

Table 3. Nitrogen fertility tests at Marana in 1967 and 1968.

1967		Harvest date								
		July 25			August 17			September 14		
Nitrogen level (Lbs/A)	Root yield (T/A)	Sugar content (%)	Sugar yield (Lbs/A)	Root yield (T/A)	Sugar content (%)	Sugar yield (Lbs/A)	Root yield (T/A)	Sugar content (%)	Sugar yield (Lbs/A)	
0	22.0	13.1	5760	23.9	12.7	6070	29.1	11.5	6690	
100	28.0	12.5	7000	27.3	11.9	6500	30.7	11.6	7120	
200	22.6	11.5	5200	24.7	11.0	5430	29.3	10.4	6090	
LSD.05	3.5	0.7	1080	NS	0.6	NS	NS	NS	NS	

1968		Harvest date					
		July 31			September 6		
Nitrogen level (Lbs/A)	Root yield (T/A)	Sugar content (%)	Sugar yield (Lbs/A)	Root yield (T/A)	Sugar content (%)	Sugar yield (Lbs/A)	
0	15.7	11.6	3660	19.1	13.6	5200	
100	17.5	11.4	3980	23.7	12.8	6040	
200	17.1	10.8	3680	20.8	12.1	5020	
LSD.05	NS	0.6	NS	NS	1.0	800	

Effect of Planting Date and Nitrogen Fertility on
Late Season Sugarbeet Production

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Summary

Several cultural factors were studied to determine their effect on late season sugarbeet production in central Arizona. As in previous tests, September planted beets gave higher yields than those planted in November, when harvest was in July or August. Increasing the nitrogen fertilizer application rate resulted in increased root yields but did not appear to have an effect on late season stand losses or losses in leaf area. A 62 percent reduction in leaf area per plant occurred between April 16 and July 12. Stand losses in July and early August were low and were not greatly affected by planting date. It appears that there are many things that can happen to sugarbeets held in the field in July and August and most of them are bad!!

In order to maintain continuous operation of the processing facility for the longest possible time, beets must be harvested during the month of July in central Arizona. However, quite often the yield and quality of the crop decline when harvest is in July or later. Environmental conditions associated with the summer season, such as high temperatures and rainfall, undoubtedly contribute to the poor performance of beets late in the season. Studies have been conducted at the University of Arizona Mesa Farm the past several seasons to determine the proper management of cultural factors for maximum late season production.

Results of previous studies to determine the effect of planting date, variety and irrigation cut-off date on production of sugarbeets for early August harvest were reported in the 1980, 1981 and 1982 Sugarbeet Reports (Series P-48, P-52 and P-55). Those studies showed that September planted beets produced higher yields than beets planted in October or later, when harvest was in July or August. During July sucrose percentages generally decreased resulting in lower sugar yields. Age of the planting did not appear to influence late season stand losses. The length of the preharvest irrigation dryup period did not have a measureable effect on late season production. Each year, heavy leaf area losses occurred between mid May and mid July.

Materials and Methods

Seeds of the cultivar SS-E1 were planted at the Mesa Farm on September 12 and November 6, 1981. Nitrogen fertilizer rates of 70, 140, 210 and 280 lbs/A of N were compared in both planting dates. Plots in the September and November plantings received 70 or 140 lbs/A of N on October 24, 1981 and January 8, 1982, respectively. Additional N was supplied to certain plots in both plantings on March 8, 1982 to give N rates of 210 and 280 lbs/A. The plantings were irrigated every 14 to 17 days late in the season and a 14 day dryup preceded each harvest. Roots were harvested July 14 and August 11, 1982. Sugar percentages were not determined for the August 11th harvest because Spreckels' tare laboratory had shut down before that date.

Results

Root yield and other agronomic data are shown in Tables 1 and 2. In this test, root yields were lower than is typical for this location. This was probably due, in part, to virus diseases. Beets in both planting dates showed leaf yellowing symptoms in early spring that are typical of those of the virus yellows diseases that have hampered beet production in the past. As in previous tests, late season root and sugar yields were highest when beets were planted in September. The September planting produced over 8 tons more roots per acre than the November planting in July and over 6 tons more roots per acre in August. Beets did not produce appreciable growth during the period of July 14 through August 11, regardless of the planting date.

Sugarbeets in both plantings responded to N fertilizer (Tables 1 and 2). Nitrogen fertilizer rates of 140 to 210 lbs/A of N gave maximum yields. Beets in all plots were deficient or nearly deficient in N by early May (Table 3). Petiole samples collected July 29 showed that plants started taking up N late in the season. Rainfall in July may have made N available by leaching nitrate from the tops of beds into the root zone.

Leaf area decreased rapidly late in the season, as in previous years. Measurements showed that a 62 percent reduction in leaf area per plant occurred between April 16 and July 12 (Table 4). The number of leaves per plant and the area per leaf both decreased during this period (Table 5 and Figure 1). Leaf areas per plant were similar for the two planting dates from June through August 10. Leaf blades produced late in the season were very small, averaging about 7.4 cm² or 1.1 inches² per leaf. Possible factors responsible for the reduction in leaf area include: high maximum air temperatures, low N fertility and virus yellows diseases.

Stand losses late in the season were low and were not greatly affected by planting date or N fertility (Tables 1 and 2). Only a few plants were observed to have root rots in July and August, even though soil temperatures were high. It appears that the large loss of leaf area that occurs late in the season may be a major factor in stand losses at this location.

Table 1. Effect of planting date and N fertilizer rate on yields, sucrose percentages and stand losses of sugarbeets harvested July 14, 1982.

Planting date	N fertilizer (lbs N/A)	Yield		Sucrose (%)	Stand losses ^{3/} (%)
		Sugar (T/A)	Roots (T/A)		
Sept. 12	70	4.11 b ^{1/}	24.7 b	16.6 a	0
	140	4.45 ab	27.5 ab	16.4 a	2
	210	5.07 a	30.8 a	16.4 a	2
	280	<u>5.05 a</u>	<u>31.2 a</u>	<u>16.2 a</u>	<u>1</u>
	Planting date means ^{2/}	4.67	28.6	16.4	1
Nov. 6	70	2.75 c	16.4 b	16.8 a	0
	140	3.06 bc	18.3 ab	16.9 a	0
	210	3.81 a	22.8 a	16.8 a	0
	280	<u>3.64 ab</u>	<u>22.7 a</u>	<u>16.0 a</u>	<u>0</u>
	Planting date means ^{2/}	3.32	20.1	16.6	0

^{1/} Means for N fertilizer rates within a planting date followed by the same letter are not significantly different at the 5% level according to Duncan's Multiple Range Test.

^{2/} Means for planting dates were significantly different at the 5% level for sugar and root yield but not for sucrose percentage.

^{3/} Percentage of plants that died late in the season.

Table 2. Effect of planting date and N fertilizer rate on root yield and stand losses of sugarbeets harvested August 11, 1982.

Planting date	N fertilizer (lbs N/A)	Root yield (T/A)	Stand losses ^{3/} (%)
Sept. 12	70	19.8 c ^{1/}	4.5
	140	25.2 b	2.0
	210	28.0 ab	3.0
	280	<u>30.2 a</u>	<u>3.0</u>
	Planting date means ^{2/}	25.8	3.1
Nov. 6	70	15.7 b	2.5
	140	19.3 a	2.0
	210	20.6 a	3.0
	280	<u>22.8 a</u>	<u>1.5</u>
	Planting date means	19.6	2.3

^{1/} Means for N fertilizer rates within a planting date followed by the same letter are not significantly different at the 5% level according to Duncan's Multiple Range Test.

^{2/} Root yield means for planting dates were significantly different at the 5% level.

^{3/} Percentage of plants that died late in the season.

Table 3. Effect of planting date and N fertilizer rate on petiole NO₃-N.

Planting date	N fertilizer (Lbs/A)	Sampling date							
		11/13/81	12/18	1/15/82	3/9	4/9	5/11	6/25	7/29
		(ppm NO ₃ -N)							
Sept. 12	70 ^{1/}	5,000	1,290	370	1,280	1,040	360	940	1,720
	140 ^{2/}	9,530	2,710	540	1,380	910	180	940	1,630
	210 ^{2,3/}	9,600	3,240	1,010	2,080	3,150	950	750	1,610
	280 ^{2,4/}	10,570	2,430	510	1,590	4,700	1,120	840	1,370
Nov. 6	70 ^{5/}	--	--	--	7,900	770	240	800	2,070
	140 ^{6/}	--	--	--	9,280	1,290	270	980	1,550
	210 ^{6,3/}	--	--	--	10,400	3,930	550	810	1,840
	280 ^{6,4/}	--	--	--	8,450	7,350	410	660	1,850

^{1/}70 lbs N/A applied 10/24/81.
^{2/}140 lbs N/A applied 10/24/81.
^{3/}70 lbs N/A applied 3/8/82.
^{4/}140 lbs N/A applied 3/8/82.
^{5/}70 lbs N/A applied 1/8/82.
^{6/}140 lbs N/A applied 1/8/82.

Table 4. Effect of planting date, N fertilizer rate and sampling date on leaf area of sugarbeets.

Planting date	N fertilizer (lbs/A)	Leaf area/plant				
		Sampling date				
		4/16	5/14	6/14	7/12	8/10
		(dm ²)				
Sept. 12	70	5.3	5.6	6.2	2.8	1.7
	140	8.0	5.9	5.7	3.7	1.6
	210	10.6	8.8	6.4	4.1	2.1
	280	<u>12.4</u>	<u>10.5</u>	<u>7.3</u>	<u>4.2</u>	<u>2.9</u>
	Planting date means	9.1	7.7	6.4	3.7	2.1
Nov. 6	70	6.4	5.7	3.3	2.7	2.1
	140	7.4	7.4	5.4	3.5	3.1
	210	10.7	10.9	5.6	3.5	2.3
	280	<u>15.3</u>	<u>11.2</u>	<u>7.8</u>	<u>4.5</u>	<u>2.4</u>
	Planting date means	10.0	8.8	5.5	3.6	2.5

Table 5. Effect of planting date, N fertilizer rate and sampling date on the number of leaves per plant.

Planting date	N fertilizer (lbs/A)	Leaves/plant				
		Sampling date				
		4/16	5/14	6/14	7/12	8/10
	 (na)				
Sept. 12	70	58	58	50	42	35
	140	84	65	52	41	33
	210	73	62	56	42	36
	280	<u>98</u>	<u>61</u>	<u>49</u>	<u>39</u>	<u>29</u>
	Planting date means	78	62	52	41	33
Nov. 6	70	28	34	36	36	29
	140	35	43	40	39	31
	210	38	39	37	31	28
	280	<u>41</u>	<u>40</u>	<u>39</u>	<u>32</u>	<u>27</u>
	Planting date means	36	39	38	35	29

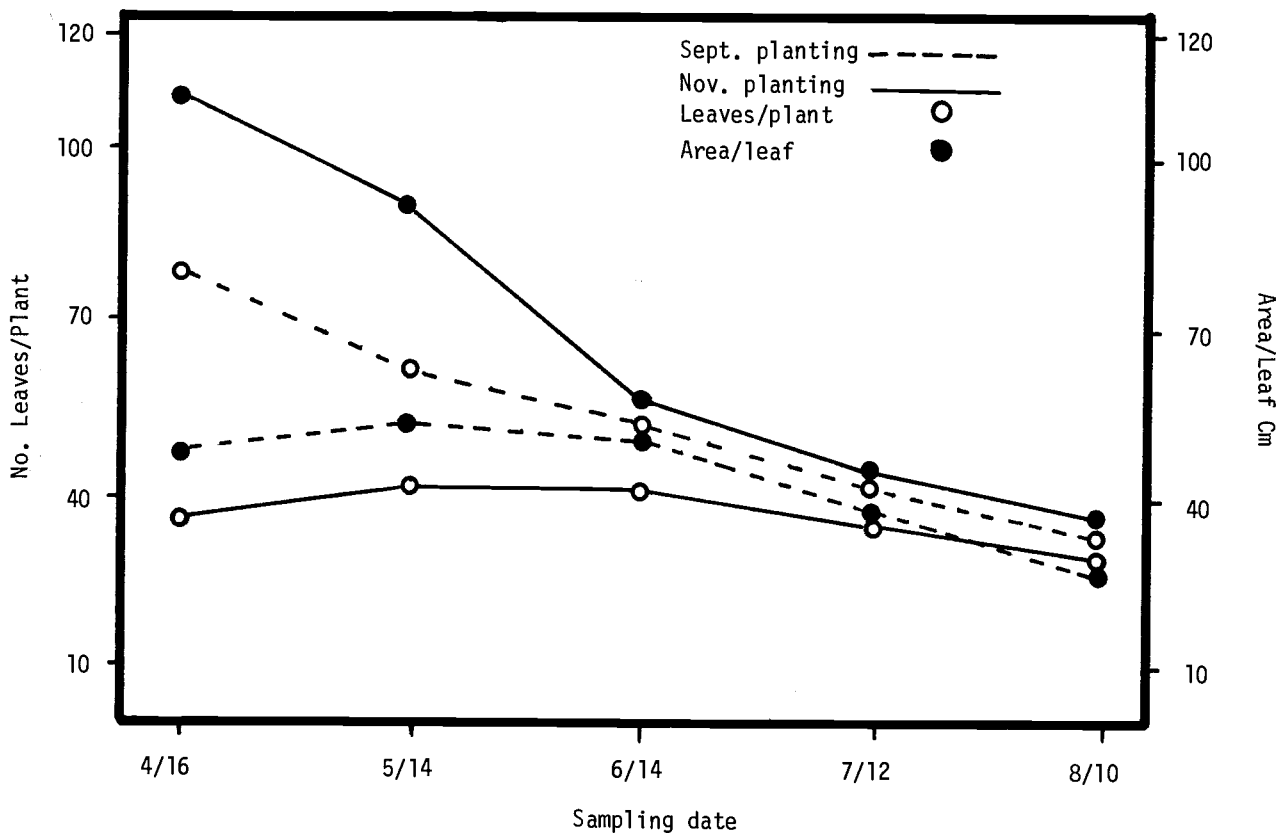


Figure 1. Effect of planting date and sampling date on the number of leaves per plant and area per leaf.