

COMPARING YIELD AND QUALITY OF SUGARBEET PLANTED IN 22 AND 11 INCH ROWS.

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Introduction and Objective

Research shows that a plant population of 150 plants per 100 feet in 22 inch rows at the six leaf stage using conventional sugarbeet varieties would produce the highest recoverable sucrose per acre at harvest. Since 2002, a few growers have started commercial production of sugarbeet in 11-inch rows.

This research was conducted to compare yield and quality of sugarbeet when grown in 22-inch rows, 8 inches apart and in 11-inch rows 8, 10, 12 and 14 inches apart.

Materials and Methods

Research was conducted at Foxhome, MN and Prosper, ND. VDH 46177 sugarbeet seeds were planted with a John Deere MaxEmerge 2 planter into plots 11 feet wide and 30 feet long on April 26 and 30 at Foxhome and Prosper, respectively. Seeds were placed 1.25 inches deep and spaced about 3 inches apart within rows. Counter was applied at 11.9 lb/acre at planting to control sugarbeet root maggot. Treatments were manually thinned according to the respective population; 8 inches apart for the 22-inch rows, and 8, 10, 12, and 14 inches apart for the 11-inch rows during the four to six leaf stages. The experiment was a randomized complete block design with four replicates. Fertilization was done according to standard recommendation for sugarbeet. Plots were kept weed free using micro-rates of herbicides recommended for sugarbeet and hand-weeding. Fungicide was used to control *Cercospora* leaf spot.

Rows 3 and 4 of the 22-inch row plots and rows 6 and 8 of the 11-inch row plots were harvested on October 4 and 5 at Foxhome and Prosper, respectively. Yield was determined and quality analysis performed by American Crystal Sugar Company Quality Tare Laboratory, East Grand Forks, Minnesota. One additional sample of 10 to 12 roots were randomly selected from the first three treatments, washed, placed into plastic bags and set in cold storage at 4° C. Thirty day respiration rates were then determined by measuring mg CO₂ per kg of root per hour at USDA – ARS, Northern Crop Science Laboratory, Fargo, ND.

Data was analyzed by analysis of variance and LSD using Agriculture Research Manager, version 6.0.

Summary of Results

At Foxhome ([Table 1](#)), there was no significant difference in recoverable sucrose per acre and per ton, root yield, percent sucrose and percent sugar loss to molasses between the 22-inch row treatment and the 11-inch row treatments. However, the 14 inch spacing between plants within the row resulted in significantly higher recoverable sucrose per acre and root yield than the 8 inch and 10 inch spacing between plants in the 11-inch rows. The 22-inch wide row treatment resulted in significantly higher average root weight than the different spacing within the 11-inch row; average root weights decreased as within row spacing decreased (or as plants were spaced closer together resulting in higher plant populations).

At Prosper ([Table 2](#)), there was no significant difference in recoverable sucrose per acre and per ton, root yield, percent sucrose and percent sugar loss to molasses between the 22-inch row treatment and the 11-inch row treatments. The 22-inch row treatment where plants were 8 inches apart within the row resulted in higher recoverable sucrose than the 11-inch wide rows where plants were spaced 8 inches and 10 inches apart within the row; a similar trend occurred at Foxhome. The sucrose content of 11-inch rows were generally higher than the 22-inch row but were not statistically significant. The 8 inch spacing between plants within the 22-inch wide row treatment resulted in significantly higher average root weight than the different spacing (8, 10, 12 and 14 inches) within the 11-inch row; average root weights decreased as within row spacing decreased (or as plants were spaced closer together). The 11 inch row width at 8 inch within row plant spacing resulted in the lowest average root weight compared to all treatments.

The 22-inch row treatment at Foxhome ([Table 3](#)) and Prosper ([Table 4](#)) resulted in the lowest respiration rate while the 11-inch row at 8 inch plant spacing treatment resulted in the highest respiration rate. At Foxhome the 22-inch row treatment at 8 inch plant spacing resulted in a significantly lower respiration rate compared to all 11-inch row treatments while the 11-inch row at 8 inch plant spacing treatment resulted in a significantly higher respiration rate compared to all treatments. At both locations, respiration rates generally decreased as within row plant spacing increased for 11-inch row treatments.

The data suggest a potential increase in recoverable sucrose per acre when planting sugarbeet in 11-inch rows 12 and 14 inches apart within the row compared to 22-inch rows spaced 8 inches apart. However, average root weight (and size) of roots from the 11-inch rows were significantly lower than roots from the 22-inch row treatment. Smaller root size may adversely affect harvesting and storage, especially if smaller roots results in higher respiration rates in storage piles. It is possible that higher recoverable sucrose can be achieved in 22-inch rows by using a closer within row spacing than the currently recommended 8 inch spacing.

Acknowledgement

Special thanks to the Sugarbeet Research and Education Board of Minnesota and North Dakota for funding this research. Thanks to Charles Hotvedt of American Crystal Sugar Company Quality Tare Laboratory, East Grand Forks, Minnesota, for sugarbeet quality analysis, and thanks to Nyle Jonason at USDA-ARS, Fargo for measuring respiration rates.

Table 1. Yield and Quality of Sugarbeet Planted in 22 and 11 inch Rows at Foxhome, MN.

Treatment Row spacing; within row spacing	Recoverable Sucrose		Root Yield (tons/A)	Sugar (%)	SLM* (%)	Ave root wt (lb)
	(lbs/A)	(lbs/T)				
22 inches; 8 inches	8584 ab	324 a	26.7 ab	17.03 a	0.80 a	1.73 a
11 inches; 8 inches	7237 b	321 a	23.0 b	16.90 a	0.88 a	0.75 d
11 inches; 10 inches	7549 b	328 a	23.2 b	17.22 a	0.85 a	0.88 cd
11 inches; 12 inches	9094 ab	324 a	28.2 ab	16.99 a	0.80 a	1.14 bc
11 inches; 14 inches	10100 a	332 a	30.6 a	17.45 a	0.80 a	1.34 b
LSD (P=.05)	2082	27	6.2	1.28	0.14	0.28
CV	15.72	5	15.1	4.85	10.61	15.29

*Sugar loss to molasses.

Table 2. Yield and Quality of Sugarbeet Planted in 22 and 11 inch Rows at Prosper, ND.

Treatment Row spacing; within row spacing	Recoverable Sucrose		Root Yield (tons/A)	Sugar (%)	SLM* (%)	Ave root wt (lb)
	(lbs/A)	(lbs/T)				
22 inches; 8 inches	7773 a	298 a	26.2 a	15.95 a	1.02 a	1.84 a
11 inches; 8 inches	6090 a	307 a	20.0 a	16.36 a	0.98 a	0.94 c
11 inches; 10 inches	7662 a	300 a	25.8 a	16.01 a	1.00 a	1.06 bc
11 inches; 12 inches	8033 a	313 a	26.0 a	16.75 a	1.10 a	1.08 bc
11 inches; 14 inches	7847 a	300 a	26.9 a	16.04 a	1.02 a	1.30 b
LSD (P= .05)	2290	28	7.8	1.40	0.17	0.34
CV	19.67	6	20.0	5.61	10.72	17.74

*Sugar loss to molasses.

Table 3. Respiration Rate 30 Days Post Harvest at Foxhome, MN

Treatment Row spacing; within row spacing	Avg root weight (kg)	Respiration rate mg CO₂/kg root/hour
22 inches; 8 inches	0.81 a	2.80 c
11 inches; 8 inches	0.31 c	5.32 a
11 inches; 10 inches	0.34 c	4.42 b
11 inches; 12 inches	0.53 b	4.32 b
11 inches; 14 inches	0.43 bc	4.29 b
LSD (P= .05)	0.19	0.73
CV	20.5	8.89

Table 4. Respiration Rate 30 Days Post Harvest at Prosper, ND

Treatment Row spacing; within row spacing	Avg root weight (kg)	Respiration rate mg CO₂/kg root/hour
22 inches; 8 inches	0.59 a	3.89 a
11 inches; 8 inches	0.48 a	4.67 a
11 inches; 10 inches	0.45 a	4.36 a
11 inches; 12 inches	0.49 a	4.20 a
11 inches; 14 inches	0.75 a	4.30 a
LSD (P= .05)	0.37	1.16
CV	35.27	14.44