USPB / SFA
OUT-OF-STORAGE CHIP QUALITY
2012-2013 MICHIGAN REGIONAL REPORT

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Procedure:

The 2012 USPB / SFA Chip Trial was harvested on October 4, 2012 at Sandyland Farms LLC, Howard City, MI. The crop experienced 3178 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 December 2012 and March 2013 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 mid-January 2013 with a pile temperature of 52 ºF and in early April 2013 with a pile temperature of 55 ºF. For sprout control, CIPC was applied to the storages in November 2012.

Eighteen, 30 tuber samples were also collected from each trial entry at harvest and stored in two bulk storages at the Michigan Potato Industry Commission's (MPIC) Cargill Potato Demonstration Storage Facility. One set of nine samples was stored at approximately 54ºF for monthly evaluation from October 2012 through June 2013. The remaining nine, 30 tuber samples, were stored at approximately 50ºF and evaluated from October 2012 to June 2013. These samples from the MPIC storage were processed at Techmark, Inc. for a glucose value (percent of fresh weight), a sucrose rating (percent of fresh weight X 10), an SFA 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 – 68. For sprout control, CIPC was applied in the MPIC storages in November 2012.

Results:

Tables 1 and 2 summarize the chip quality of the 40 pound samples after being processed at Herr Foods, Inc. on January 15th and April 8th, 2013. The varieties are listed in chip quality performance order based on Herr's rankings. As seen in Table 1, NY148, MN99380-14 and Atlantic exhibited the least amount of internal chip defects on this processing date. Overall, Herr Foods ranked NY140 as the top performing variety in the January 15th fry test.

From Table 2, W2978-3 was selected by Herr's as being the best overall performer in the April 8th fry test, with 19.9 percent total chip defects recorded. A01143-3C and CO00188-4W had the lowest percent of total chip defects recorded at 6.3 and 6.2, respectively.

Figures 1-68 summarize the 30 tuber chip quality samples collected at harvest from each entry and stored at the MPIC Demonstration Storage in the fall of 2012 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 SFA chip color and sugar related color defects over time in storage at the given temperature regime. The comments about the varieties below are in yield order, high to low, top to bottom, based on the 2012 field trial results.

Atlantic: Atlantic provided a chip quality reference point for the variety trial directly out of the field. No storage sugar data is provided in Figures 1-68 for this variety.

NY140: NY140 had an average to above average chip quality performance at Herr Foods on both processing dates (Tables 1-2). It ranked first overall on the January 15th processing date. Glucose levels were excellent for this variety at both storage temperatures. Sucrose trended downward into late April 2013 when this variety was stored at 50 ºF (Figure 1). At 54 ºF, this downward trend ended in mid-February 2013 (Figure 3). Chip color and color defect scores were excellent at both storage temperatures (Figures 2, 4). This variety had very good chip processing quality late in storage from both storage temperatures. Tuber yield performance was excellent in 2012. NY140 performed slightly above the trial specific gravity average at 1.072 and common scab susceptibility was evident.

W4980-1: W4980-1 was a marginal performing line at Herr Foods, ranking at or below average on both processing dates (Tables 1-2). Sucrose levels were stable only through December 2012 at both storage temperatures. The glucose levels elevated, soon after the sucrose increased, resulting in marginal chip quality after January 2013 (Figures 5 - 8).

Snowden: Snowden had an above average chip quality performance at Herr Foods on January 15th, 2013, then was ranked below average on the April 8th, 2013 processing date (Tables 1-2). Snowden processed acceptably until mid-March 2013 at 50 ºF (Figures 9-10). From Figures 11 and 12, the chip quality in this variety was best prior to mid-February 2013 when stored at 54 ºF.

NY148: This variety was identified as one of the top performers at the January 15th chip quality evaluation at Herr's and also remained above average for the April 8th processing date (Tables 1-2). The chip quality of this line from both storage temperatures was remarkably good with glucose levels remaining stable season long (Figures 13-16).

MSL292-A (Manistee): This variety was one of the top chip quality performing lines at Herr Foods in April 2013 and was also above average in the January 15th evaluation (Tables 1-2). MSL292-A appeared to have stable simple sugar levels at both storage temperatures through mid-March 2013. The cooler storage temperature prolonged slightly better chip quality than did the warmer storage temperature which is to be expected (Figures17-20).

W6483-5: This variety was ranked average for both processing dates at Herr Foods (Tables 1-2). The 50 ºF storage samples showed the sucrose levels declining from October 2012 to late January 2013 then rising quickly through the end of May 2013 (Figure 21). The glucose

values remained stable when sucrose was low, but as sucrose rose steadily, the glucose level soon followed, resulting in poor chip quality after mid-February 2013 at 50 °F (Figures 21-22). The same response was seen at the warmer storage temperature, but the poor chip quality began in mid-January 2013 (Figures 23-24).

MSR061-1: This variety was ranked 4th for overall processing quality at Herr Foods on April 8th, 2013 (Table 2). At Herr's, the MSR061-1 exhibited a good AGTRON score of 63.2, with a low percent of internal defects identified at only 0.40%. The 54 ºF storage samples showed the sucrose levels declining from October to late March, at which time they began to rise steadily to the end of the storage season (Figure 27). Glucose levels and subsequent chip quality was acceptable until the late March, early April time frame (Figure 28). At either temperature, dormancy break appears to have occurred at about the same time, resulting in very similar chip quality at both storage temperatures during the 2012-2013 storage season (Figures 26 and 28).

W2978-3: W2978-3 was an above average performing line at Herr Foods on both processing dates (Tables 1-2). This clone was ranked number one at Herr Foods for processing quality on April 8th, 2013. This variety responded well in storage at both temperatures for the duration of the season. Sucrose and glucose levels were stable throughout the majority of the season at 50 ºF, resulting in good chip quality until mid-May 2013 (Figures 29-30). The variety appeared to experience dormancy break in mid-April as a result of the 54 ºF storage temperature, but maintained good chip quality until this time (Figures 31-32).

AF4157-6: This clone was an average to below average chip quality performer at Herr Foods on both processing dates (Tables 1-2). Figures 33-36 show almost identical chip quality performances for this variety regardless of storage temperature differences. AF4157-6 appears to break dormancy in mid-February, followed by significant chip quality loss. This variety appears to have better chip quality out-of-the-field than from storage.

CO02321-4W: The chip quality performance for this variety was average to slightly above average at Herr Foods (Tables 1-2). At both storage temperatures, a rapid increase in sucrose was observed in mid to late February (Figures 37 and 39). The increase in simple sugars was much less pronounced in the tubers stored at the colder storage temperature, resulting in acceptable chip quality until mid-May 2013 (Figure 38). The warmer storage temperature resulted in tubers that produced chips that lost processing quality in mid-March (Figure 40).

CO00197-3W: The chip quality performance for this variety was ranked below average on both processing dates at Herr Foods (Tables 1-2). Sugar stability appears to be lost in early to mid-February for this clone at either storage temperature (Figures 41 and 43). The cooler storage temperature appears to have induced poor chip quality rather than prolong it (Figure 42). The warm storage temperature resulted in tubers that maintain a slightly better chip quality into late February 2013 (Figure 44).

A01143-3C: This clone ranked above average at Herr Foods on both processing dates and it ranked third overall at the April 8th, 2013 processing date, recording one of the higher specific gravities of the trial and having no internal defects reported at Herr's (Table 2). At the cooler storage temperature, the sucrose and glucose levels remained within acceptable ranges, resulting in excellent season long chip quality from 50 °F (Figures 45-46). The dormancy of

this variety appears to hold into mid-April, and even at the warmer storage temperature, produces chips that are acceptable in early to mid-April.

W5015-12: W5015-12 had average to above average chip quality at Herr Foods (Tables 1-2). Sucrose levels rose in early January 2013 at the colder storage temperature (Figure 49), but the glucose level did not follow as expected until much later in the storage season. Interestingly enough, overall chip quality remained good for tubers stored at this temperature into mid-May (Figure 50). The warmer 54 °F storage samples saw sucrose levels increase rapidly in early March 2013 followed much later by a rise in glucose in mid-May (Figure 51). This increase in simple sugars is observed in a decline in chip quality in mid-March (Figure 52).

ND8304-2: This clone ranked worst of all the entries at Herr Foods on both processing dates (Tables 1-2). Internal defects and poor AGTRON scores are reflective of the overall chip quality of ND8304-2 at the time of processing at Herr's. The variety appears to lose dormancy and has no sugar stability after just a few months in storage. Both sets of storage samples, across temperature, reveal poor chip quality and sugar stability for this clone (Figures 53-56).

MN99380-1Y: MN99380-1Y had an average to below average performance at Herr Foods on both processing dates (Tables 1-2). The sucrose values at both storage temperatures do not appear to reach any level of stability (Figures 57 and 59). Chip processing quality appeared to be acceptable until mid-January 2013 at which time a rapid decline in chip quality was evident (Figures 58 and 60).

CO00188-4W: This variety had a below average chip quality performance at Herr's in January 2013, and then was ranked above average at the April 2013 chip quality evaluation (Tables 1-2). This variety exhibited a below average yield in the 2012 on-farm trial, but the chip quality of this clone from both storage temperatures appeared to be acceptable for most of the storage season. At 50 °F, the sucrose and glucose levels remained very stable into early June 2013, resulting in acceptable chip quality in mid-May 2013 (Figures 61-62). Similar chip quality was apparent at the 54 °F storage temperature with stable sugar values being exhibited through early June 2013, but chip quality appeared to have been lost in mid-April at the warmer storage temperature (Figures 63-64).

ND8305-1: This variety exhibited below average chip quality performance at Herr Foods on both processing dates (Tables 1-2). Sucrose remained stable or declined into February when stored at 50 ºF, and at 54 ºF (Figures 65, 67). Chip quality appeared to be negatively impacted shortly after the sharp rises in sucrose at both temperatures (Figures 66, 68).

Table 1. 2012-2013 Out-of-Storage Chip Quality, January 15, 2013, Sandyland Farms, LLC [1].

Entry	Agtron Color	SFA[2] Color	Specific Gravity	Percent Chip Defects[3] Internal	External	Total	Comments
NY140	50.3	3	1.073	22.7	11.5	34.2	Internals: Little stem end. Good color in most. Externals: Some scab & green. Medium to large grade.
NY148	52.3	3	1.080	3.8	22.3	26.1	Internals: Good color. Light scab and a few starch pockets. Medium size.
Snowden	57.1	3	1.069	1.2	31.0	32.2	Internals: Good chip color, a few surface defects. Externals: Light scab. Nice size.
W2978-3	52.1	4	1.060	14.7	11.6	26.3	Internals: Stem color and leaf roll. Externals: Scabbing present. Medium grade.
AO1143-3C	49.9	3	1.072	2.8	7.4	10.2	Internals: Good color. Externals: Little stem end and scab. Large grade.
CO02321-4W	56.4	3	1.065	6.8	14.9	21.7	Internals: Nice color on internal. Externals: Scab and rot present with minor green. Inconsistent size, very small to large.
W5015-12	50.8	3	1.077	2.7	3.6	6.3	Internals: Little color, overall good. Externals: Minor scab. Very small grade.
MSL292-A	52.3	3	1.065	5.9	18.3	24.2	Internals: Light shading, mostly ok color. Externals: Fair amount of scab. Large grade, a lot of big potatoes.
W4980-1	51.9	3	1.064	9.2	2.5	11.7	Internals: Little shading. Externals: Some stem end and little scab. Medium, large grade.
W6483-5	51.5	3	1.055	15.0	6.8	21.8	Internals: Minor leaf roll, mostly good color. Externals: Little stem end and scab. Large grade, mostly oblong shape.
ND8305-1	51.2	3	1.074	4.0	18.2	22.2	Internals: Little shading. Externals: Fusarium rot, minor scab. Small grade.
MSR061-1	51.4	3	1.069	3.7	14.9	18.6	Internals: Good internally/nice color. Externals: Light scab. Nice size.
CO00188-4W	51.1	4	1.055	3.1	2.4	5.5	Internals: Some color. Minor scab. Very small grade.
AF4157-6	53.7	3	1.062	9.1	25.0	34.1	Internals: Little vascular color. Externals: A lot of scab. Small to medium grade.
CO00197-3W	51.1	4	1.063	12.0	12.3	24.3	Internals: Some color around vascular ring. Externals: Scabbing present. Small to medium grade. Nice size.
MN99380-14	52.5	4	1.066	8.8	13.9	22.7	Internals: Yellow in color. Not ideal for chipping. Externals: Minor scab. Nice size. Some misshapen potatoes.
Atlantic	51.9	4	1.069	35.6	8.6	44.2	Internals: Light scab & hollow heart. Externals: Little stem end and color in flesh of potato. Medium to large grade.
ND8304-2	50.6	4	1.055	22.9	16.7	39.6	Internals: A lot of color in finished product. Externals: Fair amount of scab. Size inconsistent, some really small to large.

1 Samples removed from 57 ºF storage and processed by Herr Foods Inc., Nottingham, PA on January 15, 2013.

Chip defects are included in Agtron and SFA samples

2 SFA 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. 2012-2013 Out-of-Storage Chip Quality, April 8, 2013, Sandyland Farms, LLC [1].

Entry	Agtron Color	SFA[2] Color	Specific Gravity	Percent Chip Defects[3] Internal	External	Total	Comments
W2978-3	66.9	2	1.059	5.9	14.0	19.9	Small amount of stem end. Small amount of scab. Nice size.
MSL292-A	63.8	2	1.072	4.7	14.3	19.0	Very nice color. Some scabbing. Nice size.
AO1143-3C	62.0	3	1.073	0.0	6.3	6.3	Nice internal color. Light scab. Small to medium size.
MSR061-1	63.2	3	1.066	0.4	15.7	16.1	Very light scab. Nice raw grade. Nice size 2 to 3 1/4 inches.
W5015-12	60.4	3	1.072	1.6	12.0	13.6	Minor scab. Nice color.
NY148	63.2	2	1.082	9.6	12.0	21.6	Nice internal color. Some scab. Good gravity.
CO000188-4W	59.5	3	1.059	2.1	4.1	6.2	Good internals. Minor shading. Nice externals. Very small in size.
AF4157-6	59.5	3	1.060	3.9	55.1	59.0	Light pressure bruise. Heavy scabbing
W6483-5	62.8	3	1.059	9.2	6.7	15.9	Light internal shading. Minor scabbing. Big in size and oblong in shape.
NY140	60.8	3 to 4	1.074	11.9	27.8	39.7	Little shading. Scabbing present.
MN99380-14	61.0	4	1.064	9.3	6.8	16.1	Yellow in color with little stem end. Too small, max size was 2 inches on only a few potatoes.
CO02321-4W	61.8	3	1.070	10.4	22.9	33.3	Little interior color in finished product. Minor scab. Nice size 2 1/2 to 3 inches.
Snowden	65.8	4	1.069	20.2	8.5	28.7	Fair amount of internal shading. Nice raw grade inside and out.
CO00197-3W	59.8	4	1.062	21.4	20.3	41.7	Little hollow heart with a lot of internal shading. Heavy Scab.
ND8305-1	57.4	4	1.076	17.0	20.2	37.2	Little stem end and internal color. Minor scab. Most potatoes very small 1 3/4 inch range.
W4980-1	60.4	4 to 5	1.065	35.1	18.0	53.1	Fair amount of internal color. Minor scabbing. Wide variety of sizes from 1 1/2 to 4 inches.
Atlantic	53.5	5	1.071	53.3	13.7	67.0	Little hollow heart, very bad internal color. Some scabbing. Not sure why we are doing Atlantic sample this late in storage.
ND8304-2	41.6	5 to 6	1.054	92.4	1.9	94.3	Very dark in color. Light scab. Very small in size.

1 Samples removed from 55 °F storage and processed by Herr Foods Inc., Nottingham, PA on April 8, 2013.

Chip defects are included in Agtron and SFA samples.

2 SFA 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.

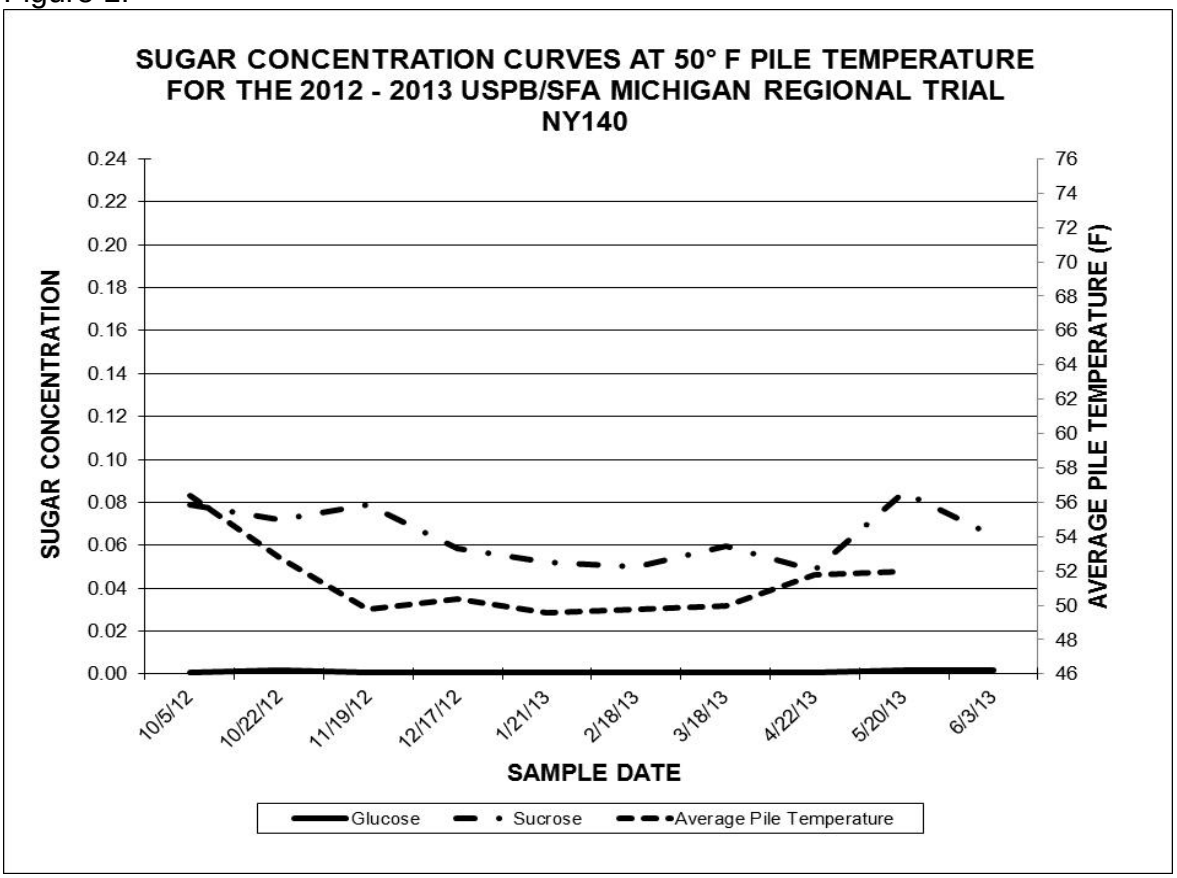
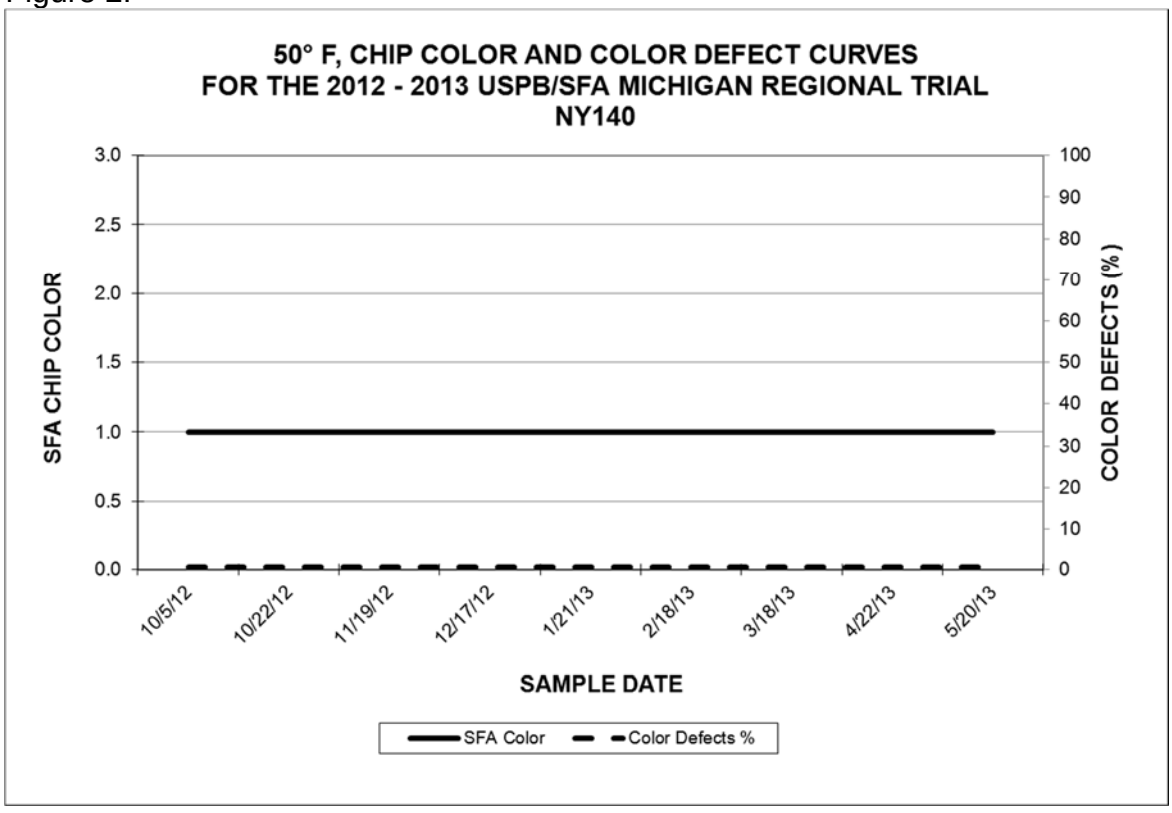


Figure 2.



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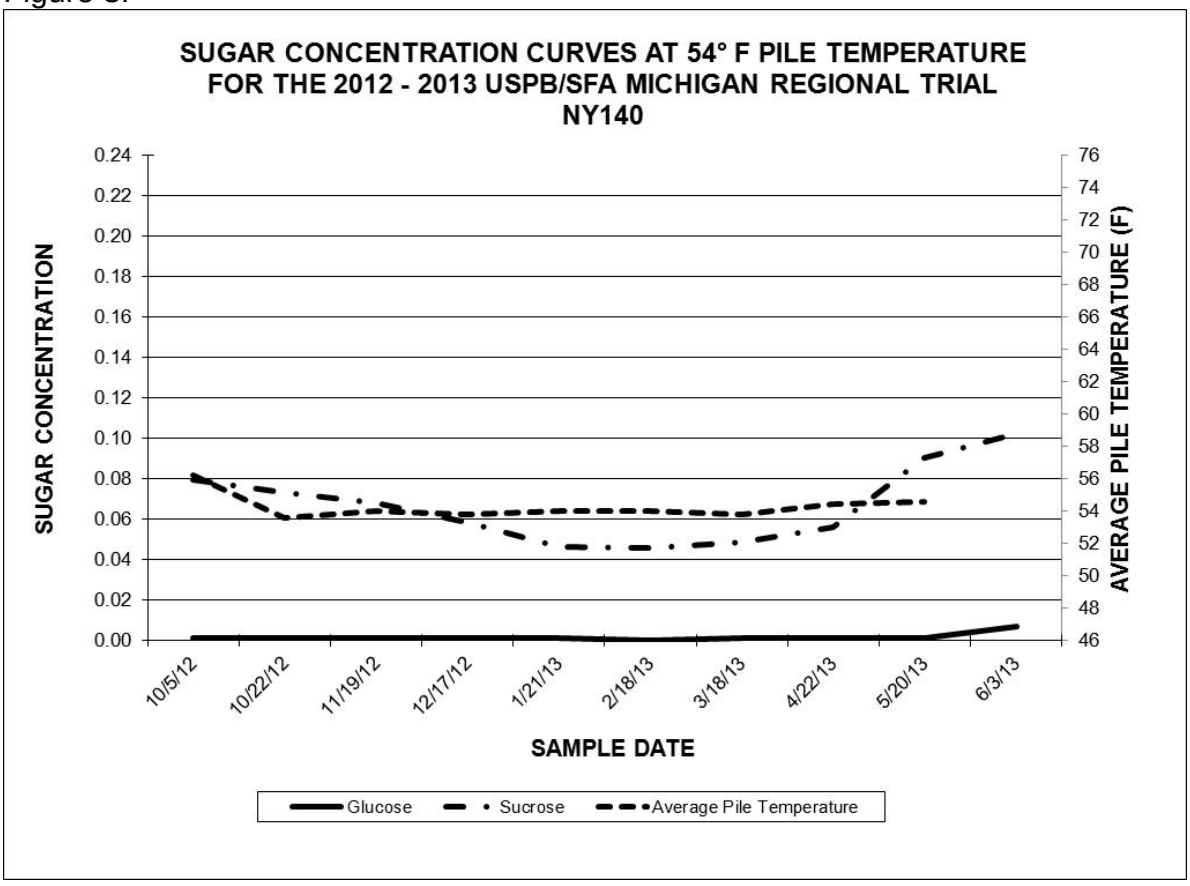

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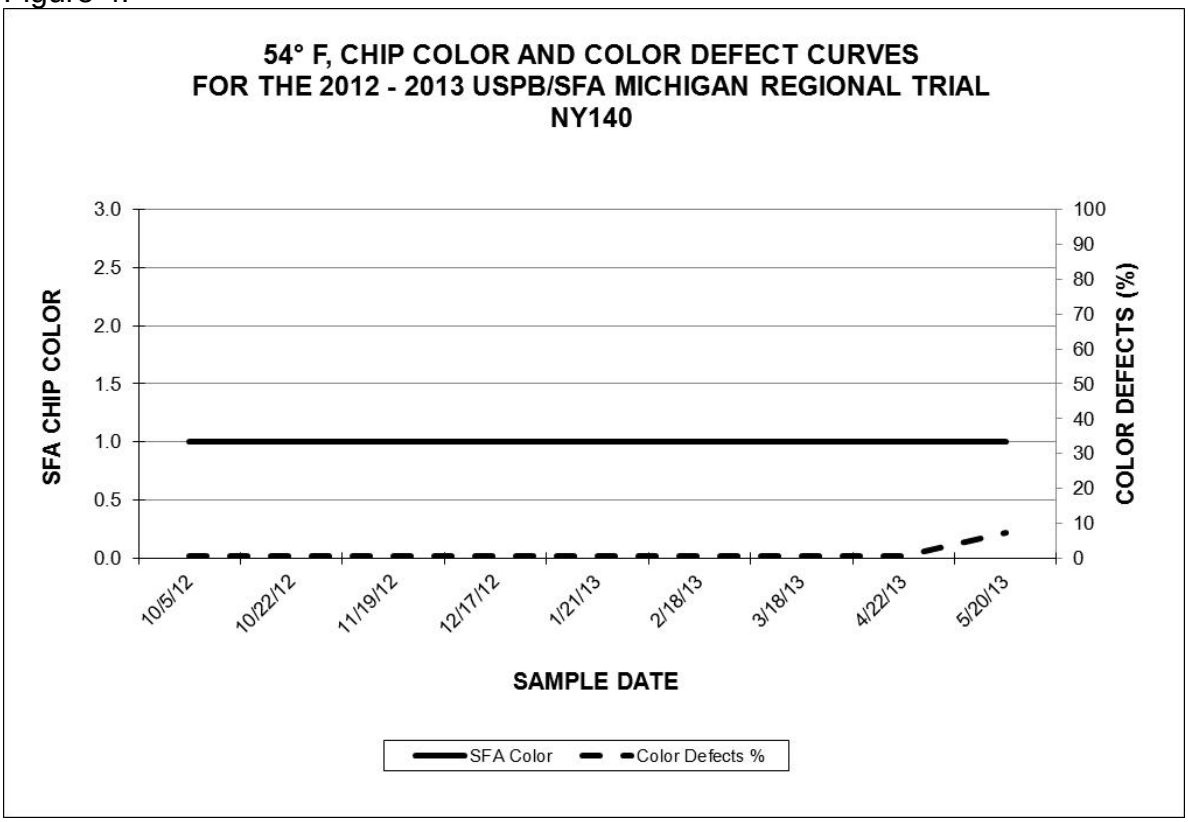

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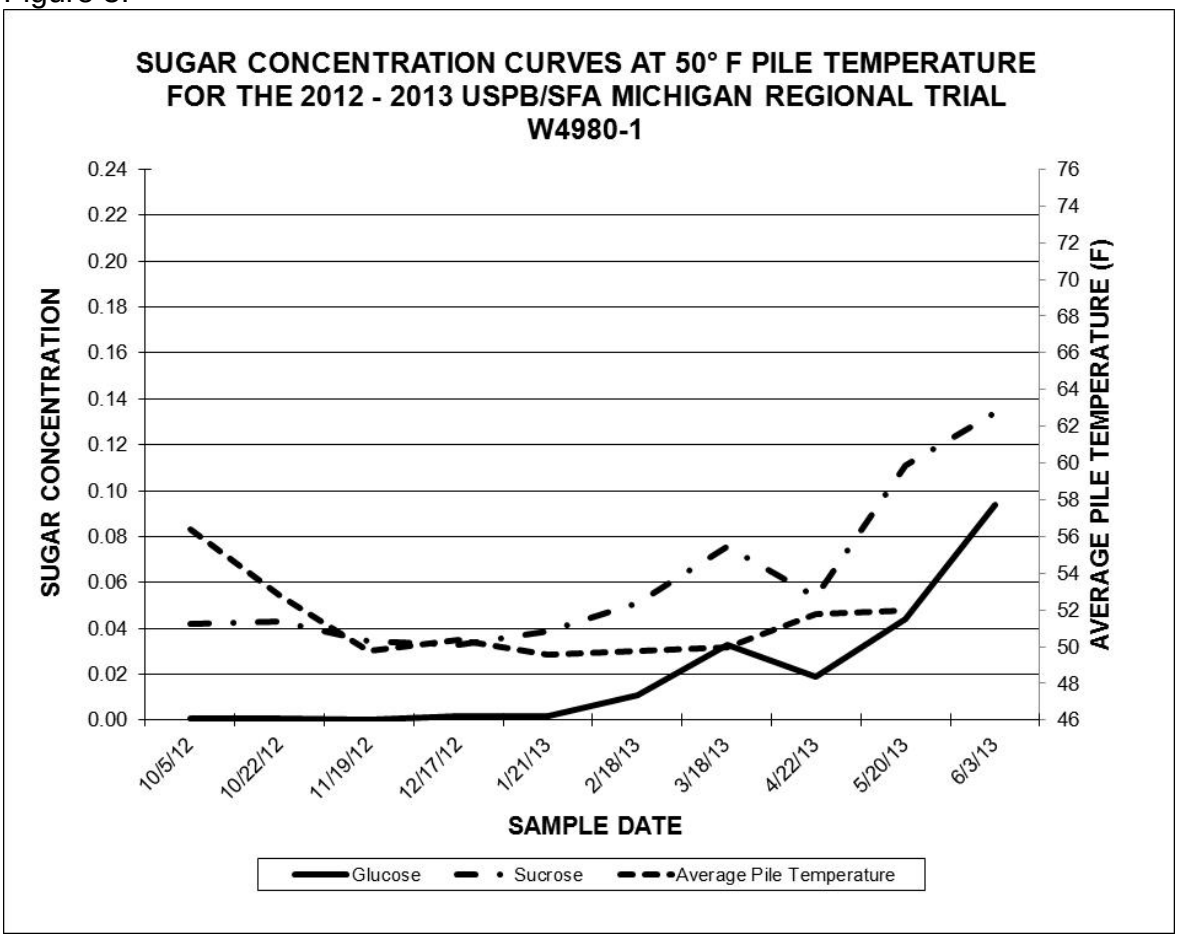

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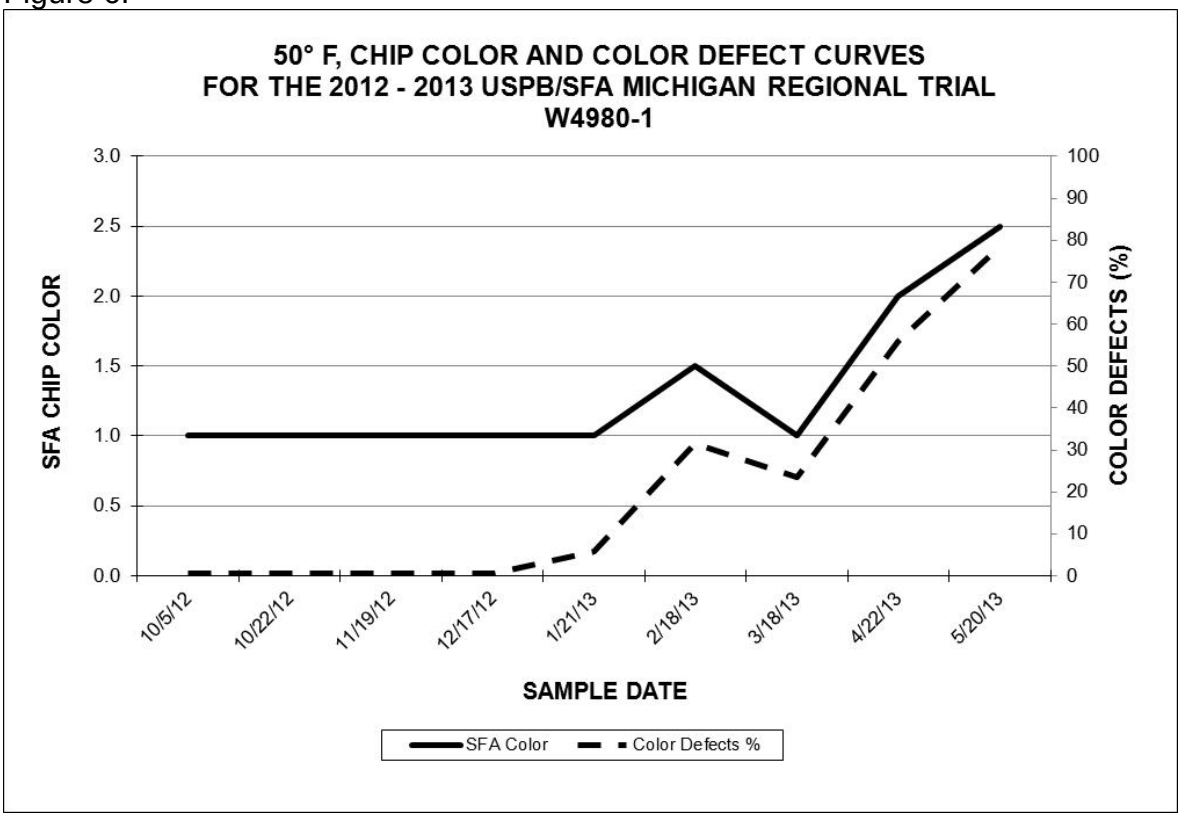

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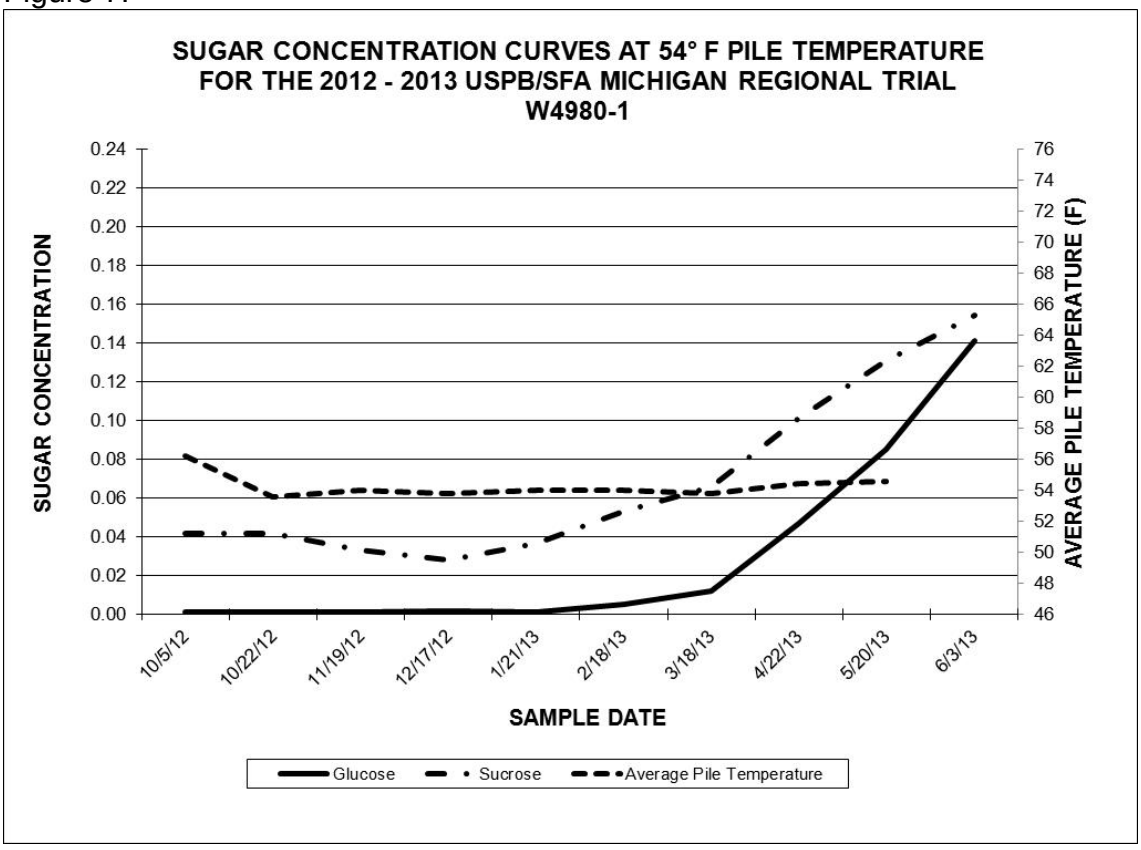

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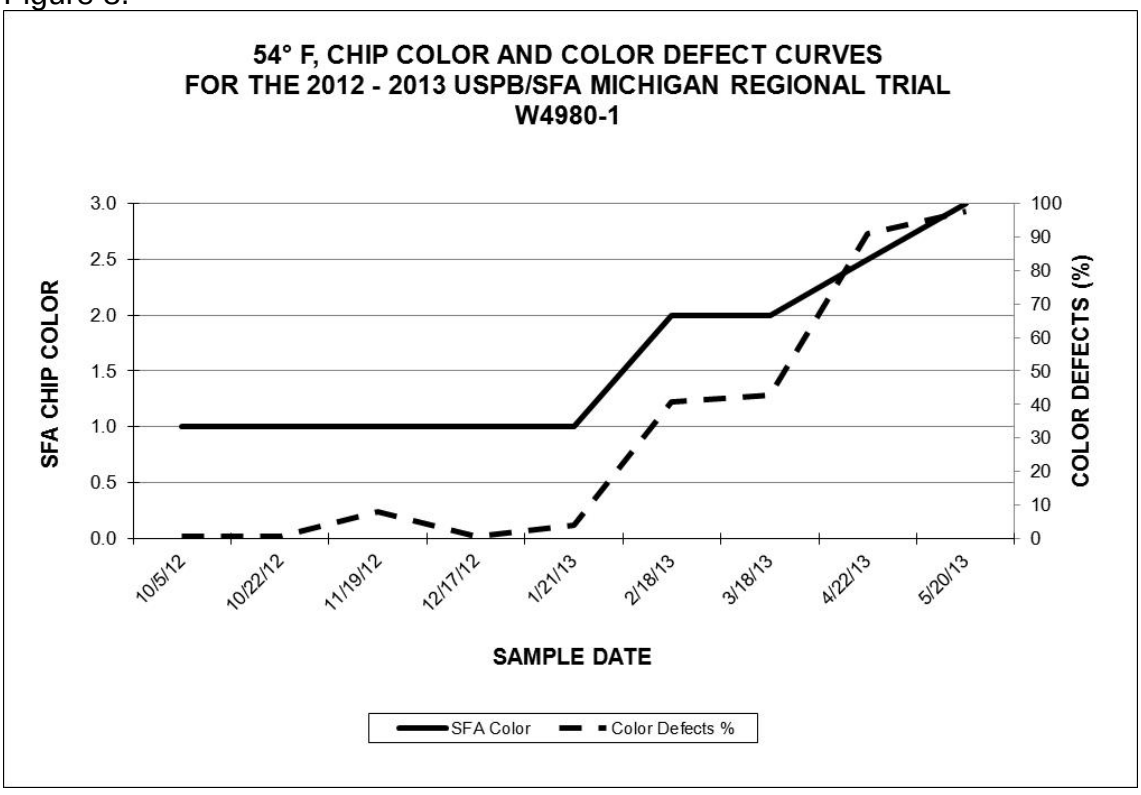

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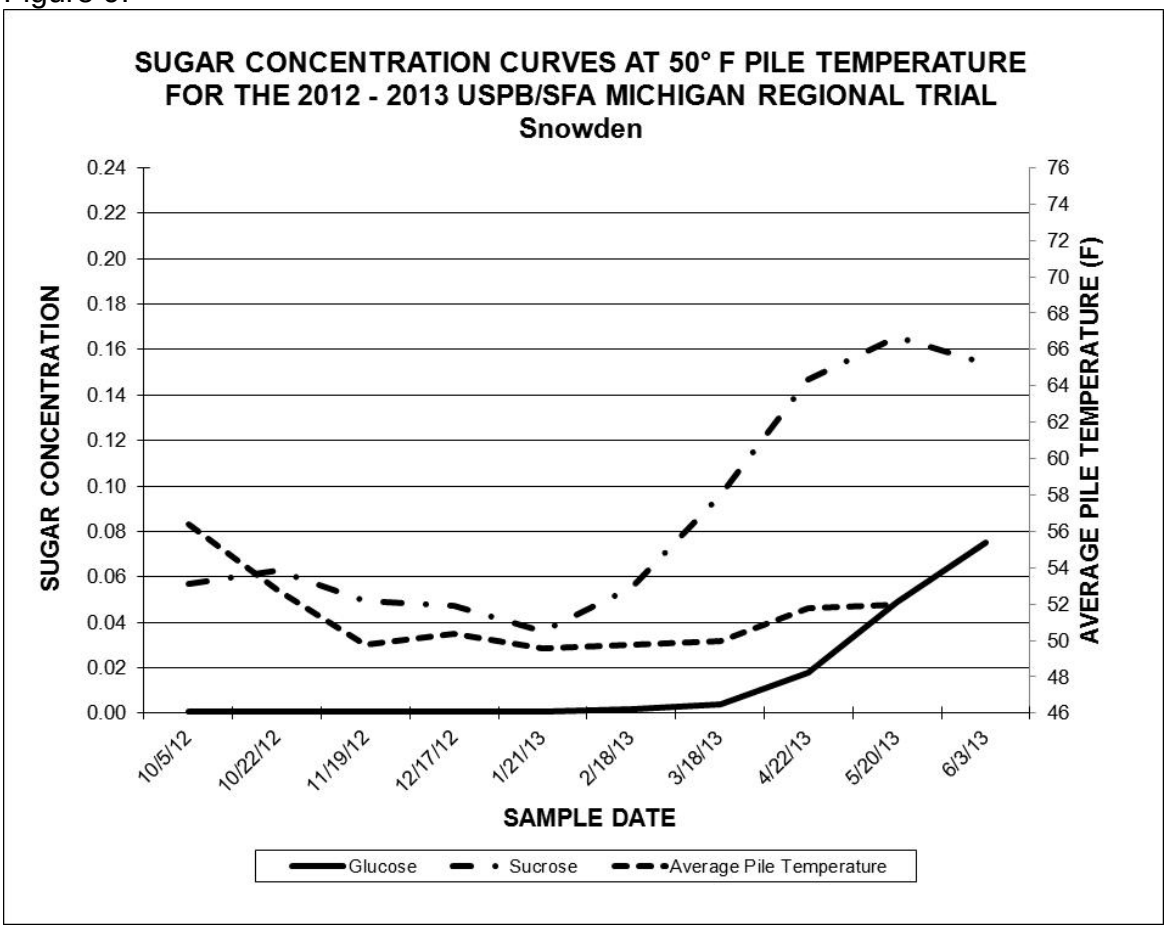

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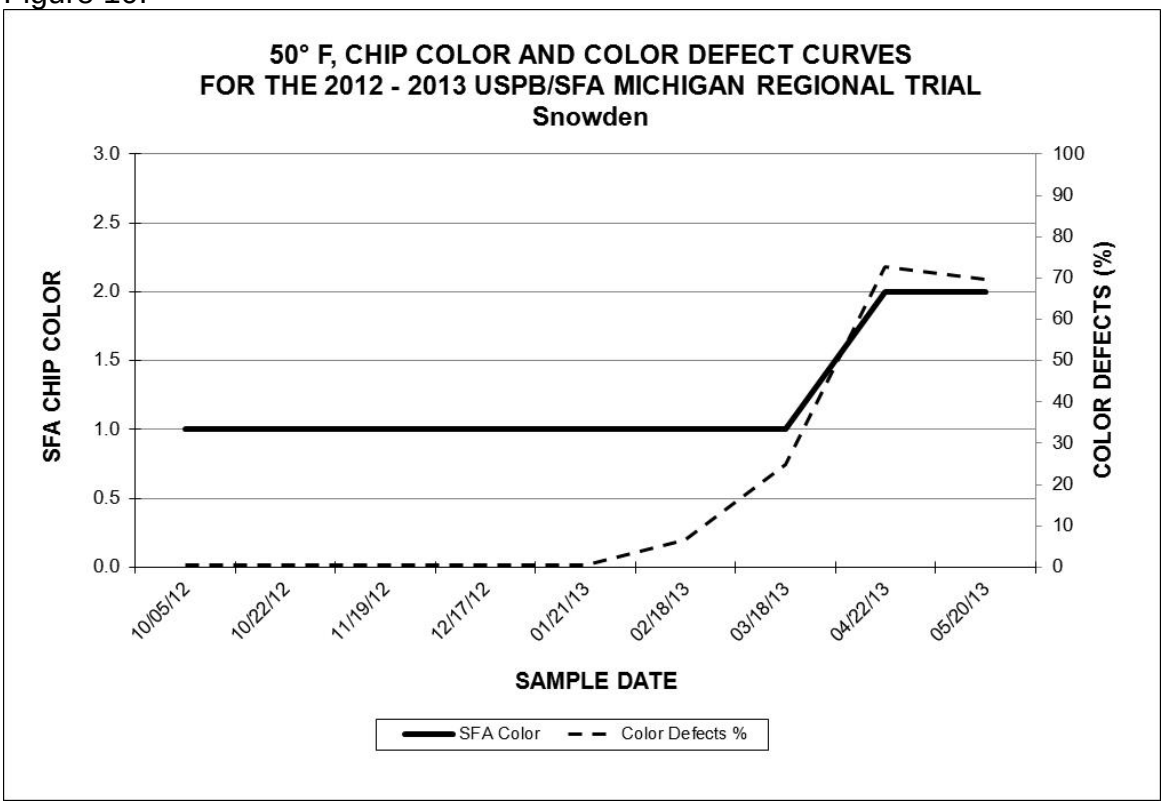

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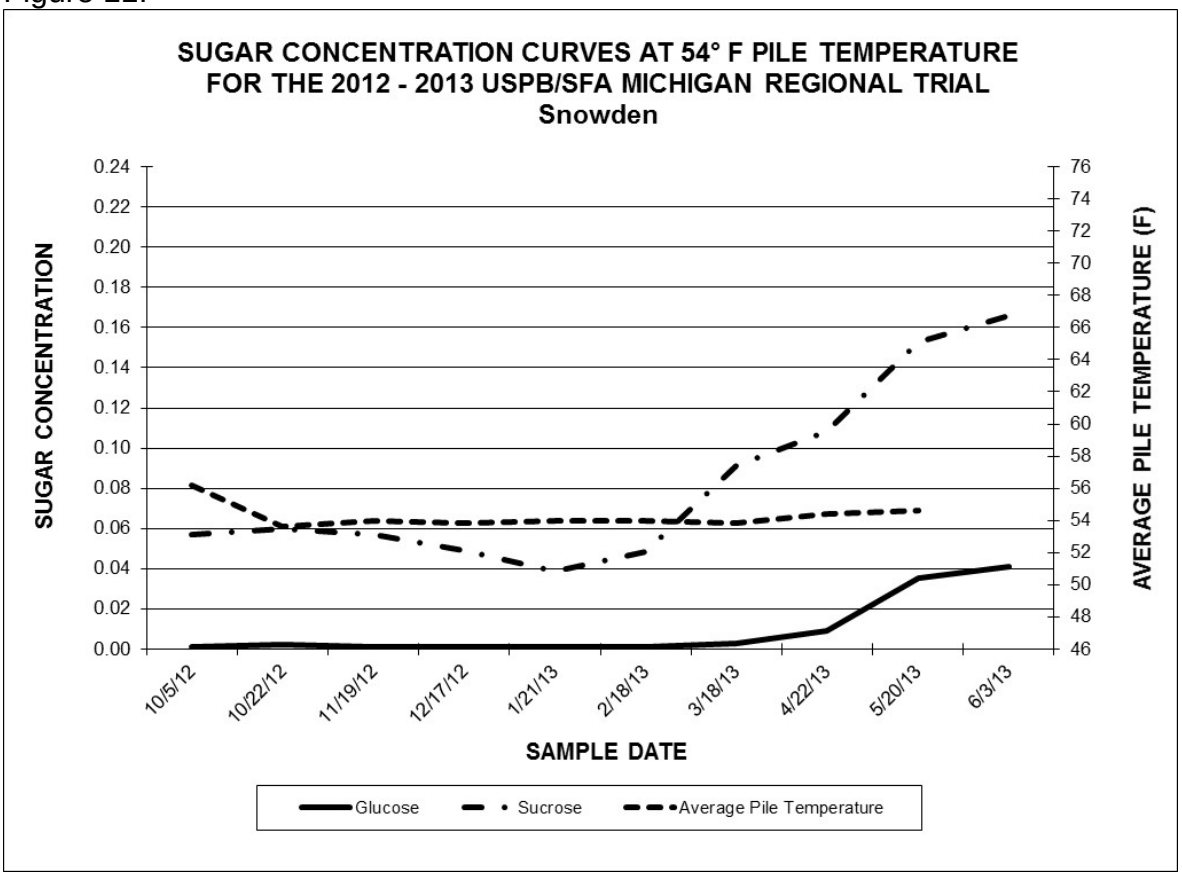

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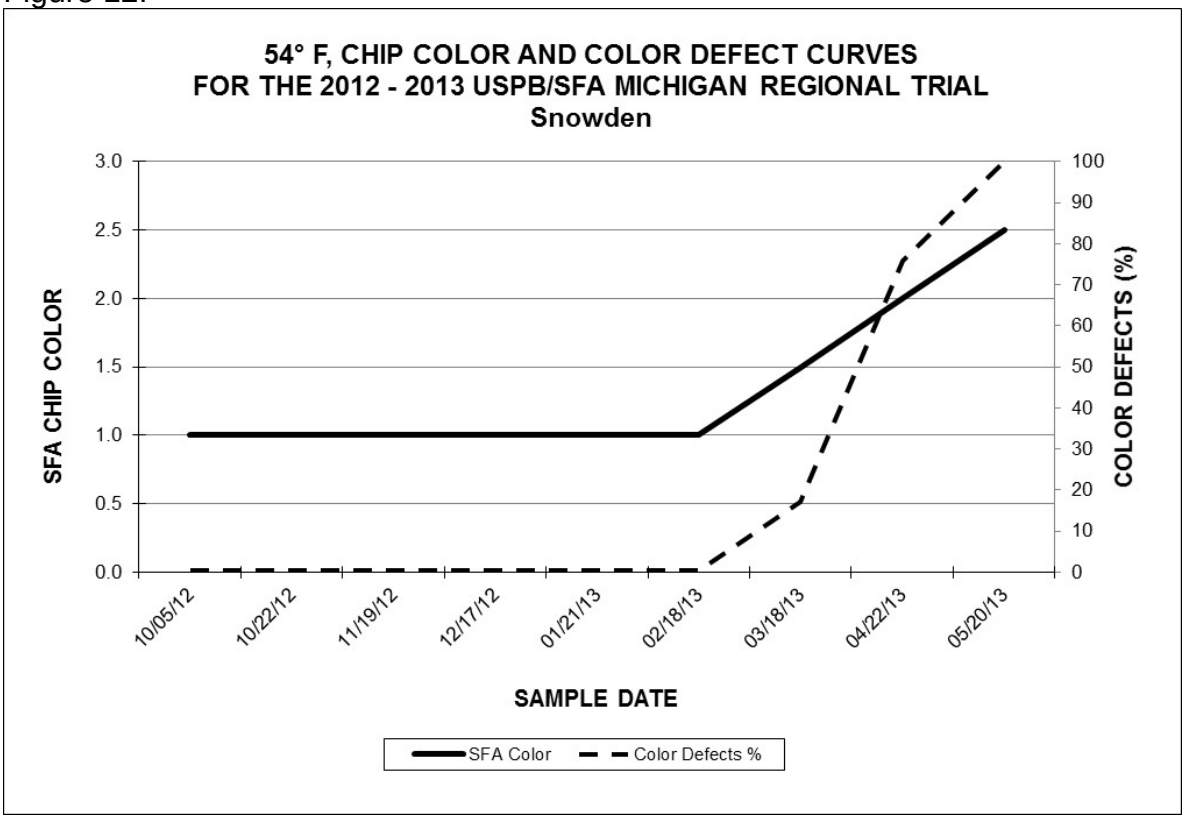

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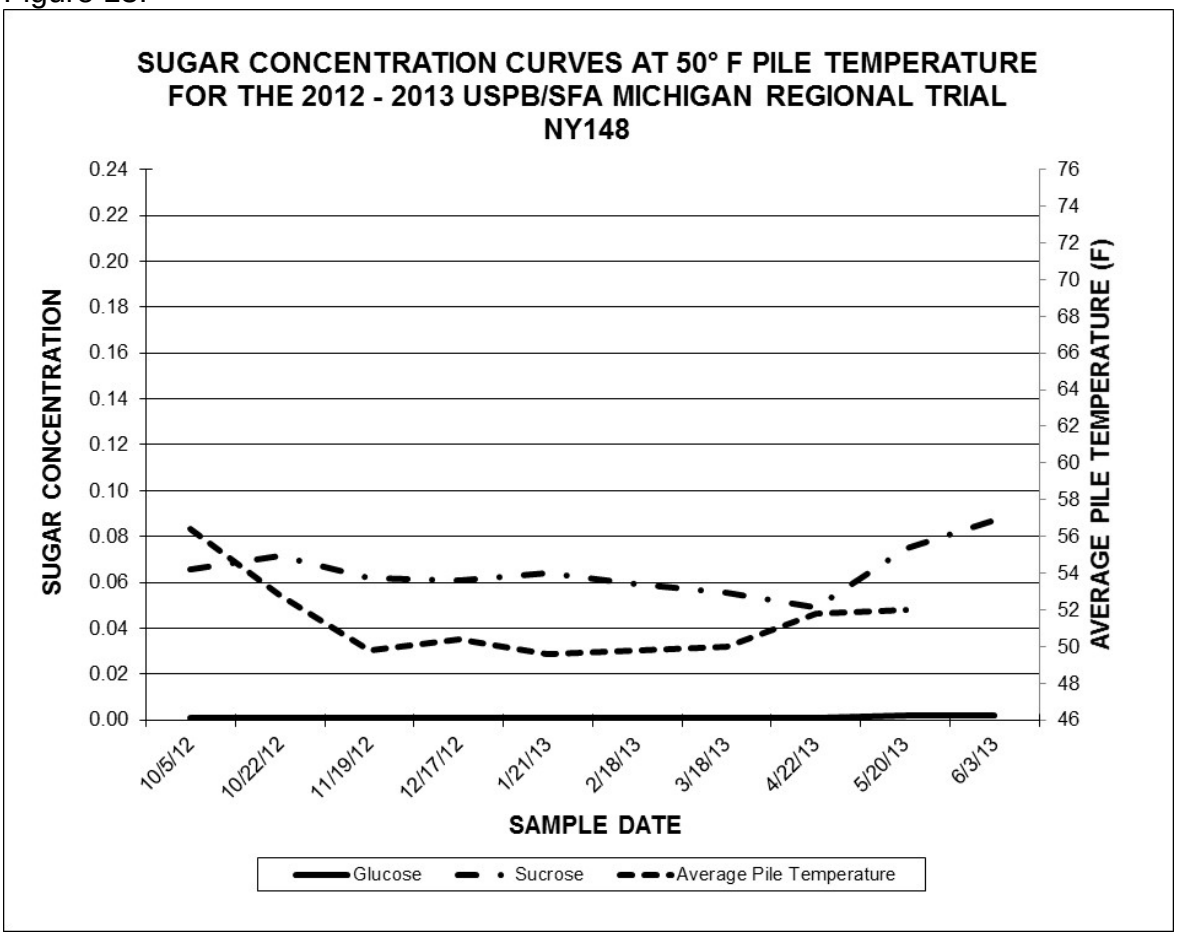

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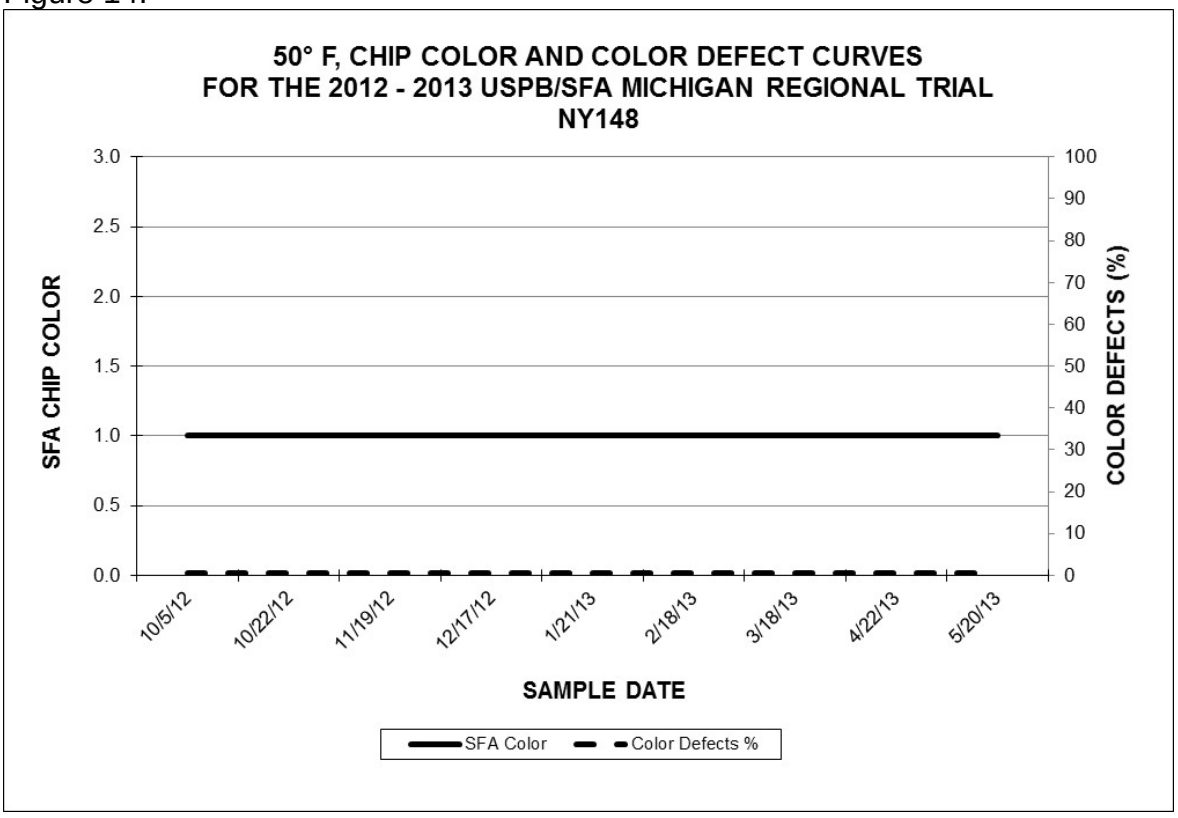

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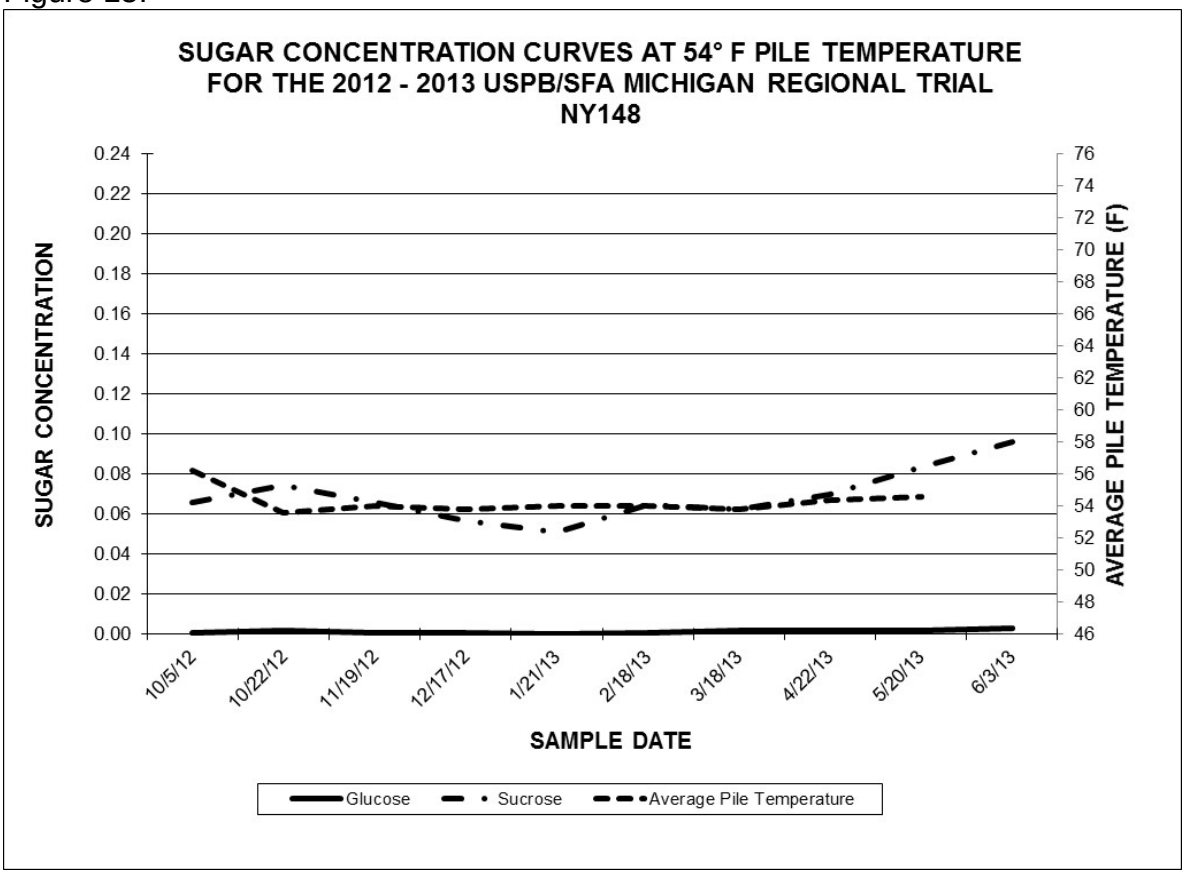

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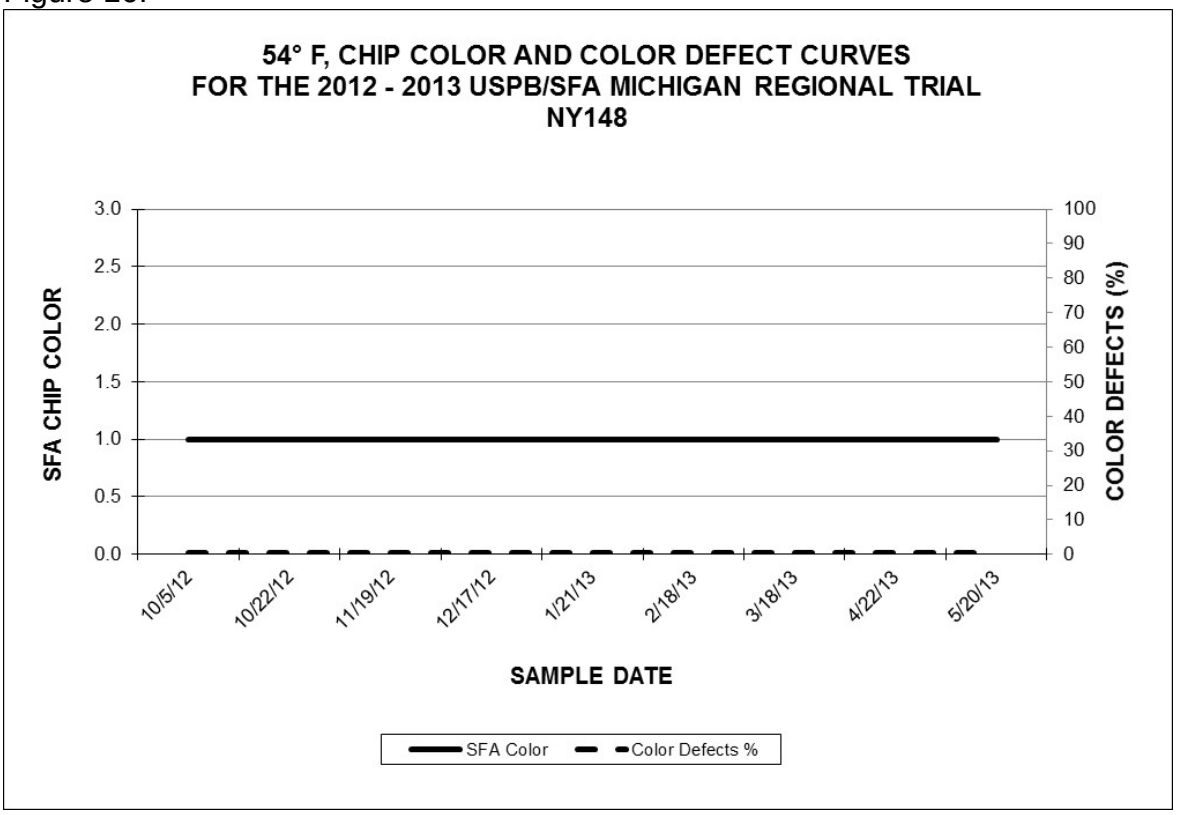

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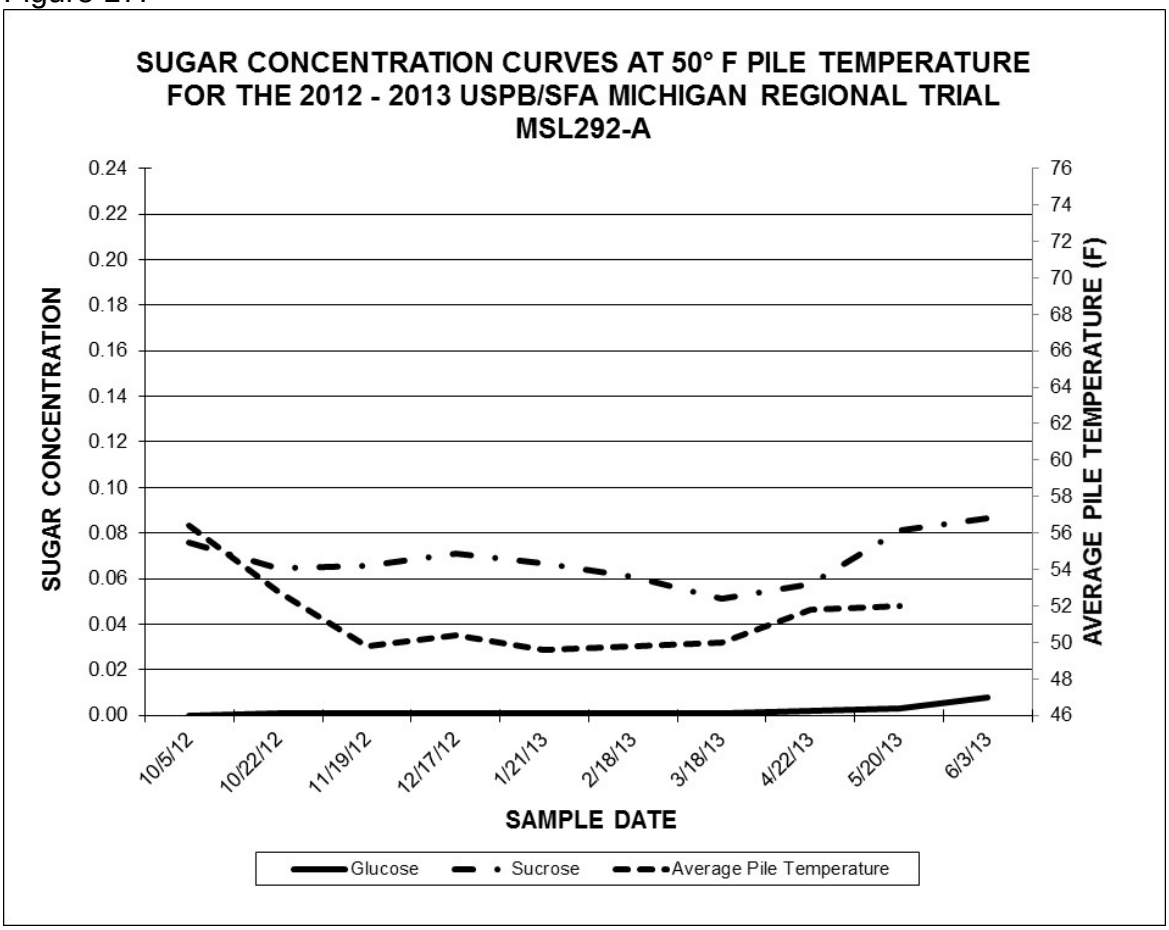

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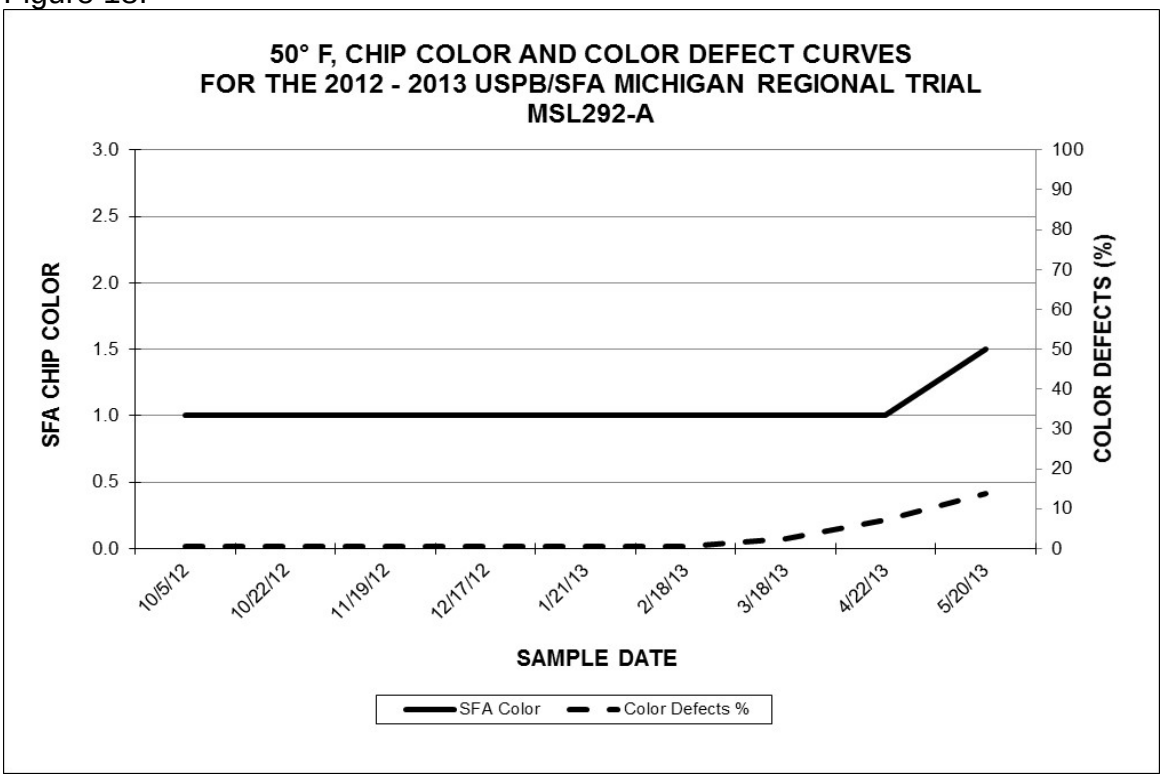

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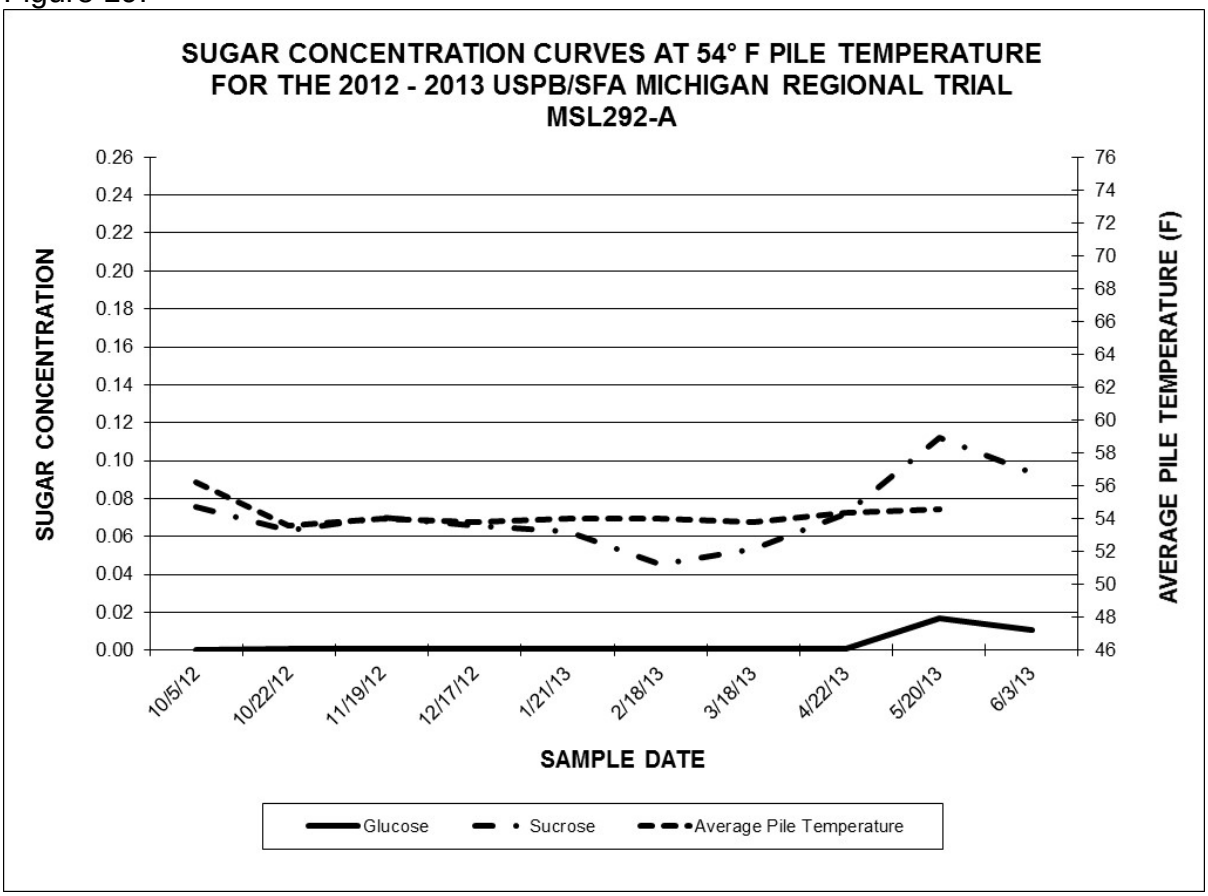

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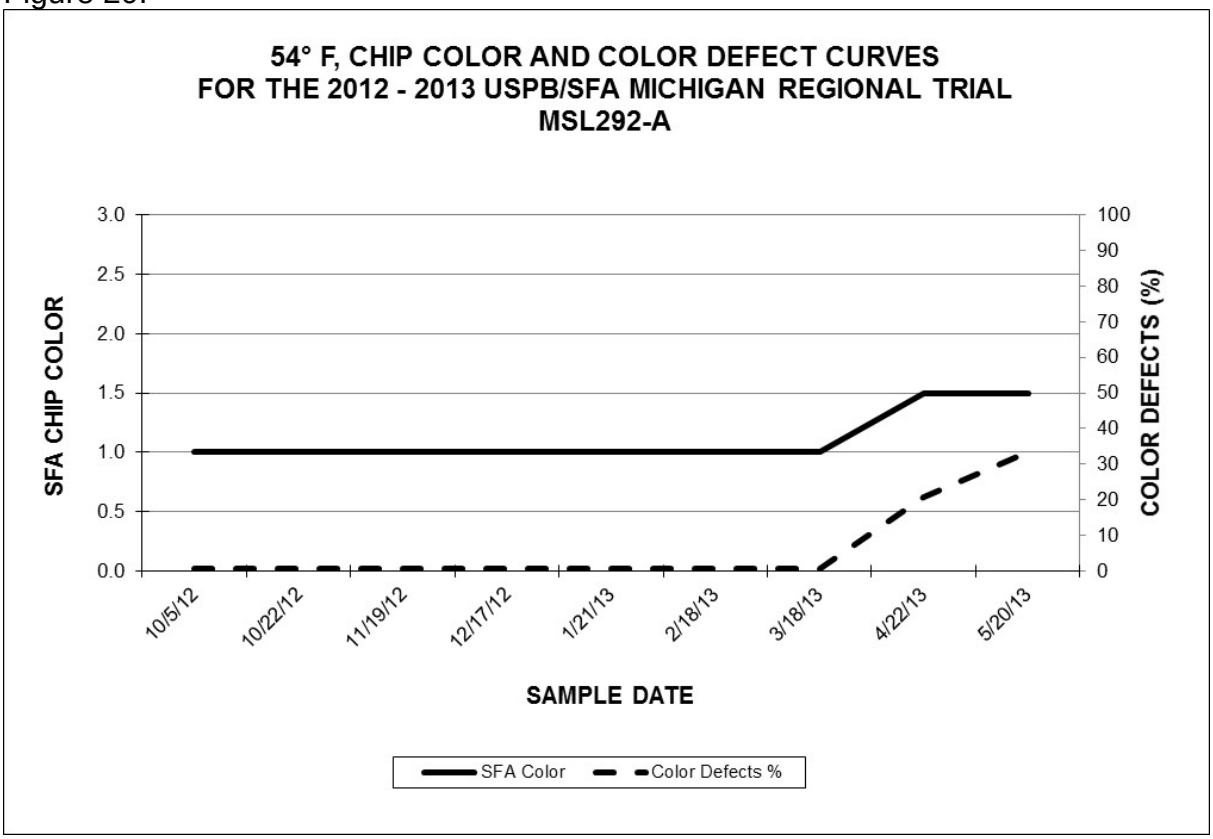

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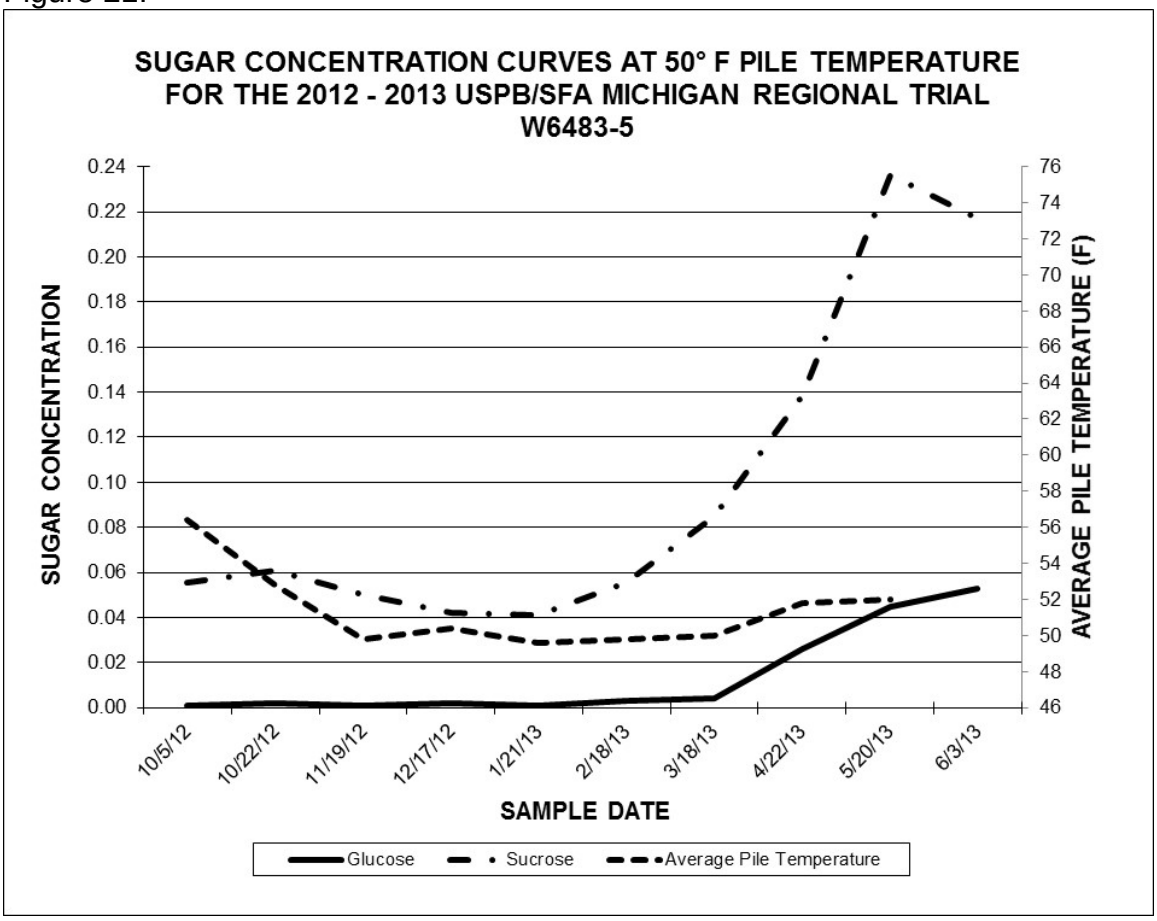

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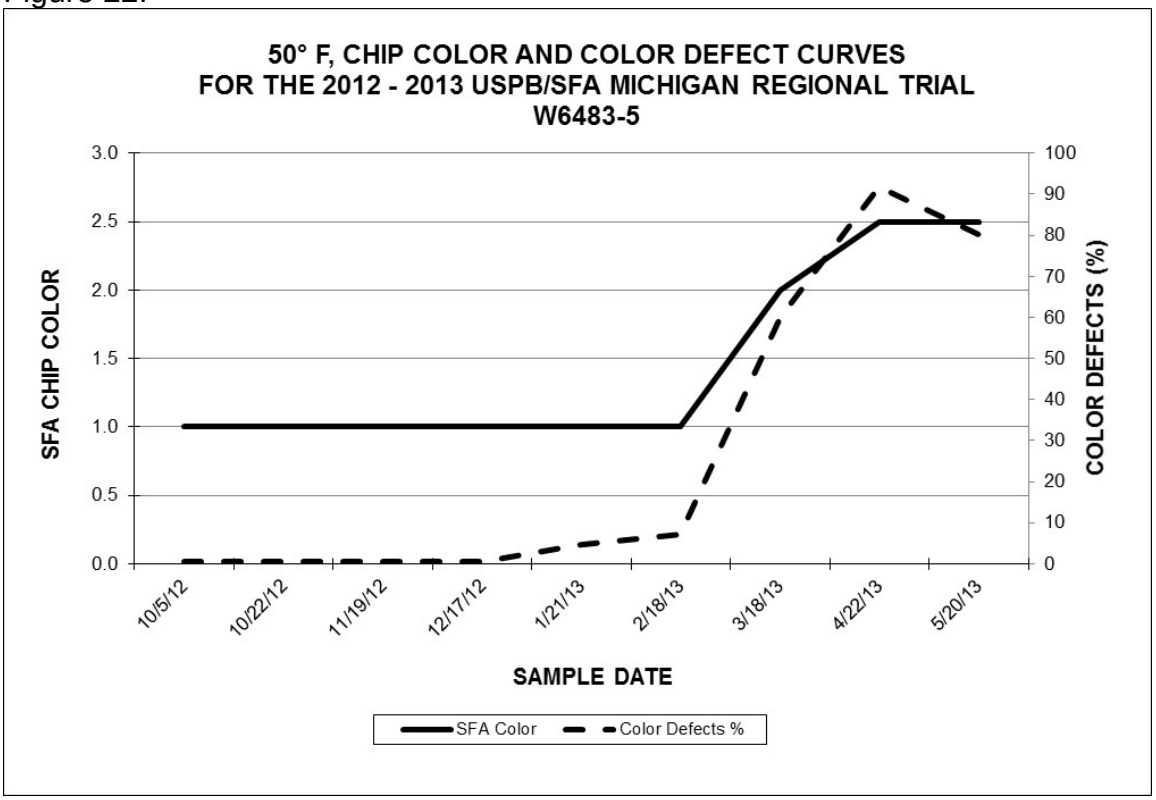

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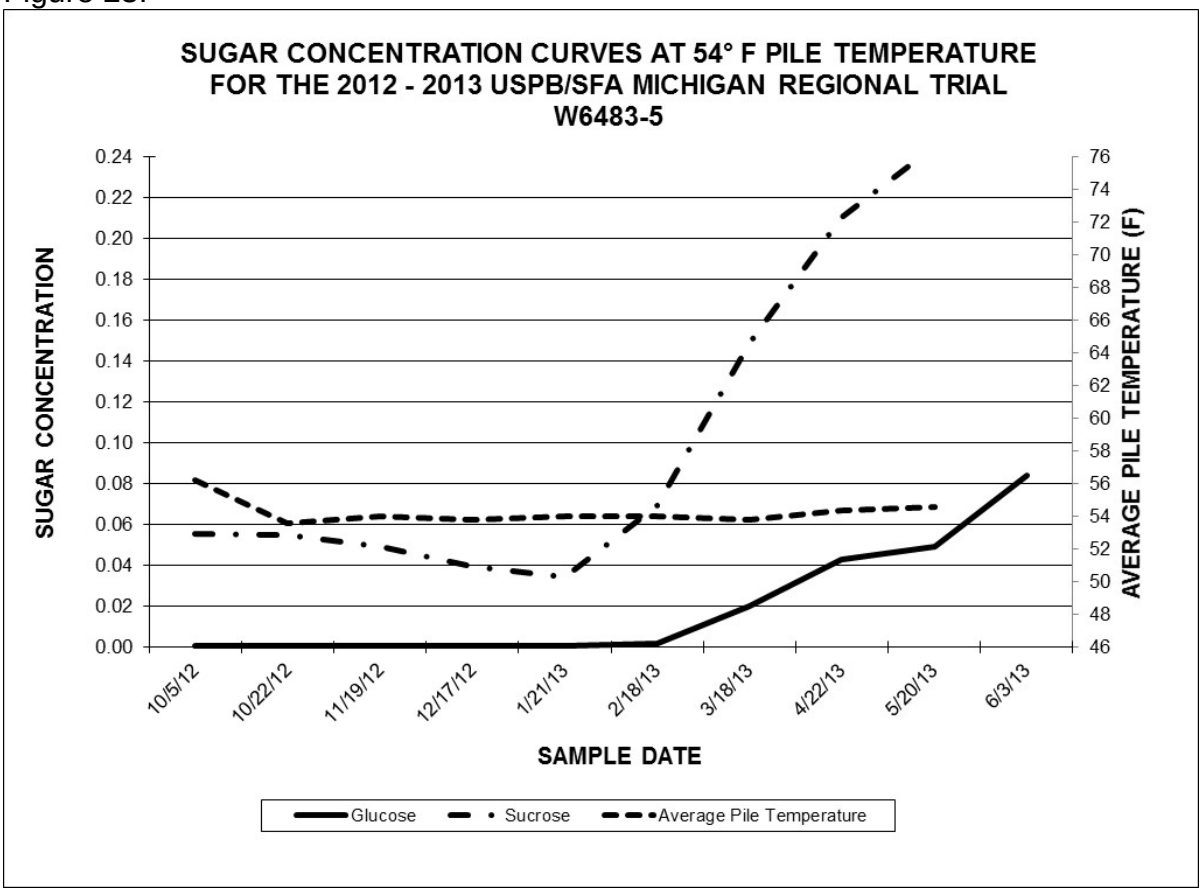

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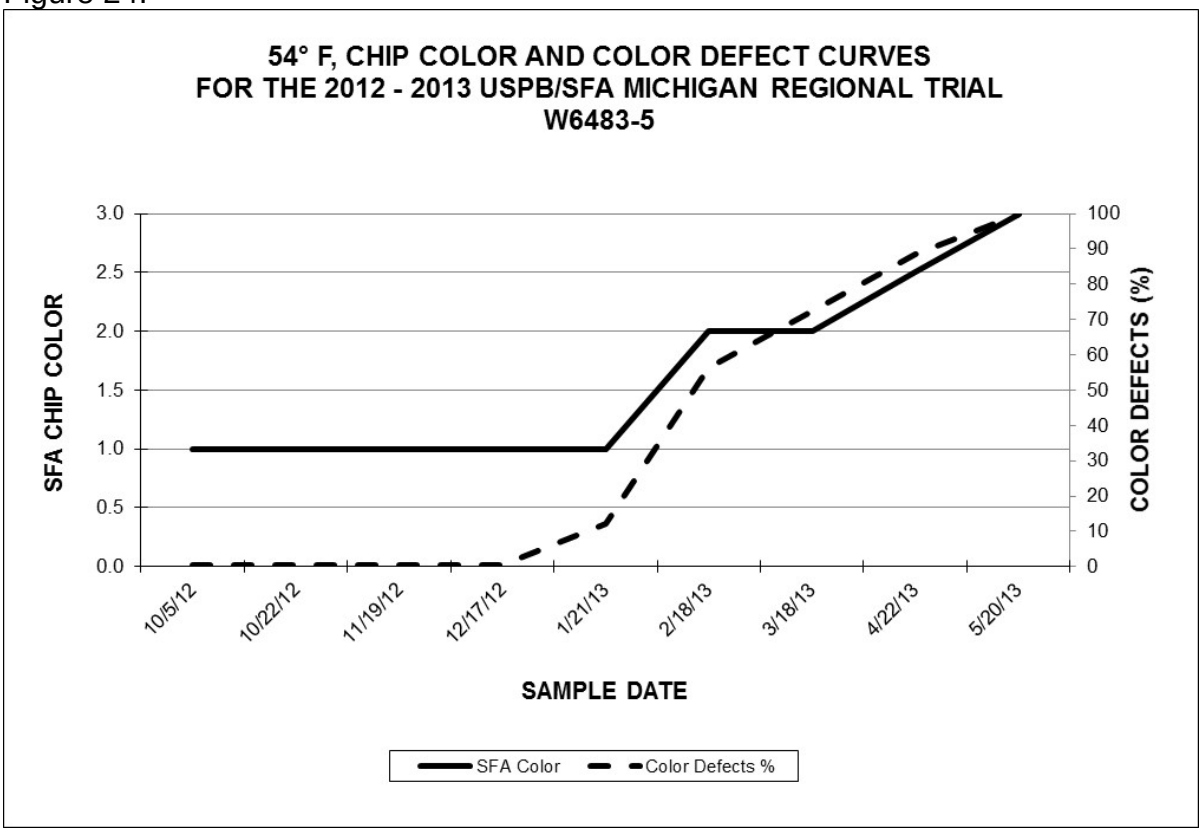

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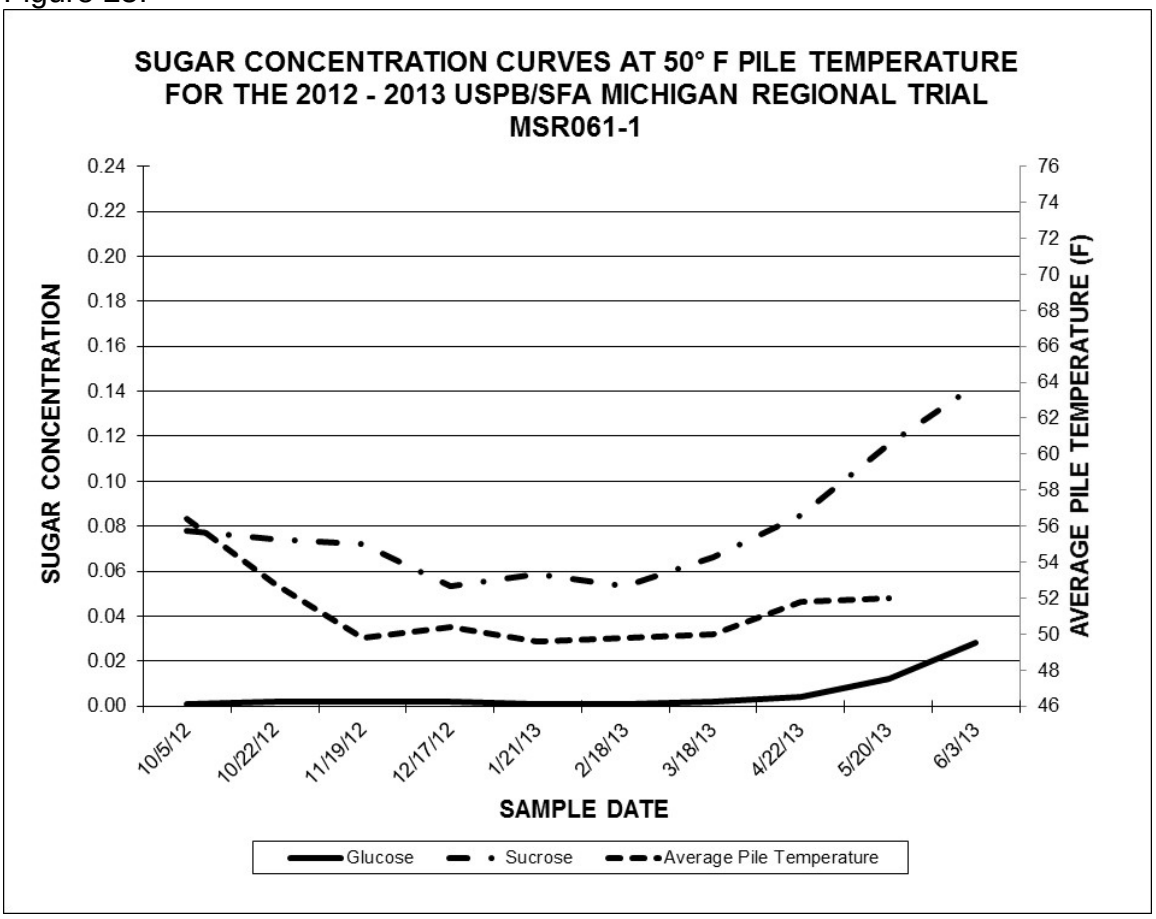
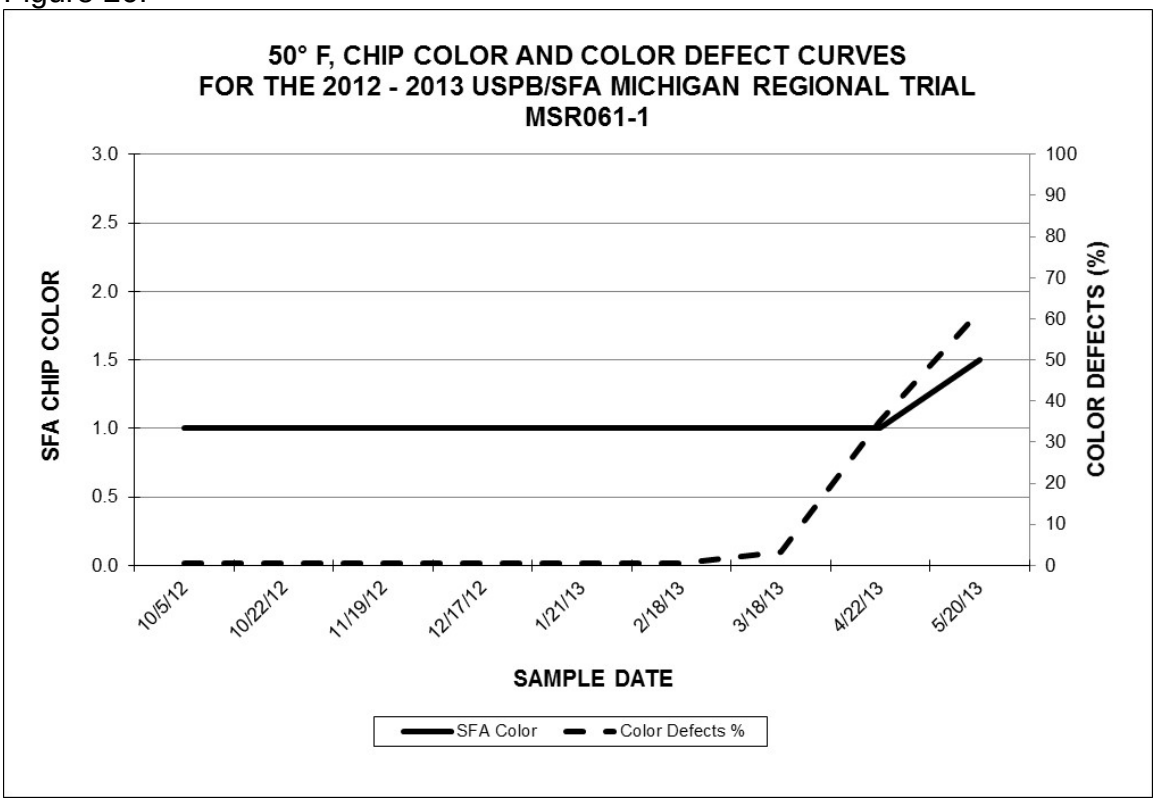


Figure 26.



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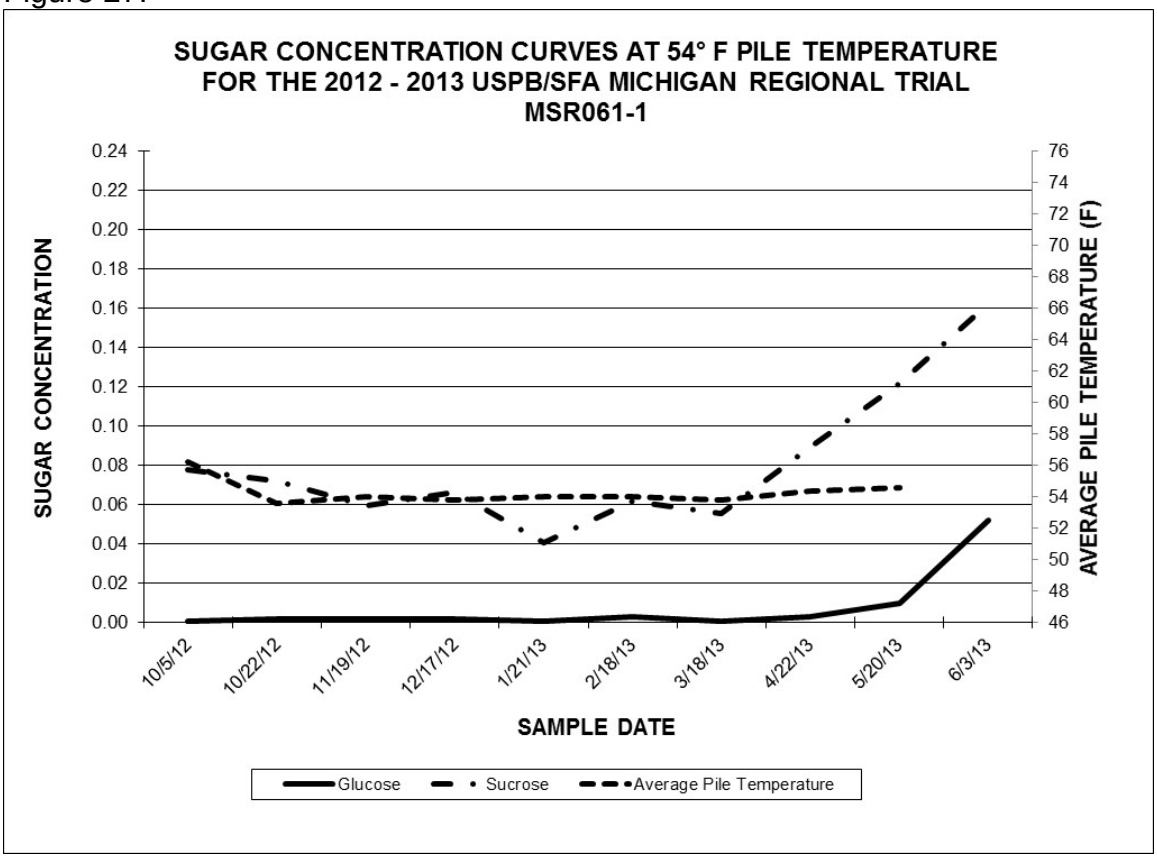

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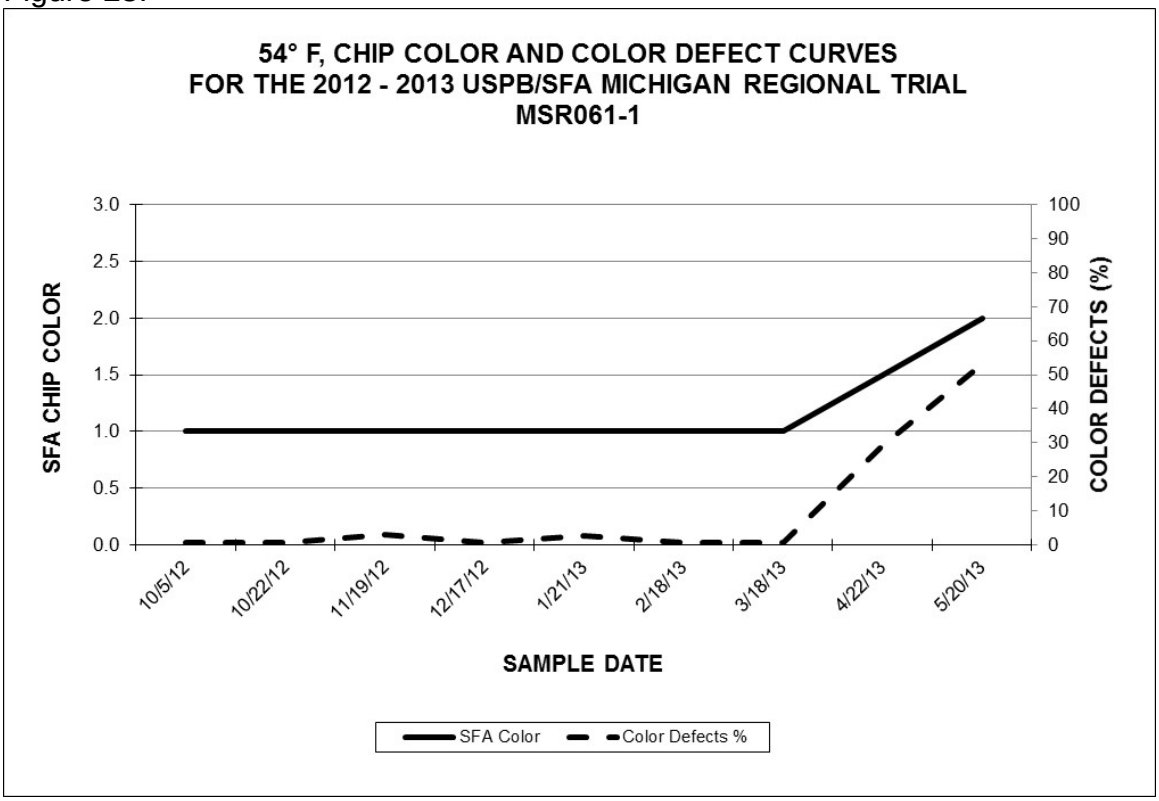

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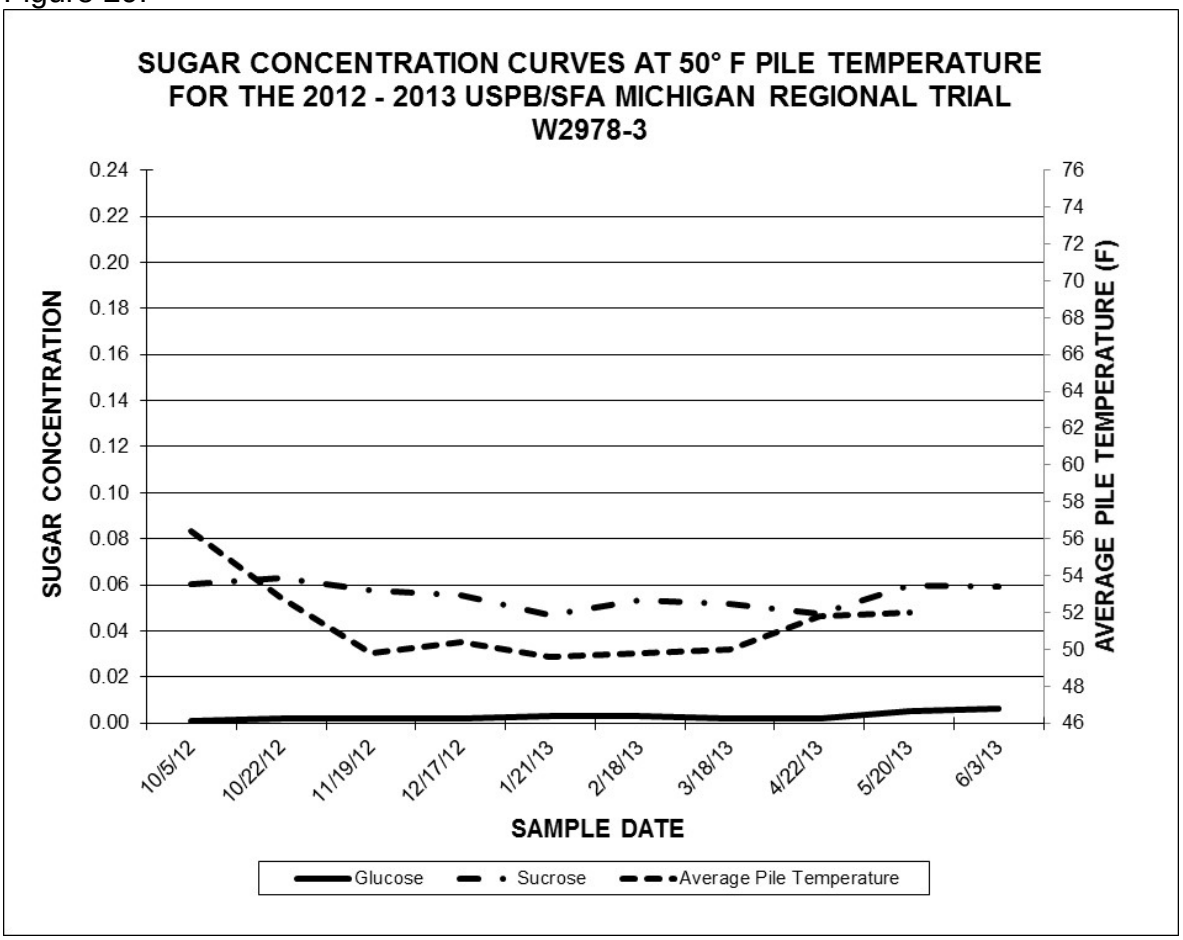

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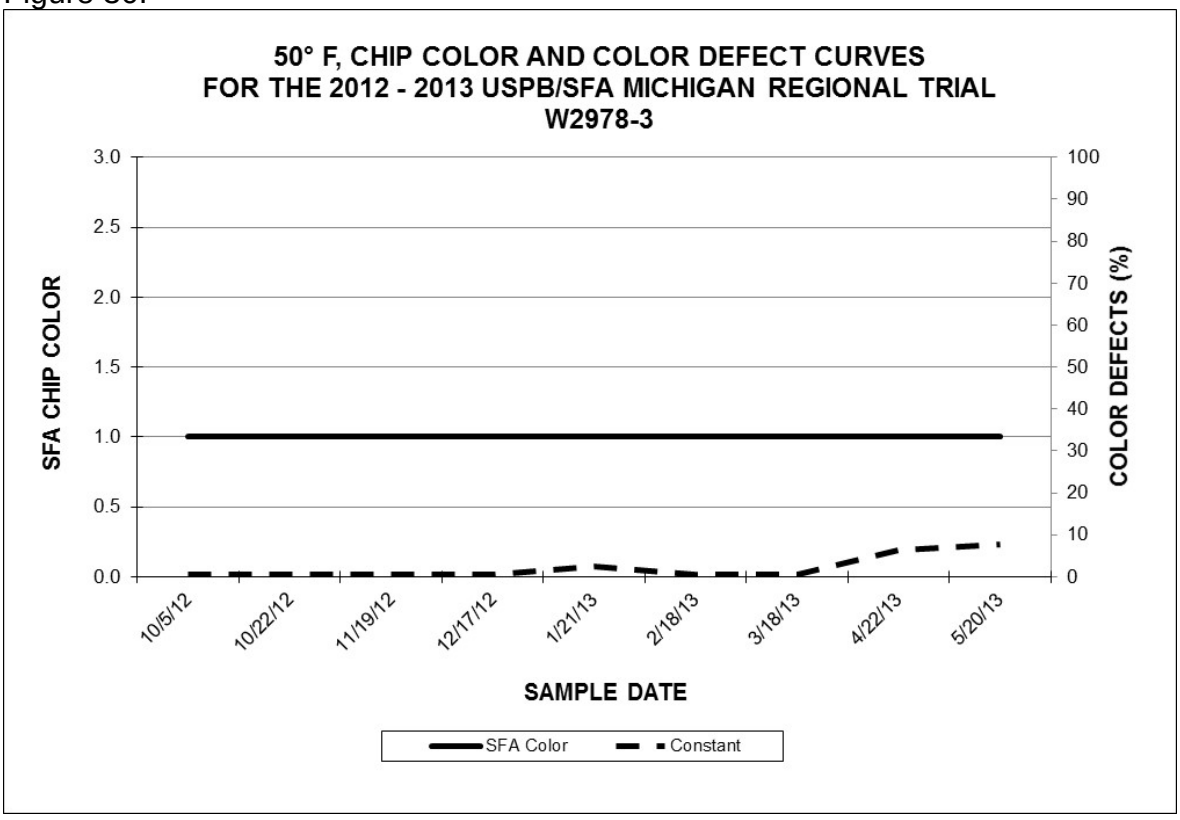

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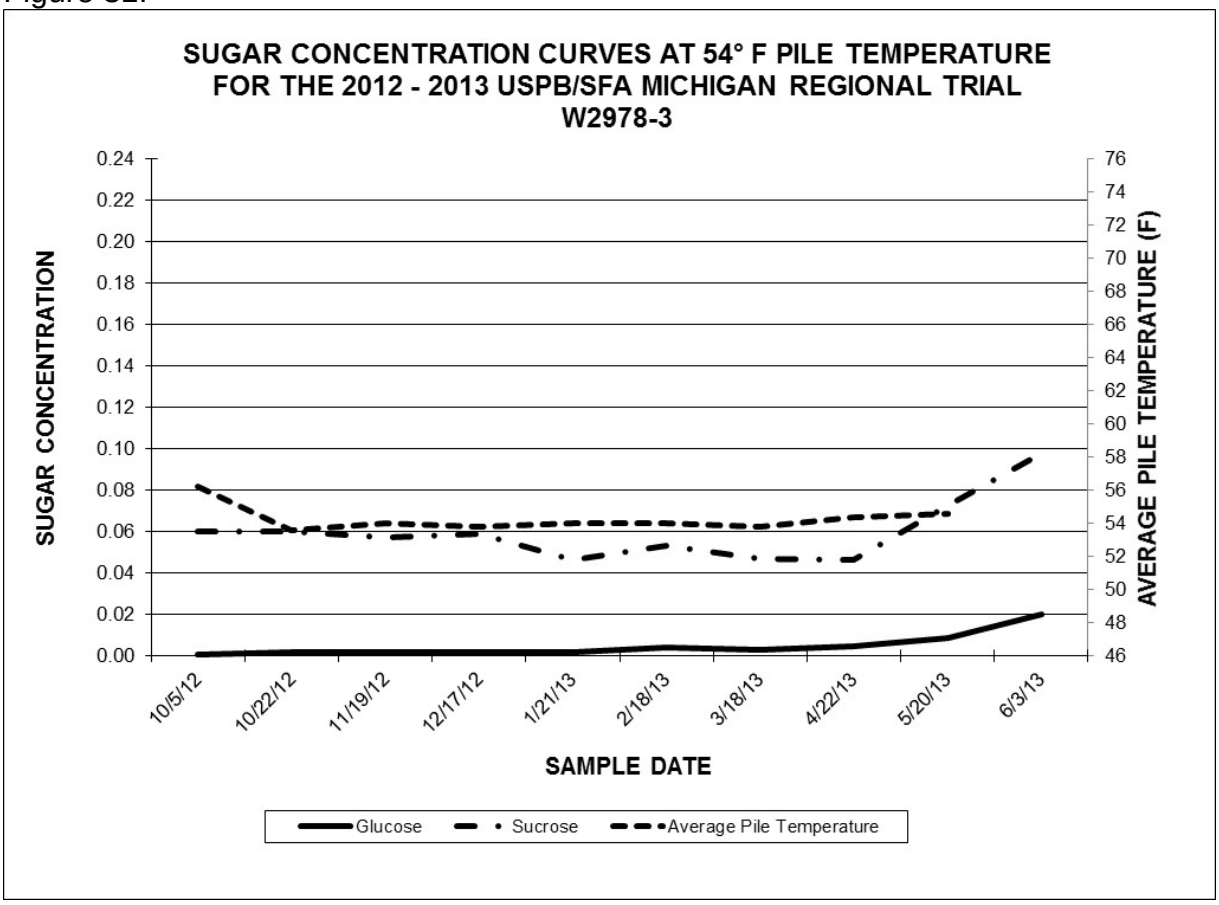

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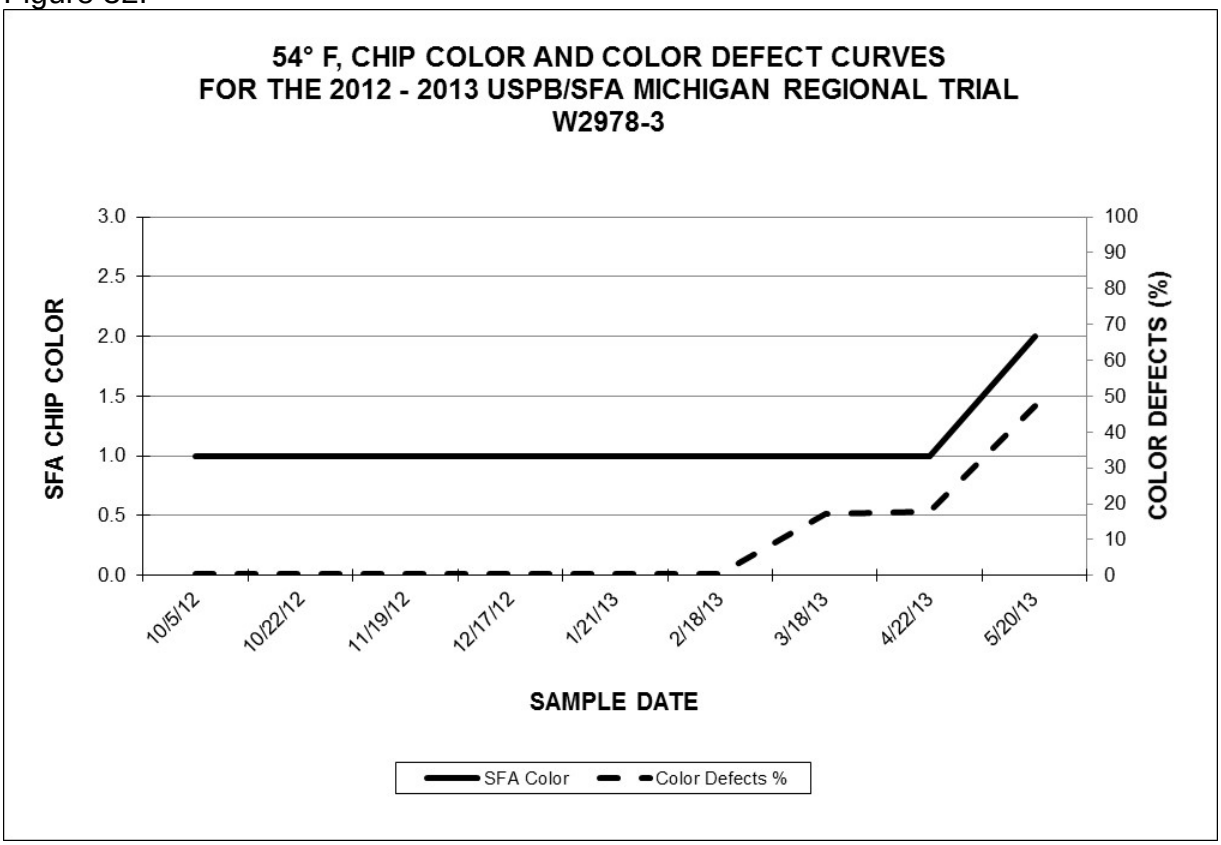

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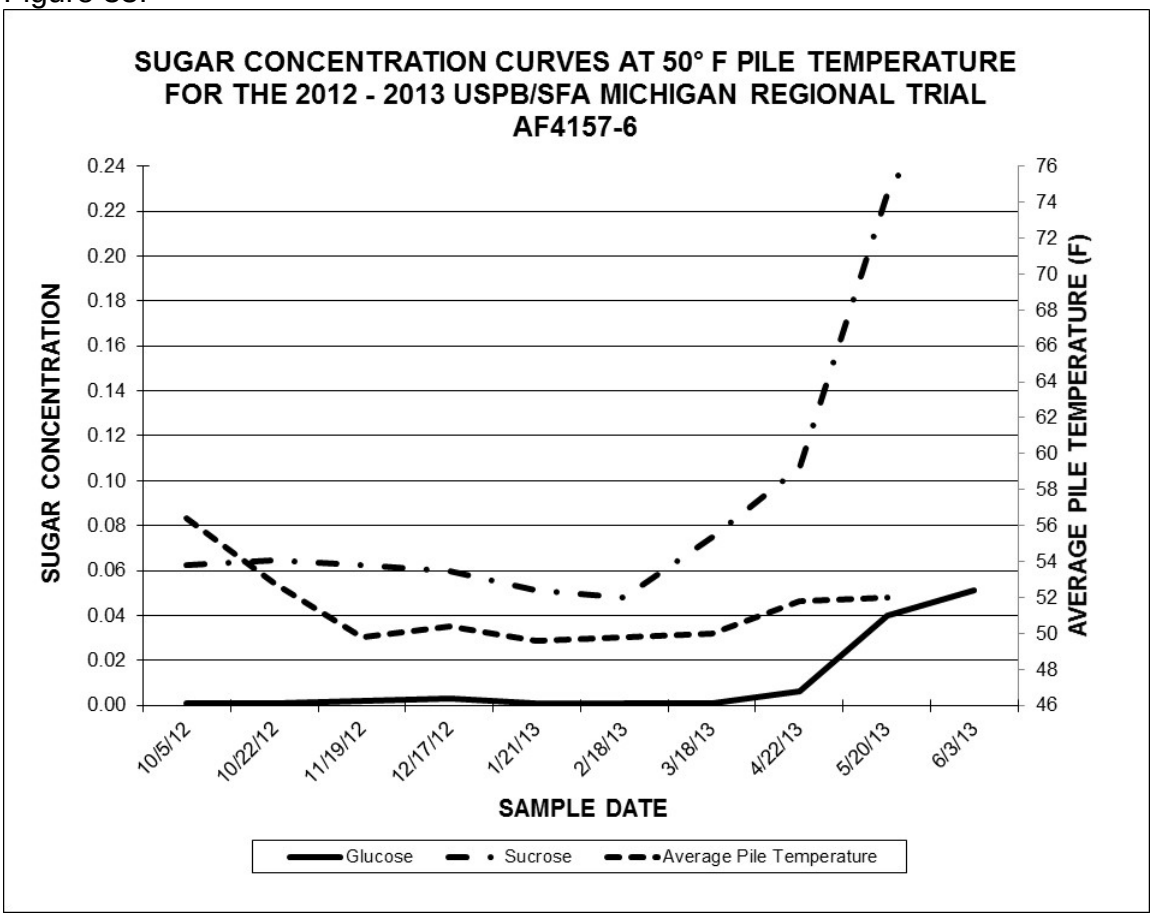

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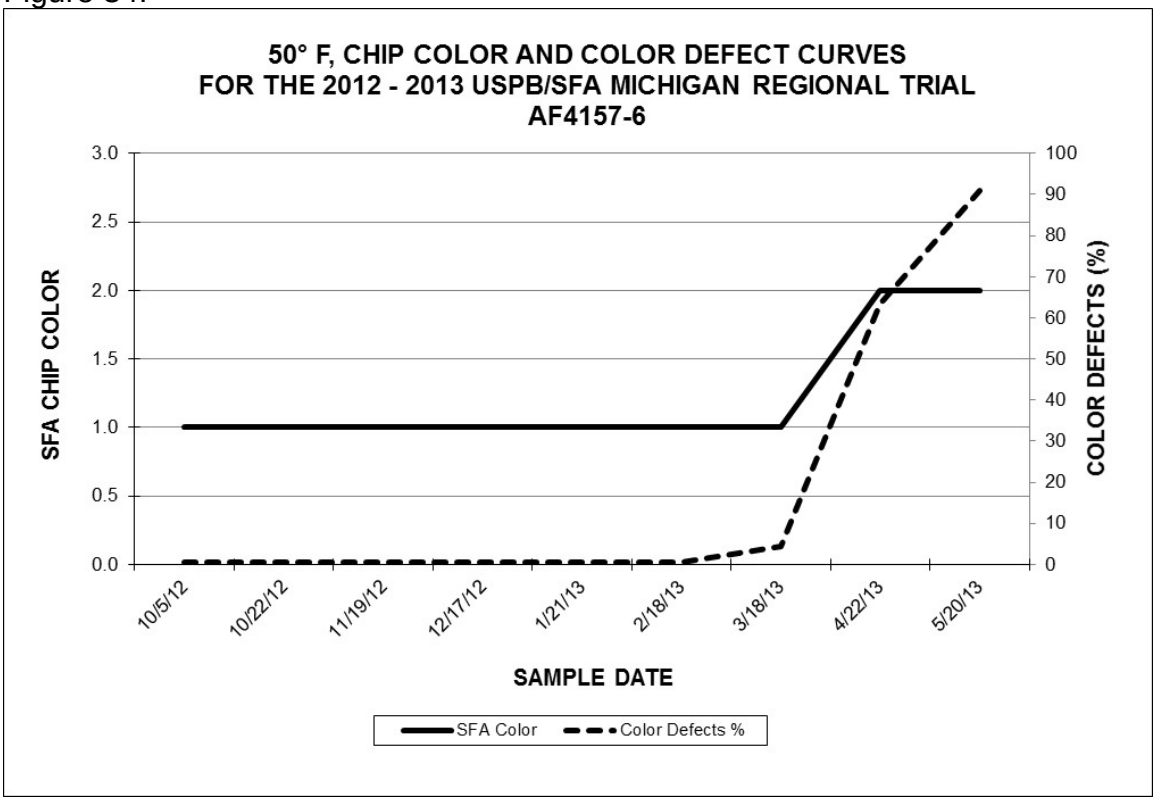

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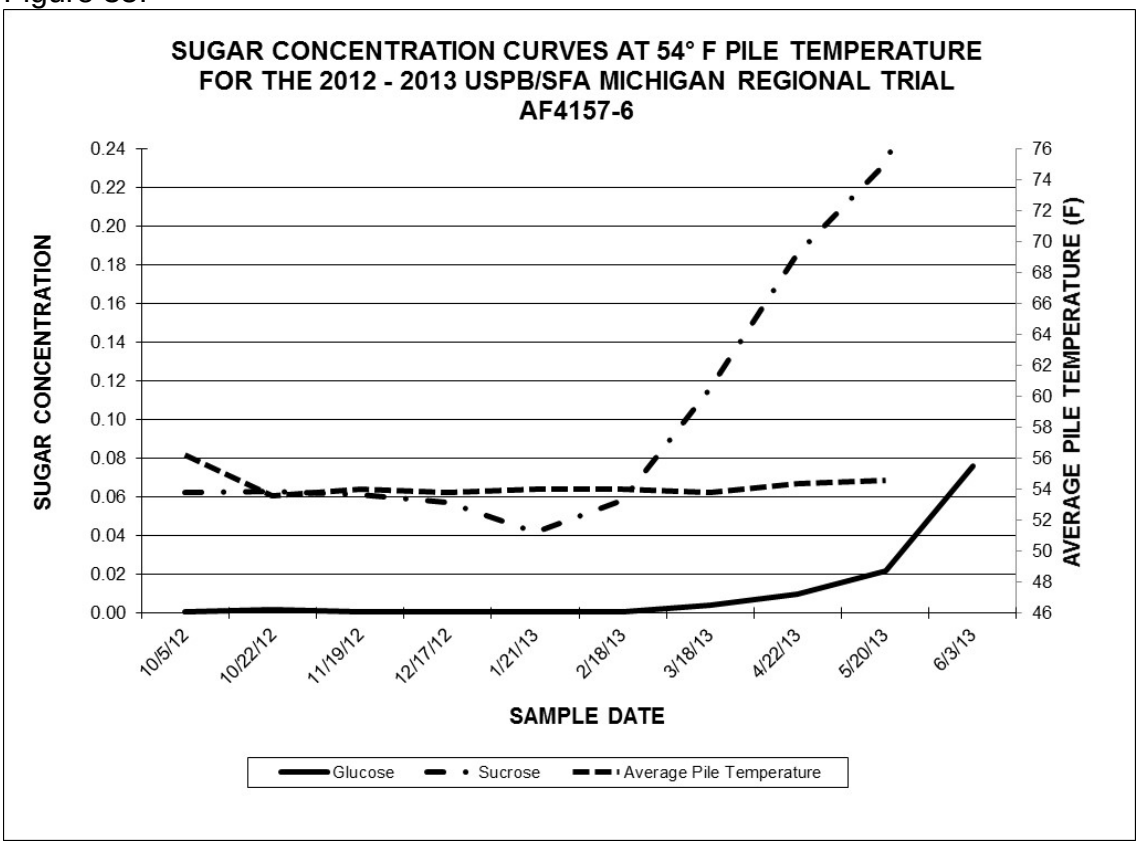

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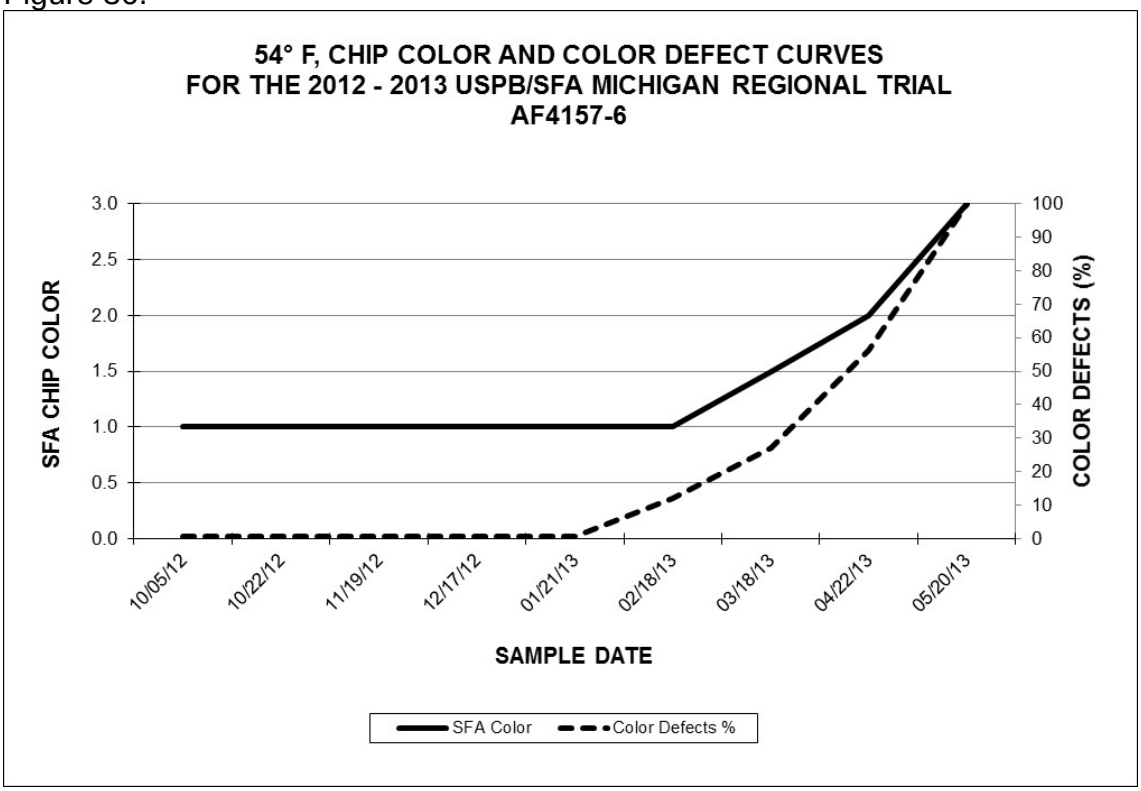

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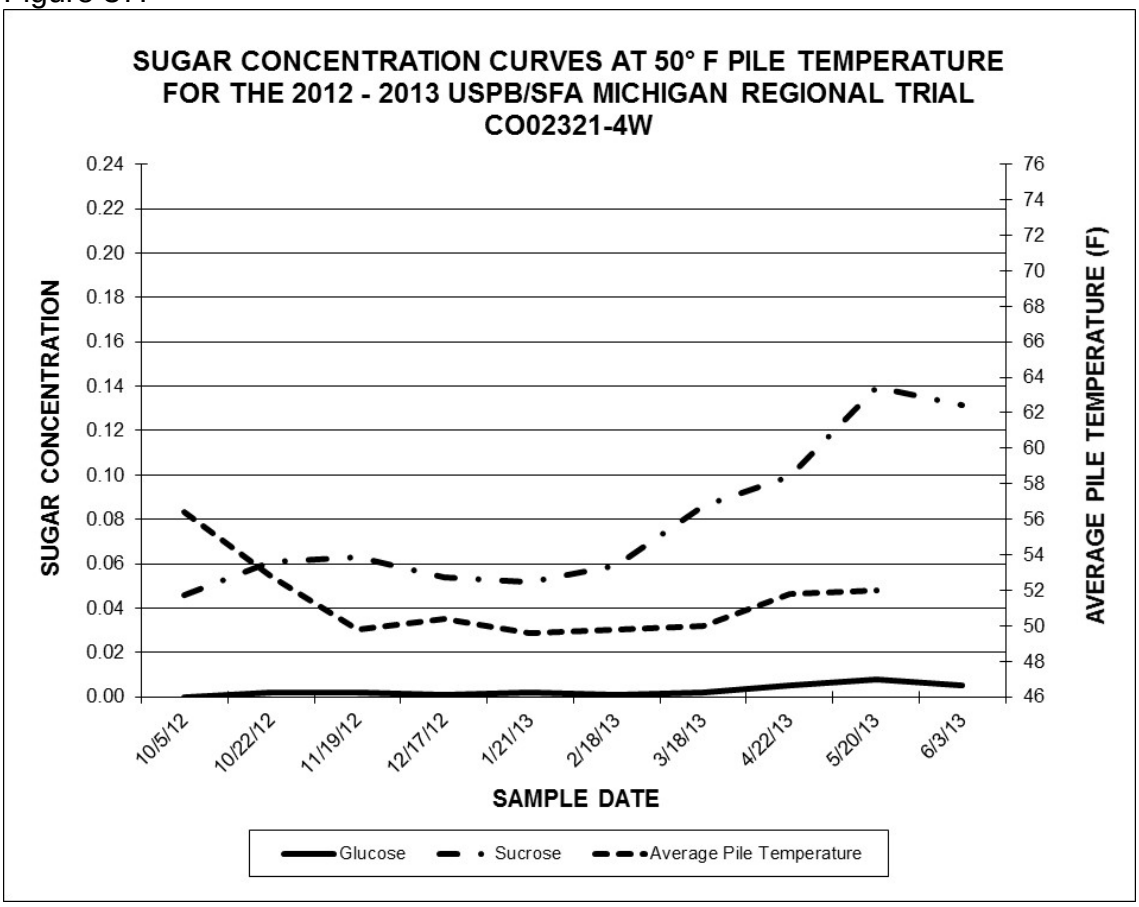

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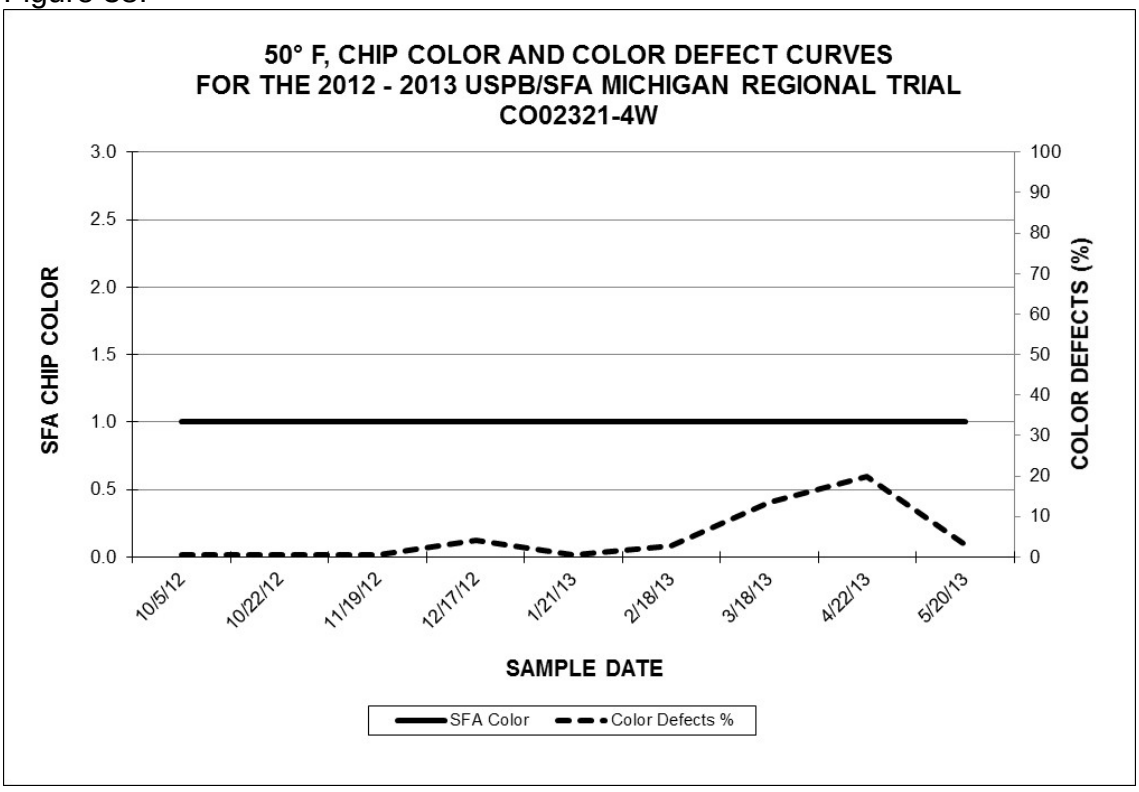

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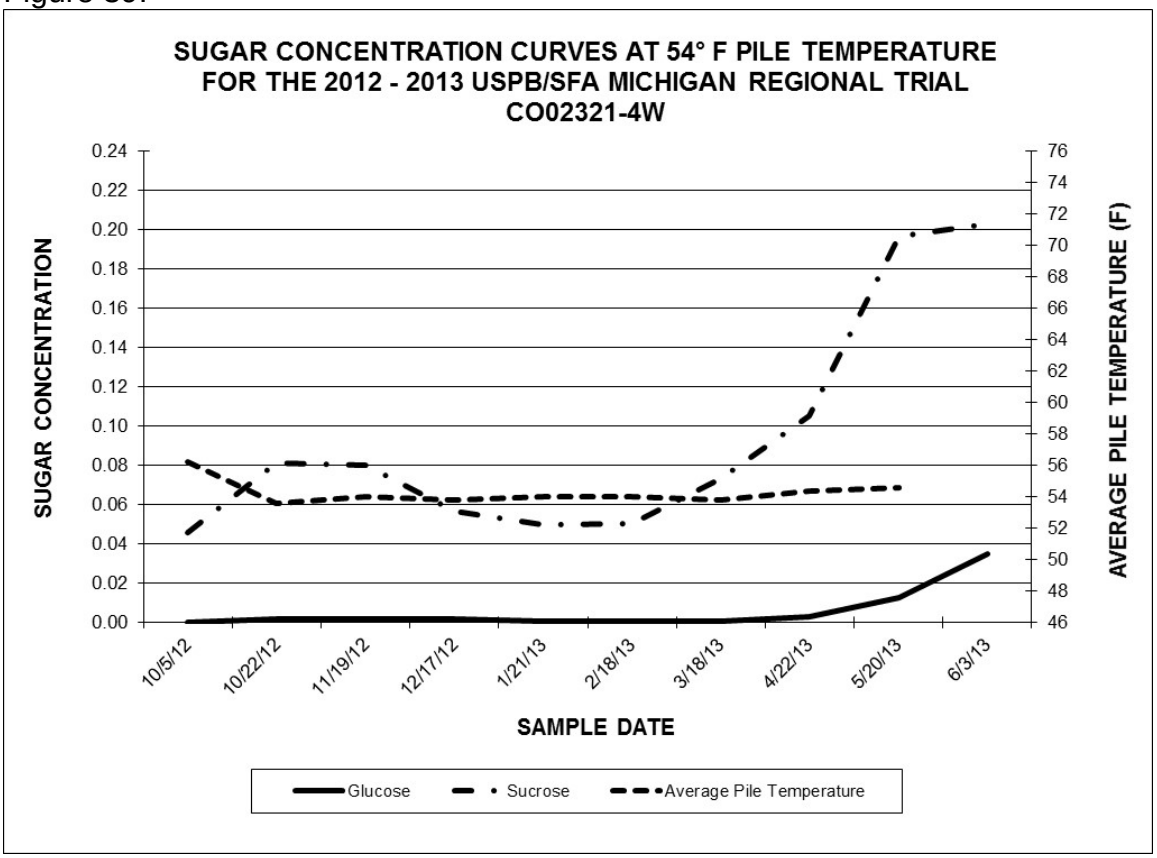

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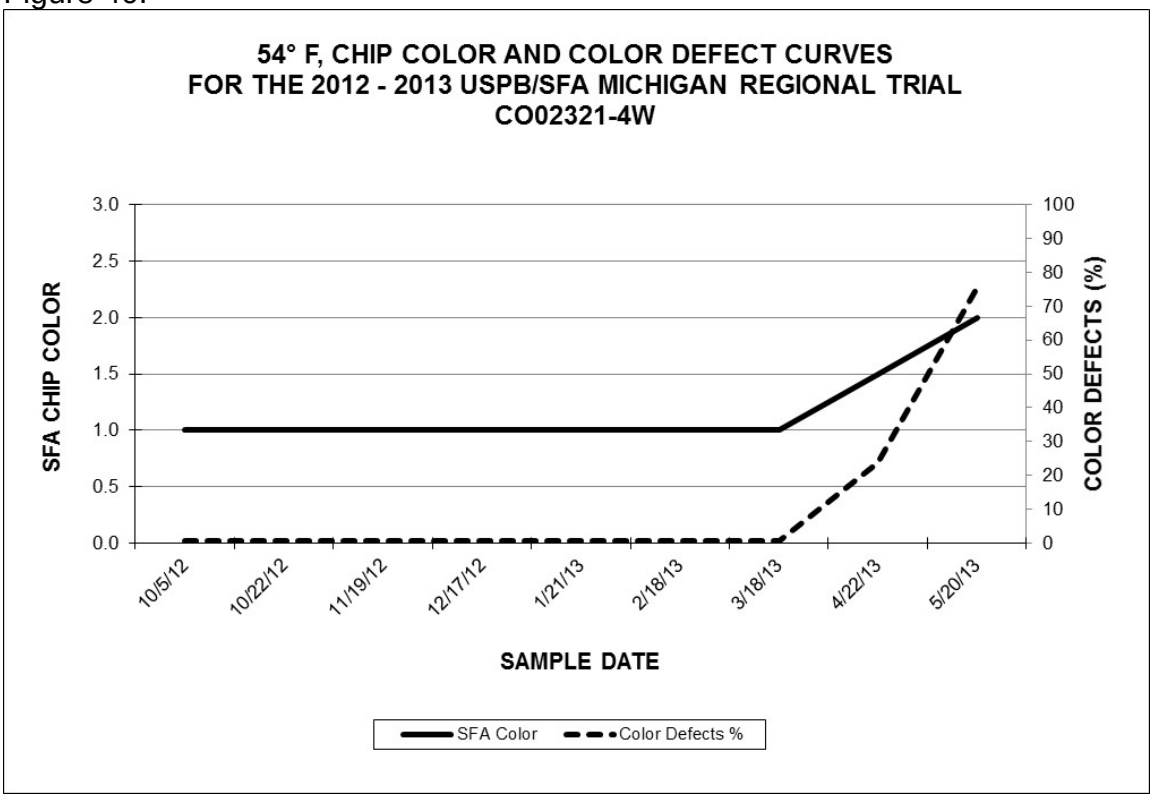

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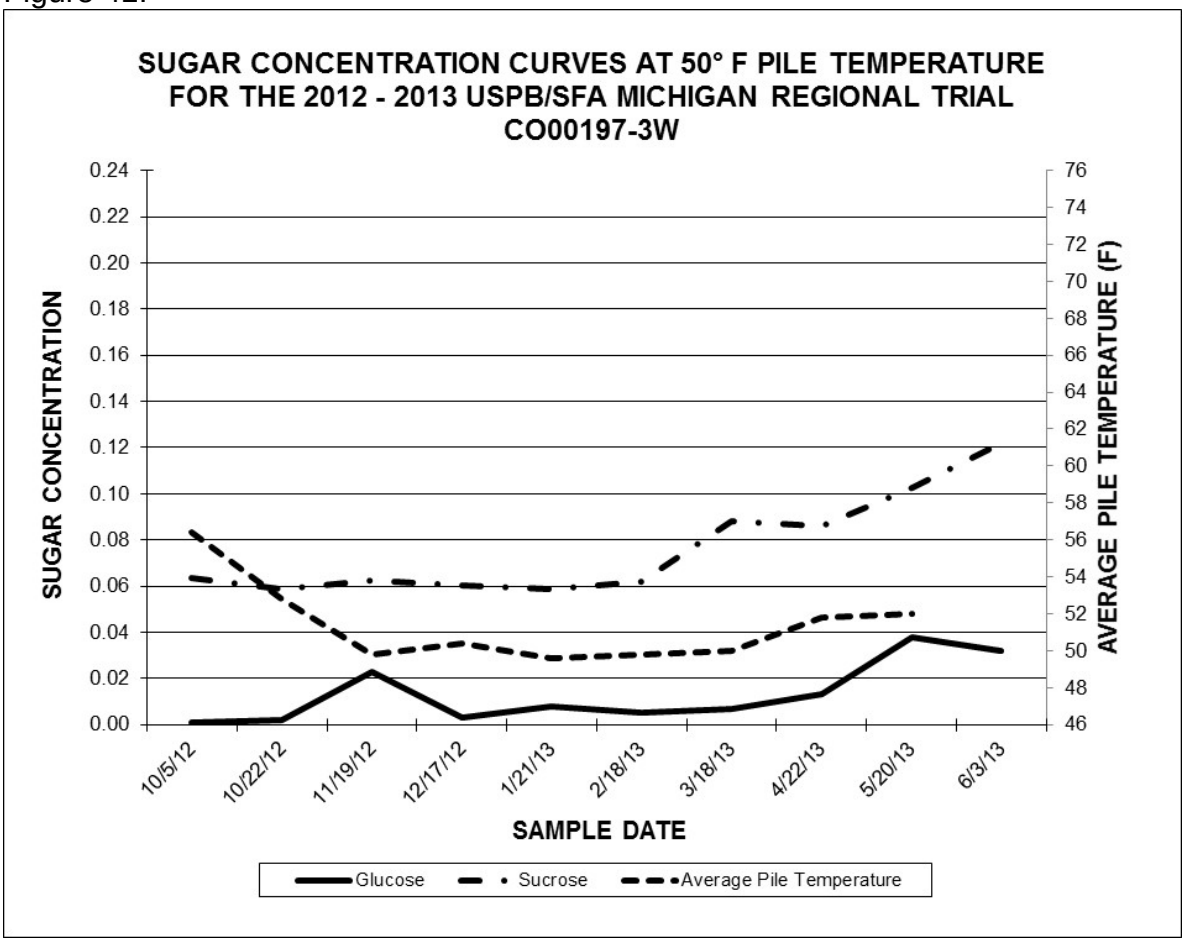

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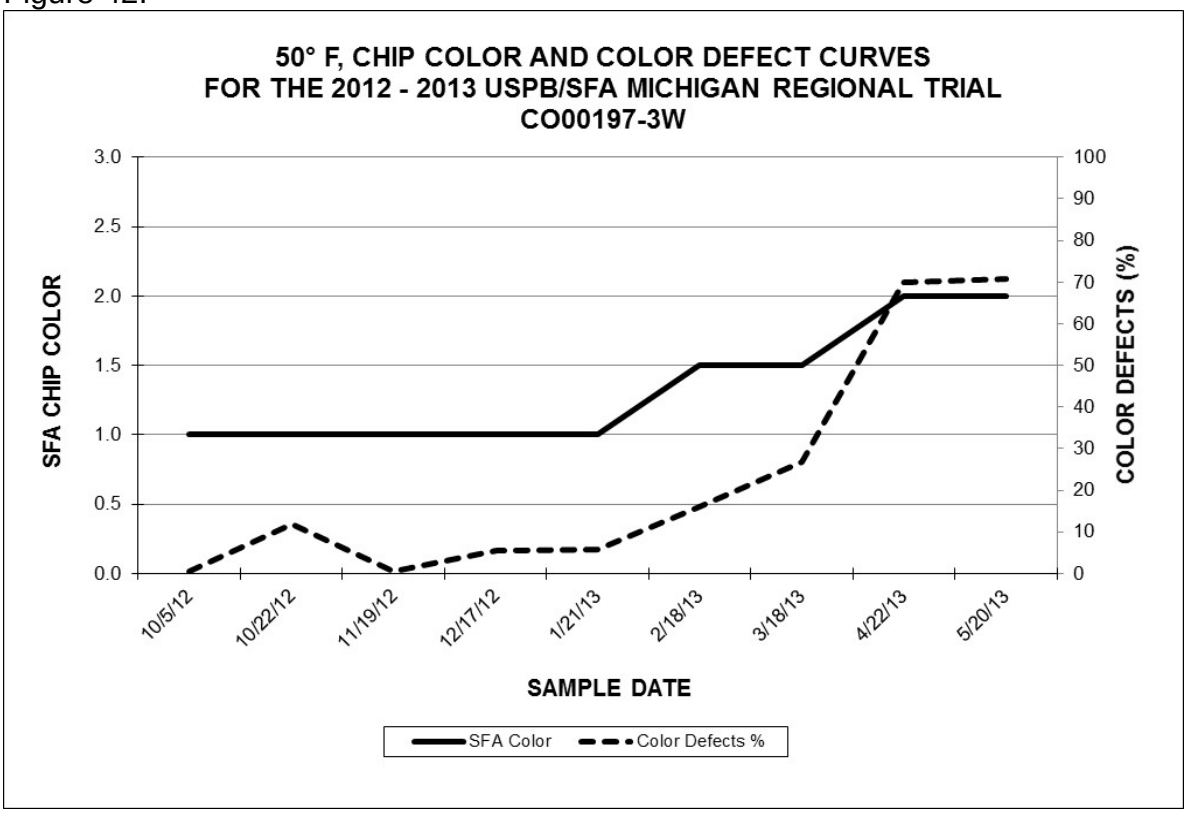

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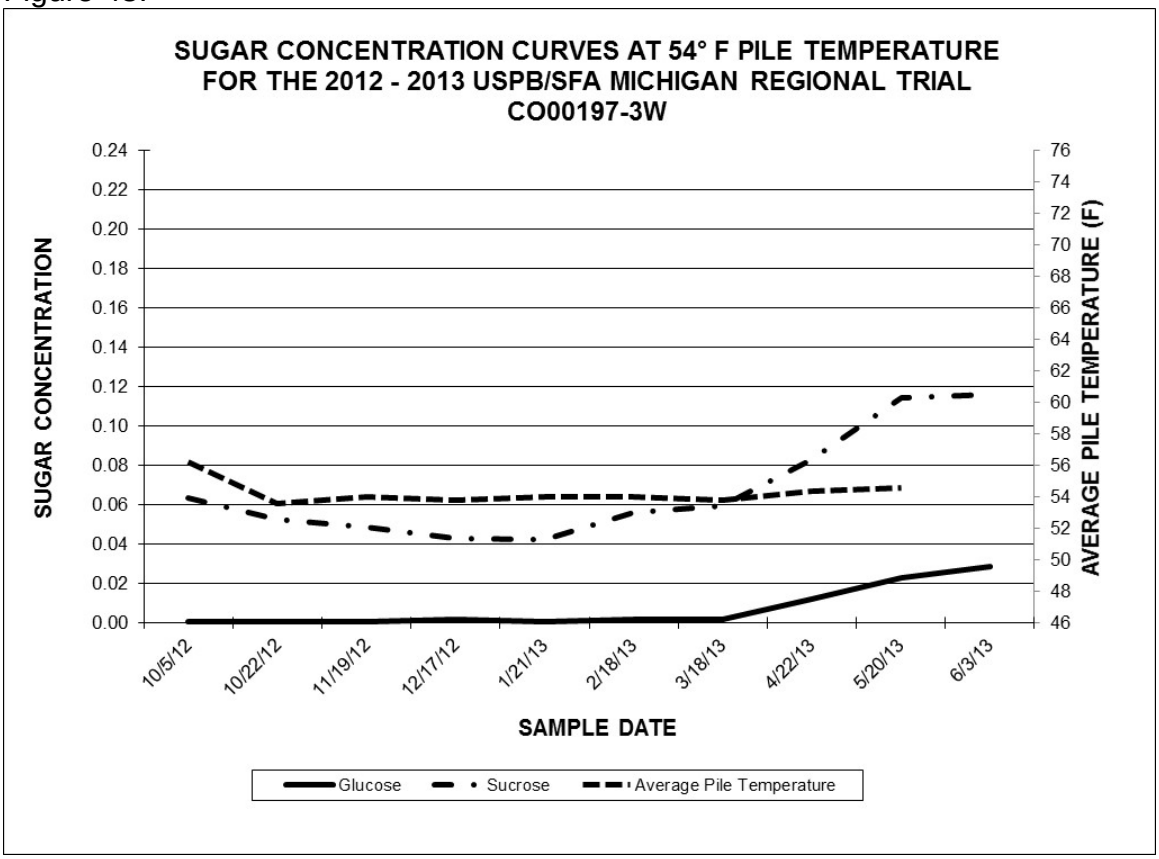

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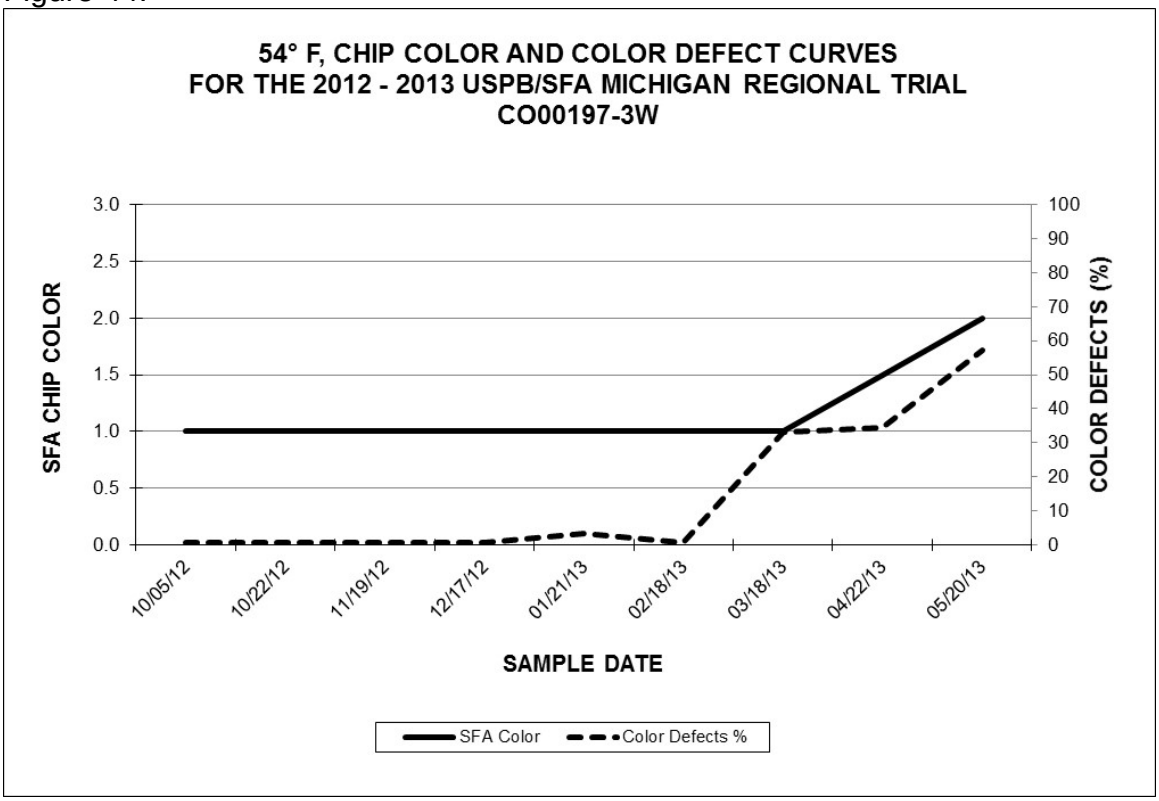

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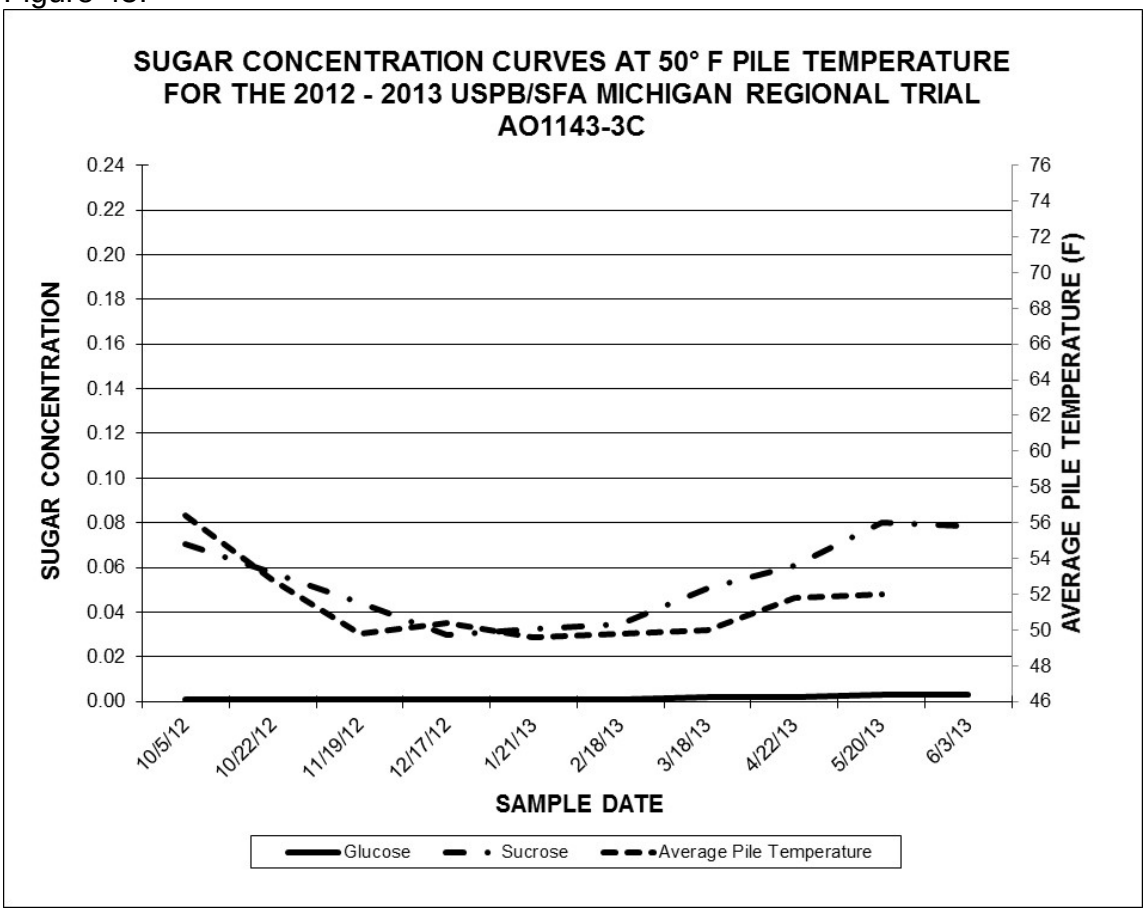

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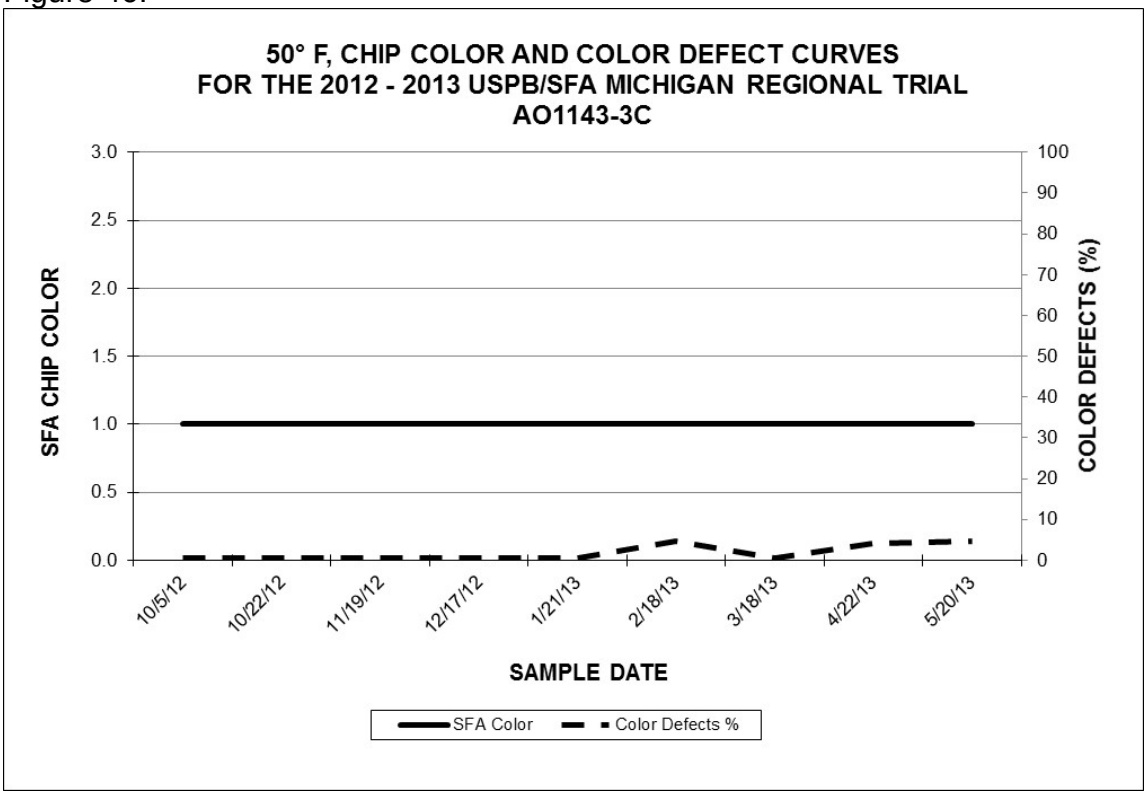

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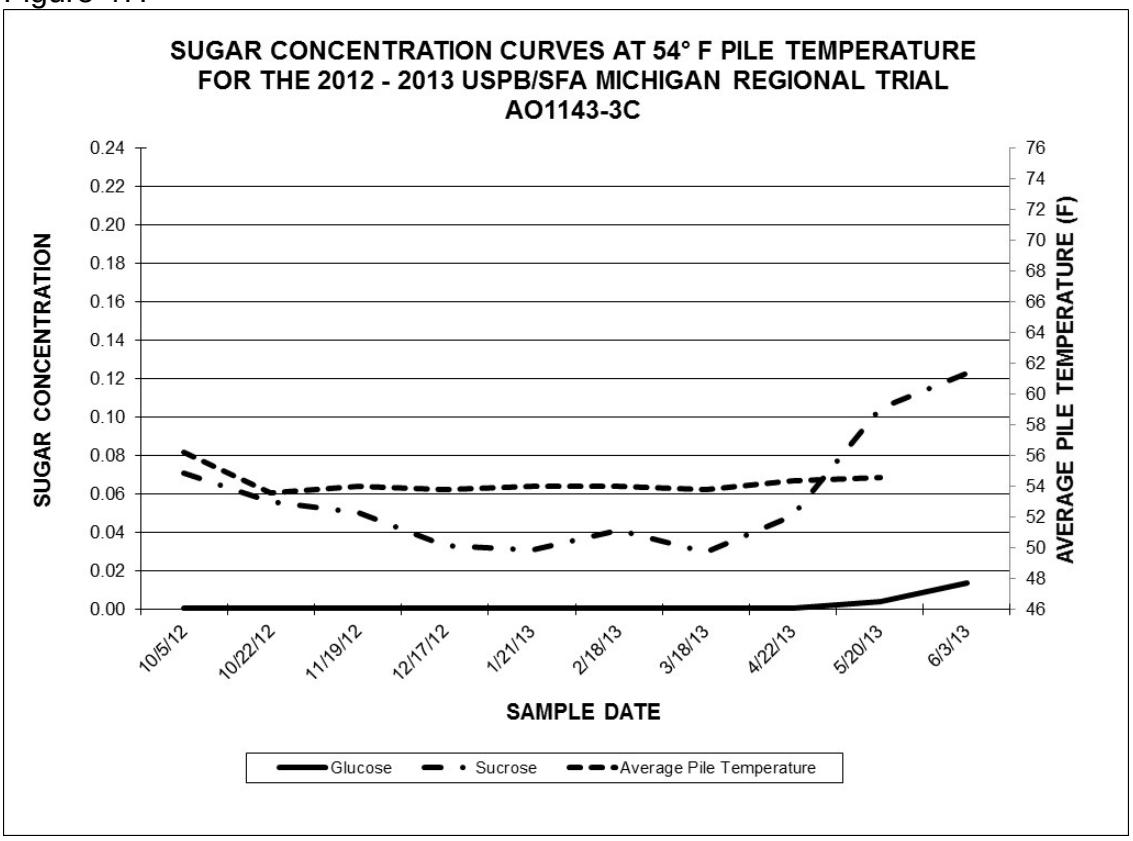

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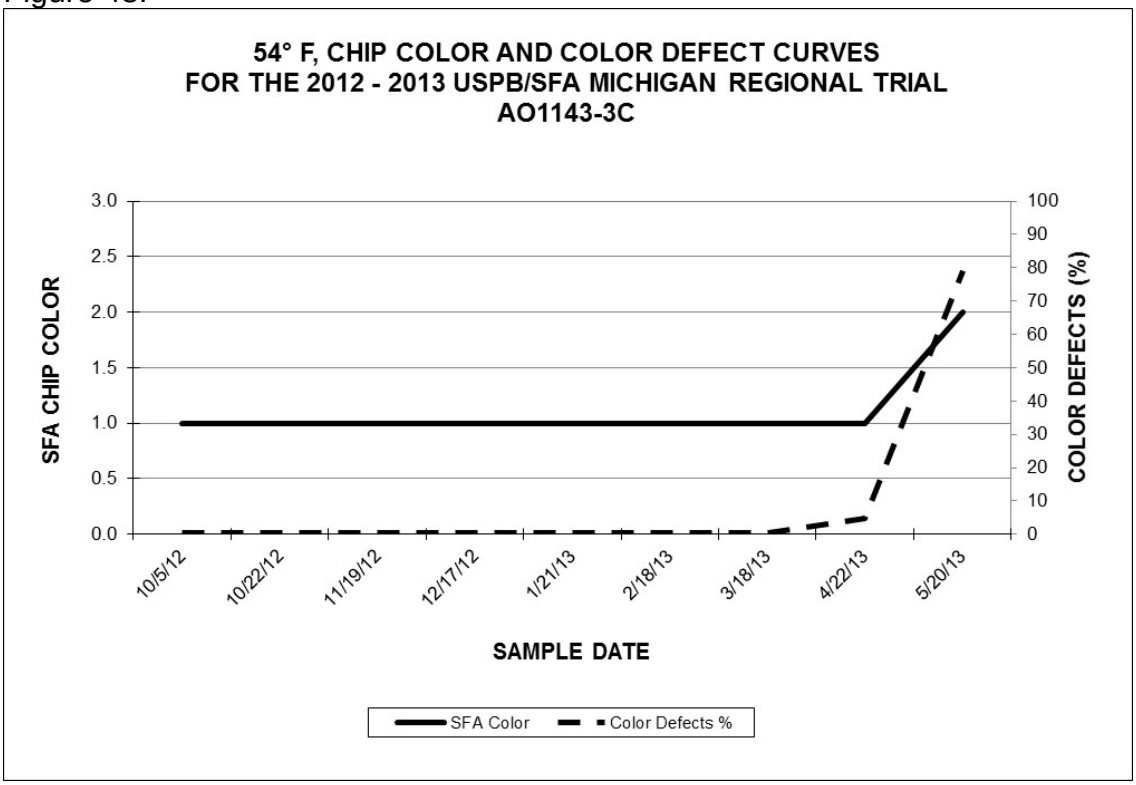

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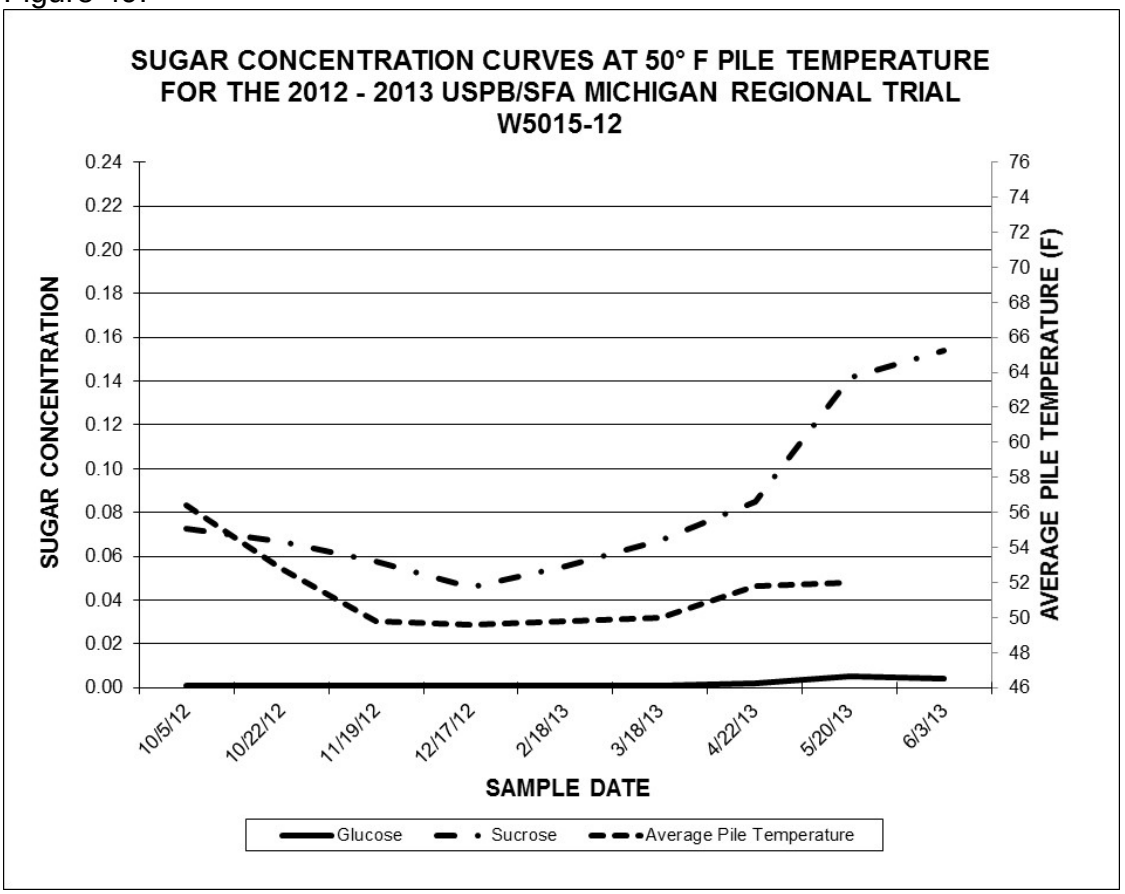

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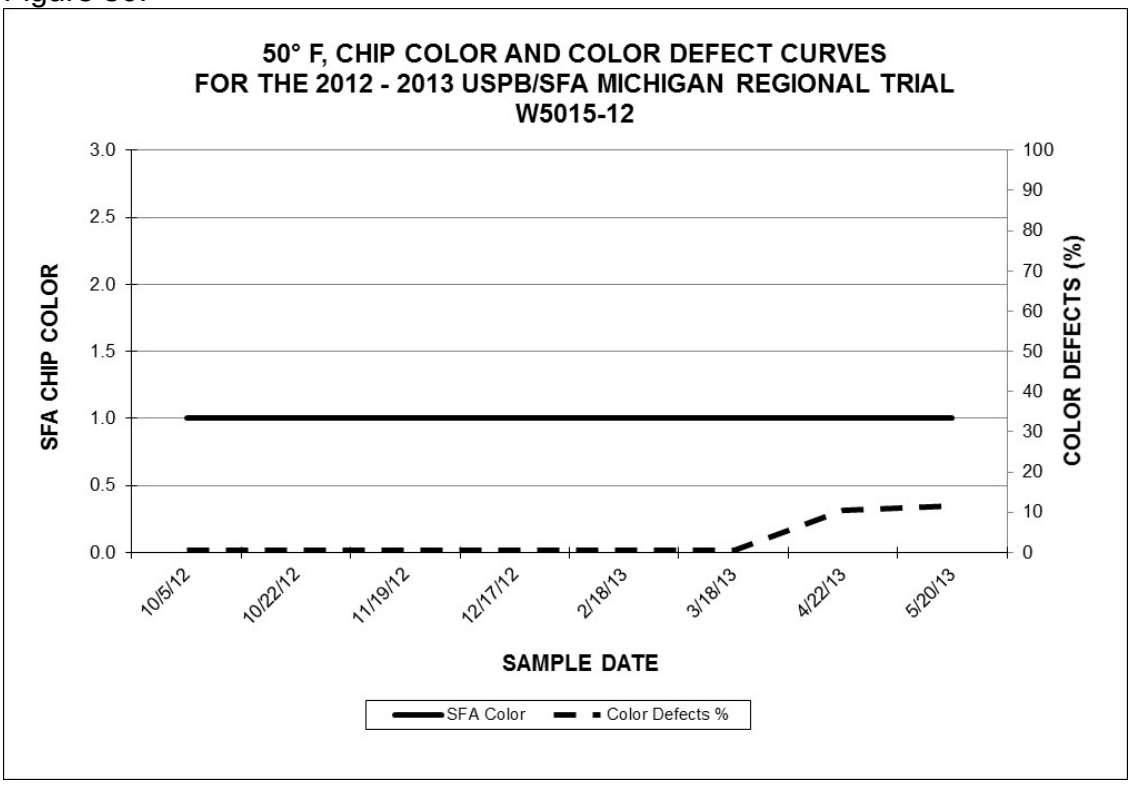

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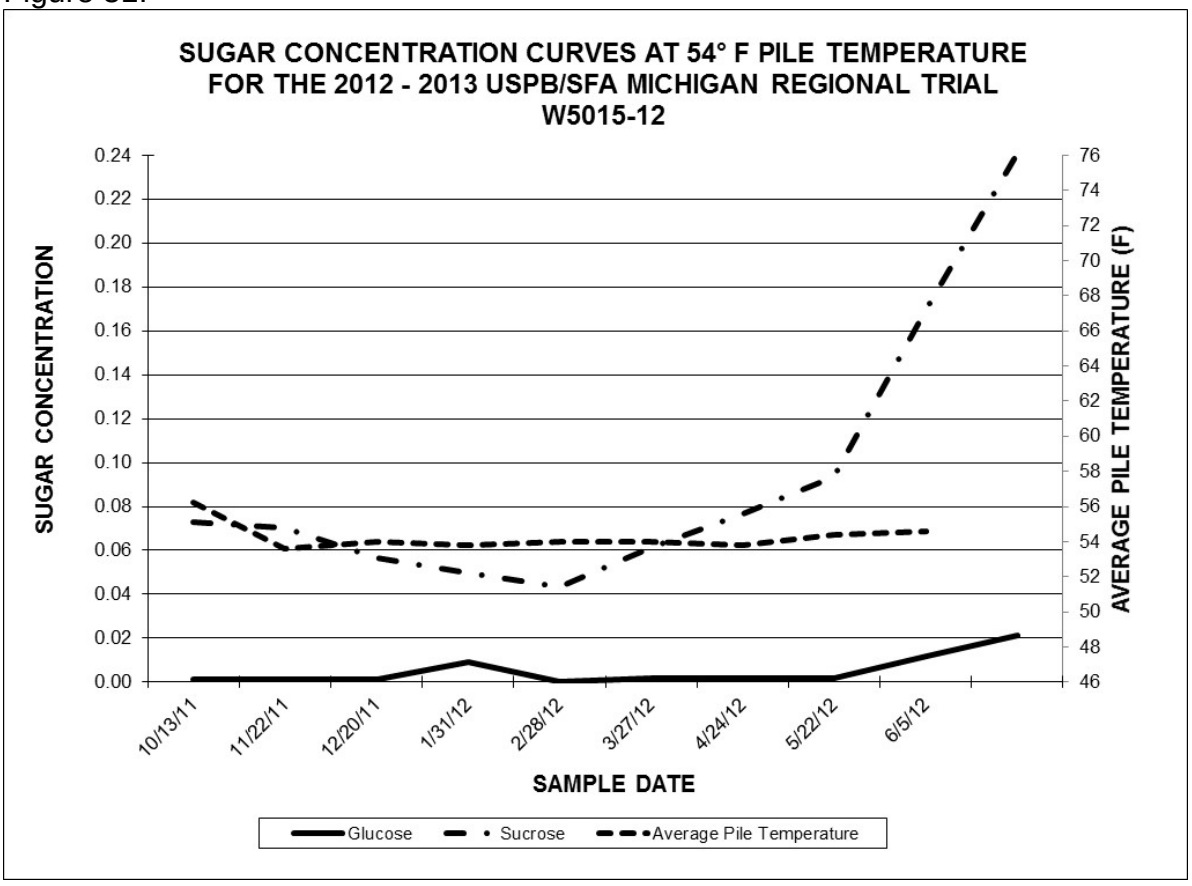

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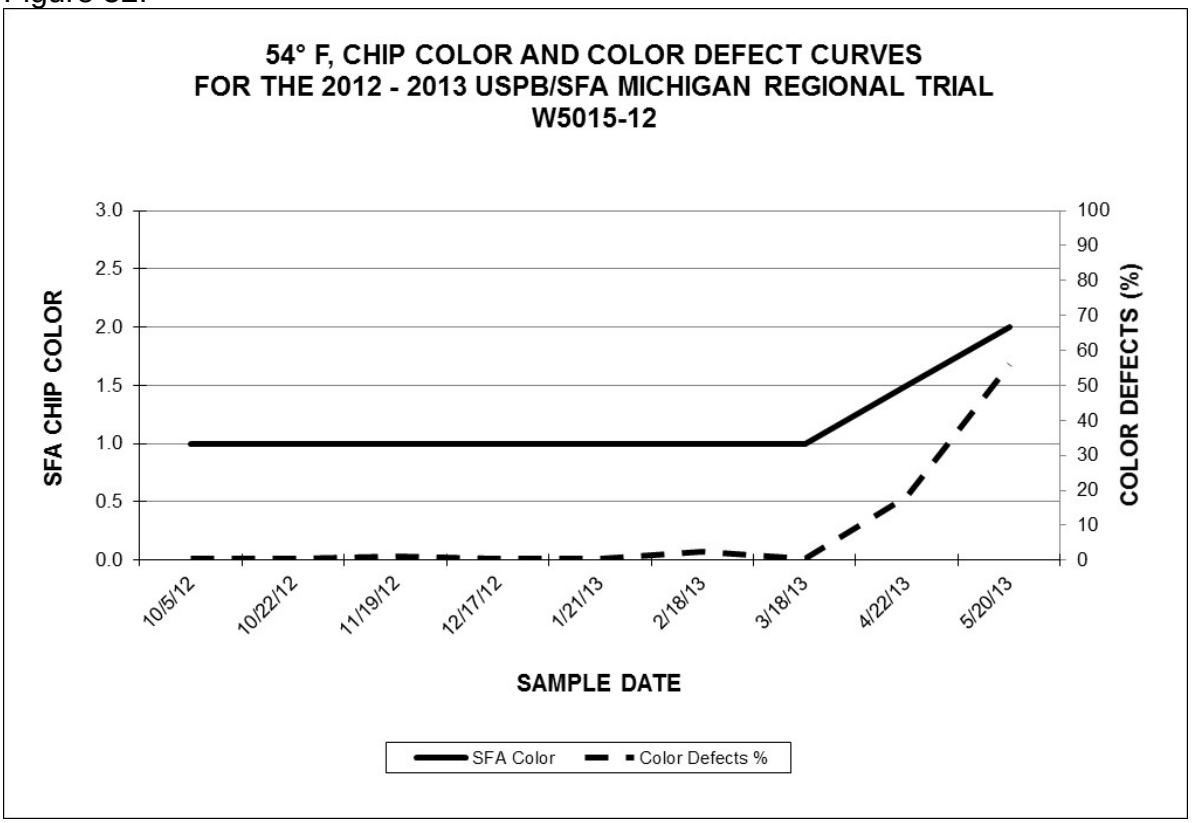

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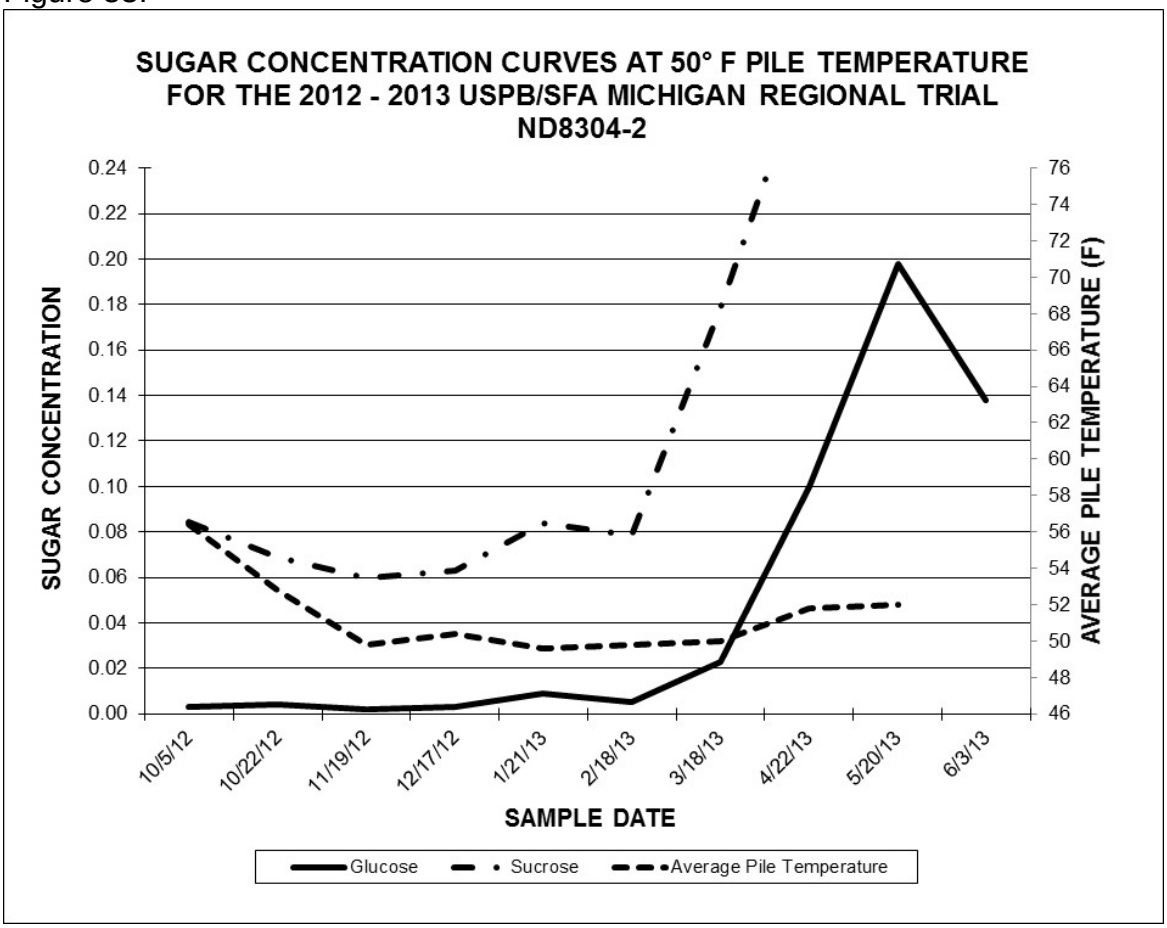

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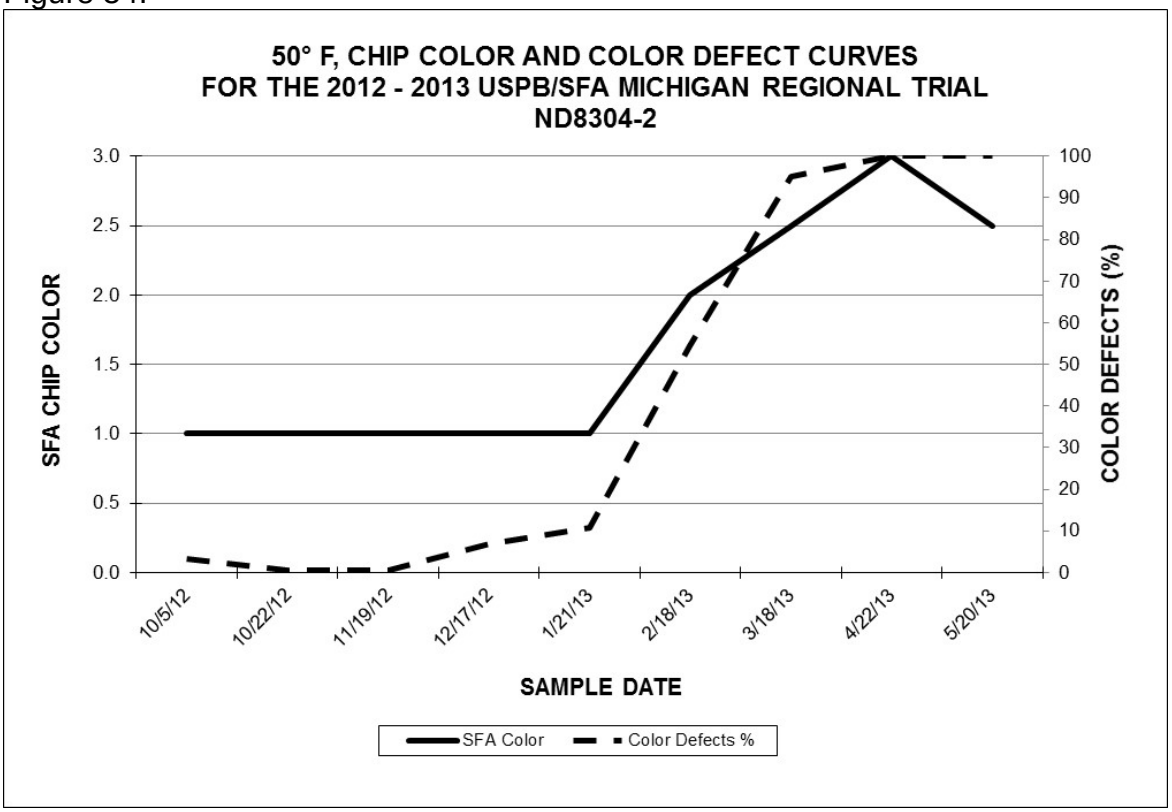

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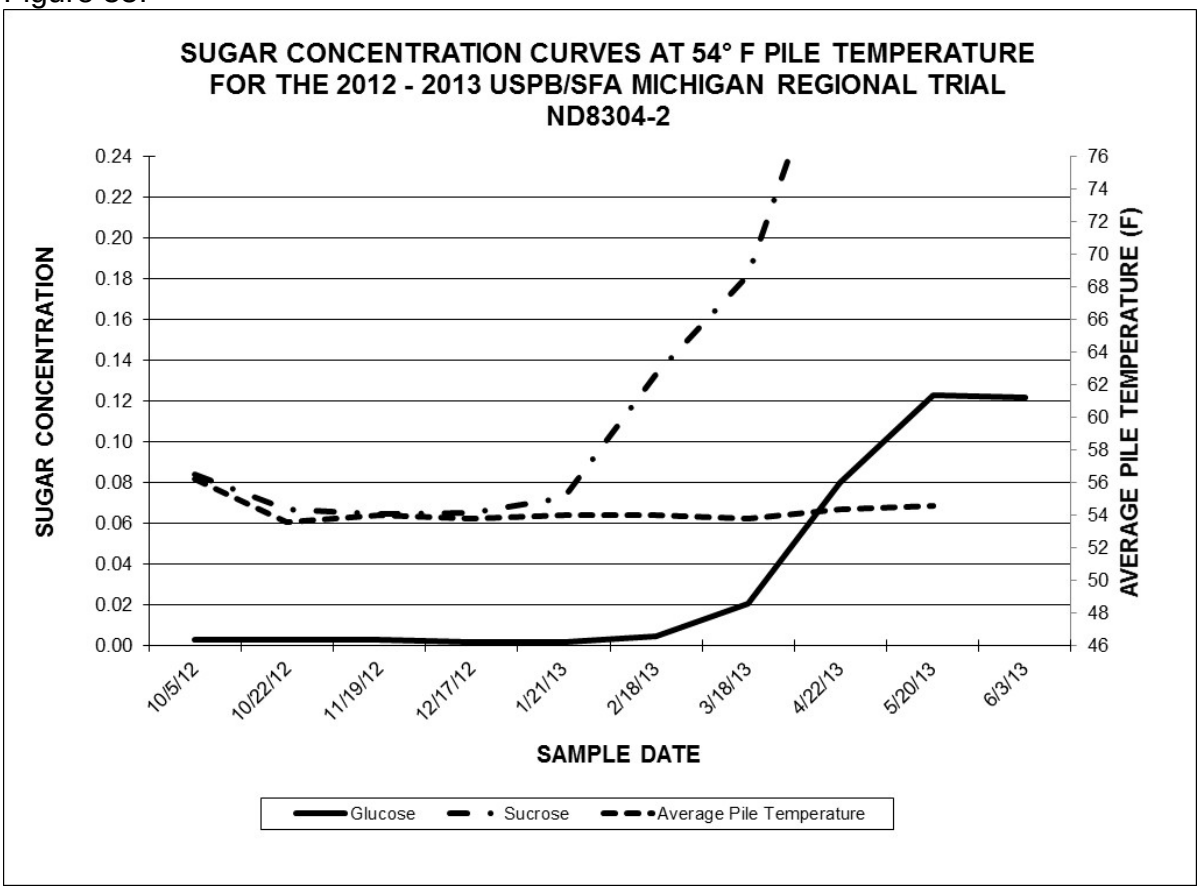

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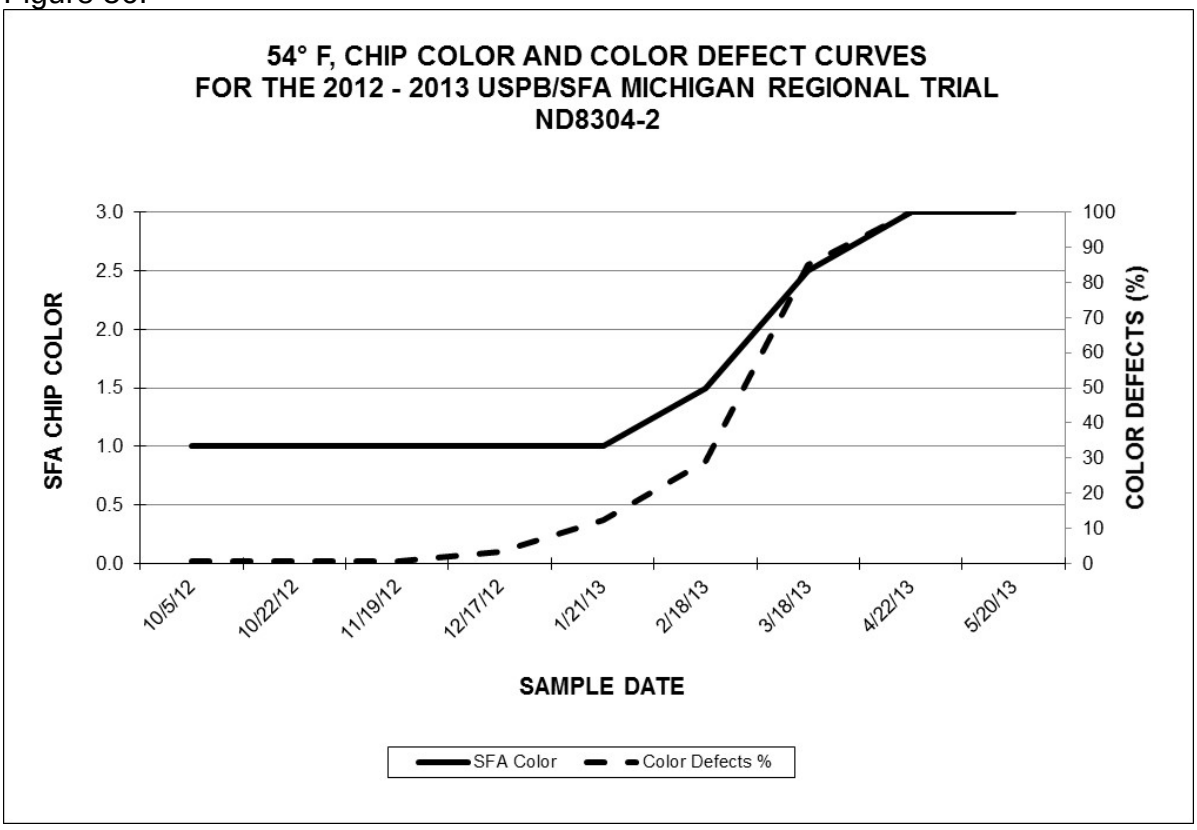

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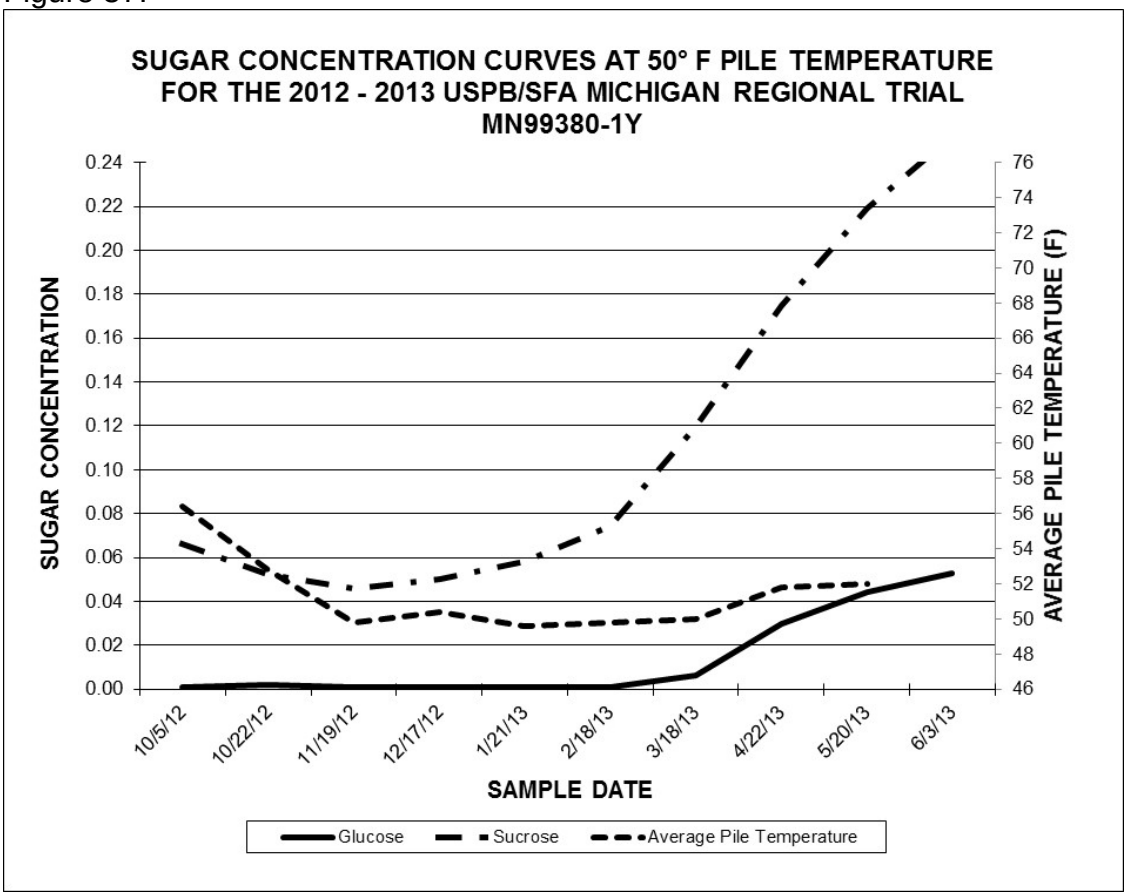

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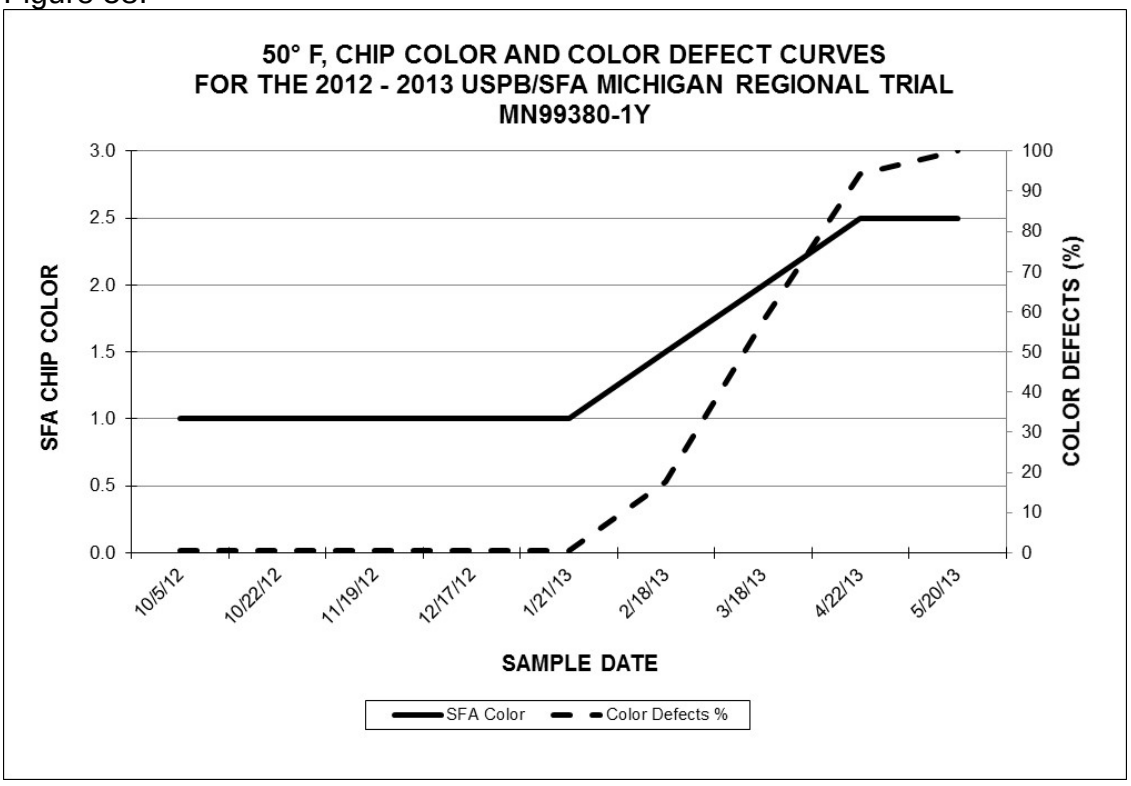

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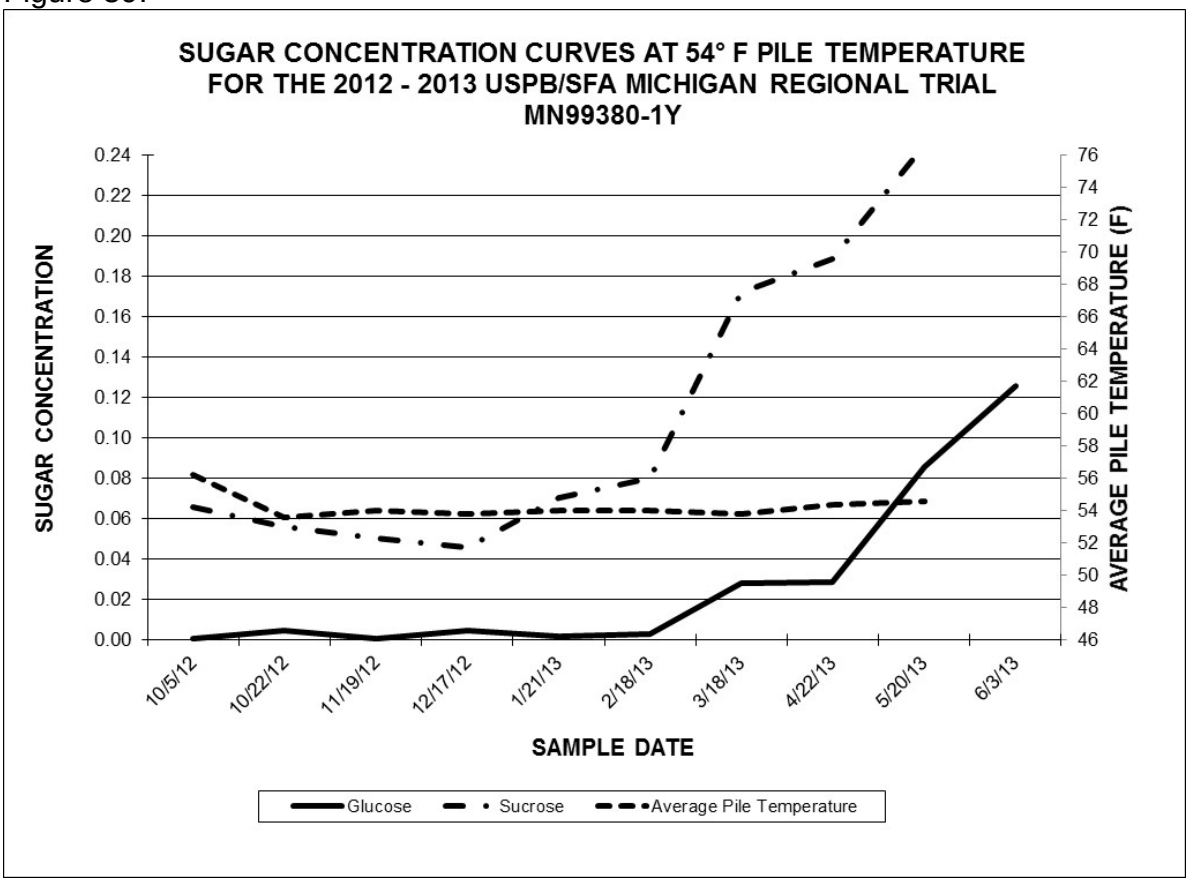

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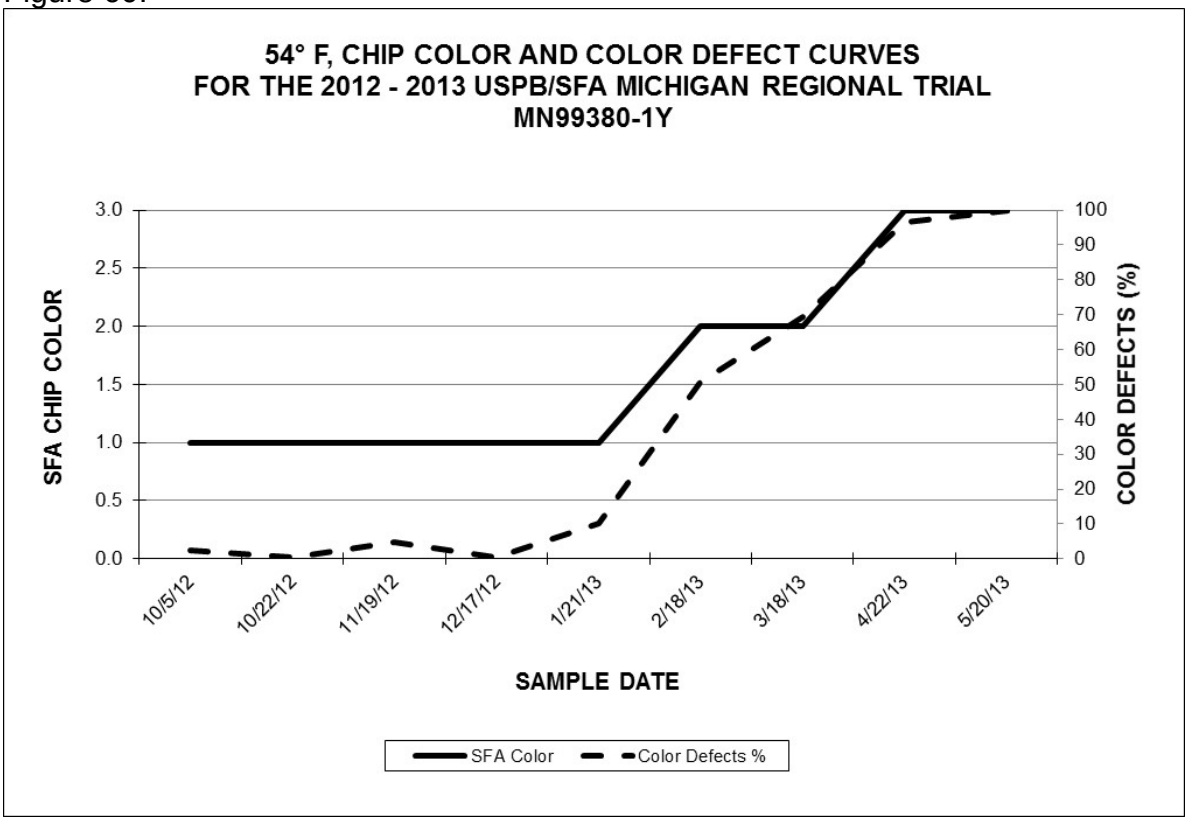

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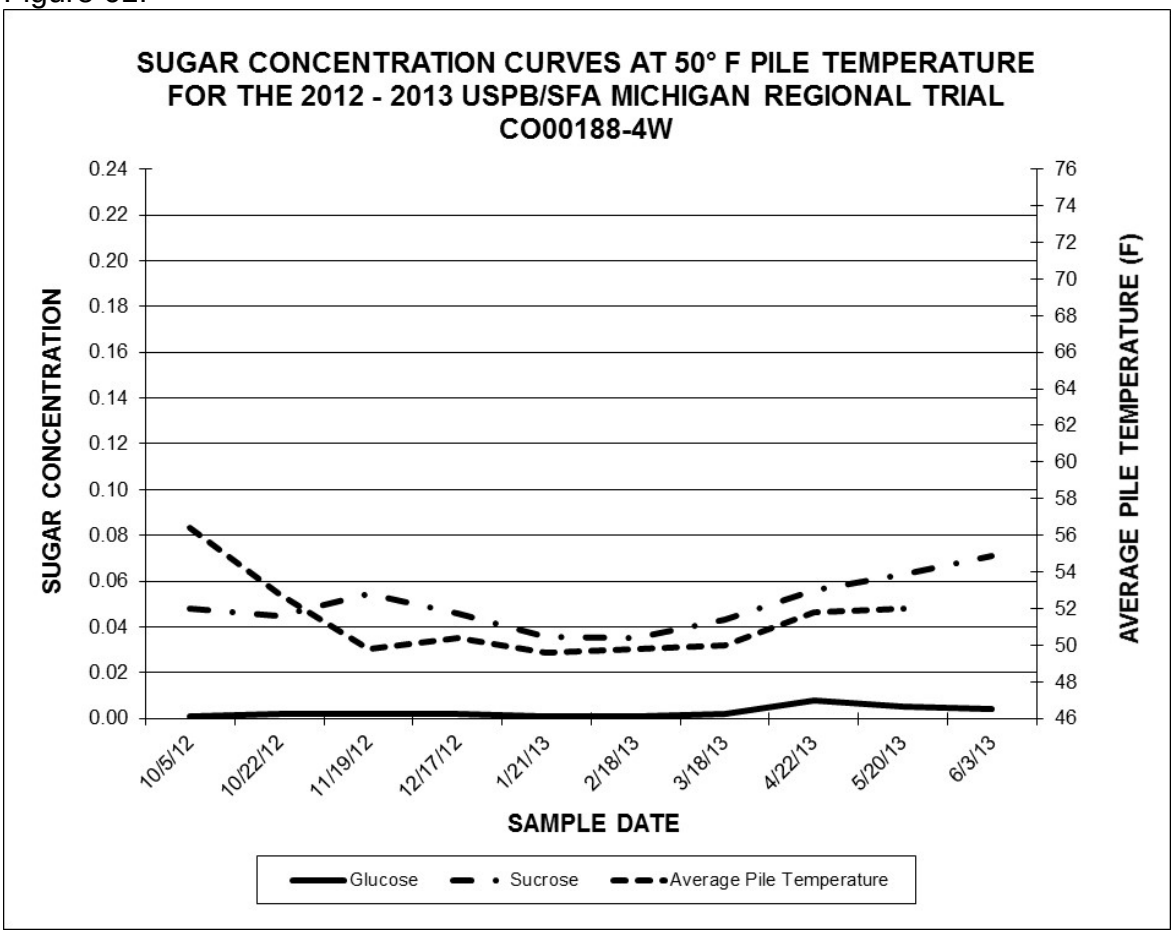

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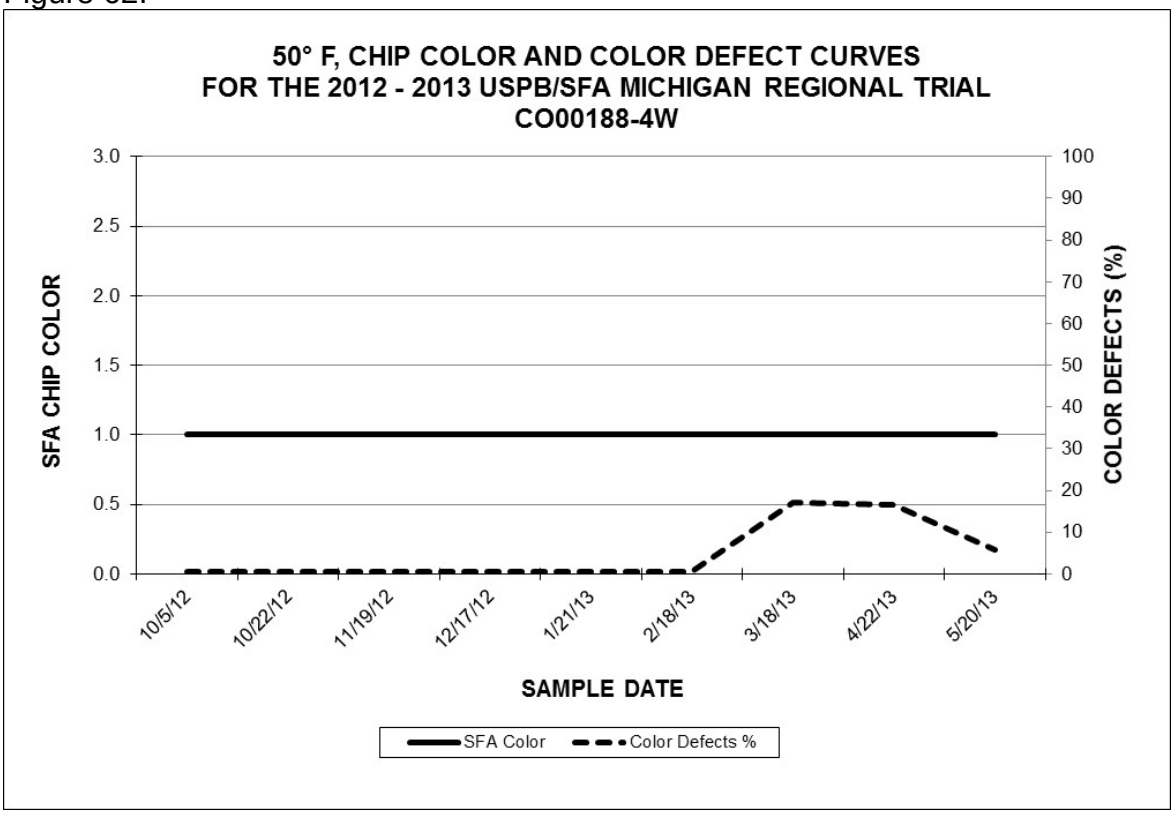

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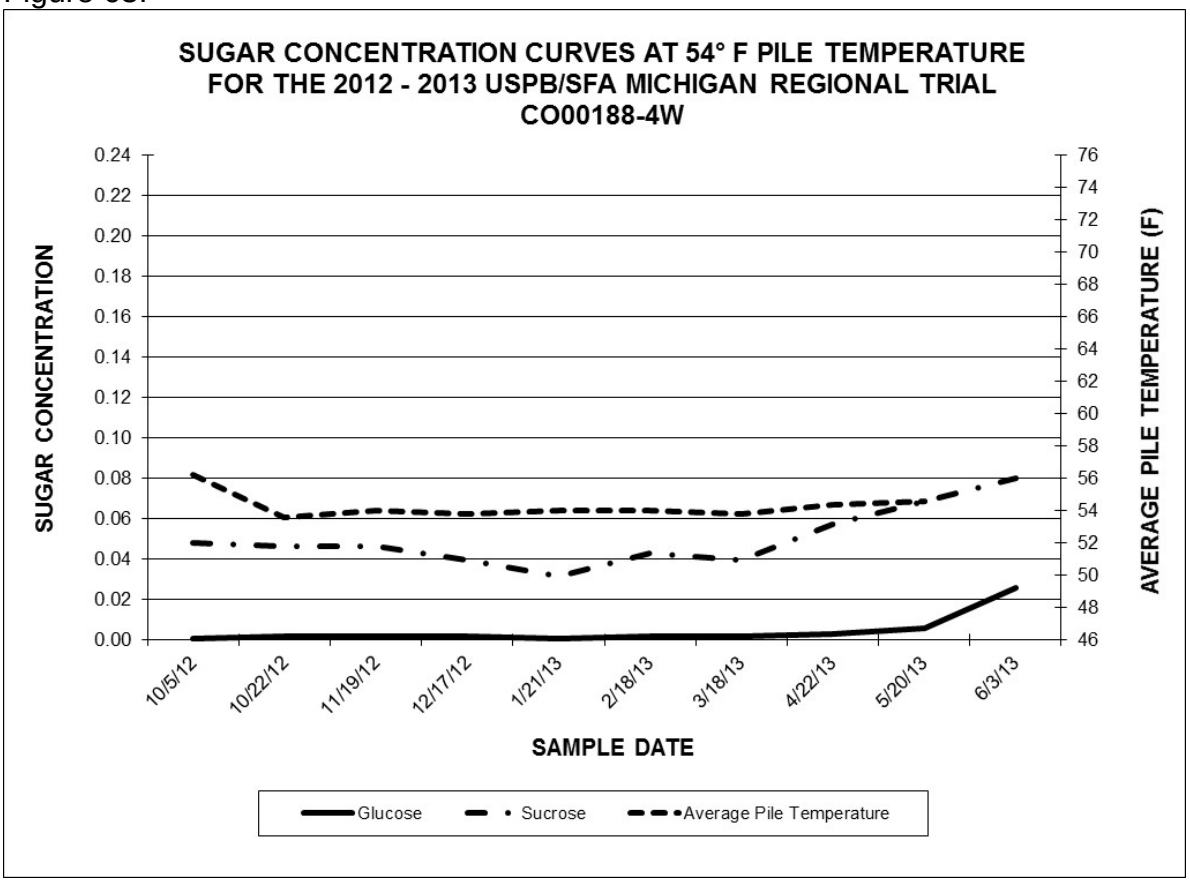

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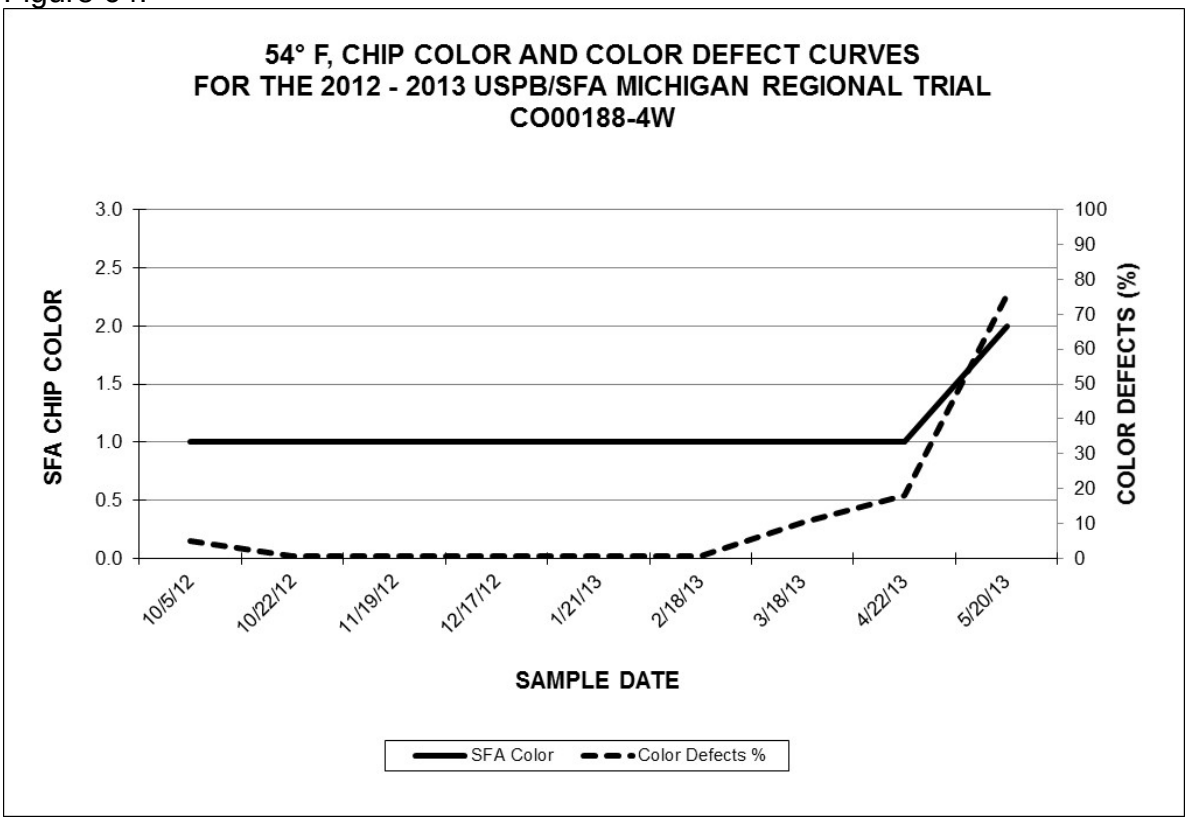

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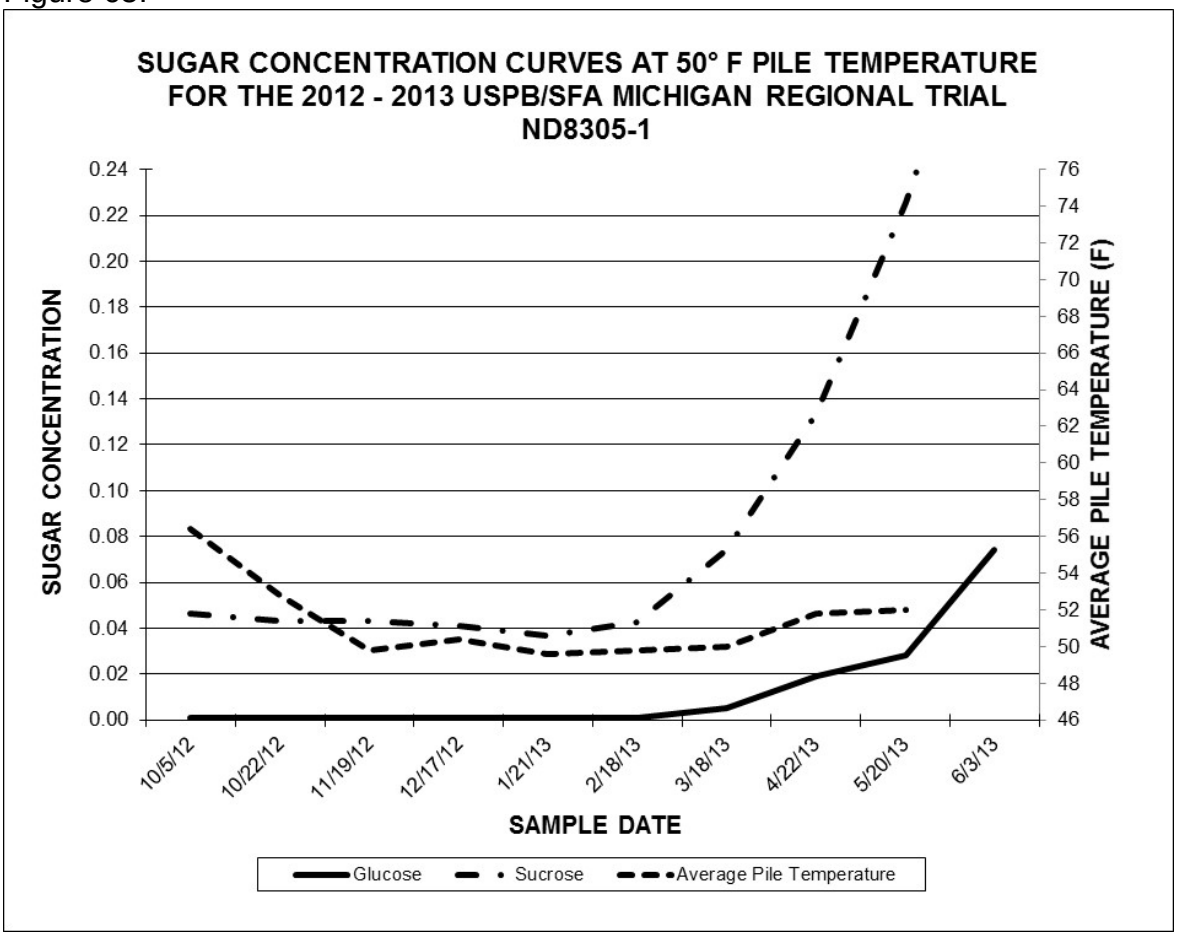

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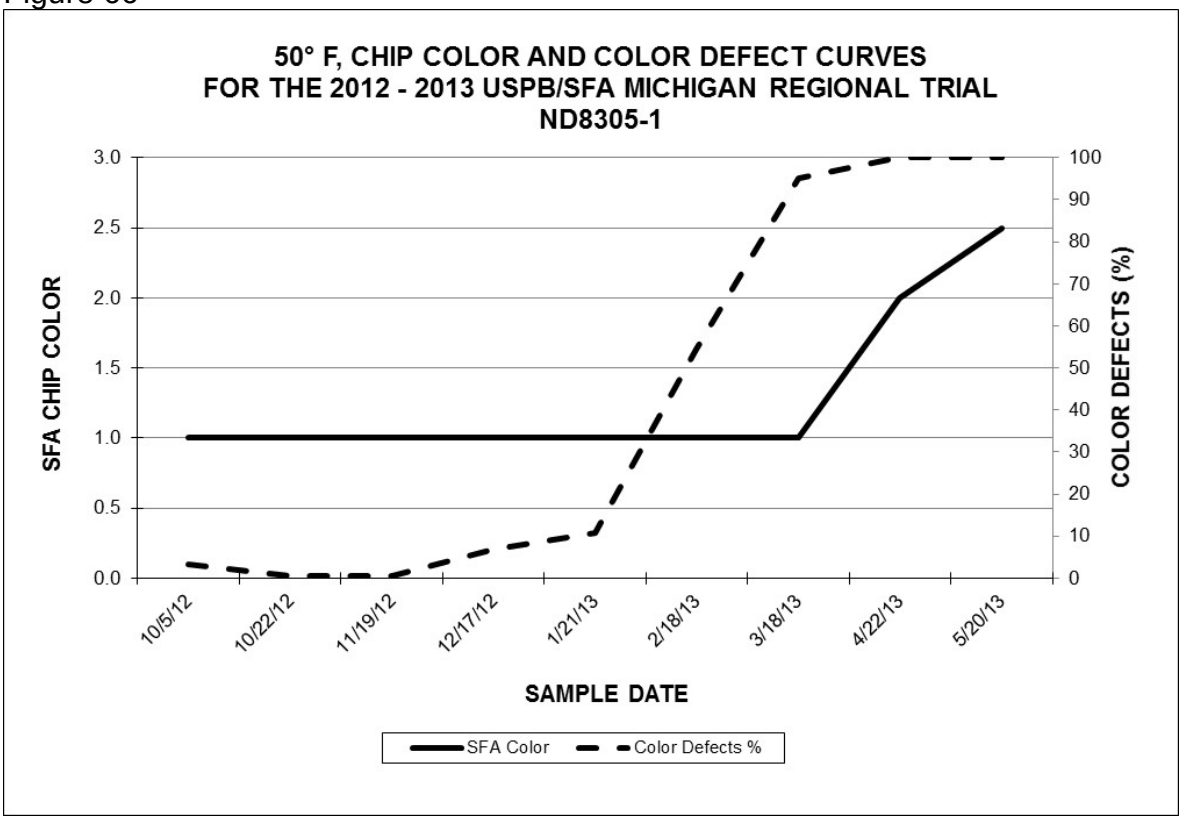

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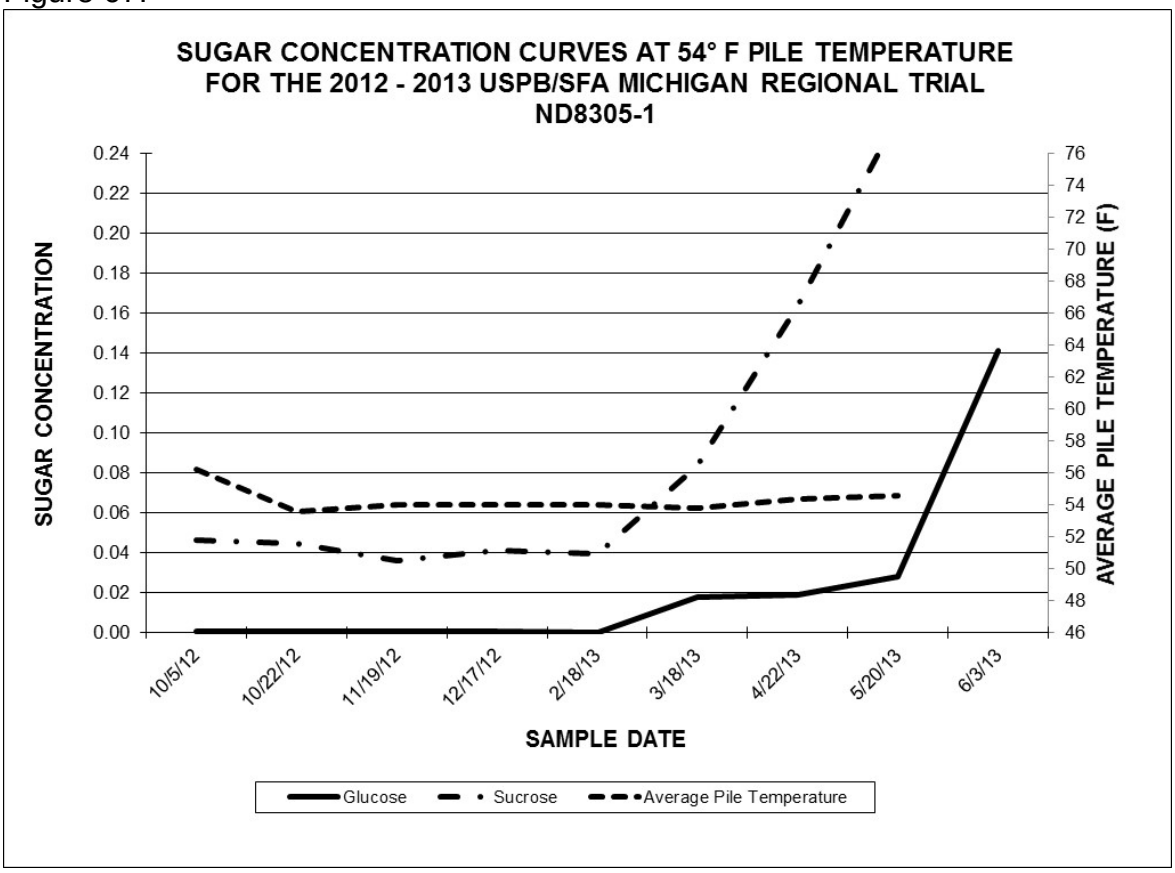

Figure 68.