

EFFECT OF SUGARBEET PLANT SPACING UNIFORMITY ON SUGAR PRODUCTION, 3 YEAR SUMMARY

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Uniform spacing of sugarbeet (*Beta vulgaris* L.) plants is recommended to maximize light interception and reduce weed competition in order to maximize production of sugar. With the rapid changes in soil moisture conditions and a very short time period for planting in during the early spring, there is a desire among sugarbeet growers to increase planter ground speed. Results from planter test stand grease belts have shown decreased uniformity of seed spacing with increasing ground speeds. The objectives of this study were to determine (1) the effect of increasing planter ground speed on sugarbeet plant spacing in the field and (2) the effect of plant spacing on sugar production.

Materials and Methods

Field experiments were established on Bearden silty clay loam (Fine-silty, mixed, super active, frigid, Aeric Calciaquoll) near Glyndon, MN 2001, 2002 and 2003. The experiment was arranged in a randomized complete block design with six replications. Individual treatment plots measured 11 feet wide and 30 feet long. Soil nitrogen levels were adjusted with fertilizer to approximately 130 lbs/acre of available residual soil test N plus added fertilizer N.

Sugarbeet, Crystal 9581, was planted May 25, May 1, April 29, in 2001, 2002, 2003 respectively, with a 6 row John Deere MaxEmerge 2 at ground speeds of 4, 5, 6, and 7 MPH. Small minimum buildup and MiniPellet (2M) seed were used each year at each of the ground speeds. Sugarbeet was placed 1.25 inches deep with a 5.5-inch in-row spacing in 2001, a 5.25-inch spacing in 2002 and 2003. A 22-inch row spacing was used. Counter was surfaced band applied at 11.9 lbs/a and incorporated with chain at planting. The distance between plants was determined to the nearest half inch at the two to four leaf stage. Post emergence herbicides, cultivation and hand labor was used as needed for weed control. Two applications each of Eminent and Super Tin were applied for Cercospora leafspot control.

Sugarbeet were harvested the last week of September each year. Plant top material was removed with an Alloway 3-drum flail at a ground speed of 3 MPH. The middle two rows of each 6 row plot were harvested. Yield determinations were made and quality analysis performed at American Crystal Sugar Quality Tare Lab, East Grand Forks, MN.

Results and Discussion

The uniformity of sugarbeet plant spacing was decreased with increasing planter ground speed. Percent of total number of plants at the target seed spacing was reduced more with increasing ground speed in 2001 with MiniPellet seed and in 2002 and 2003 with both seed types. Occurrence of plants with in an inch or two of each other was more common with the minimum buildup seed.

The recoverable sugar production was higher in 2001 ([Table 1](#)) than that of 2002 ([Table 2](#)), even though planting occurred earlier in 2002. Below normal temperatures experienced in May 2002 delayed emergence and growth of sugarbeet in to early June. Ideal moisture condition following early planting in 2003 produced the greatest recoverable sugar production ([Table 3](#)). Differences between seed types were not statistically significant in any year, thus speed means are shown in the tables. Although statistical analyses do not show significant differences in the harvest parameters, a decrease in net sucrose percentage, root yield, extractable sugar, and harvest population with increasing ground speed is shown in each year. Three year mean values in [Table 4](#) show the same trends. Some of this decrease is due to the inability to completely remove top growth material from the crown of sugarbeet that is in close proximity to other sugarbeet, causing a lower net sucrose. The competition between these close sugarbeet plants also reduces the number of harvestable roots, thus decreasing root yield. The three year mean reduction in gross return per ton of \$1.81 and \$46.00 per acre, as planter speed increases from 4 to 7 MPH, can have a great impact on the cash flow of an individual grower.

Conclusion

Increasing planter ground speed caused non-uniformity in sugarbeet plant spacing. As a result of this irregular plant spacing, sugar production decreased due to petioles remaining on the crown following flailing and the competition of close sugarbeet plants to obtain size sufficient for harvest. Using lower ground speed during planting is recommended. The inclusion of the smaller size roots resulting from increased planter speed may also have a detrimental effect during pile storage.

Table 1. Effect of planter ground speed on net sucrose percentage, root yields, recoverable sugar production, harvest population and gross return, 2001.

PLANTER SPEED (mph)	Net Sucrose (%)	Root Yield (t/a)	Ext. Sugar yield (lbs/a)	Harvest Population (beets/100ft)	Gross Return (\$/t)	Gross Return (\$/a)
4	14.95	25.8	7085	153	34.47	817
5	14.81	26.4	6963	148	33.85	796
6	14.96	26.3	6812	148	34.51	796
7	14.42	26.4	6641	144	32.04	741
LSD (.05)	ns	ns	ns	ns	ns	ns

Table 2. Effect of planter ground speed on net sucrose percentage, root yields, recoverable sugar production, harvest population and gross return, 2002.

PLANTER SPEED (mph)	Net Sucrose (%)	Root Yield (t/a)	Ext. Sugar yield (lbs/a)	Harvest Population (beets/100ft)	Gross Return (\$/t)	Gross Return (\$/a)
4	14.15	20.2	5710	151	30.80	622
5	14.13	20.3	5750	157	30.72	626
6	13.77	20.0	5523	145	29.02	586
7	13.47	19.2	5185	129	27.70	535
LSD (.05)	.64	ns	ns	14	2.94	ns

Table 3. Effect of planter ground speed on net sucrose percentage, root yields, recoverable sugar production, harvest population and gross return, 2003.

PLANTER SPEED (mph)	Net Sucrose (%)	Root Yield (t/a)	Ext. Sugar yield (lbs/a)	Harvest Population (beets/100ft)	Gross Return (\$/t)	Gross Return (\$/a)
4	16.8	25.8	8646	184	42.77	1103
5	16.9	26.4	9027	188	43.56	1162
6	16.8	26.3	8860	184	43.02	1133
7	16.8	26.2	8814	179	42.86	1126
LSD (.05)	ns	ns	ns	ns	ns	ns

Table 4. Effect of planter ground speed on net sucrose percentage, root yields, recoverable sugar production, harvest population and gross return, 3 year mean.

PLANTER SPEED (mph)	Net Sucrose (%)	Root Yield (t/a)	Ext. Sugar yield (lbs/a)	Harvest Population (beets/100ft)	Gross Return (\$/t)	Gross Return (\$/a)
4	15.3	23.2	7147	163	36.01	847
5	15.3	23.5	7246	165	36.05	861
6	15.2	23.0	7065	159	35.53	836
7	14.9	22.8	6880	151	34.20	801
LSD (.05)	0.4	ns	ns	9	1.75	ns