PLANT POPULATION AND DATE OF PLANTING EFFECTS ON SUGARBEET YIELD AND QUALITY Larry J. Smith, Head, Northwest Research and Outreach Center U of M, Crookston, MN

The wet spring conditions of 2001 delayed planting of sugarbeet, especially in the northern areas of the Red River Valley. Similar conditions were present in many areas in 2002. Below normal temperatures in late April and May delayed emergence of early planted sugarbeet which, in some cases, resulted in reduced plant populations. In addition, high winds and a frost on May 23 further damaged existing stands, resulting in replanting decisions for many producers. This led to questions relative to what plant population was needed to avoid replanting, as well as what population should be used in replant or late-plant situations. In 2001, a trial was conducted on late -planted sugarbeet with populations ranging from 23760-47520 plants per acre. In 2002, the trial was expanded to include an additional population, two varieties and two planting dates.

Procedures: Seedex Thunder and Beta 6447 sugarbeet seed were planted in 22-inch rows at a 1.25 inch spacing to insure adequate thinning populations on April 30 and May 28, 2002. The varieties were chosen because of their wide variation in yield (106 vs 93% of the mean) and sugar content (98 vs 103% of the mean) as reported in the "Three Year Performance of Varieties Approved for Sale to ACS Growers in 2002."

Plots in both plantings were thinned to uniform populations of 17820, 23760, 29700, 35640, 41580 and 47520 seedlings per acre at the six-leaf stage. These correspond to plant populations of 75, 100, 125, 150, 175 and 200 plants per 100 ft of 22-inch row. Recommended fertility, herbicide, insecticide and fungicide practices were followed. The trial was harvested on September 24 and quality determined at the ACSC Quality laboratory in East Grand Forks, MN.

<u>Results and Discussion:</u> Plant populations of 29700-47520 per acre resulted in the highest recoverable sucrose and highest gross return per acre, if the varieties and planting dates are looked at individually (Tables <u>1</u> & <u>2</u>). The gain in yield and net sucrose (% sucrose - %LM) between the April 30 and May 28 plantings was less than expected based on previous research. This may well relate to the below normal temperatures experienced in May, which delayed emergence and growth of the April planting. Harvestable root weights decreased as plant populations increased. The magnitude of decrease was similar to that observed in 2001 on a trial planted on May 30. The values equate to 93.6%; 70.9% and 67.8% of the thinned population that would be harvestable based on the April 30 planting and 87.4%; 72.5% and 53.9% on the May 28 planting for the 23760, 35640 and 47520 populations. The main effects of planting date, variety and plant population are shown in Tables <u>3-5</u>. The April 30 planting date significantly increased all variables measured except % loss to molasses (LM) as compared to the May 28 planting. As stated earlier, these differences were not as large as previously experienced. Most of the significant differences in the variables measured for plant population were due to the low population of 17820 plants/acre.

No problems were encountered with any population relative to harvestability. Populations of 40000- 47500 plants/ A gave results equal to populations of 24000-35000 plants per acre.

In a replant situation, such as was experienced from wind and frost in 2002, a low population of 17820 (75 beets per 100 ft of 22-inch row) planted early would have given equal or greater recoverable sucrose/A than a replant situation of 35000-47500 plants per acre.

Population	Recoverable Sucrose		Yield	Sucrose	LM	Ave. Beet Wt	Gross Return ¹	
(plants/A)	(lb/A)	(lb/T)	(T/A)	(%)	(%)	(lbs)	(\$/T)	(\$/A)
					•			
			A	prii 30 Flant	ing			
17820 (75)	5417	278.0	19.5	15.50	1.60	2.15	29.67	578
23760 (100)	6053	288.0	21.0	15.78	1.38	1.94	31.96	672
29700 (125)	6335	286.5	22.1	15.68	1.35	1.94	31.62	699
35640 (150)	6534	297.0	22.0	16.10	1.25	1.64	34.02	749

Table 1. Effect of Planting Date and Population on Beta 6447

41580 (175)	6474	295.5	21.9	16.08	1.30	1.55	33.68	738
47520 (200)	6358	295.0	21.6	16.05	1.30	1.36	33.56	722
Stat. Sign. ²	uu	NS	uu	NS	uu	uu	NS	u
LSD 05	626		1.5		0.13	0.27		109
			N	1ay 28 Plant	ing			
17820	4812	274.5	17.5	15.10	1.38	1.95	28.87	506
23760	5061	276.5	18.3	15.18	1.35	1.81	29.33	537
29700	5451	283.5	19.2	15.45	1.28	1.78	30.93	594
35640	5330	281.5	19.0	15.38	1.30	1.51	30.47	576
41580	5376	284.5	18.9	15.55	1.33	1.46	31.16	588
47520	5284	284.0	18.6	15.43	1.23	1.20	31.04	578
Stat. Sign.	uu	NS	u	NS	NS	uu	NS	u
LSD 05	358		1.0			0.18		60

¹ Basis ACSC November 15, 2002 payment schedule
² u, uu statistically significant at the .05 and .00 level respectively

Table 2.	Effect of Po	pulation at	Different	Planting	Dates on	Seedex	Thunder
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Population	lation Recoverable Sucrose		Yield	Sucrose	LM	Ave. Beet Wt	Gross	Return						
(plants/A)	(lb/A)	(lb/T)	(T/A)	(%)	(%)	(lbs)	(\$/T)	(\$/A)						
	April 30 Planting													
17820	5717	270.0	21.2	14.90	1.40	2.41	27.84	590						
23760	6187	274.0	22.6	15.10	1.40	1.98	28.75	649						
29700	6508	281.0	23.2	15.48	1.43	1.93	30.36	703						
35640	6369	283.0	22.6	15.43	1.28	1.89	30.82	692						
41580	6411	286.0	22.4	15.60	1.30	1.67	31.50	706						
47520	6318	282.5	22.4	15.50	1.38	1.37	30.70	686						
Statistical Sign	u	NS	u	u	NS	uu	NS	u						
LSD 05	496		1.1	0.61		0.21		84						
]	May 28 Plant	ting									
				-	-									
17820	4904	269.5	18.2	14.93	1.45	2.14	27.72	503						
23760	5567	277.5	20.1	15.30	1.43	1.89	29.56	592						
29700	5523	275.5	20.1	15.20	1.43	1.82	29.10	583						

35640	5652	278.5	20.3	15.33	1.40	1.53	29.78	604
41580	5825	281.0	20.7	15.33	1.28	1.47	30.36	631
47520	5967	283.0	21.1	15.45	1.30	1.29	30.82	650
Statistical Sign	u	NS	u	NS	NS	uu	NS	u
LSD 05	695		1.8			0.19		109

Table 3. Main Effects of Planting Date (ave. over varieties and populations)

	Recoverable Sucrose		Yield Sucrose		LTM	Gross Return	
Planting Date	(lb/A)	(lb/T)	(T/A)	(%)	(%)	(\$/T)	(\$/A)
April 30	6223	284.7	21.9	15.6	1.36	31.21	682
May 28	5396	279.1	19.3	15.3	1.34	29.92	578
Statistical Sign	uu	u	uu	u	NS	u	uu

Table 4. Main Effects of Variety (ave. over populations and planting dates)

	Recoverable Sucrose		Yield	Sucrose	LTM	Gross Return	
Variety	(lb/A)	(lb/T)	(T/A)	(%)	(%)	(\$/T)	(\$/A)
Beta 6447	5912	285.4	20.0	15.6	1.33	31.36	628
Seedex Thunder	5707	278.4	21.2	15.3	1.37	29.78	632
Statistical Sign	uu	NS	uu	NS	NS	NS	NS

Table 5. Main Effects of Population (ave. over planting dates and varieties)

	Recoverable Sucrose		Yield	Sucrose	LTM	Gross	Return
Population	(lb/A)	(lb/T)	(T/A)	(%)	(%)	(\$/T)	(\$/A)
17820	5212	273	19.1	15.10	1.46	28.52	544
23760	5717	279.0	20.5	15.34	1.39	29.90	612
29700	5954	281.6	21.1	15.45	1.37	30.50	645
25(10)	5051	205.0	20.0	15.50	1.01	21.25	~ - -
35640	5971	285.0	20.9	15.56	1.31	31.27	655
41.500	(0.2.1	2000	21 0	15.64	1.00	21.65	
41580	6021	286.8	21.0	15.64	1.30	31.67	666
47520	5981	286.1	20.9	15.60	1.30	31.53	659

Statistical Sign	uu	uu	uu	u	uu	u	uu
LSD ₀₅	262	7.3	0.7	0.33	0.7	1.67	44