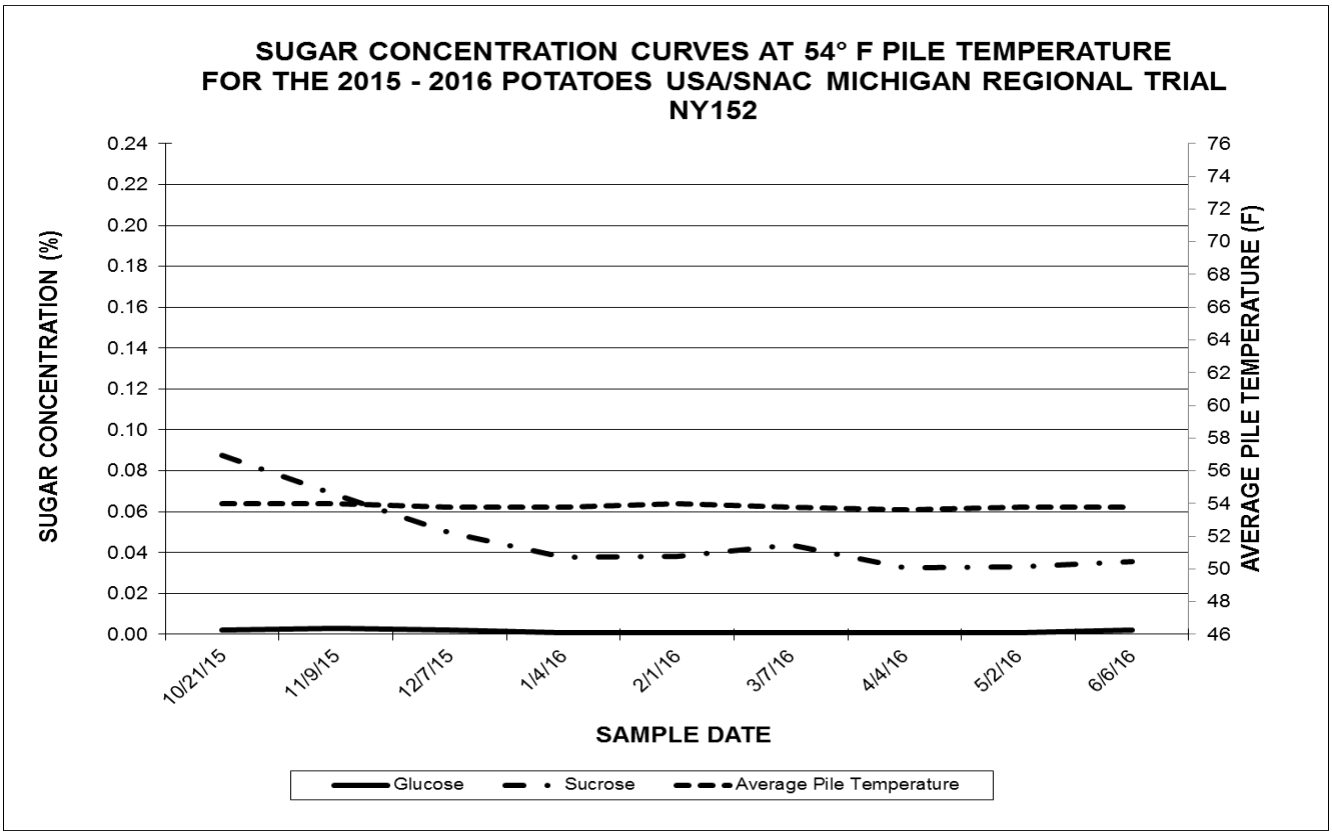

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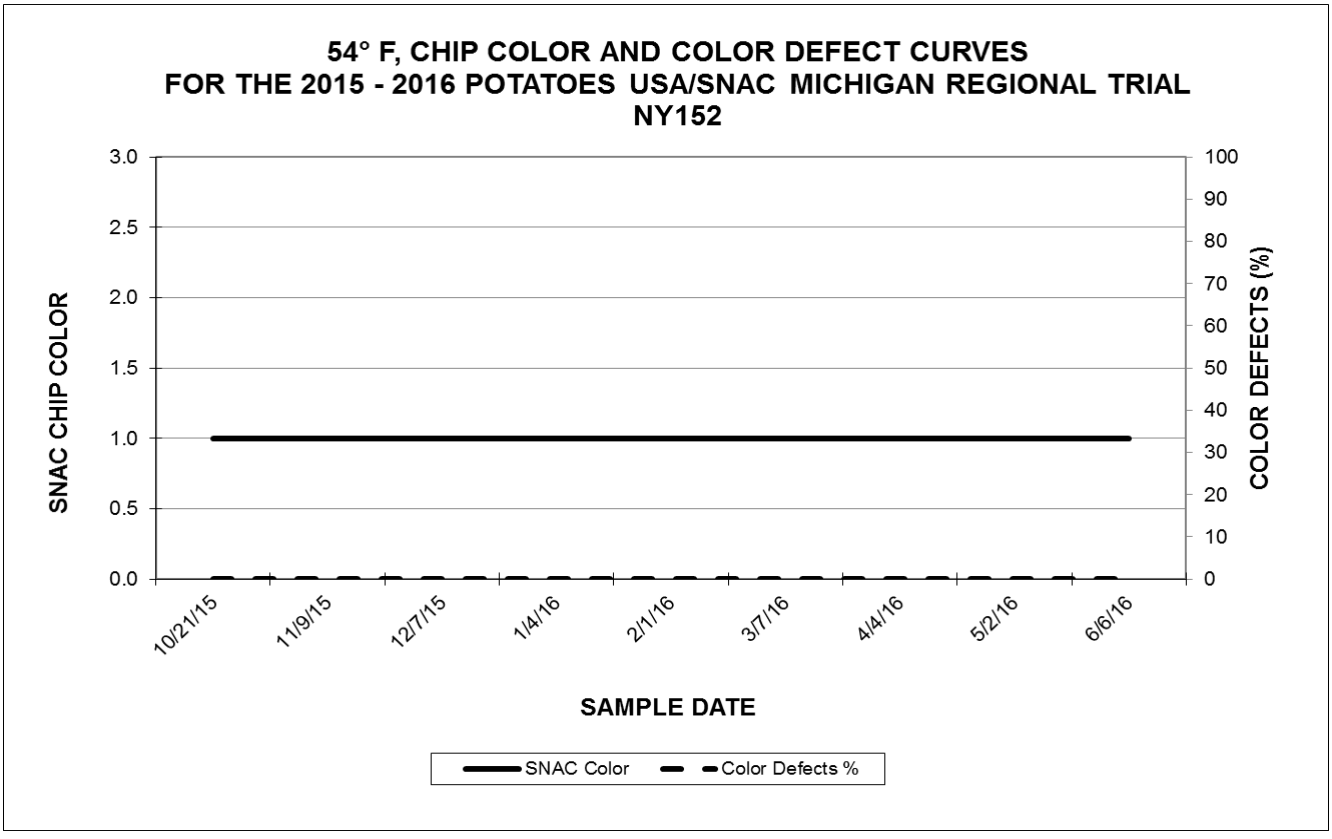

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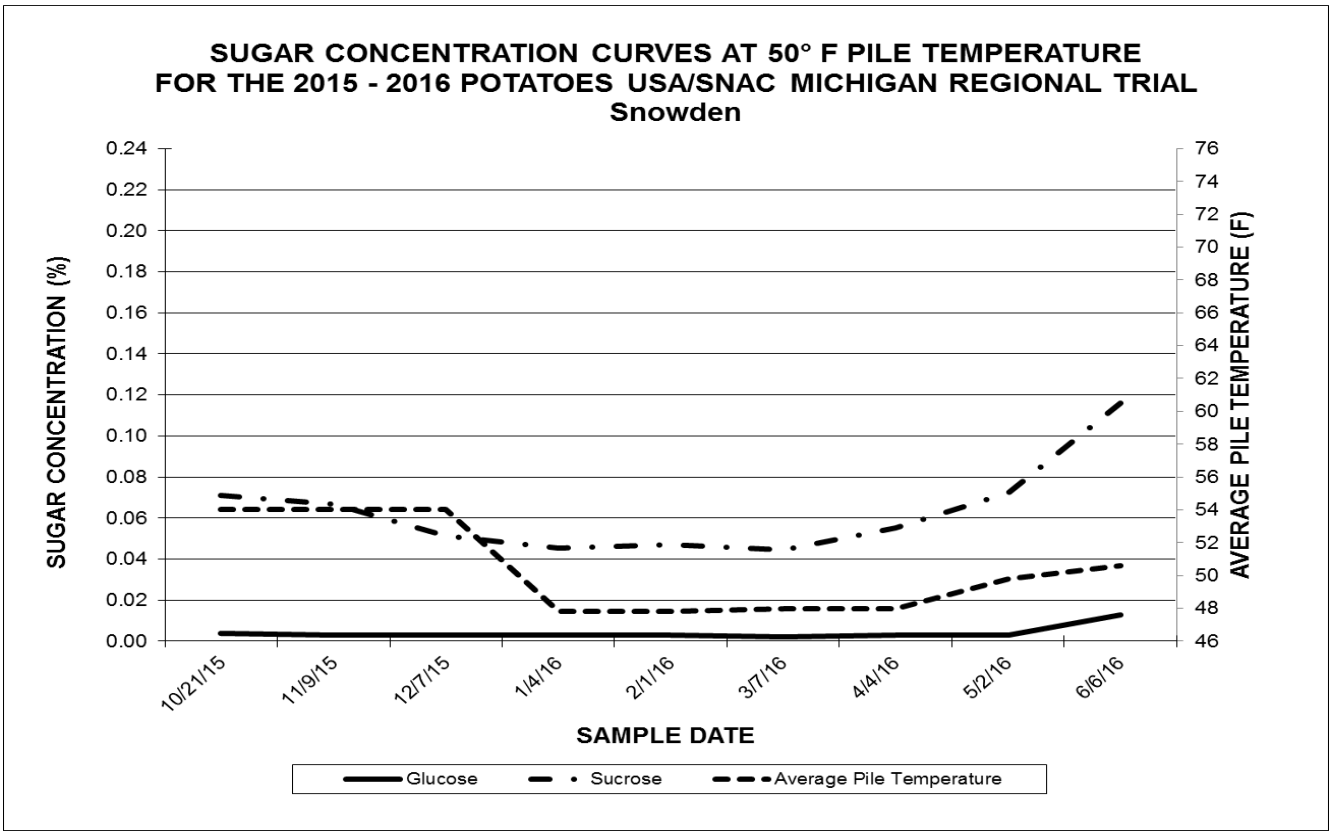

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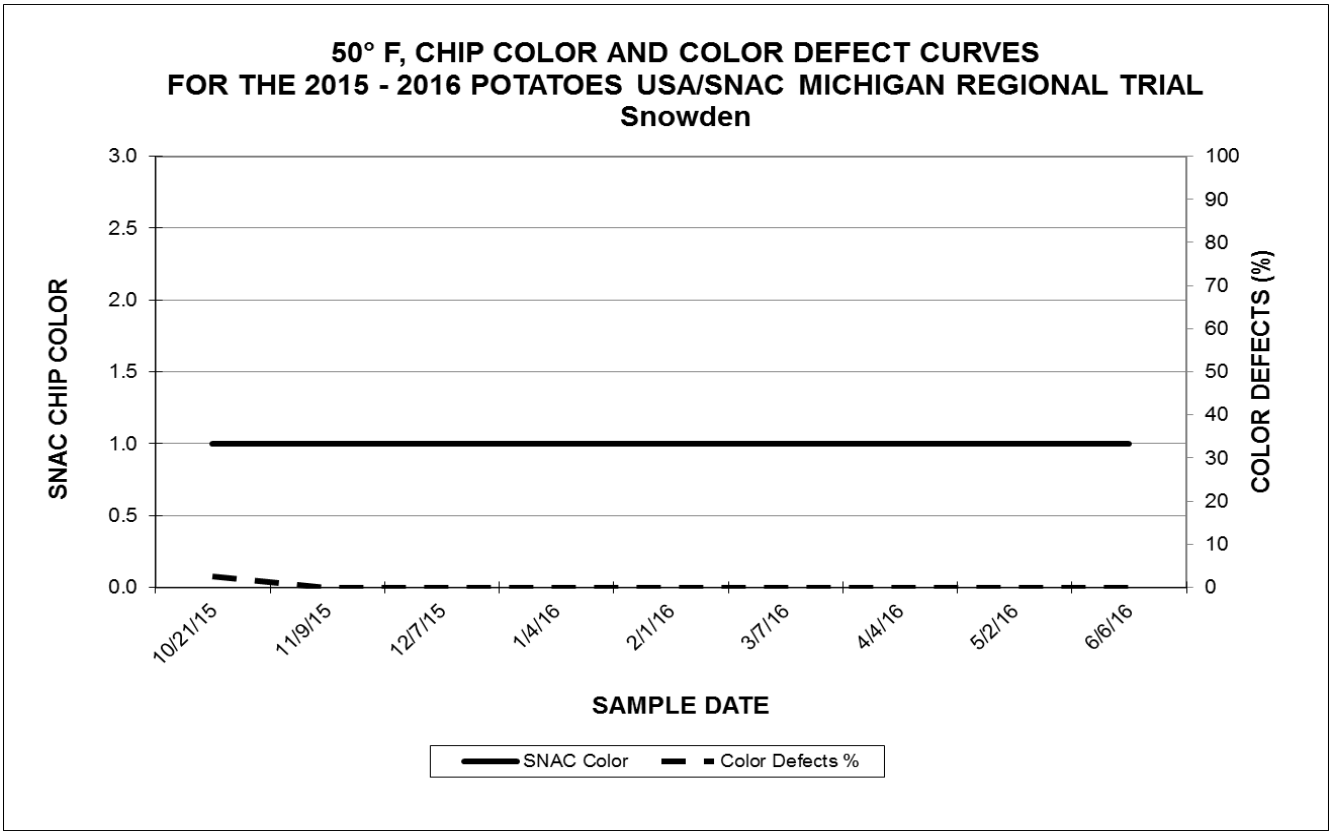

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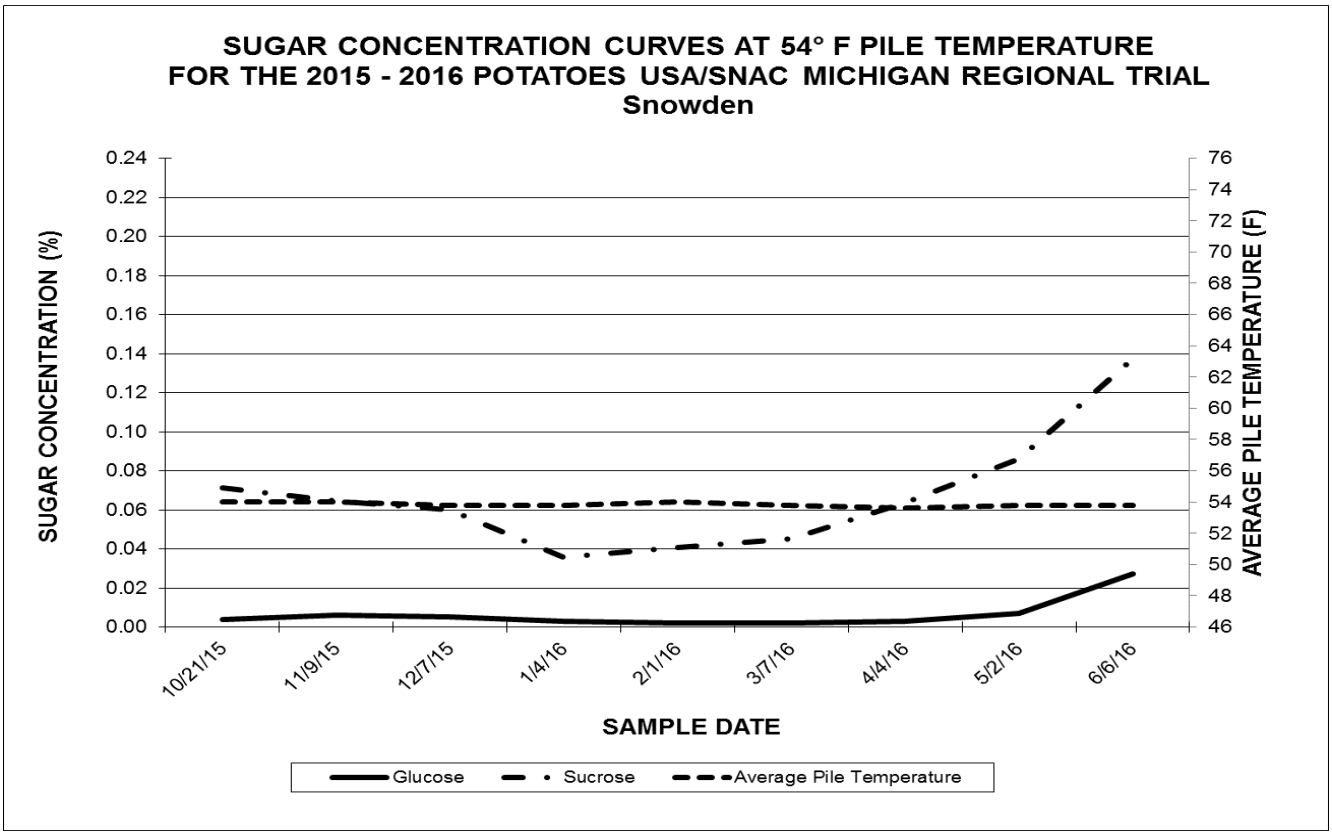

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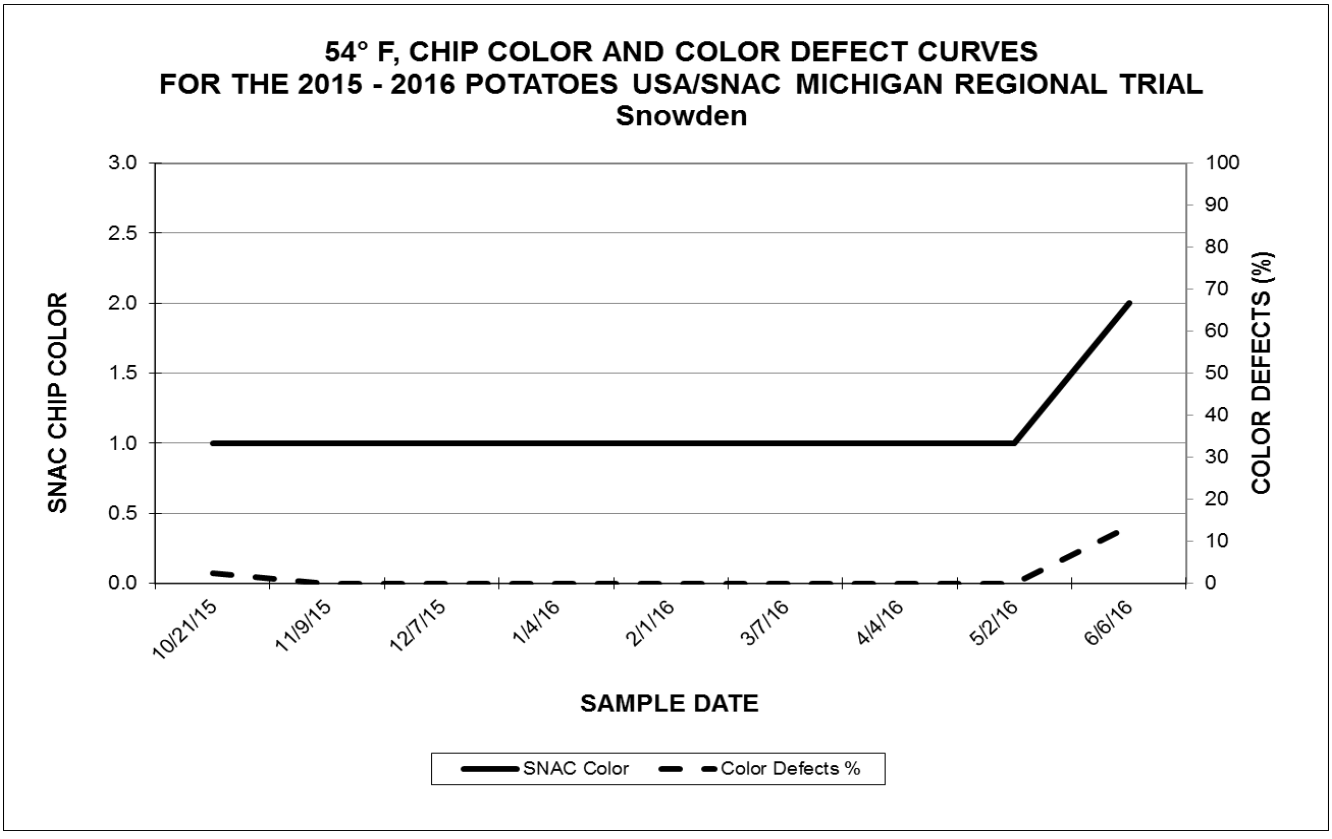

Figure 37.

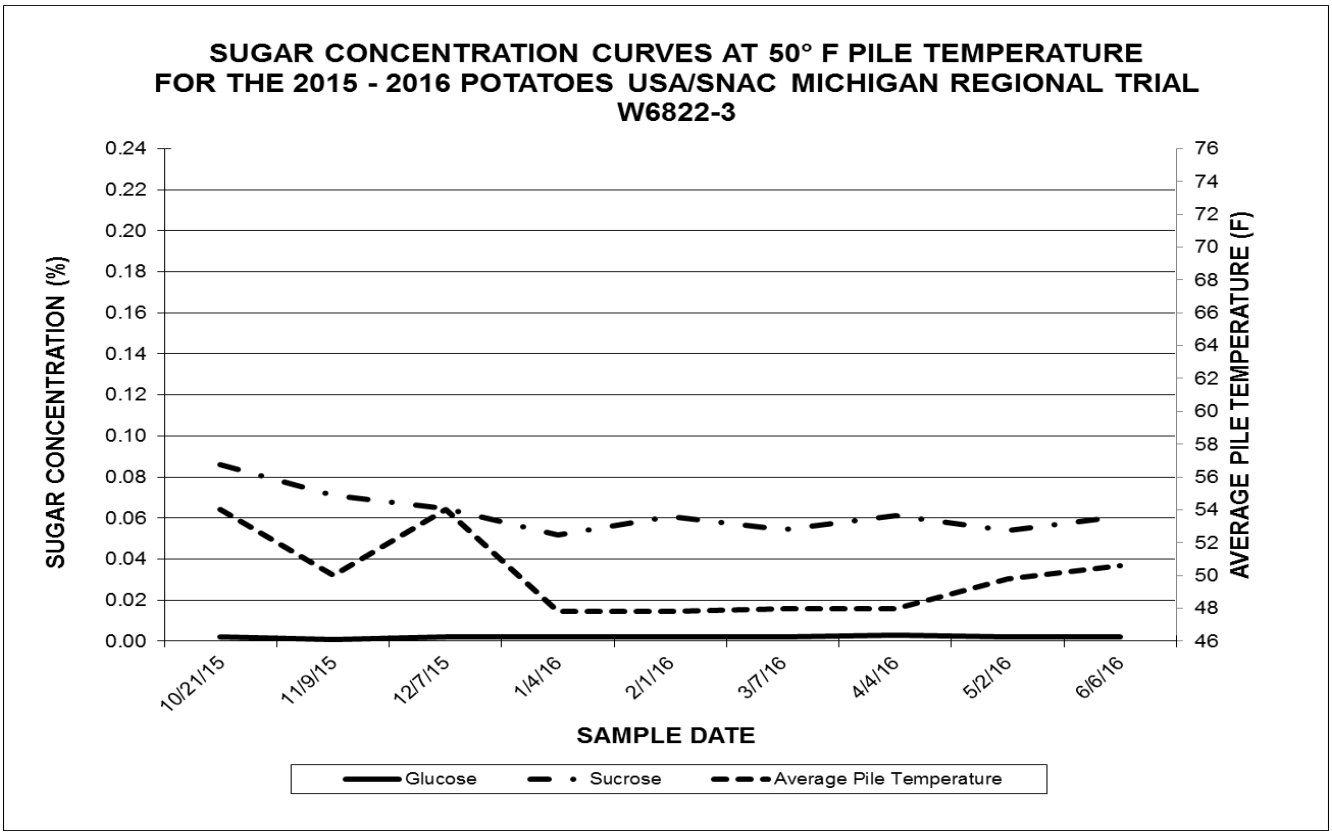

Figure 38.

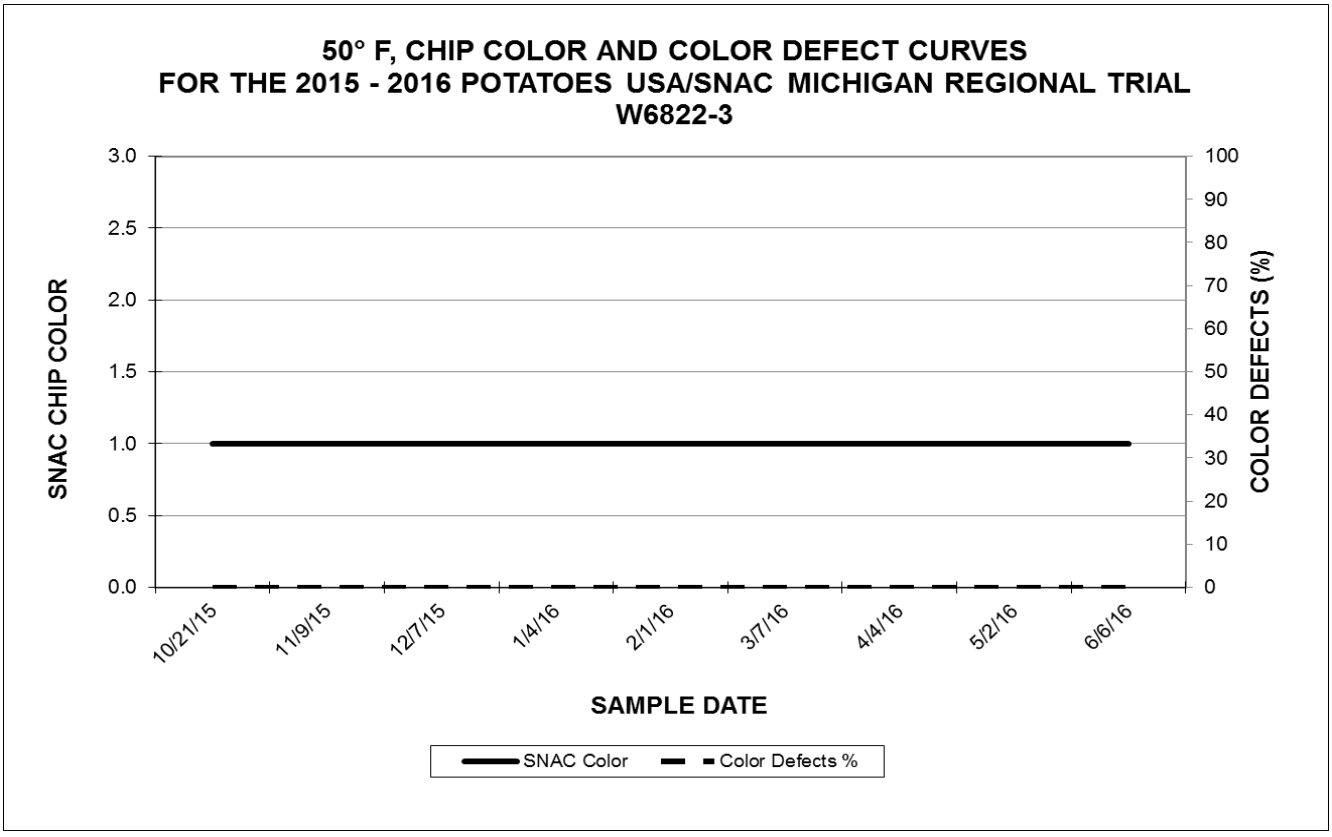

Figure 39.

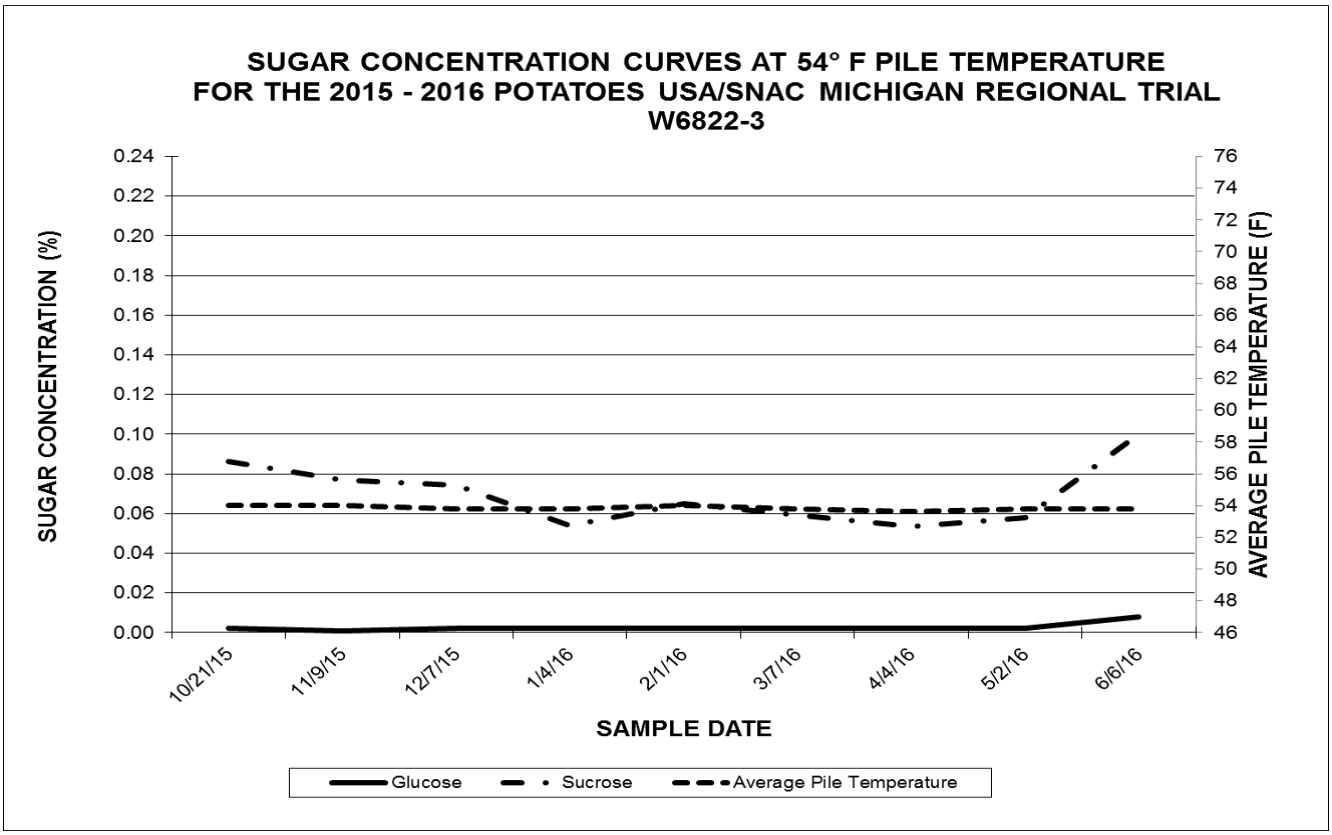

Figure 40.