

## NITROGEN, VARIETY AND PLANT POPULATION EFFECTS ON SUGARBEET YIELD, QUALITY AND PROFITABILITY

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Excellent spring planting and early season growing conditions of the past few years has resulted in an increase in sugarbeet plant populations. Producers have questioned the need for additional (above recommended) nitrogen fertilizer for these higher plant populations in order to maximize yield. Some have also questioned if all varieties (i.e. diploid vs triploid) react the same to these increased populations. In an attempt to answer these questions, a trial was initiated at the University of Minnesota Northwest Research and Outreach Center (NWROC) in 2000 that dealt with these factors as they relate to yield, quality and profitability.

**Materials and Methods:** On May 1, 2000, Beta 6447 and Hilleshog Shasta sugarbeet seed was over planted into plots 11 ft in width (6-22 inch rows) and 35 ft. in length containing different levels of available soil nitrogen (N). An October 20, 1999, soil test showed 44 lb/A  $\text{NO}_3\text{-N}$  in the 0-2 ft soil profile and 33 lb/A in the 2-4 ft depth. Urea was added to bring the total available N levels of each plot to 80, 120 or 160 lb/A. On June 2, seedlings of each variety and at all N levels were thinned to uniform plant populations of 28,500, 38,000 or 47,500 plants/A. These populations correspond to 120, 160 and 200 plants per 100 ft of 22 inch row. Standard cultural practices were used for phosphorous fertilization, insect, weed and cercospora leaf spot control. The design of the trial was a factorial arrangement of a randomized complete block design with four replications. The middle 2-rows of each 6-row plot were harvested for yield on September 26. Quality analysis was performed at the American Crystal Sugar Company Quality Tare Laboratory, East Grand Forks, MN.

**Results and Discussion:** The analysis of variance for the trial is shown in [Table 1](#). Of the variables measured, N level had statistically non significant affects on yield, but significantly affected the quality factors. Variety had non significant effects on all variables measured, while plant population affected only the quality factors. All interactions were not statistically significant.

The main effects of N are shown in [Table 2](#). Increasing N above 80 lb/A available in the 0-4 ft soil profile reduced sucrose content and increased sugar loss to molasses (LTM). Every 40 lb/A increase in available N above 80 lb/A significantly decreased net sucrose % (%sucrose -%LTM).

The main effect of population is shown in [Table 3](#). Increasing the plant population from 28,500 plants/A to 38,000 plants/A significantly increase % sucrose, net sucrose and corresponding recoverable sucrose/T. There was no statistically significant difference between the populations of 38,000 and 47,500 plants/A on any of the variables measured. The slight decrease in % sucrose and increase in % LTM is thought to be related to an increase in petiole material on the crown at the higher population. The trial was not scalped, which would have alleviated this problem.

None of the variable measured for variety were statistically significant ([Table 4](#)).

**Table 1. Analysis of variance**

Source	Yield T/A	Sucrose (%)	LTM (%)	Net Sucrose	Recoverable Sucrose	
					(lb/ )	(lb/T)
Nitrogen (N)	NS	**	**	**	*	**
Variety (V)	NS	NS	NS	NS	NS	NS
Population (P)	NS	*	*	*	NS	*
N x V	NS	NS	NS	NS	NS	NS
N x P	NS	NS	NS	NS	NS	NS
V x P	NS	NS	NS	NS	NS	NS
N x V x P	NS	NS	NS	NS	NS	NS

**Table 2. Main effects of N level (Averaged over varieties & populations)**

N Level (lb available 0-4')	Yield T/A	Sucrose (%)	LTM (%)	Net Sucrose (%)	Recoverable Sucrose		Gross Return	
					(lb/A)	(lb/T)	(\$/T)	(\$/A)
80	21.7	17.71	1.25	16.45	7153	329.2	31.69	688
120	21.8	17.46	1.33	16.13	7031	322.7	30.38	662
160	22.0	17.00	1.37	15.63	6869	312.7	28.35	624
LSD <sub>05</sub>	—	0.28	0.05	0.30	208	5.98		

**Table 3. Main effects of population (Averaged over N level and variety)**

Population (plants/A)	Yield T/A	Sucrose (%)	LTM (%)	Net Sucrose (%)	Recoverable Sucrose		Gross Return	
					(lb/A)	(lb/T)	(\$/T)	(\$/A)
28,500 (120)	21.8	17.16	1.31	15.85	6919	317.0	29.22	637
38,000 (160)	21.8	17.56	1.28	16.28	7114	325.6	30.96	675
47,500 (200)	21.8	17.44	1.35	16.10	7019	321.9	30.21	659
LSD <sub>05</sub>	—	0.28	0.04	0.30	—	5.98		

LSD05	—	—	—	—	—	—		