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EFFECT OF PLANT POPULATION AND PLANTING DATE ON SUGAR PRODUCTION

Joseph F. Giles, and Norman R. Cattanach

Associate Professor and Research Specialist
Department of Soil Science, North Dakota State University

Introduction

Plant populations of 150 to 175 plants per 100 ft of 22 inch row are recommended at the six leaf growth stage for early seeded sugarbeet to maximize sugar production in the Red River Valley of Minnesota and North Dakota. Most of the research on which this recommendation is based was conducted during the late 1970's and early 1980's and is reported in the Sugarbeet Research and Extension Reports. Some of the studies evaluated the effect date of planting and plant population had on sugarbeet yield and quality. Limited data evaluating the date of planting has been collected in recent years. The lateness of planting in the spring of 2001, provided an opportunity to evaluate the effect of plant population effects on late seeded sugarbeet. This study was expanded in 2002 to include two planting dates using two varieties of sugarbeet, a tonnage variety and a sugar variety.

Materials and Methods

Field experiment was established on Bearden silty clay loam (Fine-silty, mixed, super active, frigid, Aeric Calciaquoll) on the Kirk Watt farm at Glyndon, MN. Each planting date was arranged in a randomized complete block design with three replications. Individual treatment plots measured 11 feet wide and 30 feet long. Soil nitrogen levels were adjusted with fertilizer to approximately 120 lbs/acre of available residual soil test plus added fertilizer N.

Sugarbeet, Seedex Thunder and Beta 6447, was planted on May 2 and May 30 with a John Deere MaxEmerge 2. Sugarbeet was placed 1.25 inches deep with 3.5-inch in-row spacing. A 22-inch row spacing was used. Counter was surfaced band applied at 11.9 lbs/a and incorporate with chain at planting.. Post emergence herbicides, cultivation and hand labor was used as needed for weed control. Two applications each o Eminent and Super Tin were applied for Cercospora leafspot control.

Sugarbeet populations of 75, 100, 125, 150, 175, and 200 plants per 100 feet of row were established with hand thinning at the four-leaf stage on each planting date.

Sugarbeet were harvested September 26. 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 yield data indicate a population of at least 100 plants per 100 feet of row is needed to maximize sugar production of these sugarbeet varieties regardless of planting date (Table 1 - 4). The significant increases in recoverable sugar per acre occurred with plant populations of 125 to 150 in the May 2 planting with the sugar variety, Beta 6447, while a plant population of 175 produced the most sugar in the May 2 planting of Seedex Thunder and 100 plants per 100 feet of row produced the most sugar in the May 30 planting. A plant population of 75 plants per 100 feet of row in the May 1 planting of Beta 6447 produced more recoverable sugar than any May 30 plant population. However, a plant population of 125 was needed in the May 2 planting of Seedex Thunder to compare to recoverable sugar production of any May 30 plant population over 125.

Recoverable sugar production averaged across planting date and variety was significantly increased as plant population was established at greater than 100 plants per 100 feet of row (Table 5). A non-significant decrease in root yield, recoverable sugar per acre and per ton resulted as plant population reached 200. This decrease may be due to the large decrease in harvestable roots as a percentage of the established plant population.

The May 2 planting significantly increased the root yield and recoverable sugar per acre as compared to the May 30 planting (Table 6). These differences are lower than normally expected and are related to the usually slow plant growth resulting from the below normal temperatures experienced during May 2002. These conditions may have also contributed to a decreased effect of variety averaged over plant population and planting date.

Table 1. Effect of planting date (May 2) and population of Beta 6447 on root yields, sucrose percentage, sucrose loss to molasses, recoverable sugar production, and harvest population, Glyndon, MN, 2002.

POPULATION (plants /A)	ROOT YIELD Tons/A	SUCROSE Percent	LOSS TO MOLASSES Percent	RECOVERABLE SUGAR Lbs/Acre	REC SUGAR Lbs/T	HARVEST BEETS /100 FT

17820	(75)	20.4	16.14	2.11	5751	280.4	72
23760	(100)	22.2	16.30	2.23	6241	281.6	89
29700	(125)	21.6	17.48	1.97	6704	310.3	116
35640	(150)	21.7	17.00	1.90	6550	301.9	125
41580	(175)	21.1	16.83	1.84	6336	299.8	145
47520	(200)	18.3	15.65	2.26	4978	267.7	127
LSD (.05)		3.4	1.09	ns	1274	27.3	

Table 2. Effect of planting date (May 30) and population of Beta 6447 on root yields, sucrose percentage, sucrose loss to molasses, recoverable sugar production, and harvest population, Glyndon, MN, 2002.

POPULATION (plants /A)		ROOT YIELD Tons/A	SUCROSE Percent	LOSS TO MOLASSES Percent	RECOVERABLE SUGAR Lbs/Acre	REC SUGAR Lbs/T	HARVEST BEETS /100 FT
17820	(75)	18.4	16.45	2.09	5302	287.1	75
23760	(100)	19.9	16.36	2.37	5553	279.8	94
29700	(125)	19.1	16.59	2.08	5546	290.3	115
35640	(150)	18.6	15.89	2.31	5046	271.6	123
41580	(175)	18.7	15.95	2.26	5128	273.8	157
47520	(200)	18.6	16.99	2.03	5573	299.3	146
LSD (.05)		ns	ns	.27	ns	27.4	

Table 3. Effect of planting date (May 2) and population of Seedex Thunder on root yields, sucrose percentage, sucrose loss to molasses, recoverable sugar production, and harvest population, Glyndon, MN, 2002.

POPULATION (plants /A)		ROOT YIELD Tons/A	SUCROSE Percent	LOSS TO MOLASSES Percent	RECOVERABLE SUGAR Lbs/Acre	REC SUGAR Lbs/T	HARVEST BEETS /100 FT
17820	(75)	17.2	15.33	2.35	4485	259.6	68
23760	(100)	20.9	15.52	2.30	5526	264.3	93
29700	(125)	22.6	15.68	2.20	6096	269.5	124
35640	(150)	21.5	16.42	2.32	6053	281.9	119
41580	(175)	23.2	16.76	1.93	6871	296.6	157
47520	(200)	21.2	15.85	2.10	5826	275.0	167
LSD (.05)		2.9	1.22	.37	887	29.1	

Table 4. Effect of planting date (May 30) and population of Seedex Thunder on root yields, sucrose percentage, sucrose loss to molasses, recoverable sugar production, and harvest population, Glyndon, MN, 2002.

POPULATION (plants /A)		ROOT YIELD Tons/A	SUCROSE Percent	LOSS TO MOLASSES Percent	RECOVERABLE SUGAR Lbs/Acre	REC SUGAR Lbs/T	HARVEST BEETS /100 FT
17820	(75)	17.0	14.95	2.52	4250	248.5	69
23760	(100)	21.3	16.69	2.03	6245	293.2	98
29700	(125)	21.4	15.86	2.37	5800	269.8	134
35640	(150)	19.5	16.27	2.29	5456	279.5	136
41580	(175)	21.1	16.50	2.16	6034	286.9	160
47520	(200)	21.2	16.41	2.02	6101	287.7	166
LSD (.05)		ns	.94	.25	1413	22.8	

Table 5. Effect of population over variety and planting date on root yields, sucrose percentage, sucrose loss to molasses, recoverable sugar production, and harvest population, Glyndon, MN, 2002.

POPULATION (plants /A)	ROOT YIELD Tons/A	SUCROSE Percent	LOSS TO MOLASSES Percent	RECOVERABLE SUGAR Lbs/Acre	REC SUGAR Lbs/T	HARVEST BEETS /100 FT
17820 (75)	18.3	15.72	2.27	4947	268.9	71
23760 (100)	21.1	16.22	2.23	5891	279.7	94
29700 (125)	21.2	16.41	2.16	6036	285.0	122
35640 (150)	20.3	16.39	2.21	5776	283.7	126
41580 (175)	21.0	16.51	2.05	6092	289.3	155
47520 (200)	19.8	16.23	2.10	5620	282.4	151
LSD (.05)	1.7	.63	.19	617	15.4	

Table 6. Effect of planting date over population and variety on root yields, sucrose percentage, sucrose loss to molasses, recoverable sugar production, and harvest population, Glyndon, MN, 2002.

PLANTING DATE	ROOT YIELD Tons/A	SUCROSE Percent	LOSS TO MOLASSES Percent	RECOVERABLE SUGAR Lbs/Acre	REC SUGAR Lbs/T	HARVEST BEETS /100 FT
May 2	21.0	16.25	2.13	5951	282.3	117
May 30	19.6	16.24	2.21	5503	280.6	123
LSD (.05)	1.0	ns	.ns	387	ns	ns

Table 7. Effect of variety over population and planting date on root yields, sucrose percentage, sucrose loss to molasses, recoverable sugar production, and harvest population, Glyndon, MN, 2002.

VARIETY	ROOT YIELD Tons/A	SUCROSE Percent	LOSS TO MOLASSES Percent	RECOVERABLE SUGAR Lbs/Acre	REC SUGAR Lbs/T	HARVEST BEETS /100 FT
Beta 6447	19.9	16.47	2.12	5726	287.0	115
Seedex Thunder	20.7	16.02	2.22	5729	276.1	124
LSD (.05)	ns	.36	ns	ns	8.8	ns