

EFFECT OF PLANT POPULATION ON RESPIRATION RATE OF SUGARBEET

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Introduction and Objective

The optimum plant population for sugarbeet is 150 plants per 100 foot of 22 inch row with an approximate root weight of 1.5 lbs. Current research has indicated that higher recoverable sugar per acre can be achieved using a higher plant population of 175 plants per 100 feet of row, however, a reduction in root weight will occur. Although storage of sugarbeet roots at 150 plants per 100 feet of row has been adequate, it is important to determine whether a reduction in root weight will adversely impact root storage.

The objective of this research was to determine if plant populations greater than 150 plants per 100 feet of row would adversely impact root storage.

Materials and Methods

Research was conducted at Foxhome, MN. VDH 46177 (diploid) and Beta 4818 (triploid) sugarbeet seeds were planted with a John Deere MaxEmerge 2 planter into plots 11 feet in width (six 22-inch wide rows) and 30 feet in length on April 26. 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 during the four to six leaf stages to obtain 100, 125, 150, 175, 200 and 225 plants per 100 foot of row. The experiment was a split plot design with four replicates. 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 October 4. Samples of 10 to 12 roots were randomly selected from the first three reps of each treatment, washed, placed into plastic bags and stored in a cooler at 4° C. Thirty day respiration rates were then determined by measuring mg of CO₂ given off per kg of root per hour at USDA – ARS, Northern Crop Science Laboratory, Fargo, ND. Data was analyzed for differences by analysis of variance and LSD using Agriculture Research Manager, version 6.0.

Respiration rates for Beta 4818 generally increased as plant populations increased while respiration rates for VDH 46177 did not seem to follow this trend. Respiration rates were

lower for both VDH 46177 and Beta 4818 at 150 plants per 100 feet of row compared to 175 plants per 100 feet of row; however, they were not significantly different. It is important to note that respiration rates for VDH 46177 and Beta 4818 at all plant populations were within the range of healthy sugarbeet roots.

This research suggests that increasing the plant population of VDH 46177 and Beta 4818 from 150 plants per 100 feet of row to 175 plants per 100 feet of row would not adversely impact root storage.

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Table 1. Effect of Root Size on Respiration Rate

Treatment (Plants/ 100 ft row)	Ave. root wgt. (kg)	Respiration Rate mg CO₂/ kg root/ hour
Beta 4818		
100	0.68 bcd	3.22 cd
125	0.66 cd	3.61 bcd
150	0.66 cd	3.77 bc
175	0.70 bc	3.86 bc
200	0.55 d	4.85 a
225	0.68 bcd	3.87 bc
VDH 46177		
100	0.64 cd	3.84 bc
125	0.90 a	3.71 bc
150	0.81 ab	2.77 d
175	0.60 cd	3.62 bcd
200	0.65 cd	4.31 ab
225	0.57 cd	3.62 bcd
LSD	0.14	0.89
CV	12.06	13.28