

EFFECT OF ROW WIDTH AND POPULATION ON SUGARBEET YIELD AND QUALITY

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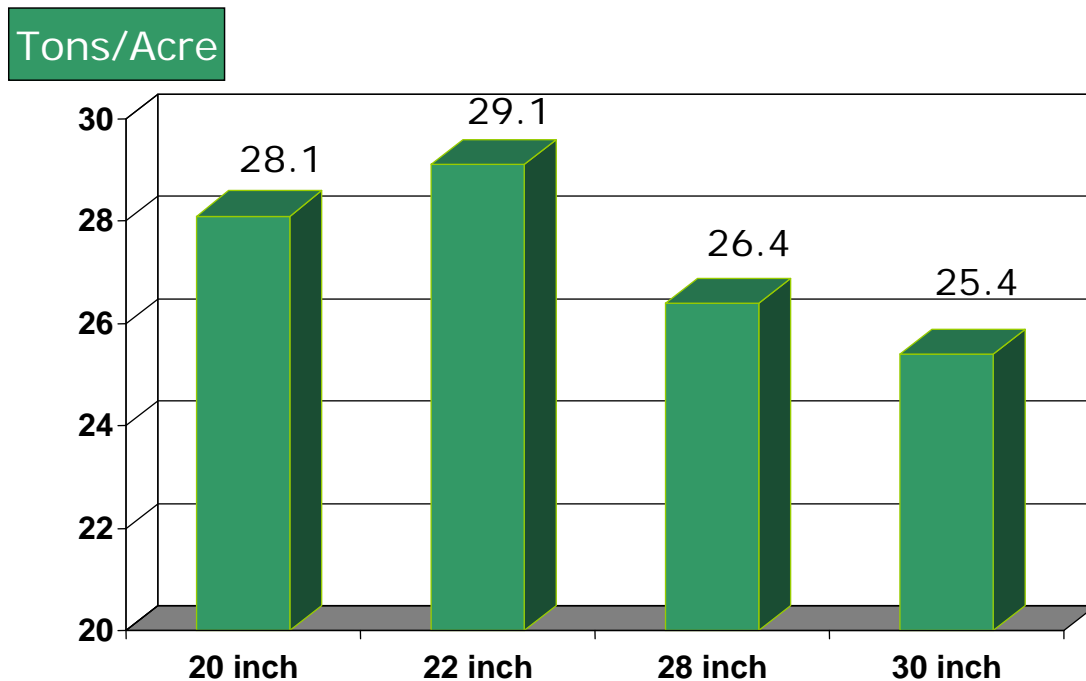
Introduction:

In the effort to improve beet yield and quality in Michigan, row width has become an important topic. Approximately 20% of Michigan Sugar Company growers are growing beets in narrow rows. Data (Chart 1) shows the average yield of Michigan Sugar Company growers at various row widths. For the planting season of 2009, Michigan Sugar Company's Agricultural Research made the change from 30 inch row width to 22 inch row width. Trials were conducted in 2009 and 2010 to compare these two row widths. These trials compared the yield difference between the two row widths at varying populations. Future testing will include population comparisons, as well as disease and weed control comparisons.

Chart 1.

Michigan Sugar Company Grower Data

Source: Michigan Sugar Company Grower Records



Objectives:

The trials in 2009 and 2010 were conducted to compare the yield and quality of sugarbeets grown in different row widths, 22 inch and 30 inch. These trials also compare different populations of beets between the two row widths. In 2009, the trial compared beet populations from 75-250 beets per 100 feet of row. In 2010, the trials compared beet populations from 15,000 to 50,000 beets per acre as well as canopy closure throughout the growing season. These trials would help to determine not only which of the two row widths performed better, but also at which population each row width was best.

Methods and Materials:

In 2009, one trial was conducted comparing 30 inch to 22 in row widths at seven populations (75, 100, 125, 150, 200, 225, and 250 beets/100ft. of row). This trial was a small plot replicated trial with each plot being 6 rows wide and 38 feet long with 6 replications. The trial was planted at a high population and then thinned at the four leaf stage to the respective amount of beets/100ft of row. All treatments received a banded Quadris application at the 4-6 leaf stage, as well as glyphosate and fungicide applications throughout the growing season. The center 4 rows of each 6 row plot were harvested for data comparison.

In 2010, two trials were conducted comparing 30 inch to 22 inch row widths at six populations (15000, 20,000, 25,000, 30,000, 40,000, and 50,000 beets/acre). These trials were small plot replicated trials with each plot being 6 rows wide and 38 feet long with 6 replications. The trials were planted at a high population and then thinned at the four leaf stage to the respective amount per acre. A disease resistant variety was selected to reduce the risk of disease problems. All treatments received a banded application of Quadris at the 4-6 leaf stage, as well as glyphosate and fungicide applications throughout the growing season. Canopy closure measurements were taken three times throughout the growing season. The center 4 rows of each 6 row plot were harvested for data comparison.

Population Description for 2010 Trials

Sugar Beets/ Acre	Sugar Beets/100ft. Of row 22"	30"
15,000	63	86
20,000	84	115
25,000	105	143
30,000	126	172
40,000	168	230
50,000	211	287

Results:

In 2009, when populations were averaged, beets planted in 22 inch rows had an increased yield of 2.97 tons/acre compared to 30 inch rows. In general, yields increased as populations increased for both row widths. The highest yielding population for 22 inch rows was at the 250 beets per 100ft. population (Table 1.) In 30 inch rows, the yield declined at the highest populations. There was no difference in sugar content between the two row widths.

<u>Effect of Row Spacing and Sugarbeet Population on Sugarbeet Yield and Quality 2009</u>						
Table 1.						
22" Rows						
Row Spacing	Beets/ 100 ft	RWSA ¹	RWST ²	Tons/A	% Sucrose	% CJP ³
22"	250	9953	273	36.4	18.4	95.3
22"	175	9140	268	34.2	18.1	94.9
22"	125	9091	263	34.6	18.0	94.4
22"	200	9090	268	34.0	18.2	94.6
22"	225	8907	271	32.5	18.4	94.6
22"	150	8647	264	32.8	18.0	94.6
22"	100	8312	256	32.5	17.6	94.3
22"	75	8063	252	32.0	17.5	93.9
Average		8900	264	33.6	18.0	94.6
LSD (P=.05)		766.1	9.9	2.6	0.6	0.7
CV		6.3	2.6	5.6	2.2	0.5

30" Rows						
Row Spacing	Beets/ 100 ft	RWSA ¹	RWST ²	Tons/A	% Sucrose	% CJP ³
30"	200	8373	272	30.8	18.5	94.7
30"	225	8163	264	30.9	18.1	94.3
30"	100	8144	268	30.3	18.4	94.4
30"	125	8132	266	30.6	18.3	94.2
30"	175	8103	264	30.7	18.1	94.4
30"	250	8063	263	30.7	17.9	94.6
30"	150	8021	263	30.5	18.0	94.3
30"	75	7555	245	30.8	17.4	92.7
Average		8069	263	30.7	18.1	94.2
LSD (P=.05)		766.1	9.9	2.6	0.6	0.7
CV		6.3	2.6	5.6	2.2	0.5

¹RWSA – Recoverable Sugar per Acre

²RWST – Recoverable Sugar per Ton

³CJP - Clear Juice Purity

In 2010, when populations were averaged, beets planted in 22 inch rows had an increased yield of 3.4 tons/acre and an increase in sucrose by .4 percentage points over beets planted in 30 inch rows (Table 2). Yields tended to increase in 22 inch rows as the population increased with the highest yield being at the 50000 beets per acre population (Table 3). Beets planted in 30 inch rows had their highest yield at the 40,000 beets per

acre population. When both row widths were combined to compare populations, both yield and quality increased as populations increased (Table 4). When the canopy closure was averaged throughout the year, the 22 inch rows had a 20% improvement in closure over the 30 inch rows.

Effect of Row Spacing and Sugarbeet Population on Sugarbeet Yield, Quality, and Canopy Development 2010								
Table 2. (All populations combined)								
Row Spacing	RWSA ¹	RWST ²	Ton/A	%Sucrose	%CJP ³	% Canopy Closure		
						June	July	Aug
22 inch	7709	244.7	31.5	17.1	93.6	79	91	88
30 inch	6652	239.4	27.9	16.7	93.9	56	77	73
LSD 5%	224	4.0	0.87	0.21	0.26	2.9	1.3	1.7
¹ RWSA – Recoverable Sugar per Acre								
² RWST – Recoverable Sugar per Ton								
CJP ³ - Clear Juice Purity								

Effect of Row Spacing and Sugarbeet Population on Sugarbeet Yield, Quality, and Canopy Development 2010										
Table 3.										
Row Spacing	Beets/Acre	Beets/100 ft	RWSA ¹	RWST ²	Tons / Acre	% Sucrose	% CJP ³	% Canopy Closure		
								June	July	Aug
22 inch	50000	211	8324	249.5	33.2	17.3	93.9	82	93	92
22 inch	40000	168	8103	253.8	32.0	17.4	94.5	80	91	89
22 inch	30000	126	7835	248.4	31.6	17.4	93.6	82	92	88
22 inch	25000	105	7643	243.4	31.4	17.0	93.7	77	91	90
22 inch	20000	84	7640	239.9	31.9	16.9	93.3	79	90	88
30 inch	40000	230	6937	245.1	28.4	16.9	94.4	57	79	73
30 inch	50000	287	6883	249.5	27.7	17.1	94.5	59	78	75
30 inch	25000	143	6777	239.8	28.4	16.8	93.8	57	76	73
22 inch	15000	63	6709	233.1	28.7	16.7	92.7	76	88	84
30 inch	30000	172	6653	238.6	28.1	16.6	94.0	57	77	73
30 inch	20000	115	6464	232.1	27.9	16.5	93.1	53	75	73
30 inch	15000	86	6199	231.9	26.8	16.2	93.8	53	74	70
LSD 5%			554	9.9	2.13	0.53	0.65	7.2	3.3	4.1
CV%			9.5	5.1	8.9	3.9	0.9	13.2	4.9	6.3
Mean			7180.5	242.1	29.7	16.9	93.8	67.7	83.6	80.5

¹ RWSA – Recoverable Sugar per Acre										
² RWST – Recoverable Sugar per Ton										
CJP - Clear Juice Purity										

**Effect of Row Spacing and Sugarbeet Population
on Sugarbeet Yield, Quality, and Canopy Development 2010**

Table 4. (22" and 30" row widths combined)

Beets / Acre	RWSA ¹	RWST ²	Ton/A	%Sucrose	%CJP ³	% Canopy Close		
						June	July	Aug
50000	7603	249.5	30.4	17.2	94.2	71	85	83
40000	7520	249.4	30.2	17.1	94.4	69	85	81
30000	7244	243.5	29.9	17.0	93.8	69	84	80
25000	7210	241.6	29.9	16.9	93.7	67	84	82
20000	7052	236.0	29.9	16.7	93.2	66	83	80
15000	6454	232.5	27.8	16.4	93.3	65	81	77
LSD 5%	388	7.0	1.5	0.37	0.46	5.1	2.3	2.9

¹RWSA – Recoverable Sugar per Acre

²RWST – Recoverable Sugar per Ton

³CJP - Clear Juice Purity

Conclusion:

Based on two years data comparing 22 inch and 30 inch rows, there is a significant gain in yield when growing 22 inch rows. Beets grown in 22 inch rows increase in yield to the highest populations represented in the trials. Future trials will try to determine the point at which population in 22 inch rows becomes too high and yield begins to decrease. Beets grown in 30 inch rows have their highest yield near the 40,000 beets per acre population. Results from 2010 show an increase in sugar of 0.4 percentage points in 22 inch rows over 30 inch rows. The results from 2009 showed no significant difference. Canopy closure was significantly better in 22 inch rows when compared to 30 inch rows by an average of 20%. Future trials will try to determine if canopy closure has an effect on the amount of weed pressure as well as the development of cercospora and rhizoctonia.