

Date of Harvest Trials

Lake Lillian, Hector, and Wood Lake, MN - 2020

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Introduction: Sugar beets are a biennial crop and will continue to increase in yield and sugar content during the first year of growth until the beets are harvested. This rate of growth and sugar accumulation can vary based on the environmental conditions present in any given year and the health of the sugar beet foliage.

Objectives: In 2011, SMBSC began to perform trials to measure the rate of growth of the sugar beets during the period from mid-August through early-October. These trials provided rate of growth data for each season for sugar content, tons per acre (TPA), purity, and extractable sugar per acre (ESA). The weekly harvest information could also be used to look at the SMBSC prepile premium and how effectively it compensates shareholders for early harvesting of a portion of their sugar beet crop.

Methods: Trials were established at 2-4 locations across the Cooperative each season since 2011. These trials were often conducted on the same locations as the SMBSC Official Variety Trials. In 2020, the three Date of Harvest Trials were conducted at a location near Wood Lake, Lake Lillian and Hector. Trial maintenance was performed similar to the nearby Official Variety Trial, and followed Best Management Practices. Each week during the mid-August to early-October period approximately 180' of row was harvested from each trial location. Harvest was accomplished with a tractor mounted one-row defoliator and one-row sugar beet harvester. The beets harvested each week were placed in tare bags and brought to the SMBSC Tare Lab for weights and quality analysis. Sample analysis included tare, sugar content, and purity. Row lengths were measured each week prior to harvest and these lengths were used to accurately calculate the area harvested. The calculated harvested area for each week was used to determine yield on a per acre basis.

Results and discussion: The first harvest date for the trial was August 13, 2020. Harvesting continued on a weekly basis until October 15, 2020. Harvest was conducted once a week, although intervals of exactly 7 days were unachievable due to weather. A total of twelve harvest timings were completed in 2020. Trials sites saw even stands and canopy development, minimal root rot, and CLS managed well. The Lake Lillian trial site was damaged by an early-July hail storm. It is possible that this event negatively influenced rate of gain for that site.

Table 1 shows the average pounds extractable sugar per acre (ESA) increase per day for each of the past ten years, between mid-August to early-October. From 2011-2019, the daily average rate of increase in ESA was 80.3 pounds extractable sugar per day. The increase in ESA per day for 2020 of 79.0 pounds was similar to the long term mean rate of gain. Growth rate across the season for ESA is illustrated in Figure 1.

Table 2 shows the average rate of gain for percent sugar concentration data. The long-term rate of increase on percent sugar is 0.06% per day and approximately 0.4% per week. In 2020, sugar increased at a rate slightly above the long term average at 0.07% per day and approximately 0.47% per week. This is slightly increased from the ten year average. That said, 2018 saw an unprecedentedly low rate of gain which influences the long-term average. When 2018 is removed, the long term rate of gain is closer to 0.07% sugar per day. Figure 2 illustrates the data from 2020 for sugar percent rate of gain.

Table 3 shows the average rate of gain of tons per acre for the ten year period of 2011-2020. The long-term average is 0.21 tons per acre gained per day, and approximately 1.49 tons per week. The 2020 rate of gain for TPA continues to show a relatively linear rate of gain as in prior years, but the rate of gain was considerably slowed, at 0.16 TPA per day and 1.12 TPA per week, about 75% the long-term rate of gain. Figure 3 illustrates the data collected in 2020. This reduction may be influenced by early-July hail damage that occurred on one of the three sites tested in 2020 and the subsequent reduction in growth rate it created on that site.

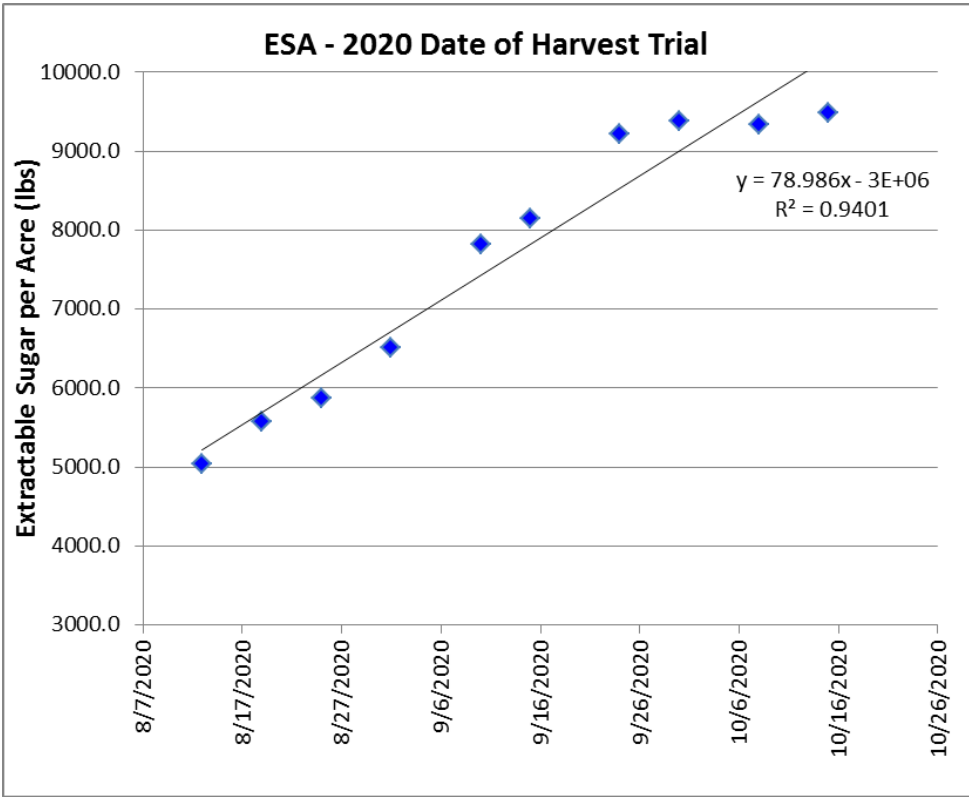


Figure 1. Extractable sugar per acre (ESA) data collected during the 2020 Date of Harvest trials, plotted across the harvest period, depicting a general positive trend.

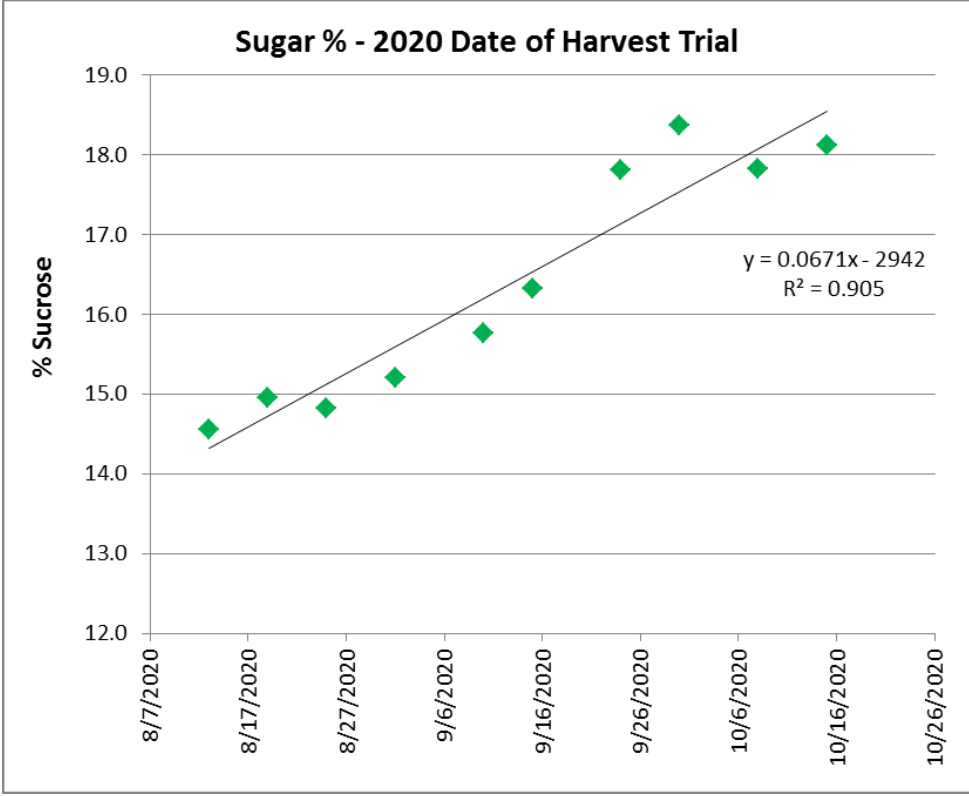


Figure 2. Sugar percent data collected during the 2020 Date of Harvest Trials, plotted across the harvest period, depicting a general positive trend.

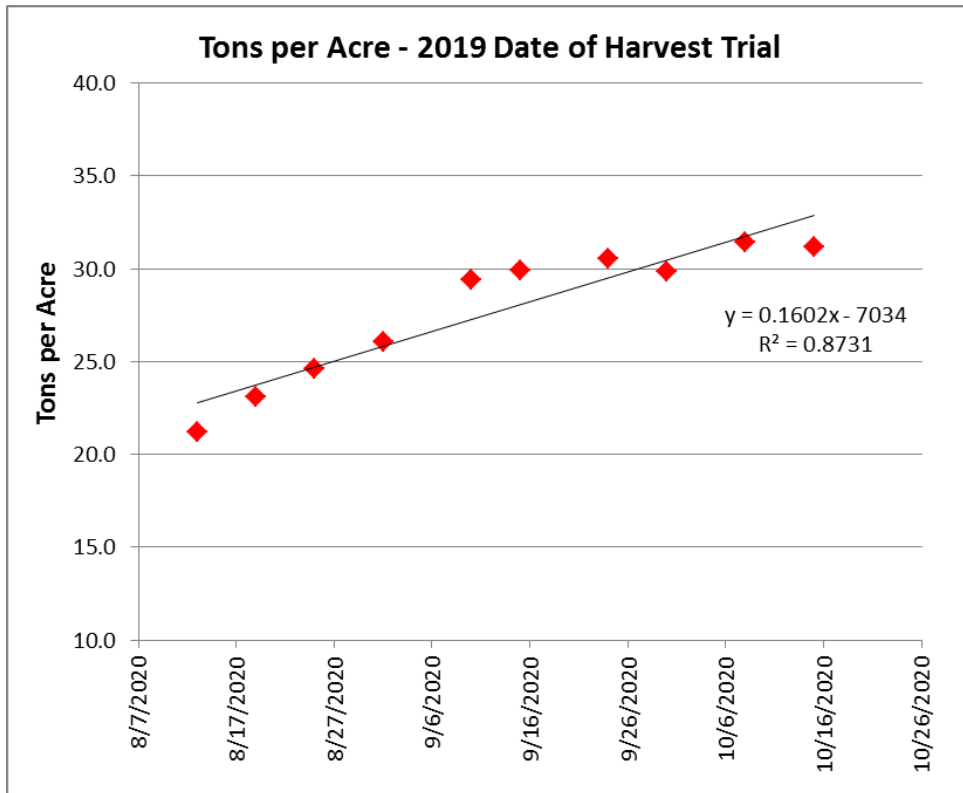


Figure 3. Tons per acre data collected during the 2020 Date of Harvest Trials, plotted across the harvest period, depicting a general positive trend.

Table 1.

2011-2020 Regression Analysis of Extractable Sugar per Acre Increase per Day	
<u>Year</u>	<u>Extractable Sugar per Acre Increase per Day (lbs.)</u>
2011	100.7
2012	89.0
2013	91.6
2014	93.4
2015	99.8
2016	45.7
2017	60.0
2018	63.8
2019	78.6
Average (2011-2019)	80.3
2020	79.0

Table 2.

<u>2011-2020 Regression Analysis of Percent Sugar Increase per Day</u>		
<u>Year</u>	<u>Percent Sugar Increase per Day (%)</u>	<u>Percent Sugar Increase per Week (%)</u>
2011	0.10	0.68
2012	0.09	0.61
2013	0.05	0.38
2014	0.09	0.60
2015	0.06	0.44
2016	0.03	0.18
2017	0.06	0.40
2018	0.005	0.04
2019	0.04	0.30
Average (2011-2018)	0.06	0.40
2020	0.07	0.47

Table 3.

<u>2011-2020 Regression Analysis of Ton per Acre Increase per Day</u>		
<u>Year</u>	<u>Ton per Acre Increase per Day (tons)</u>	<u>Ton per Acre Increase per Week (tons)</u>
2011	0.25	1.74
2012	0.15	1.06
2013	0.29	2.01
2014	0.23	1.59
2015	0.24	1.67
2016	0.14	0.99
2017	0.12	0.82
2018	0.27	1.87
2019	0.24	1.66
Average (2011-2019)	0.21	1.49
2020	0.16	1.12