The Influence of Nitrogen Rate x Irrigation Frequency x Harvest Date on Yield and Quality of Sugar Beets

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The purpose of this study was to measure the interaction of fertilizer rate, irrigation and date of harvest on the growth and development of sugar beets.

The study was established in September, 1973, for the second year of a series of Irrigation x Fertilizer x Harvest studies. A common preplant application of 175 pounds of 18-46-0 was applied to the trial area. Plots were 12 rows wide and 100 feet long. There were 3 irrigation and 4 fertilizer treatments for a total of 12 treatments. Three harvest dates were selected: May 30, July 1, and July 24. The nitrogen treatments were (1) 0 nitrogen, (2) 75 pounds nitrogen sidedress on November 20, (3) 75 pounds in November plus 75 pounds on February 11, and (4) 75 pounds in November plus 75 pounds on April 1. The nitrogen source for November was Urea with ammonium nitrate on February 11 and April 1. The irrigation study began February 16th starting with the sixth irrigation for the experiment. The wet regime received an additional 14 irrigations at 7 day intervals, the middle regime received 8 irrigations on a 14 day interval, and the dry regime received an additional 6 irrigations on a 21 day interval. The results of these data appear in Table I.

Generally, these data show little difference in sugar per acre, root yield, and sucrose percent as influenced by irrigation frequency. The 75 pound nitrogen rate was significantly higher in root yield than the check, but not significantly different from 150 pounds of nitrogen applied as a split application. The optimum harvest date was July 1.

A summary of these data show that sugar percent was influenced by harvest date and fertilizer rate and timing of the sidedress applications. Sugars fell dramatically during July, probably because of high temperatures and rot. Irrigation had essentially no effect on sugar percent for any given harvest date. The zero and 75 pound nitrogen treatments were highest in sucrose percentage and the late spring sidedress of 75 pounds of nitrogen on April 1 was a significant factor in lowering sucrose concentration over the single 75 pound nitrogen application. These data verify last year's results in that harvest date was the most influential factor affecting sugar percentage while fertilizer rate appeared less limiting.

Root yields generally showed significant increases from 75 pounds of nitrogen over the zero check, under all irrigation regimes. Additional nitrogen applications resulted in significant increases over the 75 pound rate in the dry irrigation regime, but little or no difference was observed with additional nitrogen in the wet regime. A significant increase in yield was observed for all treatments on July 1 over the May 30 harvest. Additional root yield increases were observed on the final harvest date from the 150 pound treatment under the 14 and 21 day irrigation frequency regimes.

Irrigation frequency did not significantly influence root yield or sugar percent. The July 1 harvest showed the highest yield in sugar per acre where significant increases in root yield were enhanced by excellent sugar percentage. The 75 pound rate was optimum for the July 1 harvest, but the 150 pound rate was higher on July 24th.

Roots were examined for rot on July 1 and July 24. No rot was observed on July 1, however, it did appear by the final harvest date. The data shows that both irrigation frequency and nitrogen influenced its occurrance. Rot increased in all irrigation regimes with additional nitrogen and late spring sidedress. The frequent irrigation regime was also affected more than the dry regime.

Table 1
Summary Irrigation x Fertilizer x Harvest - Chandler, Arizona 1974

	Treat-ments	Lbs/ Acre	Sugar/Acre			Root Yield (T/A)			Sugar (%)			Rot Rating*
			5/30	7/01	7/24	5/30	7/01	7/24	5/30	7/01	7/24	
I-1 20 Irrig. Wet	F1	A	3.866	4.495	4.112	24.8	28.6	30.7	15.4	15.2	13.3	2.5
	F2	B	4.558	5.366	4.938	29.6	36.2	36.2	15.4	15.0	13.7	2.2
	F3	C	4.745	5.428	5.233	32.2	37.2	38.7	14.7	14.8	13.4	2.8
	F4	D	4.250	5.212	4.765	31.8	36.4	37.5	13.3	14.4	12.6	3.1
	Average		4.355	5.125	4.762	29.6	34.6	35.8	14.7	14.8	13.2	2.65
I-2 14 Irrig. Optimum	F1	A	3.779	4.778	4.270	24.2	29.5	30.8	15.6	16.1	13.8	2.0
	F2	B	4.280	5.037	4.461	28.0	32.2	31.4	15.5	16.0	14.2	2.3
	F3	C	4.558	4.978	5.188	31.7	33.3	37.4	14.4	15.0	13.9	2.4
	F4	D	4.112	4.984	4.833	30.3	34.6	37.5	13.5	14.5	12.9	2.7
	Average		4.182	4.944	4.688	28.6	32.4	34.3	14.8	15.4	13.7	2.35
I-3 12 Irrig. Stress	F1	A	3.764	4.696	4.104	23.6	29.4	29.9	15.9	16.0	13.7	2.0
	F2	B	4.386	5.091	4.630	28.7	32.5	35.1	15.2	15.7	13.2	2.4
	F3	C	4.484	5.248	5.079	32.0	35.2	39.2	14.0	15.0	12.9	2.5
	F4	D	4.007	5.184	4.916	29.9	36.4	39.0	13.4	14.2	12.6	2.7
	Average		4.160	5.054	4.682	28.6	33.4	35.8	14.6	15.2	13.1	2.3

*Based on a 1 to 5 basis with 1 showing no rot.
Month of July was wet (rains) and rot was extreme in some treatments.