

**2020-2021**  
***Spreckels Sugar***  
***RESEARCH REPORT***



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# 2020-2021 Furrow and Sprinkler Field Irrigation Project

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## Justification:

The Imperial Valley climate can be very severe for emergence of seedling sugar beet plants. The daily high temperatures in September are often in excess of 100 degrees F. In addition to these temperatures, many of the soils in the Imperial Valley have salt levels that can create emergence issues for small seeded crops. Traditionally sugar beets are furrow irrigated in the Imperial Valley. However, there has been increasing interest in utilizing solid set sprinkler pipe during the germination and emergence period. This project was set up to attempt to quantify if there are emergence differences between these two irrigation methods, and if differences do exist, do these differences equate to a yield difference at harvest.

## Objective:

The objective of this project is to determine if an advantage exists to sprinkler irrigation versus furrow irrigation during the germination and emergence period. Comparisons will include emergence percent and yield. The project will create and utilize a database of 2020-2021 Imperial Valley sugar beet fields to gather data and analyze any differences between the two types of irrigation.

## Material and Methods:

This project is not a replicated small plot research project, but a collection of data from current year production fields in the Imperial Valley of California. The Agricultural Team at Spreckels Sugar collected stand counts on 80 sugar beet fields in September – November 2020. In each of these fields, the Agriculturists were instructed to collect 20 stand counts scattered throughout the field. The stand counts consisted of counting all the emerged sugar beets in 10 foot of row per location in the field. These stand counts were averaged on a field basis to establish the sugar beet population for every field in the database. The average stand count per field was utilized to calculate the percent emergence for each field. In addition to the stand counts, the Agriculturists collected the following information from the farmers for each field: variety, seed spacing, planting date, first water date, and sprinkler or furrow irrigation. All of this information was input into the ArcGIS Collector App (ESRI) which allowed spatial display of the field locations. The data was exported into Excel (Microsoft Corp.) for analysis.

During the harvest season, Spreckels Sugar Agriculturists measure all partially harvested fields each week to obtain a weekly yield for each field and also a weekly yield average for the company. Weekly yields for each irrigation project field were added to the sprinkler/furrow irrigation database. The weekly yields allowed for yield comparison and also revenue per acre calculations for sprinkler and furrow irrigated fields on a weekly basis.

## Results:

Harvest began on April 1, 2021, at Spreckels Sugar. Weekly harvest data was accumulated and summarized beginning in the first week of April. Fields included in the irrigation project were summarized each week by irrigation type and emergence percent, yield parameters, and estimated revenue per acre were calculated for the harvested acreage. Since the month of September can have the most difficult conditions for emergence, the fields planted in the month of September were the fields utilized in the data to be presented. The results shown are the average of the fields harvested each week for each irrigation type. Table 1 has the comparison of sprinkler versus furrow irrigation fields for the first seven weeks of the 2021 harvest season. Gross revenues were estimated and calculated by using a Spreckels Sugar Revenue Calculator with \$0.33/pound NSP.

<u>Week Ending</u>	<u>Irrigation Type</u> <u>Sprinkler/Furrow</u>	<u>Harvested</u> <u>Acres</u>	<u>Percent</u> <u>Emergence</u>	<u>Extractable</u> <u>Sugar/Acre</u>	<u>Gross</u> <u>Rev/Acre</u>
4/5/21	Sprinkler	422	56.4	9,730	\$1,950
4/5/21	Furrow	367	48.1	8,410	\$1,688
4/12/21	Sprinkler	329	58.7	10,185	\$2,044
4/12/21	Furrow	546	49.5	9,177	\$1,844
4/19/21	Sprinkler	264	51.9	10,566	\$2,120
4/19/21	Furrow	341	48.2	10,234	\$2,055
4/26/21	Sprinkler	449	54.3	11,590	\$2,326
4/26/21	Furrow	194	50.2	11,123	\$2,232
5/3/21	Sprinkler	428	60.3	12,533	\$2,515
5/3/21	Furrow	171	52.4	12,410	\$2,493
5/10/21	Sprinkler	246	63.8	14,141	\$2,836
5/10/21	Furrow	300	52.8	11,479	\$2,307
5/17/21	Sprinkler	195	58.7	14,873	\$2,987
5/17/21	Furrow	184	60.0	12,952	\$2,605

Table 1: Comparison of sprinkler versus furrow irrigated fields planted in September 2020 and harvested during the first 7 weeks of the 2021 harvest.

In Figure 1, the advantage of sprinkler versus furrow irrigated fields for extractable sugar per acre is shown for each of the seven weeks. In each of the seven weeks of data, the sprinkler irrigated fields out yielded the furrow irrigated fields for extractable sugar per acre. The average advantage for the sprinkler irrigated fields was 1,119 pounds of extractable sugar per acre.

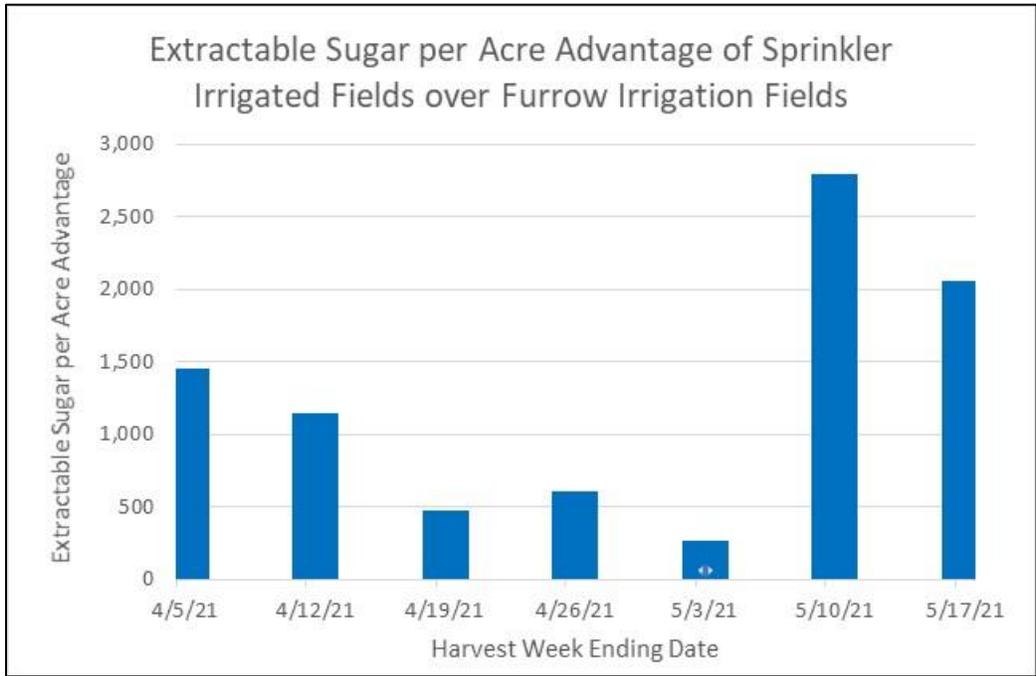


Figure 1: Extractable sugar per acre advantage of sprinkler irrigated fields versus furrow irrigated fields from the first seven weeks of the 2021 harvest season.

In Figure 2, the advantage of sprinkler irrigated fields over furrow irrigated fields over the first seven weeks of harvest is shown. The revenue per acre difference shown is a gross revenue per acre value and does not include any costs associated with either type of irrigation system. Figure 2 illustrates that in each of the seven weeks shown, sprinkler irrigated fields had higher revenue per acre than the furrow irrigated fields. This revenue advantage averaged \$222 per acre over the seven week period.

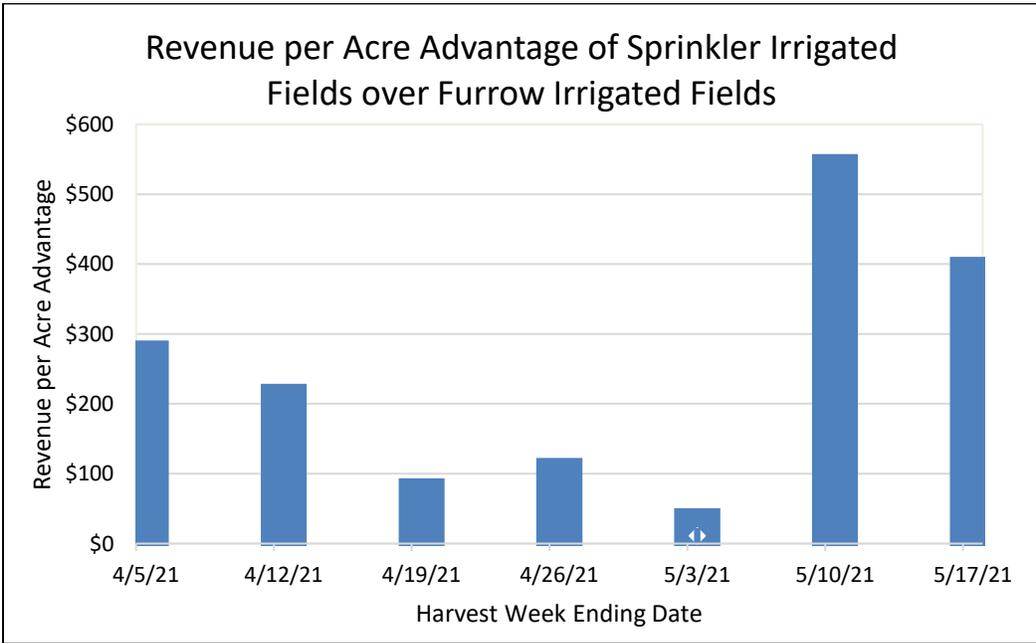


Figure 2: Revenue per acre advantage of sprinkler irrigated fields versus furrow irrigated fields from the first seven weeks of the 2021 harvest season.

The data shown in this report is one year data from the 2021 harvest season. This project will be repeated for the 2021-2022 growing season to obtain a second season of data. In addition to the field project, a research trial to compare sprinkler versus furrow irrigation for the emergence period is planned.

This irrigation project would not have been possible without the efforts of the Spreckels Sugar Agriculturists collecting the field information and stand counts on the fields during the fall of 2020. Thank you to Israel Santiago, Dimitri Boratynski, and Lauren Hutchinson for collecting the field data. Thank you to Sergio Bastidas for providing the weekly yield data and thank you to Shelby Drye for organizing and prioritizing this project.

# At What Plant Stand is Replanting Needed?

## 2017 to 2021 Final Report

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**Justification:** Establishing an optimum sugar beet plant stand is important to maximizing extractable sucrose yield in the Imperial Valley of California. If conditions are right at planting, then an optimum stand is the result. If there are problems such as seed quality, hot weather, or crusting soil, the stand will be reduced. Currently, the growers in the Imperial Valley aim for a plant stand of 30 sugar beet plants per ten feet of row for optimum production. At what plant stand should a grower decide to replant when the emergence is sub-optimal? The current answer to the question is 15 to 16 sugar beet plants per 10 feet of row. Since the advent of glyphosate resistant sugar beet varieties, there has been no research information from the Imperial Valley about replanting thresholds.

**Objective:** Determine the threshold plant stand that requires replanting in early and late harvested sugar beet production.

**Methods and Materials:** The treatments are listed in Table 1. The study was a randomized complete block design with 4 replications. There were seven plant stand treatments to represent different plant population thresholds. Stands were thinned after emergence. Treatments 1, 2, 3, and 4 were thinned to an even stand while treatments 5, 6, and 7 were thinned unequally simulating an uneven stand that would occur when poor emergence occurs (gappy). Treatment 8 was similar to when a replant decision was made. Seven sites were established during the study from Fall 2017 to Summer 2021, Table 2. There were four early harvest and three late harvest sites. The planting, thinning, and harvest dates are listed in Table 2. All locations were planted with Beta 5460. Root yield was determined on the dates reported in Table 2. Root quality was determined by the Spreckels Sugar Tare Laboratory.

Table 1. Treatments for the proposed reduced stand study.

Treatment	Sugar beet per 10 feet of row
1	34
2	30
3	26
4	22
5	18 gaps
6	14 gaps
7	10 gaps
8	30 replant – planted at 4-5 weeks after original planting.

Table 2. Planting, thinning, and harvest dates for the replanting study.

Site	Planting date	Thinning date	Replant	Harvest date
Site 1 2017-2018	Oct. 2, 2017	Oct. 30, 2017	Nov. 15, 2017*	June 5, 2018 (early)
Site 2 2017-2018	Oct. 6, 2017	Nov. 9, 2017	Nov. 13, 2017	July 17 and 18, 2018 (late)
Site 1 2018-2019	Oct. 19, 2018	Nov. 27, 2018	Dec. 12, 2018	July 15, 2019 (late)
Site 1 2019-2020	Sept 14, 2019	Oct 17, 2019	Nov. 1, 2019	April 06, 2020 (early)
Site 3 2019-2020	Oct. 12, 2019	Nov. 11-12, 2019	Dec. 6, 2019	June 17, 2020 (late)
Site 1 2020-2021	Sept. 23, 2020	Oct. 22, 2020	Oct. 22, 2020	April 14, 2021 (early)
Site 2 2020-2021	Oct. 28, 2020	Dec. 3, 2020	Dec. 2, 2020	May 18, 2021 (early)

\* birds ate seed from the previous planting in early November.

**Results:**

Growing season 2017-2018

*Early harvest 2017-2018 Site 1:* The root yields and quality were good for an early harvest location. The population treatments significantly affected root yield, extractable sucrose per acre, brei nitrate, and stand, Table 3. Extractable sucrose per ton and purity were not affected by the treatments. The root yields for all of the population treatments, 1 through 7 were not significantly different, Table 4. The root yield for the replant treatment, 8, was significantly less than the root yields for the other treatments. Extractable sucrose per acre was the greatest for treatment 3. The stand was significantly affected by the treatments. This shows that the treatment did get established as intended. Brei nitrate was significantly increased by the replant treatment (8). The late planting of treatment 8 caused most of the significant differences that occurred at this site.

Table 3. Statistical analysis for the Early Harvest Replanting Trial – Site 1 2017-2018.

Statistics	Root yield	Extractable sucrose per ton	Extractable sucrose per acre	Purity	Brei nitrate	Stand
Rep	0.77	0.14	0.29	0.29	0.13	0.36
Treatment	0.0001	0.32	0.0001	0.61	0.04	0.0001
C.V. (%)	5.7	3.7	5.7	1.0	44.7	5.0
Grand mean	59.7	281	16766	90.14	18	89
LSD <sub>0.05</sub>	5.0	NS	1407	NS	12	6.5

Table 4. Means for root yield, extractable sucrose per ton, extractable sucrose per acre, purity, brei nitrate, and stand for early harvest replant study, Site 1, 2017-2018.

Treatment	Root yield	Extractable sucrose		Purity	Brei nitrate	Stand
plants per 10 ft of row	ton/A	lb/ton	lb/A	%	ppm	plants/plot
1 (34)	61.4	281	17238	90.3	13	133
2 (30)	63.6	273	17335	89.8	18	116
3 (26)	65.2	292	19031	90.9	13	101
4 (22)	64.5	286	18388	90.1	15	85
5 (18 gappy)	63.3	278	17568	90.1	17	68
6 (14 gappy)	63.9	280	17893	90.4	16	55
7 (10 gappy)	61.2	279	17044	89.7	20	39
8 (30 replant)	34.5	279	9631	89.9	34	112

*Late harvest 2017-2018 Site 2:* The root yield and quality for this site was very good for a late harvested sugar beet crop. The plant stand treatments did not significantly affect the extractable sucrose per ton, purity or brei nitrate-N, Table 5 and 6. Root yield was only affected by the replant treatment, 8. Treatment 6 was superior in root yield while treatment 5 was superior in extractable sucrose per acre. The stand was significantly affected by the treatments. This shows that the treatments did get established as intended. The late planting of treatment 8 caused most of the significant difference that occurred in this study.

Table 5. Statistical analysis for the Late Harvest Replanting Trial – Site 2 2017-2018.

Statistics	Root yield	Extractable sucrose per ton	Extractable sucrose per acre	Purity	Brei nitrate	Stand
Rep	0.38	0.47	0.20	0.52	0.95	0.66
Treatment	0.0001	0.20	0.0001	0.88	0.56	0.0001
C.V. (%)	4.9	4.4	4.8	1.2	28.9	2.1
Grand mean	89.7	245	21989	87.0	162	92.9
LSD <sub>0.05</sub>	6.5	NS	1561	NS	NS	2.8

Table 6. Means for root yield, extractable sucrose per ton, extractable sucrose per acre, purity, brei nitrate, and stand for late harvest replant study, Site 2, 2017-2018.

Treatment	Root yield	Extractable sucrose		Purity	Brei nitrate	Stand
plants per 10 ft of row	ton/A	lb/ton	lb/A	%	ppm	plants/plot
1 (34)	86.9	244	21169	87.0	155	131
2 (30)	90.7	238	21531	86.6	183	122
3 (26)	92.4	249	22975	87.3	153	113
4 (22)	95.1	245	23247	86.8	162	89
5 (18 gappy)	92.3	259	23918	87.6	119	69
6 (14 gappy)	96.3	240	23062	86.8	170	56
7 (10 gappy)	94.4	240	22682	86.7	162	40
8 (30 replant)	71.6	247	17595	87.2	190	124

#### Growing season 2018-2019

*Late harvest 2018-2019 Site 1:* The root yields and quality were good for a late harvest location. The population treatments significantly affected root yield, extractable sucrose per ton, extractable sucrose per acre, purity, brei nitrate, and stand, Table 7. The root yields for all of the population treatments, 1 through 6 were not significantly different, Table 8. Root yield for the treatment, 7, was significantly less than the root yields for treatments 1, 2, 4 and 6. The root yield for the replant treatment, 8, was significantly less than the root yields for the other treatments.

Extractable sucrose per ton was the greatest for treatment 3. The extractable sucrose for treatments 1, 2, 4, 5 and 6 were significantly less than the greatest extractable sucrose per ton while extractable sucrose per ton for treatment 7 was 5 lb per ton less than the middle group. The replant sugar beet for treatment 8 had the least amount of extractable sucrose per ton.

The extractable sucrose per acre at this site was over 20,000 lb per acre for sugar beet treated with planting treatments 1, 2, 3, 4, 5, and 6. Treatment 7 had less extractable sucrose per acre than the other non-replanted treatments. The replanted treatment, 8, had the least amount of extractable sucrose per acre.

Purity was only significantly affected by the replanted treatment 8. The rest of the sugar beet planted to the different stands were similar.

Brie nitrate-N in the sugar beet root was affected by the plant stand treatment. The replant treatment, 8, had the greatest brie nitrate-N while the sugar beet roots from the other treatments were less. There was no relationship between the plant stand and the amount of brie nitrate-N in the sugar beet roots.

The stand was significantly affected by the treatments. This shows that the treatment did get established as intended.

Table 7. Statistical analysis for the Late Harvest Replanting Trial – Site 1 2018-2019.

Statistics	Root yield	Extractable sucrose per ton	Extractable sucrose per acre	Purity	Brei nitrate	Stand
Rep	0.25	0.001	0.77	0.66	0.89	0.31
Treatment	0.0001	0.0001	0.0001	0.03	0.0007	0.0001
C.V. (%)	6.6	1.5	6.6	0.7	21.2	4.7
Grand mean	69.6	285	19841	90.25	66	85
LSD <sub>0.05</sub>	6.8	6.1	1920	0.92	20	5.9

Table 8. Means for root yield, extractable sucrose per ton, extractable sucrose per acre, purity, brei nitrate, and stand for late harvest replant study, Site 1, 2018-2019.

Treatment	Root yield	Extractable sucrose		Purity	Brei nitrate	Stand
plants per 10 ft of row	ton/A	lb/ton	lb/A	%	ppm	plants/plot
1 (34)	78.9	286	22544	90.4	61	131
2 (30)	77.7	285	22103	90.6	66	118
3 (26)	74.4	297	22050	91.1	43	106
4 (22)	77.2	284	21932	90.4	62	85
5 (18 gappy)	72.9	285	20742	90.1	75	71
6 (14 gappy)	77.3	286	22086	90.2	46	52
7 (10 gappy)	70.2	279	19596	90.1	73	40
8 (30 replant)	27.9	276	7679	89.2	96	77

Growing season 2019-2020

*Early harvest 2019-2020 Site 1:* The root yields and quality were good for an early harvest location. The population treatments significantly affected root yield, extractable sucrose per acre, and stand, Table 9. The root yields for all of the population treatments, 1 through 7 were not significantly different, Table 10. The root yield for the replant treatment, 8, was significantly less than root yields for the other treatments.

The mean extractable sucrose per acre at this site was 9507 lb per acre. The significant difference in extractable sucrose per acre occurred for treatment 8 compared to the other treatments. The replanted treatment 8 extractable sucrose per acre was half compared to the other treatments (1, 2, 3, 4, 5, 6, and 7).

Extractable sucrose per ton, root purity, and brei nitrate-N were not affected by the stand treatments.

The stand was significantly affected by the treatments. This shows that the treatment did get established as intended.

Table 9. Statistical analysis for the early harvest replanting trial – Site 1 2019-2020.

Statistics	Root yield	Extractable sucrose per ton	Extractable sucrose per acre	Purity	Brei nitrate	Stand
Rep	0.63	0.28	0.31	0.11	0.29	0.31
Treatment	0.0001	0.76	0.0001	0.33	0.78	0.0001
C.V. (%)	8.3	3.0	7.2	0.6	76.7	5.1
Grand mean	34.5	275	9507	89.44	10	88
LSD <sub>0.05</sub>	4.2	12.2	1012	0.73	11	6.6

Table 10. Means for root yield, extractable sucrose per ton, extractable sucrose per acre, purity, brei nitrate, and stand for early harvest replant study, Site 1, 2019-2020.

Treatment	Root yield	Extractable sucrose		Purity	Brei nitrate	Stand
plants per 10 ft of row	ton/A	lb/ton	lb/A	%	ppm	plants/plot
1 (34)	36.7	279	10225	89.7	8	124
2 (30)	37.2	274	10201	89.4	11	104
3 (26)	38.6	272	10507	89.2	13	105
4 (22)	35.2	280	9818	89.6	9	85
5 (18 gappy)	38.2	276	10544	89.8	7	69
6 (14 gappy)	35.8	277	9882	89.3	9	56
7 (10 gappy)	36.1	274	9878	89.5	14	40
8 (30 replant)	18.6	270	5000	89.0	7	122

*Late harvest 2019-2020 Site 3:* The root yields and quality were good for a late harvest location. The population treatments significantly affected root yield, extractable sucrose per ton, extractable sucrose per acre, brei nitrate, and stand, Table 11. The root yields for population treatments, 1 through 6 were not significantly different, Table 12. The root yield for treatment 7 (gappy 10 plants per 10 feet of row) and the replant treatment, 8, were significantly less than the root yields for the other treatments.

Extractable sucrose per ton at this site was very good. The overall average was 315 lb sucrose per ton of beet root processed. The uniform stands of 30 and 26 plants per 10 feet of row had the greatest extractable sucrose. The extractable sucrose per ton for 14 gappy, 22 uniform, and 34 uniform plants per 10 feet or row were statistically similar to the best stands. The least amount of extractable sucrose per ton occurred with sugar beet with stands of gappy 10, gappy 18, and the replant treatment of 30 uniform plants per 10 feet of row.

The mean extractable sucrose per acre at this site was 16451 lb per acre. The significant difference in extractable sucrose per acre occurred for treatment 8 compared to the other treatments. The replanted treatment 8 extractable sucrose per acre was a little over half the extractable sucrose per acre compared to the better treatments (1, 2, 3, 4, 5, and 6).

Root brei nitrate is statistically affected by the plant stand. In general, as the stand was reduced the amount of brei nitrate in the root increased.

Root purity, was not affected by the stand treatments.

The stand was significantly affected by the treatments. This shows that the treatment did get established as intended.

Table 11. Statistical analysis for the late harvest replanting trial – Site 3 2019-2020.

Statistics	Root yield	Extractable sucrose per ton	Extractable sucrose per acre	Purity	Brei nitrate	Stand
Rep	0.03	0.16	0.02	0.16	0.02	0.52
Treatment	0.0001	0.05	0.0001	0.14	0.006	0.0001
C.V. (%)	6.2	2.0	5.7	0.7	18.5	1.9
Grand mean	52.2	315	16451	90.48	17	92
LSD <sub>0.05</sub>	4.7	9.1	1362	0.82	4.8	2.6

Table 12. Means for root yield, extractable sucrose per ton, extractable sucrose per acre, purity, brei nitrate, and stand for late harvest replant study, Site 3, 2019-2020.

Treatment	Root yield	Extractable sucrose		Purity	Brei nitrate	Stand
plants per 10 ft of row	ton/A	lb/ton	lb/A	%	ppm	plants/plot
1 (34)	57.3	314	17977	90.4	20	135
2 (30)	55.1	322	17752	90.8	15	120
3 (26)	56.4	322	18154	90.8	15	105
4 (22)	58.5	316	18452	91.0	12	88
5 (18 gappy)	56.2	310	17379	90.3	17	71
6 (14 gappy)	53.9	316	17034	90.4	19	57
7 (10 gappy)	48.2	311	15007	89.9	21	40
8 (30 replant)	31.7	311	9850	90.2	21	122

#### Growing season 2020-2021

##### *Early harvest 2020-2021 Site 1:*

The root yields and quality were good for an early harvest location. The population treatments significantly affected root yield, extractable sucrose per acre, and stand, Table 13. The root yields for all of the population treatments, 1

through 7 were not significantly different, Table 14. The root yield for the replant treatment, 8, was significantly less than the root yields for the other treatments.

The mean extractable sucrose per acre at this site was 11451 lb A<sup>-1</sup>. The significant difference in extractable sucrose per acre occurred for treatment 8 compared to the other treatments. The replanted treatment 8 extractable sucrose per acre was two thirds compared to the other treatments (1, 2, 3, 4, 5, 6, and 7).

Extractable sucrose per ton, root purity, and brei nitrate-N were not affected by the stand treatments.

The stand was significantly affected by the treatments. The stand for treatment 1 was less than it should have been. The other stands got established as intended.

Table 13. Statistical analysis for the early harvest replanting trial – Site 1 2019-2020.

Statistics	Root yield	Extractable sucrose per ton	Extractable sucrose per acre	Purity	Brei nitrate	Stand
Rep	0.67	0.67	0.30	0.80	0.02	0.45
Treatment	0.0001	0.80	0.0001	0.53	0.51	0.0001
C.V. (%)	6.2	3.5	5.0	1.2	30.3	15.7
Grand mean	40.1	286	11451	89.47	13	89
LSD <sub>0.05</sub>	3.6	14.5	840	1.50	6	21

Table 14. Means for root yield, extractable sucrose per ton, extractable sucrose per acre, purity, brei nitrate, and stand for early harvest replant study, Site 1, 2020-2021.

Treatment	Root yield	Extractable sucrose		Purity	Brei nitrate	Stand
plants per 10 ft of row	ton/A	lb/ton	lb/A	%	ppm	plants/plot
1 (34)	39.8	291	11543	89.83	12	115
2 (30)	40.4	286	11574	88.40	15	120
3 (26)	42.5	283	12012	89.40	13	104
4 (22)	43.4	282	12222	89.28	12	86
5 (18 gappy)	41.7	288	12006	89.83	11	72
6 (14 gappy)	42.6	282	12000	89.55	12	56
7 (10 gappy)	40.8	291	11852	89.88	13	40
8 (30 replant)	29.5	285	8403	89.58	17	120

*Early harvest 2020-2021 Site2:*

The root yield and quality were good at site 2. The stand was significantly affected by the treatment. This is good as it is the foundation for the treatment, Table 15 and 16. Root yield and extractable sucrose per acre were significantly affected by the treatments, Table 5. The root yield was significantly less for treatments 1 and 8. Treatment 8 was the replanted treatment with a stand of 30 plants per 10 feet of row. This reduction was 10 to 14 ton per acre. Treatment 1 root yield is just significantly less than the root yield for treatments 2, 3, 4, 5, 6, and 7. The reason for this is unknown. Extractable sucrose per acre follows the same trend as the root yield.

Root quality was not affected by the stand. Extractable sucrose per ton, root purity, and brei nitrate were not significantly affected by the stand treatments, Table 5 and 6.

At this earlier harvest site in 2020 – 2021 growing season, it did not pay to replant sugar beet with gappy stands as low as 10 plants per 10 feet of row.

Table 15. Statistical analysis for the early harvest replanting trial – Site 2 2020-2021.

Statistics	Root yield	Extractable sucrose per ton	Extractable sucrose per acre	Purity	Brei nitrate	Stand
Rep	0.01	0.02	0.38	0.22	0.17	0.56
Treatment	0.0001	0.11	0.0001	0.52	0.15	0.0001
C.V. (%)	5.1	2.9	5.0	1.0	30.7	0.5
Grand mean	37.4	274	10240	90.0	35.2	92
LSD <sub>0.05</sub>	2.8	12	750	1.2	16	0.6

Table 16. Means for root yield, extractable sucrose per ton, extractable sucrose per acre, purity, brei nitrate, and stand for late harvest replant study, Site 2, 2020-2021.

Treatment	Root yield	Extractable sucrose		Purity	Brei nitrate	Stand
plants per 10 ft of row	ton/A	lb/ton	lb/A	%	ppm	plants/plot
1 (34)	36.6	282	10315	90.2	28.5	136
2 (30)	40.2	278	11135	90.3	27.6	120
3 (26)	37.2	280	10388	90.4	30.4	104
4 (22)	39.6	271	10731	89.3	35.0	88
5 (18 gappy)	41.0	265	10862	89.6	49.5	72
6 (14 gappy)	39.1	271	10553	90.1	39.9	56
7 (10 gappy)	39.9	273	10897	90.4	37.6	40
8 (30 replant)	26.0	271	7039	90.1	33	120

### Summary:

#### Growing season 2017-2018

In the growing season of 2017-2018, the replanting of a reduced stand of sugar beet would not have been advisable. This is not what was expected, as the population was reduced to 1 sugar beet per foot of row and gappy in distribution yielded very well. The late harvest site sugar beets from the gappy reduced populations (Treatments 5 to 7) were very difficult to harvest and would be a large problem for commercial harvesting equipment. The large beets caused issues with plugging the harvester. The replant treatment, 8, was not as successful as originally thought. At the early harvest site, the replanting was delayed by irrigation water scheduling and the fact that it was replanted again because of bird feeding damage. At the late harvest site, the replant may not have yielded well because of the later than originally planned replanting.

#### Growing season 2018-2019

In the growing season of 2018-2019, the replanting of a reduced stand of sugar beet would not have been advisable. This is not what was expected. As the stand was reduced to 1.4 sugar beet plants per foot of row and with an uneven distribution of plants in the row, the sucrose yield was the same as a uniform stand at an optimum density. The treatment with only 1 sugar beet per foot of row did have reduced root yield, extractable sucrose per ton, and extractable sucrose per acre compared to the other non-replanted treatments. The reduction may not have been enough to overcome the reduction in yield from a three-week delay in replanting. The sugar beets from the gappy reduced populations (Treatments 5 to 7) were very difficult to harvest and would be a large problem for commercial harvesting equipment. The large beets caused issues with plugging the harvester. The replant treatment, 8, was not as successful as originally thought. The replanting treatment had to be replanted because of bird feeding damage so the planting was significantly delayed.

#### Growing season 2019-2020

In the growing season of 2019-2020, the replanting of a reduced stand of sugar beet would not have been advisable. This is not what was expected. As the stand was reduced to 1.4 sugar beet plants per foot of row and with an uneven distribution of plants in the row, the sucrose yield was the same as a uniform stand at an optimum density. At both early and late harvest locations, the treatment with only 1 sugar beet per foot of row did have reduced root yield,

extractable sucrose per ton, and extractable sucrose per acre compared to the other non-replanted treatments. The reduction may not have been enough to overcome the reduction in yield from a three-week delay in replanting. Unlike previous experience with late harvested sugar beets, the sugar beets from the gappy reduced populations (Treatments 5 to 7) were not difficult to harvest at Location 1 early harvest. At location 3 late harvest the gappy reduced populations were difficult to harvest similar to late harvest sites in years past. The replant treatment, 8, was not as successful as originally thought.

Growing season 2020-2021

In the growing season of 2020-2021, the replanting of a reduced stand of sugar beet would not have been advisable. These sites were harvested early (April and May) and did not yield extractable sucrose greater than 13,000 pounds per acre.

Combined Results:

The effect of plant stand on extractable sucrose per acre from all sites is shown in Figure 1. For 3 of the 4 early harvest sites, plant stand between 10 and 34 plants per 10 ft. of row did affect the extractable sucrose per acre. At these sites the extractable sucrose per acre was less than 13,000 pounds per acre. At all of the late harvest sites and one early harvest site (Early 1 1718), the optimum stand can range from 18 to 33 plants per 10 ft of row.

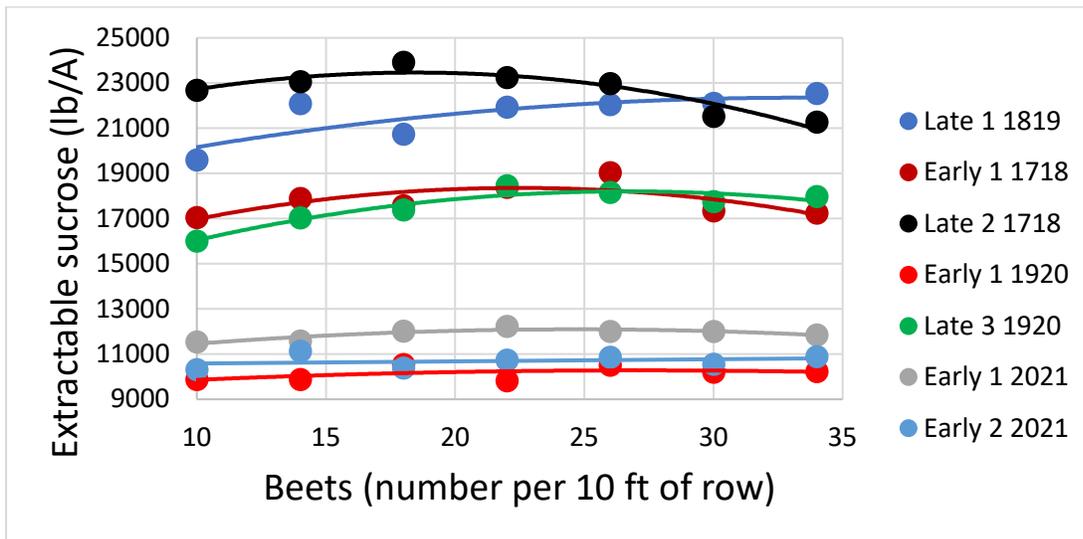


Figure 1. Plant stand effects on extractable sucrose per acre 2017-2021.

The economic effect will depend on the price of sucrose, Table 17. If sucrose is at \$0.17 per lb, a reduction in return from optimum plant stand to 14 plants per 10 feet of row can range from 0 to \$194.89 per acre. If the plant stand is reduced to 10 plants per 10 feet of row, the economic loss would be from 0 to \$284.01 per acre. These values need to be compared to the cost of replanting to make the decision.

Table 17. Optimum plant stand for extractable sucrose per acre at five locations in the Imperial Valley from 2017 to 2021.

Site	Optimum stand Plants/10 feet of row	Economic loss from optimum in \$/A (assume \$0.17 per lb sucrose)	
		14 plants/10 feet of row	10 plants/10 feet of row
Late 1 – 1819	33	-\$309.06	-\$370.87
Early 1 – 1718	22	-\$108.28	-\$234.75
Late 2 – 1718	18	-\$35.25	-\$128.55
Early 1 – 1920	No optimum	0	0
Late 3 – 1920	27	-\$296.85	-\$521.09
Early 1 - 2021	No optimum	0	0
Early 2 - 2021	No optimum	0	0

Summary points from this research for use in sugar beet production in the Imperial Valley of California are:

1. Conduct a careful evaluation of the plant stand of the field before deciding to replant.
2. A sugar beet stand goal would be 26 to 30 plants per 10 feet of row.
3. Current information would indicate the decision of replanting is not influenced by harvest date.
4. The optimum plant stand for late harvest sugar beet or sugar beet that will yield great than 13,000 pounds of extractable sucrose per acre in recent studies is around 24 plants per 10 feet of row.
5. Good yields of extractable sucrose per acre can be obtained most of the time with a stand as low as 14 plants per 10 feet of row. Current research information would not recommend replanting a stand greater than 14 plants per 10 feet of row.
6. A population of less than 14 plants per 10 feet of row late harvest sugar beet can cause harvest issues because of variable size roots.

# Nitrogen Rate Effect on Sugar Beet Varieties Grown in the Imperial Valley of California, 2020 – 2021 growing season

John A. Lamb, Ryan Kowta, and Mark Bloomquist

**Justification:** Growers in the Imperial Valley have recently adopted glyphosate resistant varieties in their sugar beet production system. Nitrogen application is one of the most important factors in producing good quality sugar beet. Many new varieties have been developed with the glyphosate resistant genetics and little is known about the varieties response in tonnage and quality to N application rates. Kaffka 2007 reported that the optimum N application rate for sugar beets harvested in June and July was 220 lb N/A with another 100 lb nitrate-N/A in the surface 43 inches of soil at planting. A number of research reports found on the Spreckels Sugar website ([www.spreckelsugar.com](http://www.spreckelsugar.com)) Research Reports tab report on recent field research on N application in the Imperial Valley. The research by Lamb, Santiago, and Bloomquist, resulted in varied responses from the use of N fertilizer in the Imperial Valley from 2013 to 2018. New information is needed because of the introduction of glyphosate resistant varieties and the increased production capacity of these new varieties.

## **Objective:**

1. Determine the effect of nitrogen rate on sugar beet varieties.

**Materials and Methods:** An experiment was established at two locations in the Imperial Valley of California in fall of 2020, Imperial Valley Research Center (IVRC) and near Holtville. The treatments were the factorial combination of eight nitrogen application rates (0, 40, 80, 120, 160, 200, 240, and 280 lb N/A) and two sugar beet varieties. These varieties were chosen using the results from the Official Variety Trials (OVT) conducted in the Imperial Valley. The varieties were a top tonnage variety (Beta 5678) and a top-quality variety (SV 983). Two additional varieties included in an incomplete factorial design (Beta 5460 and SV 2997). These varieties were be chosen based on popularity in the case of Beta 5460 and new genetics in the case of SV2997N. The N application rates for the additional varieties were 0 and 200 lb N/A. The soil test values for each site are listed in Table 1. At both sites, the soil nitrate-N to a depth of four feet was above optimum. At the IVRC, a pre-plant application of phosphate fertilizer (11-52-0) was applied to all plots. This supplied 11 lb N/acre. At the Holtville site, 100 lbs urea/acre and 250 lb MAP/acre were pre-plant applied by the cooperator. This supplied 74 lb N/acre. The nitrogen source was liquid UAN (32-0-0). The N fertilizer treatments were applied pre-plant. The treatments for this study are in Table 2. The study had four replications at the IVRC and six replicates at Holtville. The IVRC site was planted October 7, 2020 and the Holtville site was planted October 14, 2020. Petioles from the most recently matured leaves were be sampled February 25, 2021 at IVRC and March 2, 2021 at Holtville to determine the effect of the treatments on the nitrogen status of the sugar beet plants. The roots were harvested June 3, 2021 at IVRC and July 7 and 8, 2021 at Holtville. Root quality was determined by the Spreckels Sugar quality laboratory.

Table 1. Soil test values for IVRC and Holtville in fall 2020.

Soil test	IVRC	Holtville
Nitrate-N (0-4 ft.) lb N/A	280	228
Olsen P (0-1 ft.) ppm	13	14
K (0-1 ft.) ppm	473	258

Table 2. Treatments for the Nitrogen rate and application time study.

Treatment number	N rate	Variety
1	0	Beta 5678
2	40	Beta 5678
3	80	Beta 5678
4	120	Beta 5678
5	160	Beta 5678
6	200	Beta 5678
7	240	Beta 5678
8	280	Beta 5678
9	0	SV 983
10	40	SV 983
11	80	SV 983
12	120	SV 983
13	160	SV 983
14	200	SV 983
15	240	SV 983
16	280	SV 983
17	0	Beta 5460
18	200	Beta 5460
19	0	SV 2997N
20	200	SV 2997N

## Results and Discussion:

### IVRC 2020 – 2021:

#### *N rate for Beta 5678 and SV 983*

Root yield and extractable sucrose per acre were significantly affected by variety at IVRC in the 2020 – 2021 growing season, Table 3. Root yield and extractable sucrose per acre were greater for SV 983 than Beta 5678, Table 4. The differences were 4.3 ton per acre and 1382 lb per acre for root yield and extractable sucrose per acre, respectively. Nitrogen fertilizer did not affect root yield or extractable sucrose per acre. The initial soil nitrate-N was large at 280 lb N/acre so the lack of response was not a surprise.

Extractable sucrose per ton was affected by N fertilizer application, Table 3 and 4. There was a slight interaction between variety and N fertilizer rate, 0.13. This interaction is illustrated in Figure 1. The extractable sucrose per ton decreases as the N fertilizer rate

increases for Beta 5678. The response for SV 983 for extractable sucrose per ton with N rate increasing was an increase to a maximum at 120 lb N per acre and then a decrease with increasing N application above 120 lb N per acre. In general, the increased application of N fertilizer reduced extractable sucrose per ton.

Petiole nitrate-N sampled late February 2021 was greater for Beta 5678 compared to SV 983. Fertilizer N rate of application increased petiole nitrate-N concentration, Table 5. and Figure 2. As the fertilizer N rate was increased the petiole nitrate-N concentration increased.

Table 3. Statistical analysis of N rate for Beta 5678 and SV 983 for root yield, extractable sucrose per ton, extractable sucrose per acre, purity, and petiole nitrate-N at IVRC grown in the 2020 - 2021 growing season.

Term	Root yield	Extractable sucrose		Purity	Petiole nitrate-N
		lb/Ton	lb/Acre	%	ppm
Rep	0.001	0.0003	0.90	0.13	0.23
Variety	0.0001	0.93	0.0001	0.26	0.03
N rate	0.24	0.02	0.80	0.11	0.0001
Variety X Nrate	0.51	0.13	0.42	0.34	0.34
C.V. (%)	4.7	3.5	5.0	1.2	39.9
Grand mean	66.9	292	19526	89.3	1514

Table 4. The means for N rate by Variety for Beta 5678 and SV 983 for root yield, extractable sucrose per ton, and extractable sucrose per acre at IVRC grown in 2020 – 2021 growing season.

N rate lb N/A	Root yield			Extractable sucrose					
	Beta 5678	SV 983	Mean	Beta 5678	SV 983	Mean	Beta 5678	SV 983	Mean
	ton/A			lb/ton			lb/A		
0	59.2	67.6	63.4	307	296	300	18169	20004	19087
40	63.5	69.5	66.5	299	285	292	18983	19836	19399
80	65.1	68.8	67.2	304	294	299	19541	20671	20219
120	65.6	72.8	68.7	280	292	285	18315	20494	19249
160	65.3	69.1	67.2	286	298	293	19029	20578	19914
200	65.1	66.3	65.6	298	296	297	19535	19577	19556
240	66.6	68.5	67.5	279	294	285	18590	20643	19470
280	67.6	69.8	68.6	285	281	282	19353	19523	19466
Mean	64.8	69.1		291	292		18861	20243	

Table 5. The means for N rate by Variety for Beta 5678 and SV 983 for purity, and petiole nitrate-N at IVRC grown in 2020 – 2021 growing season.

N rate lb N/A	Root purity			Petiole nitrate-N		
	Beta 5678	SV 983	Mean	Beta 5678	SV 983	Mean
		%			ppm	
0	90.1	90.0	90.1	350	372	362
40	89.8	88.4	89.1	648	862	755
80	89.5	89.6	89.5	1133	285	709
120	89.2	88.8	89.0	1783	1412	1597
160	89.7	89.6	89.7	1927	1507	1717
200	90.6	89.1	89.8	884	812	843
240	88.4	89.5	88.8	2942	1665	2394
280	88.6	88.2	88.4	3701	3519	3610
Mean	89.5	89.1		1195	1165	

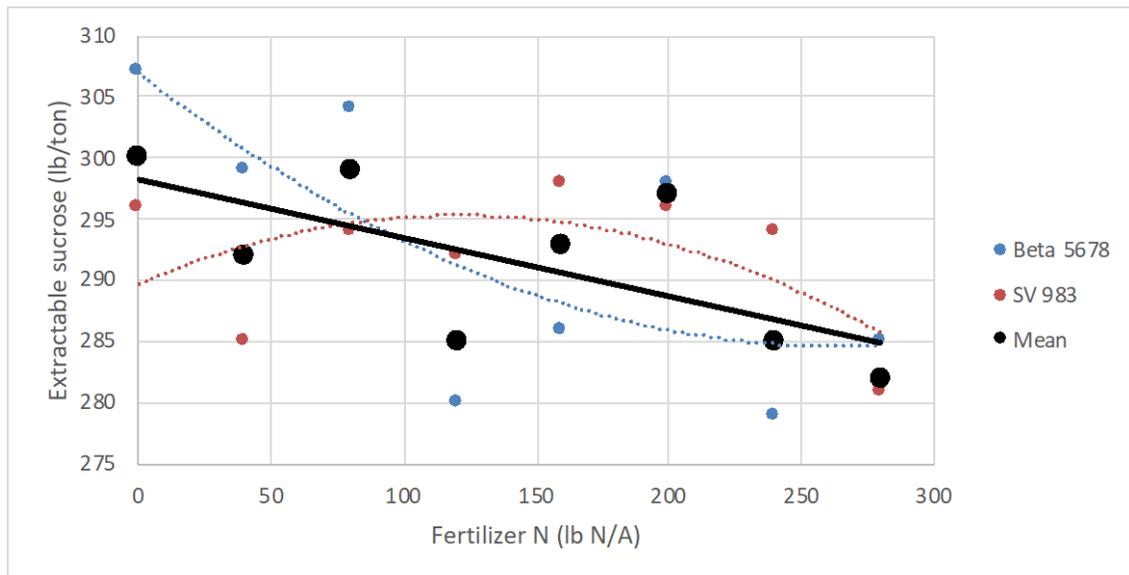


Figure 1. The effect of fertilizer N on extractable sucrose per ton at IVRC during the 2020 – 2021 growing season.

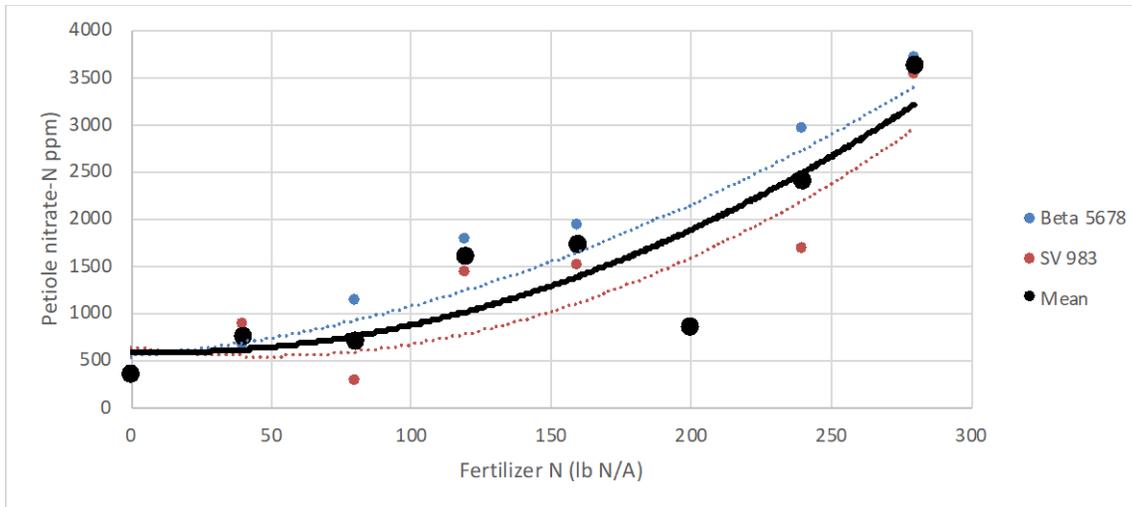


Figure 2. The effect of N fertilizer on petiole nitrate-N at IVRC during the 2020 – 2021 growing season.

*N response for Beta 5678, SV 983, Beta 5460, and SV 2997N at IVRC*

Two additional sugar beet varieties were included in the study to understand the effect of N fertilizer on a wider selection of varieties. These varieties were Beta 5460 and SV 2997N. These were compared at the 0 and 200 lb N per acre N rates.

Root yield was affected by variety and had an interaction between variety and N rate application, Table 6. The interaction was caused by a non-response to N fertilizer application by SV 983, Beta 5460, and SV 2997N and a response to N fertilizer by Beta 5678, Table 7. The response to N by Beta 5678 was not significant when the extended N treatments were used in the study (see earlier discussion). Extractable sucrose per acre was not affected by the treatments. This leads to the conclusion that the interaction for root yield is not important.

Extractable sucrose per ton was not significantly affected by variety or N fertilizer application, Table 6 and 7.

Table 6. Statistical analysis for response of Beta 5678, SV 983, Beta 5460, and SV 2997N to 200 lb N/A for root yield, extractable sucrose per ton, extractable sucrose per acre, purity, and petiole nitrate-N at IVRC grown in the 2020 - 2021 growing season.

Term	Root yield	Extractable sucrose		Purity	Petiole nitrate-N
		lb/Ton	lb/Acre	%	ppm
Rep	0.07	0.03	0.21	0.14	0.16
Variety	0.05	0.22	0.31	0.37	0.09
N rate	0.96	0.76	0.97	0.17	0.007
Variety X Nrate	0.10	0.12	0.28	0.09	0.33
C.V. (%)	4.5	3.5	4.6	0.9	65.9
Grand mean	65.5	296	19323	90.0	664

Table 7. The means for N rate by Variety for response of Beta 5678, SV 983, Beta 5460, and SV 2997N to 200 lb N/A for root yield, extractable sucrose per ton, and extractable sucrose per acre at IVRC grown in the 2020 - 2021 growing season.

Variety	Root yield			Extractable sucrose					
	0 lb N/A	200 lb N/A	Mean	0 lb N/A	200 lb N/A	Mean	0 lb N/A	200 lb N/A	Mean
	ton/A			lb/ton			lb/A		
Beta 5678	59.2	65.1	62.6	307	298	302	18169	19535	18852
SV 983	67.6	66.3	67.0	296	296	296	20004	19577	19791
Beta 5460	66.6	65.8	66.1	302	291	297	19884	19294	19589
SV 2997N	68.3	65.8	66.5	284	297	291	18635	19258	19009
Mean	65.4	65.5		297	295		19222	19416	

There was a significant interaction between variety and N application rate for beet root purity, Table 6. For SV 983 and SV 2997N purity was not affected by the addition of N fertilizer, Table 8, while purity was increased for Beta 5678 with N fertilizer addition and decreased for Beta 5460. These differences are not large.

Petiole nitrate-N was affected by both variety and N fertilizer application rate, Table 6. The addition of N fertilizer increased the petiole nitrate-N for all varieties, Table 8. Beta 5460 had the greatest petiole-nitrate-N, followed by Beta 5678 and SV 983. The variety with the least petiole nitrate-N concentration was SV 2997N.

Table 8. The means for N rate by Variety for response of Beta 5678, SV 983, Beta 5460, and SV 2997N to 200 lb N/A for purity and petiole nitrate-N at IVRC grown in the 2020 - 2021 growing season.

Variety	Root purity			Petiole nitrate-N		
	0 lb N/A	200 lb N/A	Mean	0 lb N/A	200 lb N/A	Mean
	%			ppm		
Beta 5678	90.1	90.6	90.4	350	884	617
SV 983	90.0	89.1	89.6	372	812	592
Beta 5460	90.7	89.1	90.0	554	1526	970
SV 2997N	89.9	90.0	89.9	402	543	482
Mean	90.2	89.7		425	903	

### Holtville 2020 – 2021:

#### *N rate for Beta 5678 and SV 983 at Holtville*

Root yield was significantly affected by variety at Holtville in the 2020 – 2021 growing season, Table 9. Root yield was greater for SV 983 than Beta 5678, Table 10. The difference was 2.8 ton per acre for root yield. Nitrogen fertilizer did not affect root yield.

Extractable sucrose per ton was affected by Variety and N fertilizer application, Table 9 and 10. Extractable sucrose per ton was greater for SV983 compared to Beta 5678. This difference is small. The extractable sucrose per ton has a small decrease as the N fertilizer rate increased particularly at the application of 280 lb N/A.

Extractable sucrose per acre is not significantly affected by Variety or N application, Tables 9 and 10.

Root purity was significantly affected by variety and N rate, Table 9 and 11. Beta 5678 has a greater root purity compared to SV983. This difference is only 0.6 %. The application of N decreases root purity from 90.1 to 88.7 %.

Petiole nitrate-N sampled late February 2021 was not significantly affected by variety. Nitrogen application increased petiole nitrate-N concentration, Tables 9 and 11.

The lack of response to N fertilizer is not totally surprising. The initial residual nitrate-N was 228 lb N/acre and then add the amount of N applied by the cooperators as urea and MAP, 74 lb N/acre totaled 302 lb N/acre. This is considerable.

Table 9. Statistical analysis of N rate for Beta 5678 and SV 983 for root yield, extractable sucrose per ton, extractable sucrose per acre, purity, and petiole nitrate-N at Holtville grown in the 2020 - 2021 growing season.

Term	Root yield	Extractable sucrose		Purity %	Petiole nitrate-N ppm
		lb/Ton	lb/Acre		
Rep	0.41	0.04	0.29	0.07	0.0001
Variety	0.01	0.07	0.20	0.04	0.65
N rate	0.38	0.0001	0.64	0.06	0.0001
Variety X Nrate	0.15	0.52	0.27	0.26	0.89
C.V. (%)	4.7	3.8	5.6	1.4	24.4
Grand mean	80.6	252	20299	89.6	2403

Table 10. The means for N rate by Variety for Beta 5678 and SV 983 for root yield, extractable sucrose per ton, and extractable sucrose per acre at Holtville grown in 2020 – 2021 growing season.

N rate lb N/A	Root yield ton/A			Extractable sucrose					
	Beta 5678	SV 983	Mean	Beta 5678	SV 983	Mean	Beta 5678	SV 983	Mean
				lb/ton			lb/A		
0	78.3	83.3	81.0	260	251	256	20259	20934	20597
40	79.5	78.6	79.0	262	259	260	20746	20460	20587
80	74.9	83.9	79.4	256	252	254	19138	20993	20065
120	80.3	81.6	81.0	250	249	249	19748	20595	202172
160	79.8	81.8	80.6	263	252	257	20870	20541	20738
200	77.5	81.4	79.4	249	256	253	19587	20695	20141
240	81.5	81.6	81.5	249	251	250	20287	20464	20376
280	82.0	83.6	82.8	243	233	238	20007	19269	19679
Mean	79.2	82.0		254	251		20083	20525	

Table 11. The means for N rate by Variety for Beta 5678 and SV 983 for purity, and petiole nitrate-N at Holtville grown in 2020 – 2021 growing season.

N rate	Root purity			Petiole nitrate-N		
	Beta 5678	SV 983	Mean	Beta 5678	SV 983	Mean
lb N/A	%			ppm		
0	90.9	89.3	90.1	1520	1897	1708
40	90.4	89.9	90.2	1949	1854	1901
80	90.2	89.2	89.7	2009	1662	1836
120	89.1	88.8	88.9	2622	2833	2728
160	90.6	89.2	89.9	2749	2878	2814
200	89.2	90.3	89.7	2857	1820	1839
240	89.8	89.6	89.7	3024	3057	3040
280	88.9	88.4	88.7	3278	3445	3362
Mean	89.9	89.3		2376	2431	

*N response for Beta 5678, SV 983, Beta 5460, and SV 2997N at Holtville*

Two additional sugar beet varieties were included in the study to understand the effect of N fertilizer on a wider selection of varieties. These varieties were Beta 5460 and SV 2997N. These were compared at the 0 and 200 lb N per acre N rates.

In this comparison, application of N did not affect any of the measured parameters, Tables 12, 13, and 14. This is like the results of the full N rate study with only Beta 5678 and SV 983.

Variety affected root yield, extractable sucrose per ton, and extractable sucrose per acre, Table 12. Beta 5678 and 5460 had root yield that was less than SV983 and 2997N, Table 13.

Extractable sucrose per ton was similar for Beta 5678, Beta 5460, and SV983. The significant difference is because SV2997N extractable sucrose per ton is less than the other three varieties, Table 13.

Extractable sucrose per acre was significantly affected by variety, Table 12. The variety with the greatest extractable sucrose per acre was Beta 5460, followed by SV983, Beta 5678, and SV2997N, Table 13.

Table 12. Statistical analysis for response of Beta 5678, SV 983, Beta 5460, and SV 2997N to 200 lb N/A for root yield, extractable sucrose per ton, extractable sucrose per acre, purity, and petiole nitrate-N at Holtville grown in the 2020 - 2021 growing season.

Term	Root yield	Extractable sucrose		Purity	Petiole nitrate-N
		lb/Ton	lb/Acre	%	ppm
Rep	0.95	0.15	0.54	0.17	0.0005
Variety	0.06	0.0002	0.06	0.33	0.68
N rate	0.25	0.18	0.87	0.30	0.82
Variety X Nrate	0.18	0.27	0.44	0.12	0.34
C.V. (%)	5.0	4.3	6.4	1.6	30.3
Grand mean	80.2	252	20202	90.0	1845

Table 13. The means for N rate by Variety for response of Beta 5678, SV 983, Beta 5460, and SV 2997N to 200 lb N/A for root yield, extractable sucrose per ton, and extractable sucrose per acre at Holtville grown in the 2020 - 2021 growing season.

Variety	Root yield			Extractable sucrose					
	0 lb N/A	200 lb N/A	Mean	0 lb N/A	200 lb N/A	Mean	0 lb N/A	200 lb N/A	Mean
	ton/A			lb/ton			lb/A		
Beta 5678	78.3	77.5	77.9	260	249	255	20259	19587	19923
SV 983	83.3	81.4	82.3	251	256	253	20934	20695	20815
Beta 5460	77.2	81.8	79.3	261	260	261	20163	21251	20612
SV 2997N	79.5	82.9	81.2	244	232	238	19562	19276	19419
Mean	79.6	80.9		255	250		20226	20177	

Table 14. The means for N rate by Variety for response of Beta 5678, SV 983, Beta 5460, and SV 2997N to 200 lb N/A for purity and petiole nitrate-N at Holtville grown in the 2020 - 2021 growing season.

Variety	Root purity			Petiole nitrate-N		
	0 lb N/A	200 lb N/A	Mean	0 lb N/A	200 lb N/A	Mean
	%			ppm		
Beta 5678	90.9	89.2	90.0	1520	1857	1688
SV 983	89.3	90.3	90.8	1897	1820	1859
Beta 5460	90.6	90.3	90.5	1925	2007	1966
SV 2997N	90.0	89.0	89.5	2117	1619	1868
Mean	90.2	89.7		1865	1826	

### Summary:

At IVRC and Holtville, root yield and extractable sucrose per acre were not affected by the addition of N fertilizer. Extractable sucrose per ton at IVRC was reduced with increasing N fertilizer application. This reduction was reflected in the petiole nitrate-N concentrations from samples collected in late February. Variety did not affect the response to N fertilizer application at either site. The lack of N response at both sites was explained by the large amounts of residual soil nitrate-N at the beginning of the study.

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## 2020-2021 Imperial Valley Official Variety Trial Procedures

Mark Bloomquist – Spreckels Sugar

Four Official Variety Trial locations were planted. Two of these trials were planted on early harvest fields, and two of the trials were planted on late harvest fields. Trials were planted with an ERMAS vacuum planter. Plots were two 30”-rows wide by twenty five feet long. Each variety was replicated eight times across each trial. The experimental design of the trials was a randomized complete block. Emergence counts were taken approximately 21-28 days after planting. After the emergence counts were taken, plots were thinned to a uniform spacing and all doubles were removed. Final stand counts were taken following thinning.

Weed control, insect control, and disease control applications were applied by the trial cooperator to match the practices of the field. Weed escapes were removed throughout the season to prevent competition with the sugar beets.

Prior to harvest, row lengths were taken on each harvest row to calculate yield at harvest. All plots were defoliated using a 4-row defoliator with scalpors. Each two row plot was harvested using a 2-row research harvester. All beets harvested from the two rows were weighed on a scale on the harvester and a sample of beets was taken for quality analysis at the Spreckels Sugar Tare Lab.

All varieties in their second year of testing and beyond were entered into various disease nurseries to evaluate the disease tolerance of the varieties. Rhizomania was evaluated at the Beet Sugar Development Foundation’s Rhizomania Nursery by Dr. Carl Strausbaugh in Kimberly Idaho. Curly Top was evaluated at the Beet Sugar Development Foundation’s Curly Top Nursery by Dr. Carl Strausbaugh in Kimberly Idaho. Powdery Mildew was evaluated by Dr. Stephen Kaffka at Davis California.

Data is summarized and merged with the previous two years of data to evaluate the varieties for approval. The Imperial Valley Policy sets out guidelines for minimum performance standards of the varieties. Varieties that meet all the approval criteria are approved for shareholders to plant their 2021-2022 sugar beet crop.

### 2020-2021 Imperial Valley Official Variety Trial Locations

Trial Name	Cooperator	Canal/Gate	Plant Date	Harvest Date
Early Harvest Loc. 1	Russell Allen	Magnolia 23	9/23/2020	4/13-14/2021
Early Harvest Loc. 2	Imperial Ag.	Dahlia 72	10/28/2020	5/17-18/2021
Late Harvest Loc. 1	Jason Taylor	Lavender 7	10/12/2020	6/9/2021
Late Harvest Loc. 2	Rothfleisch Ranches	Lotus 17	10/19/2020	7/19-20-2021

**Imperial Valley Early Harvest Official Variety Trials  
3 Year Data (2019-2021)**

Variety	Approval Status for 2021-22 crop	Extractable Sugar/ Acre	Extractable Sugar/ Ton	Gross Sugar/ Acre	Tons/ Acre	% Sugar	Purity	Final Stand**	% Bolt	Percent Emergence*	Curly Top	% of Mkt. Mildew***	% of Mkt. Avg.	Rhizomania Root Rating	
											--- M = 150 ---	-- M = 100			
<b>SV 983</b>	Full Approval														
2021 Trial		12,329	286.6	14,676	42.9	17.1	89.8	223	0.0	42.4	5.8	97.4	6.4	94.9	2.4
2020 Trial		10,786	299.9	12,785	36.0	17.8	90.4	207	0.0	53.1	5.3	94.9	--	--	2.3
2019 Trial		11,241	327.2	13,126	34.2	19.1	91.1	211	0.0	64.5	5.5	94.1	7.0	126.0	1.8
Average		11,452	304.6	13,529	37.7	18.0	90.4	214	0.0	53.3					
<b>BTS 582N</b>															
2021 Trial		10,866	288.5	13,106	37.9	17.4	89.4	226	0.0	52.9	5.9	99.0	7.1	105.3	2.0
2020 Trial		9,718	290.0	11,768	33.5	17.6	89.0	234	0.0	76.0	5.4	96.7	--	--	2.1
2019 Trial		10,097	323.0	11,838	31.1	18.9	91.0	213	0.0	68.7	5.9	101.0	4.2	75.6	1.6
Average		10,227	300.5	12,237	34.2	18.0	89.8	224	0.0	65.9					
<b>BTS 5983</b>															
2021 Trial		11,722	283.3	14,065	41.1	16.9	89.7	224	0.0	53.5	5.6	94.0	7.3	108.3	1.9
2020 Trial		9,931	285.6	11,915	34.5	17.1	89.7	236	0.0	72.5	5.3	94.9	--	--	2.1
2019 Trial		11,037	320.3	12,884	34.4	18.7	91.3	215	0.0	47.0					
Average		10,897	296.4	12,955	36.7	17.6	90.2	225	0.0	57.7					
<b>SV501</b>	Full Approval														
2021 Trial		11,901	276.5	14,341	43.1	16.7	89.4	225	0.0	51.2	5.9	99.0	6.1	90.5	2.4
2020 Trial		9,900	283.0	11,804	35.0	16.9	90.1	209	0.0	36.8	5.6	100.3	--	--	2.2
2019 Trial		11,306	326.4	13,240	34.8	19.1	91.0	196	0.0	42.0	5.8	99.3	4.7	84.6	2.1
Average		11,036	295.3	13,128	37.6	17.6	90.2	210	0.0	43.3					
<b>BTS 5775</b>	Full Approval														
2021 Trial		11,476	273.4	13,838	42.5	16.5	89.5	210	0.0	29.0	6.3	105.8	6.2	91.9	2.6
2020 Trial		9,158	279.7	11,050	32.8	16.9	89.4	214	0.0	44.3	5.8	103.8	--	--	2.1
2019 Trial		11,514	328.2	13,478	35.1	19.2	91.0	214	0.0	61.8	6.0	102.7	3.8	68.4	2.1
Average		10,716	293.8	12,789	36.8	17.5	90.0	213	0.0	45.0					
<b>BTS 5678</b>	Full Approval														
2021 Trial		12,097	282.0	14,499	42.7	16.9	89.7	222	0.0	38.4	5.9	99.0	7.4	109.7	2.0
2020 Trial		10,111	279.4	12,137	36.2	16.8	89.8	233	0.0	69.9	5.2	93.1	--	--	1.6
2019 Trial		11,448	316.8	13,453	36.1	18.6	90.8	213	0.0	65.1	5.7	97.6	6.1	109.8	1.5
Average		11,219	292.7	13,363	38.3	17.4	90.1	223	0.0	57.8					
<b>BTS 5460</b>	Full Approval														
2021 Trial		11,512	280.4	13,878	40.8	16.9	89.5	223	0.0	48.3	5.6	94.0	7.8	115.7	2.1
2020 Trial		9,540	280.2	11,489	34.1	16.9	89.5	228	0.0	57.3	5.2	93.1	--	--	1.6
2019 Trial		10,945	313.3	12,903	35.1	18.5	90.6	212	0.0	71.0	5.8	99.3	4.3	77.4	1.4
Average		10,666	291.3	12,757	36.7	17.4	89.9	221	0.0	58.9					
<b>SV 981</b>	Full Approval														
2021 Trial		12,101	269.4	14,501	45.2	16.2	89.8	225	0.0	43.5	6.2	104.1	6.9	102.3	2.3
2020 Trial		11,120	274.8	13,288	40.5	16.4	90.1	222	0.0	54.5	5.9	105.6	--	--	2.3
2019 Trial		11,841	309.0	13,987	38.5	18.3	90.5	210	0.0	46.9	6.1	104.4	6.3	113.4	1.8
Average		11,687	284.4	13,925	41.4	17.0	90.1	219	0.0	48.3					
<b>SV 602</b>	Full Approval														
2021 Trial		12,398	269.8	14,867	45.8	16.2	89.7	221	0.0	43.1	6.0	100.0	6.4	94.9	2.6
2020 Trial		10,439	276.1	12,454	37.8	16.5	90.2	184	0.0	22.4	6.1	109.2	--	--	2.3
2019 Trial		12,058	305.9	14,191	39.1	18.0	90.8	209	0.0	50.1	6.0	102.7	6.7	120.6	1.7
Average		11,632	283.9	13,837	40.9	16.9	90.2	205	0.0	38.5					

Mean of Fully Approved (21-22)		11,201	292.3	13,333	38.5	17.4	90.1				2021 Mean	6.0	100	6.7	100	2.3
97% of Fully Approved (21-22)		10,865	283.5	12,933	37.3	16.9	87.4				2020 Mean	5.6	100	--	--	2.1
											2019 Mean	5.8	100	5.6	100	1.8

CV	2021 Trial	2020 Trial	2019 Trial	2021 Trial	2020 Trial	2019 Trial	2021 Trial	2020 Trial	2019 Trial	2021 Trial	2020 Trial	2019 Trial	2021 Trial	2020 Trial	2019 Trial
	5.4	4.9	8.3	2.2	1.7	1.9	5.1	5.0	8.2	4.9	5.3	8.5	1.7	1.2	1.4
	0.8	0.6	0.7	2.3	3.8	3.4	0.8	0.6	0.7	2.3	3.8	3.4	--	--	--
	8.3	7.8	12.0	8.3	8.3	6.6	8.3	8.3	7.1	2.8	4.1	6.6	7.0	3.6	4.2
	7.7	--	25	7.7	--	25	7.7	--	25	0.5	0.2	0.6	0.5	0.6	0.6
	n/a	0.5	0.2	0.6	0.5	0.6	0.6								

Cooperator	Planted	Harvested	Plot Size	Notes:
Russell Allen	9/23/20	4/13-14/2021	Plot Size: 2 rows. 30" rows.	Experimental Design: RCBD
Brian Hair	10/28/2020	5/17-18/2021	Plot Size: 2 rows. 30" rows.	Experimental Design: RCBD
Cameron Ranches	9/14/19	4/6/20	Plot Size: 2 rows. 30" rows.	Experimental Trial Design : 4X4 lattice
Imperial Ag	10/31/18	6/5/19	Plot Size: 2 rows. 30" rows.	Experimental Trial Design : 4X5 lattice

Varieties ranked by Extractable Sugar per Ton.  
 \* Emergence counts taken prior to thinning and converted to a percent.  
 \*\* Final Stand counts converted to beets per 100 foot of row. Final stand counts taken after thinning.  
 \*\*\* 2021 Powdery mildew ratings are average of two raters at 2021 EH Location 2 yield trial. Ratings on 1-9 scale. 1 low disease, 9 = high disease

**Imperial Valley Early Harvest Official Variety Trials  
2 Year Data (2020-2021)**

Variety	Approval Status for 2021-22 crop	Extractable Sugar/ Acre	Extractable Sugar/ Ton	Gross Sugar/ Acre	Tons/ Acre	% Sugar	Purity	Final Stand**	% Bolt	Percent Emergence*	Curly Top	% of Mkt.	Powdery Mildew*** % of Mkt.	Rhizomania Root Rating
											--- M = 150 ---		-- M = 100	
<b>SV 983</b>	<b>Full Approval</b>													
2021 Trial		12,329	286.6	14,676	42.9	17.1	89.8	223	0.0	42.4	5.8	97.4	6.4	94.9
2020 Trial		10,786	299.9	12,785	36.0	17.8	90.4	207	0.0	53.1	5.3	94.9	--	--
Average		11,558	293.3	13,731	39.5	17.5	90.1	215	0.0	47.8				
<b>BTS 582N</b>														
2021 Trial		10,866	288.5	13,106	37.9	17.4	89.4	226	0.0	52.9	5.9		7.1	105.3
2020 Trial		9,718	290.0	11,768	33.5	17.6	89.0	234	0.0	76.0	5.4	96.7	--	--
Average		10,292	289.3	12,437	35.7	17.5	89.2	230	0.0	64.5				
<b>BTS 5983</b>														
2021 Trial		11,722	283.3	14,065	41.1	16.9	89.7	224	0.0	53.5	5.6	94.0	7.3	108.3
2020 Trial		9,931	285.6	11,915	34.5	17.1	89.7	236	0.0	72.5	5.3	94.9	--	--
Average		10,827	284.5	12,990	37.8	17.0	89.7	230	0.0	63.0				
<b>BTS 5678</b>	<b>Full Approval</b>													
2021 Trial		12,097	282.0	14,499	42.7	16.9	89.7	222	0.0	38.4	5.9	99.0	7.4	109.7
2020 Trial		10,111	279.4	12,137	36.2	16.8	89.8	233	0.0	69.9	5.2	93.1	--	--
Average		11,104	280.7	13,318	39.5	16.9	89.8	228	0.0	54.2				
<b>BTS 5460</b>	<b>Full Approval</b>													
2021 Trial		11,512	280.4	13,878	40.8	16.9	89.5	223	0.0	48.3	5.6	94.0	7.8	115.7
2020 Trial		9,540	280.2	11,489	34.1	16.9	89.5	228	0.0	57.3	5.2	93.1	--	--
Average		10,526	280.3	12,684	37.5	16.9	89.5	226	0.0	52.8				
<b>SV501</b>	<b>Full Approval</b>													
2021 Trial		11,901	276.5	14,341	43.1	16.7	89.4	225	0.0	51.2	5.9	99.0	6.1	90.5
2020 Trial		9,900	283.0	11,804	35.0	16.9	90.1	209	0.0	36.8	5.6	100.3	--	--
Average		10,901	279.8	13,073	39.1	16.8	89.8	217	0.0	44.0				
<b>BTS 5775</b>	<b>Full Approval</b>													
2021 Trial		11,476	273.4	13,838	42.5	16.5	89.5	210	0.0	29.0	6.3	105.8	6.2	91.9
2020 Trial		9,158	279.7	11,050	32.8	16.9	89.4	214	0.0	44.3	5.8	103.8	--	--
Average		10,317	276.6	12,444	37.7	16.7	89.5	212	0.0	36.7				
<b>SV 602</b>	<b>Full Approval</b>													
2021 Trial		12,398	269.8	14,867	45.8	16.2	89.7	221	0.0	43.1	6.0	100.7	6.4	94.9
2020 Trial		10,439	276.1	12,454	37.8	16.5	90.2	184	0.0	22.4	6.1	109.2	--	--
Average		11,419	273.0	13,661	41.8	16.4	90.0	203	0.0	32.8				
<b>SV 981</b>	<b>Full Approval</b>													
2021 Trial		12,101	269.4	14,501	45.2	16.2	89.8	225	0.0	43.5	6.2	104.1	6.9	102.3
2020 Trial		11,120	274.8	13,288	40.5	16.4	90.1	222	0.0	54.5	5.9	105.6	--	--
Average		11,611	272.1	13,895	42.9	16.3	90.0	224	0.0	49.0				

Mean of Fully Approved (21-22)		11,062	279.4	13,258	39.7	16.8	89.8				2021 Mean	6.0	100	6.7	100	2.3
97% of Fully Approved (21-22)		10,730	271.0	12,860	38.5	16.3	87.1				2020 Mean	5.6	100			2.1

CV	2021 Trial	5.4	2.2	5.1	4.9	1.7	0.8	2.3	--	8.3	7.0		7.7		n/a
	2020 Trial	4.9	1.7	5.0	5.3	1.2	0.6	3.8	--	7.8	3.6		--		n/a
LSD (0.05)	2021 Trial	428.1	4.2	491.4	1.4	0.2	0.5	3.6	--	2.8	0.5		0.6		0.5
	2020 Trial	482.9	4.9	586.3	1.9	0.2	0.6	8.3	--	4.1	0.2		--		0.2

<b>Cooperator</b>	<b>Planted</b>	<b>Harvested</b>	<b>Plot Size</b>	<b>Notes:</b>
Russell Allen	9/23/20	4/13-14/2021	2 rows. 30" rows.	Experimental Design: RCBD
Brian Hair	10/28/2020	5/17-18/2021	2 rows. 30" rows.	Experimental Design: RCBD
Cameron Ranches	9/14/19	4/6/20	2 rows. 30" rows.	Experimental Design : 4X4 lattice

Varieties ranked by Extractable Sugar per Ton.

\* Emergence counts taken prior to thinning and converted to a percent.

\*\* Final Stand counts converted to beets per 100 foot of row. Final stand counts taken after thinning.

\*\*\* 2021 Powdery mildew ratings are average of two raters at 2021 EH Location 2 yield trial. Ratings on 1-9 scale. 1 low disease, 9 = high disease

**Imperial Valley Early Harvest Official Variety Trials  
1- Year Data (2021)**

Variety	Approval Status for 2021-22 crop	Extractable Sugar/ Acre	Extractable Sugar/ Ton	Gross Sugar/ Acre	Tons/ Acre	% Sugar	Purity	Final Stand**	% Bolt	Percent Emergence*	--- M = 150 ---		--M = 100		Rhizomania Root Rating
											Curly Top	% of Mkt.	Powdery Mildew	% of Mkt. Avg.	
Hilleshog HIL2383		9,862	293.1	11,937	33.9	17.7	89.5	225	0.0	58.5	--	--	2.5	37.1	--
BTS 511N		12,020	292.0	14,391	40.8	17.5	89.7	224	0.0	57.2	--	--	7.5	111.2	--
BTS 582N		10,866	288.5	13,106	37.9	17.4	89.4	226	0.0	52.9	5.9	99.0	7.1	105.3	2.0
SV 1915		12,326	287.9	14,697	43.0	17.2	89.8	224	0.0	50.2	--	--	6.1	90.5	--
SV 983	Full Approval	12,329	286.6	14,676	42.9	17.1	89.8	223	0.0	42.4	5.8	97.4	6.4	94.9	2.4
BTS 5139		11,550	285.2	13,896	40.4	17.1	89.7	226	0.0	51.8	--	--	8.4	124.6	--
BTS 5983		11,722	283.3	14,065	41.1	16.9	89.7	224	0.0	53.5	5.6	94.0	7.3	108.3	1.9
BTS 5678	Full Approval	12,097	282.0	14,499	42.7	16.9	89.7	222	0.0	38.4	5.9	99.0	7.4	109.7	2.0
Hilleshog HIL2381		10,226	282.0	12,591	36.7	17.1	89.1	226	0.0	55.6	--	--	5.9	87.5	--
BTS 5460	Full Approval	11,512	280.4	13,878	40.8	16.9	89.5	223	0.0	48.3	5.6	94.0	7.8	115.7	2.1
BTS 513N		10,968	279.2	13,224	39.6	16.8	89.5	223	0.0	41.6	--	--	7.9	117.2	--
SV 1913N		10,890	278.7	13,267	39.5	17.0	88.9	220	0.0	45.6	--	--	2.3	34.1	--
SV 501	Full Approval	11,901	276.5	14,341	43.1	16.7	89.4	225	0.0	51.2	5.9	99.0	6.1	90.5	2.4
BTS 5104		11,508	275.3	13,935	41.9	16.6	89.3	224	0.0	52.5	--	--	8.0	118.6	--
Hilleshog HIL2382		11,077	274.9	13,488	40.5	16.7	89.1	222	0.0	45.4	--	--	8.0	118.6	--
BTS 5775	Full Approval	11,476	273.4	13,838	42.5	16.5	89.5	210	0.0	29.0	6.3	105.8	6.2	91.9	2.6
BTS 5128		11,219	270.9	13,602	41.9	16.4	89.3	226	0.0	50.6	--	--	8.2	121.6	--
SV 602	Full Approval	12,398	269.8	14,867	45.8	16.2	89.7	221	0.0	43.1	6.0	100.7	6.4	94.9	2.6
SV 981	Full Approval	12,101	269.4	14,501	45.2	16.2	89.8	225	0.0	43.5	6.2	104.1	6.9	102.3	2.3
BTS 5112		11,366	267.2	13,729	42.7	16.1	89.4	224	0.0	49.8	--	--	7.9	117.2	--
SV 911		12,770	267.2	15,387	47.7	16.2	89.4	222	0.0	44.1	--	--	7.2	106.8	--

Mean Appr.	6.0	6.7	2.3
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CV	5.4	2.2	5.1	4.9	1.7	0.8	2.3	--	8.3	7.0	7.7
LSD 0.05	428.1	4.2	491.4	1.4	0.2	0.5	3.6	--	2.8	0.5	0.6

<u>Cooperator</u>	<u>Planted</u>	<u>Harvested</u>	<u>Plot Size</u>
Russell Allen	9/23/20	4/13-14/2021	Plot Size: 2 rows. 30" rows.
Brian Hair	10/28/2020	5/17-18/2021	Experimental Trial Design : RCBD

Varieties ranked by Extractable Sugar per Ton.

\* Emergence counts taken prior to thinning and converted to a percent.

\*\* Final Stand counts converted to beets per 100 foot of row. Final stand counts taken after thinning.

\*\*\* 2021 Powdery mildew ratings are average of two raters at 2021 EH Location 2 yield trial. Ratings on 1-9 scale. 1 low disease, 9 = high disease

## 2020-2021 Imperial Valley Early Harvest Official Variety Trial Results - Location 1

Cooperator: Russell Allen

Entry	Entry Name	Extractable Sugar per Ton	Extractable Sugar per Acre	Gross Sugar per Acre	Tons per Acre	Percent Sugar	Extractable Sugar Percent	Percent Purity	Brei N	Percent Tare	Percent * Emergence	Final Stand ** Beets/100'	Percent Bolters
1	BTS 5460	285.3	11566	14031	40.3	17.3	14.3	88.9	12	1.5	37.8	208	0.0
2	BTS 5678	289.8	12386	14897	42.8	17.4	14.5	89.5	13	1.5	35.7	207	0.0
3	BTS 5775	281.9	11194	13536	40.1	17.1	14.1	89.1	16	1.4	26.6	191	0.0
4	BTS 582N	291.5	10349	12592	35.5	17.7	14.6	88.7	10	2.6	46.2	216	0.0
5	BTS 5983	294.3	11903	14317	40.3	17.7	14.7	89.4	8	1.7	46.9	209	0.0
6	BTS 511N	299.5	12348	14807	40.8	18.0	15.0	89.5	10	2.4	51.9	212	0.0
7	BTS 513N	286.4	10442	12641	36.8	17.3	14.3	89.2	12	2.2	33.2	210	0.0
8	BTS 5104	284.2	11621	14086	40.9	17.2	14.2	89.0	11	2.1	44.6	211	0.0
9	BTS 5112	275.8	10920	13288	39.6	16.8	13.8	88.8	13	1.7	40.8	213	0.0
10	BTS 5128	275.7	10921	13331	39.9	16.8	13.8	88.6	10	1.6	41.0	215	0.0
11	BTS 5139	294.6	12233	14638	41.6	17.6	14.7	89.7	10	1.5	46.3	214	0.0
12	SV 981	282.1	12345	14728	43.7	16.9	14.1	90.0	12	0.9	34.5	210	0.0
13	SV 1913N	280.9	10410	12739	37.1	17.2	14.1	88.3	8	2.3	36.1	210	0.0
14	SV 1915	292.8	12323	14742	42.5	17.5	14.6	89.9	9	1.9	35.9	212	0.0
15	SV 501	286.6	11769	14173	40.7	17.3	14.3	89.3	13	1.6	44.9	215	0.0
16	SV 602	280.5	12680	15185	45.0	16.8	14.0	89.9	10	1.1	37.1	208	0.0
17	SV 983	294.9	12326	14782	41.6	17.7	14.8	89.5	7	0.9	33.4	207	0.0
18	SV 911	278.0	12820	15499	46.1	16.8	13.9	89.2	9	0.8	38.5	209	0.0
19	Hilleshog HIL2381	283.7	10407	12785	36.7	17.4	14.2	88.1	12	1.9	46.2	212	0.0
20	Hilleshog HIL2382	278.6	10969	13377	39.3	17.0	13.9	88.7	10	1.3	35.8	210	0.0
21	Hilleshog HIL2383	296.1	9325	11248	31.5	17.9	14.8	89.2	8	2.0	50.8	213	0.0
Grand Mean		286.3	11489	13877	40.1	17.3	14.3	89.2	10.7	1.7	40.2	210.0	
CV (%)		1.6	4.4	4.3	4.1	1.3	1.7	0.7	21.1	18.4	9.1	2.6	
Error MS		30.6	313492	434144	3.4	0.1	0.1	0.5	7.0	0.1	16.4	36.7	
LSD (0.05)		5.4	548.7	645.7	1.8	0.3	0.3	0.7	2.6	0.3	4.0	5.9	
Reps		8	8	8	8	8	8	8	8	8	8	8	

\*Emergence counts taken prior to thinning and converted to a percent.

\*\*Final stand counts taken after thinning and converted to beets per 100' of row.

Plant Date: September 23, 2020  
 Harvest Date: April 13 & 14, 2021  
 Plot size: 2 row, 30" rows  
 Experimental Design: RCBD

## 2020-2021 Imperial Valley Early Harvest Official Variety Trial Results - Location 2

Cooperator: Brian Hair

Entry	Entry Name	Extractable		Gross Sugar per Acre	Tons per Acre	Percent Sugar	Extractable		Percent Purity	Percent Brei N	Percent Tare	Percent Emergence*	Final Stand** Beets/100'	Powdery Mildew Rating*** Average (1-9 scale)	Percent Bolters
		Sugar per Ton	Sugar per Acre				Sugar Percent	Sugar							
1	BTS 5460	275.2	11,458	13,688	41.3	16.4	13.8	90.2	29	1.4	58.5	238.5	7.8	0.0	
2	BTS 5678	274.7	11,808	14,109	42.6	16.4	13.7	90.2	32	2.1	41.0	237.0	7.4	0.0	
3	BTS 5775	264.5	11,757	14,170	45.0	15.9	13.2	89.8	37	1.5	30.7	224.8	6.2	0.0	
4	BTS 582N	286.0	11,382	13,600	40.1	17.1	14.3	90.1	20	3.2	59.9	237.5	7.1	0.0	
5	BTS 5983	273.4	11,542	13,785	41.9	16.3	13.7	90.2	22	2.4	60.5	238.3	7.3	0.0	
6	BTS 511N	286.2	11,691	13,968	40.7	17.1	14.3	89.9	29	3.3	63.1	237.5	7.5	0.0	
7	BTS 513N	272.0	11,493	13,804	42.3	16.4	13.6	89.9	30	2.4	49.6	235.8	7.9	0.0	
8	BTS 5104	266.2	11,395	13,739	43.0	16.1	13.3	89.5	26	2.4	60.6	237.7	8.0	0.0	
9	BTS 5112	257.5	11,813	14,217	46.0	15.5	12.9	89.9	31	1.7	58.8	235.3	7.9	0.0	
10	BTS 5128	264.5	11,516	13,870	43.9	15.9	13.2	89.8	26	1.8	60.2	238.8	8.2	0.0	
11	BTS 5139	276.9	10,867	13,027	39.1	16.6	13.9	89.9	27	1.9	57.7	239.9	8.4	0.0	
12	SV 981	255.9	11,857	14,313	46.9	15.4	12.8	89.7	28	1.0	52.2	239.2	6.9	0.0	
13	SV 1913N	275.7	11,370	13,796	41.8	16.7	13.8	89.1	15	2.3	54.8	230.3	2.3	0.0	
14	SV 1915	283.7	12,328	14,761	43.6	17.0	14.2	89.8	19	1.5	64.2	237.0	6.1	0.0	
15	SV 501	266.7	12,033	14,621	45.7	16.2	13.3	89.2	23	0.9	57.7	236.7	6.1	0.0	
16	SV 602	258.6	12,117	14,620	46.9	15.6	12.9	89.7	30	1.0	49.0	234.7	6.4	0.0	
17	SV 983	279.4	12,332	14,691	44.2	16.6	14.0	90.3	20	0.9	51.1	238.5	6.4	0.0	
18	SV 911	255.6	12,720	15,468	49.8	15.5	12.8	89.3	31	1.1	49.6	234.1	7.2	0.0	
19	Hilleshog HIL2381	280.3	10,044	12,045	36.3	16.8	14.0	89.8	29	0.9	65.3	239.6	5.9	0.0	
20	Hilleshog HIL2382	270.2	11,184	13,547	41.6	16.3	13.5	89.3	22	1.0	54.6	234.9	8.0	0.0	
21	Hilleshog HIL2383	291.1	10,398	12,462	35.7	17.5	14.5	89.7	23	1.5	66.8	237.5	2.5	0.0	
CV (%)		2.2	5.3	5.0	4.3	1.5	2.2	0.7	22.9	28.1	6.3	1.6	7.7		
Error MS		43.0	449,661.6	571,699.4	4.5	0.1	0.1	0.4	48.4	0.3	15.5	18.3	0.3		
LSD (0.05)		6.4	657.2	741.0	2.1	0.3	0.3	0.6	6.8	0.5	3.9	4.2	0.6		

\*Emergence counts taken prior to thinning and converted to a percent.

\*\*Final stand counts taken after thinning and converted to beets per 100' of row.

\*\*\* Mildew ratings are an average of two ratings on a 1-9 scale. 1= disease free and 9 = completely covered in disease.

Plant Date: October 28, 2020  
 Harvest Date: May 17-18, 2021  
 Plot size: 2 row, 30" rows  
 Experimental Design: RCBD

**Imperial Valley Late Harvest Official Variety Trials**

**3 Year Data (2019-2021)**

Variety	2021-2022 Marketing Approval	Year	Extractable Sugar/ Acre	Extractable Sugar/ Ton*	Gross Sugar/ Acre	Tons/ Acre	% Sugar	Purity	Final Stand Beets/100'	% Bolt	% Rot <sup>w</sup>	Percent Emergence	Curly Top Rating*	% of Mkt. Avg.	Erwinia Rating (DI)*	% of Mkt. Avg.	Powdery Mildew Rating**	% of Mkt. Avg.	Rhizomania Root Rating*
													--- M = 150 ---		--M = 300		-- M = 100		
<b>Beta 582N</b>		2021	16,959	305.0	19,763	55.0	17.8	91.3	229	0.0	0.0	58.3	5.9	100.4	n/a		5.8	90.6	2.0
		2020	18,504	290.0	22,040	65.5	17.3	90.2	234	0.0	0.2	78.9	5.4	100.0	n/a		n/a		2.1
		2019	21,166	300.7	24,995	70.8	17.7	90.7	255	0.0	0.4	76.8	5.9	101.3	27.1	94.3	4.2	84.0	1.6
		Average	18,876	298.6	22,266	63.8	17.6	90.7	239	0.0	0.2	71.3	5.7						
<b>Beta 5678</b>	Full Approval	2021	17,311	302.3	20,147	57.4	17.6	91.7	232	0.0	0.0	49.2	5.9	100.4	n/a		7.6	118.8	2.0
		2020	21,057	294.2	24,882	72.7	17.4	90.8	231	0.0	1.9	75.9	5.2	96.3	n/a		n/a		1.6
		2019	22,333	288.7	26,465	77.2	17.1	90.5	255	0.1	0.1	67.9	5.7	97.9	31.3	109.0	6.1	122.0	1.5
		Average	20,234	295.1	23,831	69.1	17.4	91.0	239	0.0	0.7	64.3	5.6						
<b>BTS 5460</b>	Full Approval	2021	17,525	299.8	20,409	58.3	17.5	91.6	232	0.0	0.0	59.1	5.6	95.3	n/a		6.9	107.8	2.1
		2020	20,735	290.0	24,537	73.3	17.1	90.7	234	0.1	0.2	71.1	5.2	96.3	n/a		n/a		1.6
		2019	21,647	286.0	25,632	75.6	16.9	90.6	257	0.0	0.0	74.5	5.8	99.6	45.3	157.6	4.3	86.0	1.4
		Average	19,969	291.9	23,526	69.1	17.2	91.0	241	0.0	0.1	68.2	5.5						
<b>BTS 5983</b>		2021	17,587	299.4	20,500	58.9	17.4	91.7	232	0.0	0.0	57.7	5.6	95.3	n/a		7.5	117.2	1.9
		2020	20,669	285.6	24,575	73.6	16.9	90.4	234	0.0	0.5	77.3	5.3	98.1	n/a		n/a		2.1
		2019	22,609	289.9	26,700	78.1	17.1	90.8	253	0.1	0.5	46.6	--	--	--		--		--
		Average	20,288	291.6	23,925	70.2	17.1	91.0	240	0.0	0.3	60.5	5.5						
<b>BTS 5775</b>	Full Approval	2021	17,815	295.0	20,852	60.5	17.2	91.5	226	0.0	0.0	40.0	6.3	107.2	n/a		6.4	100.0	2.6
		2020	21,856	285.0	26,032	78.3	17.0	90.3	230	0.0	0.7	65.8	5.8	107.4	n/a		n/a		2.1
		2019	22,758	277.2	27,389	82.2	16.7	89.6	254	0.0	0.5	58.1	6.0	103.0	36.2	126.1	3.8	76.0	2.1
		Average	20,810	285.7	24,758	73.7	17.0	90.5	237	0.0	0.4	54.6	6.0						
<b>SV 2997</b>	Limited Marketing	2021	18,586	278.0	21,948	66.9	16.4	90.9	228	0.0	0.0	46.9	6.1	103.8	n/a		6.9	107.8	2.8
		2020	20,745	269.5	24,987	79.1	16.2	89.8	233	0.1	0.2	81.3	5.6	103.7	n/a		n/a		2.4
		2019	22,353	264.5	26,999	84.7	16.0	89.6	256	0.0	0.3	80.7	--	--	--		--		--
		Average	20,561	270.7	24,645	76.9	16.2	90.1	239	0.0	0.2	69.6	5.9						
<b>SV 604N</b>	Full Approval	2021	16,969	280.1	20,217	60.7	16.7	90.4	232	0.0	0.0	58.8	5.7	97.0	n/a		4.7	73.4	2.3
		2020	17,348	256.8	21,130	68.5	15.6	89.1	228	0.2	0.1	57.8	5.4	100.0	n/a		n/a		2.1
		2019	21,425	258.4	26,033	82.4	15.7	89.1	254	0.1	0.7	50.5	5.8	99.6	2.1	7.3	5.8	116.0	1.4
		Average	18,581	265.1	22,460	70.5	16.0	89.5	238	0.1	0.3	55.7	5.6						

\* varieties ranked by Extractable Sugar per Ton

\* Disease nursery ratings: Lower numbers are more resistant, higher numbers are more susceptible.

\*\* 2021 Powdery mildew data is from ratings taken at 2020-2021 Late Harvest Loc. 2 yield trial. Rating scale 1-9 with lower ratings meaning less disease and higher ratings meaning more disease.

<sup>w</sup> Percent rot data for 2020 is from Westmoreland site only. No rot present at Ruegger site. For rot information from 2021, refer to 20-21 Loc. 2 tab

Mean of 21-22 Fully Approved	19,898	284.5	23,644	70.6	16.9	90.5
97% of 21-22 Fully Approved	19,301	275.9	22,934	68.5	16.4	87.8

Mean of Approved Varieties						
2021 Mean	5.9	100.0		6.4	100.0	2.3
2020 Mean	5.4	100.0				1.9
2019 Mean	5.8	100.0	28.8	100.0	5.0	100.0

	Year	Extractable Sugar/ Acre	Extractable Sugar/ Ton*	Gross Sugar/ Acre	Tons/ Acre	% Sugar	Purity	Final Stand Beets/100'	% Bolt	% Rot <sup>w</sup>	Percent Emergence	Curly Top Rating*	% of Mkt. Avg.	Erwinia Rating (DI)*	% of Mkt. Avg.	Powdery Mildew Rating**	% of Mkt. Avg.	Rhizomania Root Rating*
LSD (0.05)	2021	932.7	5.6	1071.7	3.1	0.2	0.6	5.2	--	--	5.3	0.5				0.5		0.5
	2020	775.8	6.2	859.9	3.1	0.3	0.5	2.8	0.5	0.5	4.9							0.2
	2019	1084.0	7.8	1234.0	3.8	0.4	0.7	5.1	0.5	0.8	5.0	0.3		7.8		--		0.6
C.V.	2021	4.7	1.8	4.6	4.5	1.3	0.6	2.1	--	--	8.9	7.0				6.9		n/a
	2020	4.3	2.4	4.0	4.7	1.9	0.6	1.3	326.6		7.5							n/a
	2019	5.2	2.9	4.9	5.0	2.2	0.8	2.1	254.9	211.0	8.1	4.2		44.2		25.0		n/a

Cooperator	Planted	Harvested	Plot Size
Jason Taylor	10/12/2020	6/9/2021	2 rows -- 30 in. 4 x 4 lattice
Fritz Ruegger Westmoreland Farms	10/12/2019	6/17/2020	2 rows -- 30 in. 4 x 4 lattice
	10/10/2019	8/10-11/2020	2 rows -- 30 in. 4 x 4 lattice
Paul Cameron	10/18/2018	7/15-16/2019	2 rows -- 30 in. 4 x 5 lattice

**Imperial Valley Late Harvest Official Variety Trials**  
2 Year Data (2020-2021)

Variety	2021-2022 Marketing Approval	Year	Extractable Sugar/ Acre	Extractable Sugar/ Ton*	Gross Sugar/ Acre	Tons/ Acre	% Sugar	Purity	Final Stand Beets/1 00'	% Bolt	% Rot <sup>w</sup>	Percent Emergence	Curly Top Rating	% of Mkt. Avg.	Powdery Mildew Rating**	% of Mkt. Avg.	Rhizomania Root Rating*
													--- M = 150 ---		-- M = 100		
BTS 5678	Full Approval	2021	17,311	302.3	20,147	57.4	17.6	91.7	232	0.0	0.0	49.2	5.9	100.4	7.6	118.8	2.0
		2020	21,057	294.2	24,882	72.7	17.4	90.8	231	0.0	1.9	75.9	5.2	96.3	n/a		1.6
		Average	19,184	298.3	22,515	65.1	17.5	91.3	232	0.0	1.0	62.6	5.6				
Beta 582N		2021	16,959	305.0	19,763	55.0	17.8	91.3	229	0.0	0.0	58.3	5.9	100.4	5.8	90.6	2.0
		2020	18,504	290.0	22,040	65.5	17.3	90.2	234	0.0	0.2	78.9	5.4	100.0	n/a		2.1
		Average	17,732	297.5	20,902	60.3	17.6	90.8	232	0.0	0.1	68.6	5.7				
BTS 5460	Full Approval	2021	17,525	299.8	20,409	58.3	17.5	91.6	232	0.0	0.0	59.1	5.6	95.3	6.9	107.8	2.1
		2020	20,735	290.0	24,537	73.3	17.1	90.7	234	0.1	0.2	71.1	5.2	96.3	n/a		1.6
		Average	19,130	294.9	22,473	65.8	17.3	91.2	233	0.1	0.1	65.1	5.4				
Beta 5983		2021	17,587	299.4	20,500	58.9	17.4	91.7	232	0.0	0.0	57.7	5.6	95.3	7.5	117.2	1.9
		2020	20,669	285.6	24,575	73.6	16.9	90.4	234	0.0	0.5	77.3	5.3	98.1	n/a		2.1
		Average	19,128	292.5	22,538	66.3	17.2	91.1	233	0.0	0.3	67.5	5.5				
BTS 5775	Full Approval	2021	17,815	295.0	20,852	60.5	17.2	91.5	226	0.0	0.0	40.0	6.3	107.2	6.4	100.0	2.6
		2020	21,856	285.0	26,032	78.3	17.0	90.3	230	0.0	0.7	65.8	5.8	107.4	n/a		2.1
		Average	19,836	290.0	23,442	69.4	17.1	90.9	228	0.0	0.4	52.9	6.1				
SV 981		2021	18,561	280.4	21,810	65.8	16.5	91.3	228	0.0	0.0	51.9	6.2	105.5	6.5	101.6	2.3
		2020	21,201	274.1	25,404	78.1	16.4	90.0	230	0.0	1.2	61.8	5.9	109.3	n/a		2.3
		Average	19,881	277.3	23,607	72.0	16.5	90.7	229	0.0	0.6	56.9	6.1				
SV 2997N	Limited Approval	2021	18,586	278.0	21,948	66.9	16.4	90.9	228	0.0	0.0	46.9	6.1	103.8	6.9	107.8	2.8
		2020	20,745	269.5	24,987	79.1	16.2	89.8	233	0.1	0.2	81.3	5.6	103.7	n/a		2.4
		Average	19,666	273.8	23,468	73.0	16.3	90.4	231	0.1	0.1	64.1	5.9				
SV604N	Full Approval	2021	16,969	280.1	20,217	60.7	16.7	90.4	232	0.0	0.0	58.8	5.7	97.0	4.7	73.4	2.3
		2020	17,348	256.8	21,130	68.5	15.6	89.1	228	0.2	0.1	57.8	5.4	100.0	n/a		2.1
		Average	17,159	268.5	20,674	64.6	16.2	89.8	230	0.1	0.1	58.3	5.6				

\* varieties ranked by Extractable Sugar per Ton

\* Disease nursery ratings: Lower numbers are more resistant, higher numbers are more susceptible.

\*\* 2021 Powdery mildew data is from ratings taken at 2020-2021 Late Harvest Loc. 2 yield trial. Rating scale 1-9 with lower ratings meaning less disease and higher ratings meaning more disease.

<sup>w</sup> Percent rot data for 2020 is from Westmoreland site only. No rot present at Ruegger site. For rot information from 2021, refer to 20-21 Loc. 2 tab

Mean of 21-22 Fully Approved	18,827	287.9	22,276	66.2	17.0	90.8
97% of 21-22 Fully Approved	18,262	279.3	21,607	64.2	16.5	88.0

	Mean of Approved Varieties				
2021 Mean	5.9	100.0	6.4	100.0	2.3
2020 Mean	5.4	100.0	--		1.9

	Year	Extractable Sugar/ Acre	Extractable Sugar/ Ton	Gross Sugar/ Acre	Tons/ Acre	% Sugar	Purity	Final Stand Beets/1 00'	% Bolt	% Rot <sup>w</sup>	Percent Emergence	Curly Top Rating	% of Mkt. Avg.	Powdery Mildew Rating	% of Mkt. Avg.	Rhizomania Root Rating
LSD (0.05)	2021	932.7	5.6	1071.7	3.1	0.2	0.6	5.2	--	--	5.3	0.5		0.5		0.5
	2020	775.8	6.2	859.9	3.1	0.3	0.5	2.8	0.5		4.9	0.2				0.2
C.V.	2021	4.7	1.8	4.6	4.5	1.3	0.6	2.1	--	--	8.9	7.0		6.9		n/a
	2020	4.3	2.4	4.0	4.7	1.9	0.6	1.3	326.6		7.5	3.6				n/a

Cooperator	Planted	Harvested	Plot Size
Jason Taylor	10/12/2020	6/9/2021	2 rows -- 30 in. 4 x 4 lattice
Fritz Ruegger	10/12/2019	6/17/2020	2 rows -- 30 in. 4 x 4 lattice
Westmoreland Farms	10/10/2019	8/10-11/2020	2 rows -- 30 in. 4 x 4 lattice

**Imperial Valley Late Harvest Official Variety Trials**  
**1 Year Data Summary (2021)**

Variety	2021-2022 Marketing Approval	Extractable Sugar/ Acre	Extractable Sugar/ Ton*	Gross Sugar/ Acre	Tons / Acre	% Sugar	Purity	Final Stand Beets/100'	% Bolt	% Rot***	Percent Emergence	Curly Top M = 150	% of Mkt. Avg.	Powdery Mildew** M = 100	% of Mkt. Avg.	Rhizomania Root Rating
BTS 511N		18,053	310.4	21,014	58.5	18.0	91.9	233	0.0	0.0	63.4	--		6.6	103.1	--
BTS 582N		16,959	305.0	19,763	55.0	17.8	91.3	229	0.0	0.0	58.3	5.9	100.4	5.8	90.6	2.0
SV 1915		18,861	303.2	22,096	62.2	17.8	91.2	231	0.0	0.0	61.8	--		5.2	81.3	--
BTS 5678	Full Approval	17,311	302.3	20,147	57.4	17.6	91.7	232	0.0	0.0	49.2	5.9	100.4	7.6	118.8	2.0
BTS 5139		16,906	300.2	19,757	56.3	17.6	91.4	231	0.0	0.0	58.7	--		7.8	121.9	--
BTS 5104		18,360	300.2	21,253	61.1	17.4	92.1	230	0.0	0.0	54.4	--		7.8	121.9	--
BTS 5460	Full Approval	17,525	299.8	20,409	58.3	17.5	91.6	232	0.0	0.0	59.1	5.6	95.3	6.9	107.8	2.1
BTS 5983		17,587	299.4	20,500	58.9	17.4	91.7	232	0.0	0.0	57.7	5.6	95.3	7.5	117.2	1.9
BTS 513N		17,756	297.9	20,698	59.6	17.4	91.7	231	0.0	0.0	45.4	--		6.7	104.7	--
SV 1913N		17,624	295.0	20,914	59.8	17.5	90.4	230	0.0	0.0	59.1	--		2.1	32.8	--
BTS 5775	Full Approval	17,815	295.0	20,852	60.5	17.2	91.5	226	0.0	0.0	40.0	6.3	107.2	6.4	100.0	2.6
BTS 5128		17,901	289.9	20,907	61.8	17.0	91.7	231	0.0	0.0	57.6	--		7.1	110.9	--
SV 981		18,561	280.4	21,810	65.8	16.5	91.3	228	0.0	0.0	51.9	6.2	105.5	6.5	101.6	2.3
SV 604N	Full Approval	16,969	280.1	20,217	60.7	16.7	90.4	232	0.0	0.0	58.8	5.7	97.0	4.7	73.4	2.3
BTS 5112		18,119	279.4	21,315	64.9	16.4	91.2	231	0.0	0.0	52.0	--		7.5	117.2	--
SV 2997	Limited Approval	18,586	278.0	21,948	66.9	16.4	90.9	228	0.0	0.0	46.9	6.1	103.8	6.9	107.8	2.8

\* varieties ranked by Extractable Sugar per Ton

\* Disease nursery ratings: Lower numbers are more resistant, higher numbers are more susceptible.

\*\* 2021 Powdery mildew data is from ratings taken at 2020-2021 Late Harvest Loc. 2 yield trial. Rating scale 1-9 with lower ratings meaning less disease and higher ratings meaning more disease.

Mean of 21-22 Full Approved	17,405	294.3	20,406	59.2	17.2	91.3						2021 Mean	5.9	100.0	6.4	100.0	2.3
97% of 21-22 Full Approved	16,883	285.5	19,794	57.4	16.7	88.6											

LSD 0.05)	932.7	5.6	1071.7	3.1	0.2	0.6	5.2	--	--		5.3	0.5		0.5			0.5
C.V.	4.7	1.8	4.6	4.5	1.3	0.6	2.1	--	--		8.9	7.0		6.9			n/a

<u>Cooperator</u>			<u>Planted</u>		<u>Harvested</u>		<u>Plot Size</u>										
Jason Taylor			10/12/2020		6/9/2021		2 rows -- 30 in. 4 x 4 lattice										

\*\*\* One year data summary is from Late Harvest Trial - Location 1.

For disease performance data, view 2020-2021 Late Harvest OVT - Location 2.

## 2020-2021 Imperial Valley Late Harvest Official Variety Trial Results - Location 1

Cooperator: Jason Taylor

Entry	Entry Code	Entry Name	Extractable Sugar per Ton	Extractable Sugar per Acre	Gross Sugar per Acre	Tons per Acre	Percent Sugar	Extractable Sugar Percent	Percent Purity	Brei N	Tare	Percent Emergence*	Final Stand Beets/100'***	Powdery Mildew Rating (1-9)***	Percent Bolters	Percent Rot
1	2020-21 IVLH- Loc 1	BTS 5460	299.8	17,525	20,409	58.3	17.5	15.0	91.6	9	1.6	59.1	232	6.9	0.0	0.0
2	2020-21 IVLH- Loc 1	BTS 5678	302.3	17,311	20,147	57.4	17.6	15.1	91.7	9	1.9	49.2	232	7.6	0.0	0.0
3	2020-21 IVLH- Loc 1	BTS 5775	295.0	17,815	20,852	60.5	17.2	14.8	91.5	13	1.5	40.0	226	6.4	0.0	0.0
4	2020-21 IVLH- Loc 1	BTS 582N	305.0	16,959	19,763	55.0	17.8	15.3	91.3	8	3.5	58.3	229	5.8	0.0	0.0
5	2020-21 IVLH- Loc 1	BTS 5983	299.4	17,587	20,500	58.9	17.4	15.0	91.7	9	1.9	57.7	232	7.5	0.0	0.0
6	2020-21 IVLH- Loc 1	BTS 511N	310.4	18,053	21,014	58.5	18.0	15.5	91.9	9	3.5	63.4	233	6.6	0.0	0.0
7	2020-21 IVLH- Loc 1	BTS 513N	297.9	17,756	20,698	59.6	17.4	14.9	91.7	13	2.8	45.4	231	6.7	0.0	0.0
8	2020-21 IVLH- Loc 1	BTS 5104	300.2	18,360	21,253	61.1	17.4	15.0	92.1	9	2.4	54.4	230	7.8	0.0	0.0
9	2020-21 IVLH- Loc 1	BTS 5112	279.4	18,119	21,315	64.9	16.4	14.0	91.2	14	1.4	52.0	231	7.5	0.0	0.0
10	2020-21 IVLH- Loc 1	BTS 5128	289.9	17,901	20,907	61.8	17.0	14.5	91.7	10	1.3	57.6	231	7.1	0.0	0.0
11	2020-21 IVLH- Loc 1	BTS 5139	300.2	16,906	19,757	56.3	17.6	15.0	91.4	10	2.0	58.7	231	7.8	0.0	0.0
12	2020-21 IVLH- Loc 1	SV 981	280.4	18,561	21,810	65.8	16.5	14.0	91.3	15	0.8	51.9	228	6.5	0.0	0.0
13	2020-21 IVLH- Loc 1	SV 1913N	295.0	17,624	20,914	59.8	17.5	14.7	90.4	7	2.0	59.1	230	2.1	0.0	0.0
14	2020-21 IVLH- Loc 1	SV 1915	303.2	18,861	22,096	62.2	17.8	15.1	91.2	9	1.1	61.8	231	5.2	0.0	0.0
15	2020-21 IVLH- Loc 1	SV 604N	280.1	16,969	20,217	60.7	16.7	14.0	90.4	11	2.2	58.8	232	4.7	0.0	0.0
16	2020-21 IVLH- Loc 1	SV 2997	278.0	18,586	21,948	66.9	16.4	13.9	90.9	13	0.9	46.9	228	6.9	0.0	0.0
		Mean	294.8	17,805.9	20,850.0	60.5	17.3	14.7	91.4	10.4	1.9	54.6	230.4	6.4		
		CV (%)	1.8	4.7	4.6	4.5	1.3	1.8	0.6	20.4	23.3	8.9	2.1	6.9		
		Error MS	33.2	905,741.6	1,195,933.6	10.1	0.1	0.1	0.4	5.6	0.2	28.9	28.2	0.2		
		LSD (0.05)	5.6	932.7	1,071.7	3.1	0.2	0.3	0.6	2.3	0.5	5.3	5.2	0.5		
		Reps	8	8	8	8	8	8	8	8	8	8	8	8		

\*Emergence counts taken prior to thinning and converted to a percent.

\*\* Final stand counts taken after thinning and converted to beets per 100' of row.

\*\*\* Powdery mildew ratings taken in mid-May at the trial. Rating is an average of ratings done by Mark Bloomquist and Ryan Kowta.

Plant Date: October 12, 2021

Harvest Date: June 9, 2021

Plot size: 2 row, 30" rows

Experimental Design: 4X4 Partially balanced lattice.

## 2020-2021 Imperial Valley Late Harvest Official Variety Trial Results - Location 2

Cooperator: Ryan Rothfleisch

Entry	Entry Code	Entry Name	Extractable Sugar per Ton	Extractable Sugar per Acre	Gross Sugar per Acre	Ton per Acre	Percent Sugar	Extractable Sugar Percent	Percent Purity	Brei N	Percent Tare	Percent Emergence*	Final Stand Beets/100' **	Percent Rot ***	Percent Bolters
1	2020-2021 IVLH - Loc. 2	BTS 5460	254.4	19,172	23,711	75.1	15.7	12.7	88.3	43	0.8	56.7	231	4.3	0.0
2	2020-2021 IVLH - Loc. 2	BTS 5678	262.5	16,852	20,536	64.5	16.0	13.1	88.9	48	1.7	48.5	235	10.2	0.0
3	2020-2021 IVLH - Loc. 2	BTS 5775	241.4	17,137	21,443	70.8	15.1	12.1	87.5	76	0.9	43.1	231	12.2	0.0
4	2020-2021 IVLH - Loc. 2	BTS 582N	261.1	5,889	7,465	23.1	16.1	13.0	88.0	47	1.6	54.3	234	59.4	0.0
5	2020-2021 IVLH - Loc. 2	BTS 5983	255.7	17,300	21,363	67.7	15.8	12.8	88.3	44	1.6	51.6	232	10.3	0.0
6	2020-2021 IVLH - Loc. 2	BTS 511N	272.3	8,949	10,872	33.7	16.6	13.6	88.6	51	1.3	56.8	234	51.6	0.0
7	2020-2021 IVLH - Loc. 2	BTS 513N	264.2	11,801	14,768	44.8	16.1	13.2	88.6	73	1.4	51.9	231	34.9	0.0
8	2020-2021 IVLH - Loc. 2	BTS 5104	260.4	18,862	22,951	71.7	15.8	13.0	89.9	36	1.4	54.3	233	13.2	0.0
9	2020-2021 IVLH - Loc. 2	BTS 5112	238.4	12,481	15,545	51.8	14.9	11.9	87.6	52	0.9	53.7	233	26.2	0.0
10	2020-2021 IVLH - Loc. 2	BTS 5128	239.6	17,464	21,937	72.4	15.1	12.0	87.1	51	0.9	51.9	232	12.3	0.0
11	2020-2021 IVLH - Loc. 2	BTS 5139	253.9	16,783	20,956	65.9	15.9	12.7	87.4	43	1.3	51.2	235	8.6	0.0
12	2020-2021 IVLH - Loc. 2	SV 981	245.0	13,078	16,062	54.2	15.1	12.3	88.4	48	0.6	47.9	231	34.4	0.0
13	2020-2021 IVLH - Loc. 2	SV 1913N	251.1	10,447	13,079	41.2	15.8	12.5	87.0	34	1.2	54.2	230	48.4	0.0
14	2020-2021 IVLH - Loc. 2	SV 1915	259.2	13,836	17,195	53.1	16.1	13.0	87.5	46	1.0	57.5	233	35.1	0.0
15	2020-2021 IVLH - Loc. 2	SV 604N	233.2	12,967	16,270	55.0	14.7	11.7	87.3	51	1.3	52.7	234	33.7	0.0
16	2020-2021 IVLH - Loc. 2	SV 2997	238.9	14,177	17,558	58.2	14.9	12.0	87.6	58	0.5	47.5	232	33.0	0.0
Grand Mean			252.0	14199.7	17606.8	56.5	15.6	12.6	88.0	50.1	1.1	52.1	232.6	26.7	
CV (%)			3.3	12.8	12.8	12.5	2.1	3.3	1.0	20.0	32.6	7.7	1.5	36.9	
Error MS			94.3	4443729.8	6702985.8	63.4	0.2	0.2	1.0	135.5	0.2	20.0	14.9	117.7	
LSD (0.05)			9.5	2065.9	2537.2	7.8	0.4	0.5	1.0	11.4	0.4	4.4	3.8	10.6	
Reps			8	8	8	8	8	8	8	8	8	8	8	8	

\* Emergence counts taken prior to thinning and converted to a percent.

\*\* Final stand counts taken after thinning and converted to beets per 100' of row.

\*\*\* Rot counts taken after defoliation. Percent rot calculated by dividing the total beets with rot by the final stand count per plot and converting to a percent.

\*\*\*\* After defoliation and prior to harvest, rot beets were pulled out of the row in every plot.

Yield reported is the yield of the good beets remaining in each plot after roguing the rot beets out of the row.

Plant Date: October 19, 2021

Harvest Date: July 19-20, 2021

Plot size: 2 row, 30" rows

Experimental Design: 4X4 Partially balanced lattice

## 2021 BSDF Curly Top Nursery Ratings for Imperial Valley

USDA/ARS - Kimbely Idaho. Dr. Carl Strausbaugh

Entry*	Entry Name	North Farm			South Farm			Overall
		8-Jul	12-Jul	22-Jul	8-Jul	12-Jul	22-Jul	
1	SV 604N	4.5 cd	5.4 de	7.2 a-c	4.5 cd	5.3 c-f	7.2 a-d	5.7 b-e
2	SV 2997	5.6 a	6.2 a	7.8 a	4.7 a-d	5.7 a-d	6.9 a-e	6.1 ab
3	SV 981	5.2 ab	6.1 ab	7.8 a	5.1 ab	5.9 a-c	7.4 ab	6.2 a
4	SV 501	5.0 a-c	5.9 a-d	7.7 ab	4.7 a-d	5.5 b-e	7.0 a-e	5.9 a-c
5	SV 602	4.8 b-d	5.8 a-d	7.5 a-c	4.8 a-c	5.8 a-c	7.3 ab	6.0 a-c
6	SV 983	4.7 b-d	5.7 a-e	7.2 a-c	4.7 a-d	5.6 a-e	7.1 a-d	5.8 a-d
7	BTS 5460	4.8 b-d	5.4 c-e	6.8 c	4.6 b-d	5.5 b-e	6.8 b-f	5.6 c-e
8	BTS 5678	4.7 b-d	5.6 b-e	7.2 a-c	5.0 a-c	5.7 a-d	7.2 a-d	5.9 a-c
9	BTS 5775	5.2 ab	6.0 a-c	7.7 ab	5.2 a	6.0 ab	7.6 a	6.3 a
10	BTS 582N	4.8 b-d	5.7 a-e	7.5 a-c	4.7 a-d	5.4 b-e	7.0 a-e	5.9 a-d
11	BTS 5983	4.8 b-d	5.7 a-e	7.1 a-c	4.5 cd	5.3 c-f	6.5 d-f	5.6 c-e
Check 1		3.8 e	4.3 g	5.4 d	3.7 e	4.3 g	5.4 g	4.4 g
Check 2		4.3 de	5.3 de	7.0 a-c	4.2 de	5.1 d-f	6.6 c-f	5.4 de
Check 3		3.7 e	4.7 fg	5.5 d	4.2 de	5.0 ef	6.1 fg	4.8 fg
Check 4		4.4 cd	5.2 ef	7.0 bc	3.9 e	4.8 fg	6.2 ef	5.2 ef
Check 5		5.2 ab	6.3 a	7.5 a-c	5.0 a-c	6.2 a	7.3 a-c	6.2 a
Mean		4.7	5.6	7.1	4.6	5.4	6.8	5.7
CV		11.0	10.0	9.0	11.0	11.0	10.0	7.0
<i>P</i> > <i>F</i>		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
LSD		0.6	0.6	0.8	0.6	0.7	0.8	0.5

Check 1 = SV836705RR, moderate resistant check,

Check 2 = SX018, moderately susceptible check.

Check 3 = B-51, moderately resistant check.

Check 4 = B-52, moderately susceptible check.

Check 5 = SV027, susceptible check

## 2021 BSDF Rhizomania Nursery Results for Imperial Valley of California

Dr. Carl Strausbaugh - USDA/ARS, Kimberly Idaho

Entry	Entry Name	Foliar rating (% susceptible) <sup>y</sup>	Root rating <sup>x</sup>	Sucrose content (%)	Nitrate (ppm)	Conductivity (mmhos)	Root yield (tons/A)	ERS (lb/A) <sup>w</sup>
11	BTS 5983	0.6 c	1.9 e	17.75 a	65 d	0.79	40.76 a	12,234 a
10	BTS 582N	0.2 c	2.0 de	17.87 a	73 d	0.78	39.44 ab	11,965 a
8	BTS 5678	0.0 c	2.0 de	17.07 bc	116 a-c	0.87	41.22 a	11,755 a
7	BTS 5460	2.6 c	2.1 de	17.46 ab	101 b-d	0.8	39.15 ab	11,530 ab
6	SV 983	0.3 c	2.4 b-e	17.12 bc	78 b-d	0.76	36.61 b-d	10,625 bc
1	SV 604N	0.0 c	2.3 c-e	16.63 c	100 b-d	0.79	36.88 bc	10,366 c
4	SV 501	0.6 c	2.4 b-d	16.78 c	74 d	0.75	35.80 c-e	10,212 cd
3	SV 981	3.8 c	2.3 c-e	16.08 d	96 b-d	0.8	37.44 bc	10,124 cd
9	BTS 5775	0.0 c	2.6 bc	16.81 c	77 cd	0.92	33.45 d-f	9,311 de
5	SV 602	0.2 c	2.6 bc	15.65 de	150 a	0.83	33.15 ef	8,682 e
2	SV 2997	12.2 b	2.8 b	15.83 de	120 ab	0.83	32.27 f	8,561 e
<b>Check<sup>z</sup></b>		100.0 a	6.2 a	15.48 e	72 d	0.95	10.30 g	2,658 f
Mean		10	2.63	16.71	94	0.82	34.71	9,835
$P > F^v$		<0.0001	<0.0001	<0.0001	0.0043	0.0955	<0.0001	<0.0001
LSD		8.1	0.5	0.54	42	NS	3.26	1,020

<sup>z</sup>BTS 4D20 was included as the BNYVV susceptible check cultivar (bold).

<sup>y</sup> Foliar rating = percentage of foliage with rhizomania symptoms (narrow yellow upright leaves).

<sup>x</sup> Root rating using a scale of 0-9 (0 = healthy and 9 = dead; Plant Disease 93:632-638);  $\geq 3$  would be considered susceptible).

<sup>w</sup> Estimated recoverable sucrose (ERS) = extraction x 0.01 x gross sucrose where extraction =  $250 + [1255.2 \times (\text{conductivity} - 15000) \times (\text{percent sucrose} - 6185)] / (\text{percent sucrose} \times [98.66 - (7.845 \times \text{conductivity})])$ .

<sup>v</sup>  $P > F$  was the probability associated with the F value. Within each variable, means followed by the same letter did not differ significantly based on Fisher's protected least significant difference (LSD;  $\alpha = 0.05$ ). NS = not significant.