

EFFECT OF PLANT POPULATION OF A RHIZOMANIA RESISTANT VARIETY ON SUGARBEET YIELD AND QUALITY

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Introduction and Objective

Past research indicated that the optimum plant population for sugarbeet was 150 plants per 100 ft. of row using conventional sugarbeet varieties. Since the confirmation of Rhizomania in southern Minnesota in 1996, significant acreages were planted with Rhizomania resistant varieties. In 2003, approximately 80% of southern Minnesota sugarbeet acres were planted with rhizomania resistant varieties. It is anticipated that the use of Rhizomania resistant varieties will also increase in the Red River Valley.

The objective of this research was to determine the optimum plant population that would result in the highest yield and quality using a Rhizomania resistant variety.

Materials and Methods

Research was conducted at Foxhome, MN and Glyndon, MN. VDH 46177 sugarbeet seeds were planted with a John Deere MaxEmerge 2 planter into plots 11 feet in width (6 22-inch wide rows) and 30 feet in length on May 15 and May 12. Seeds were placed 1.25 inches deep and spaced 3 inches apart in rows that were 22 inches wide. Counter was applied at 11.9 lb/acre at planting to control sugarbeet root maggot. Treatments were manually thinned according to the respective population during the four to six leaf stages. The experiment was a randomized complete block design with four replications. Fertilization was done according to standard recommendations for sugarbeet. Plots were kept weed free using micro-rates of herbicides recommended for sugarbeet, hand-weeding, and cultivation. Fungicide was used to control Cercospora leaf spot.

The middle two rows of each plot were harvested on September 17 and October 1. Yield was determined and quality analysis performed by American Crystal Sugar Company Quality Tare Laboratory East Grand Forks, Minnesota. Data was analyzed for differences by analysis of variance and LSD using Agriculture Research Manager, version 6.0.

Summary of Results

The Glyndon research site was lost to root rot disease. Only data from Foxhome are presented in [Tables 1 and 2](#). The percentage of plants surviving from thinning to harvest was high at 102, 98, 90, and 94 for the 100, 125, 150, and 175 plants per 100 ft of row, respectively. However, the percentage of plants surviving was lower at 86% and 78% for the higher plant populations of 200 and 225 plants per 100 ft of row, respectively. The higher mortality rate at the higher plant population was probably due to more competition. There was no significant difference in recoverable sucrose per acre, recoverable sucrose per ton, root yield per acre, and percent sucrose among the different plant populations. However, the 175 plants per 100 ft of row treatment resulted in the highest recoverable sucrose per acre and highest percent sucrose. Sugar loss to molasses was significantly lower in the 225 plants per 100 ft of row treatment compared to the 100 plants per 100 ft of row treatment. Sugar loss to molasses tended to decrease as the plant population increased. There were significant differences in the average weight of individual roots among treatments. The 100 and 125 plants per 100 ft of row treatments resulted in significantly higher root weight compared to the other treatments. The 150 plants per 100 ft of row treatments resulted in significantly higher root weight compared to 175, 200, and 225 plants per 100 ft. of row treatments. As plant populations increased individual root weight tended to decrease.

Root samples from 150, 200, and 225 plants per 100 ft of row treatments were collected at harvest, placed into plastic bags and stored in a cooler at 37° F. Respiration rates were determined thirty days after cold storage by Dr. Larry Campbell at USDA Fargo, ND. There was no significant difference in the respiration rates of the different plant populations. Please note sugarbeet roots were stored in a cooler and not a 20' high sugarbeet pile.

Table 1. Effect of Plant Population on Sugarbeet Yield and Quality

Treatment	Count at harvest	% of Thinned Stand	Recoverable Sucrose		Net Tons/A	% S	SLM*	Ave. root wgt. (lb)
			Lbs/A	Lbs/Ton				
100 plants/100 ft row	102	102	5911	286	19.8	15.84	1.55	1.66
125 plants/100 ft row	122	98	6473	295	21.3	16.11	1.38	1.50
150 plants/100 ft row	135	90	6372	301	20.4	16.43	1.40	1.29
175 plants/100 ft row	165	94	6493	301	20.8	16.53	1.45	1.08
200 plants/100 ft row	172	86	6088	291	20.3	15.93	1.38	0.93
225 plants/100 ft row	175	78	6054	302	19.4	16.44	1.30	0.97
LSD			968	23	2.6	1.00	0.22	0.20
CV			10.31	5.1	8.41	4.13	10.21	10.93

*Sugar loss to molasses

Table 2. Average Respiration Rate 30 Days Post Harvest

Treatment	Respiration rate mg CO ₂ /kg root/hour
150 plants/ 100 ft row	2.88
200 plants/ 100 ft row	3.11
225 plants/ 100 ft row	2.88

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