APPLICATION ON SUGARBEETS - DO INCREASED PLANT NITROGEN POPULATIONS REQUIRE INCREASED NITROGEN APPLICATIONS **IN MICHIGAN?** satments were applied at the ontyleden Paul Pfenninger*

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Our initial attempt to increase plant population involved getting growers interested in 22" rows. After several years of testing and relatively minimal economic success, our growers reverted back to 30" rows. Currently, 70% of our row spacings are 30" while the remainder are at 28" rows. The cost of conversion was basically too high.

As a spin-off to narrow rows, our research shifted its emphasis to increasing harvest populations by increasing our seed spacing at planting time. Our seed spacing has dropped from 6.48" in 1981 to 5.08" last year. (Table 1)

Our plant population tests over the most recent years have fostered the trend and we encourage our growers to follow our research results. Table 2, which is an average over the last three years, and covers eight different locations, strongly suggests that a good stand of beets should be our first priority in producing a high quality crop. At 160% stand, we produced 6,713 pounds of RWSA while at 60% stand, we produced 5,324 pounds of RWSA.

In 1992, we did not experience the big difference because of the unusual weather patterns in Michigan. In Table 3 however, you can see that there is a 500 pound increase in sugar per acre when we compare 100% stands versus 160% stand.

Producing a stand of beets in excess of 130 is not automatic and we too experienced difficulties in 1991. Therefore, very little data from 1991 has been included in this report.

Now, at the same time we've been increasing our plant populations, we've had an increased interest in applying more nitrogen to support the increased stands. When we consider our previous research, it's easy to understand why there was some concern.

Two things were apparent in Table 4:

- 1) Plant populations over the years averaged around 100%
- 2) The best RWSA was found not to exceed the 80-100 lbs. range of nitrogen

All the trends established since 1963 remain fairly consistent. As we increase the amount of nitrogen applied, the RWSA increases to a level and then decreases on the upper end. At the same time, the percent sugar decreases with applied nitrogen and the tons per acre level off and they too eventually decrease at the top end. The Amino Nitrogen, a direct correlation of applied nitrogen, steadily increases as expected.

Increased populations are why we attempted to determine the amount of nitrogen needed at the higher harvest populations. This study was our first attempt to determine nitrogen rates at what we considered high populations -- that is 130+.

In 1990, our high population nitrogen test became our cornerstone for grower recommendations.

As you can see in Table 5, the test consisted of two different harvest populations and three different rates of applied nitrogen. There were six replications, 30 foot in length. Liquid nitrogen was knifed into the soil on June 15th and because of application technique, seven rows were required for the test. To insure proper application, we also allowed a 50 foot gap between each replication to compensate for application differences. Only two of the seven rows were used for analysis.

At all three rates, there was either no difference or slightly higher RWSA numbers at the high population rate. For the entire test, there was no significant difference from all three rates at both plant populations. Therefore, we could conclude that additional nitrogen is not necessary for the higher plant populations.

In 1991, the spring weather took its toll on our beet crop. We did not get started with planting until early May and then we experienced some unusually warm and wet conditions that reduced our stands because of severe seedling disease.

In 1992, we did establish what we considered high populations and were able to apply four different rates of nitrogen at two different locations.

Results are found in Table 6. We did average 142 beets per 100 foot of row and we found no significant differences between the four rates of applied nitrogen. Although there is a slight trend to high RWSA at the 150 pound rate due to increased tons per acre, there is no significant difference in RWSA at the 5% level.

If we composite our low population nitrogen test (107 beets per 100'), (Table 7) statistically we find no reason to apply nitrogen above 60-90 pounds. We see some additional tons per acre at the expense of sugar but the RWSA does not merit additional nitrogen.

At the same time, by comparing the high population nitrogen test (146 beets per 100' row), (Table 8) we see trends with no significant differences to the same rates. Once again we see a slight increase in tonnage offset by a three quarter point loss in percent sugar and no significant difference at the 5% level.

This convincing data has been reported to our growers and they have reviewed it with some skepticism. Last year, according to our records, growers at Monitor applied an average 102

pounds of nitrogen to their beet crop. The 100 pound rate has been fairly consistent since 1982.

Through the help of Michigan State University, we have developed a soil nitrate testing program which has caught the growers' attention. Participation at this time is voluntary and since this is only our second year for the program, we expect to see an increase in its usage. It is a spring preplant test that should guide us to improving our crop quality.

In conclusion, we know that proper soil fertility is needed for every beet crop. However, increasing the application of nitrogen is not a guarantee for increase profits, regardless of stand counts. Table 1 SEED SPACING HISTORY 1981 6.47'' 1985 6.43" 1989 5.53"

1984	6.45"	1988	5.84"	1992	5.08"
1983	6.51"	1987	6.20"	1991	5.34"
1982	6.54"	1986	6.28"	1990	5.45"
1981	0.47	1985	0.43	1989	5.55

Table 2 POPULATION TEST

					populations.	Incid hadged bill be
STAND						BEETS/
BEETS PER		%		and the start of		100' AT
100 FT.	RWSA	SUGAR	RWST	TONS/A	% CJP	HARV.
160	6,713	18.07	263.5	25.88	94.26	it yel53 vhas line
140	6,369	18.13	265.3	24.48	94.38	135
120	6,199	18.01	262.3	23.98	94.20	120
100	6,114	17.89	259.2	24.05	93.99	102
80	5,851	17.57	252.7	23.63	93.70	84
60	5,324	16.72	237.7	22.65	93.39	66 10 000011
GM	6,095	17.73	256.8	24.11	93.99	92
nd we found no	1: WOT TO JOO	1.001 nég 21:	ige 142 her	17576 DID SY	V .J oldal /	tesuits are found in
there is a slight	Although	od nitrogen.	Table	3.1 hund off	naswited aas	ignificant different
re, litere is no		hansed a	POPULATIC	ON TEST	I add to AP	read to high RW
control and with the	our rock cuiter			LOCATION		
		TI VL	NATOL OF 2	Docation	AZW8 11 5	ignificant difference

GM LSD ((5%)	5,749 N/S	18.69 N/S	272.6 N/S	21.12 N/S	94.21 N/S	55077130 (nas)
and no	100	5,522	18.47	268.8	20.58	94.16	102
	120	5,668	18.68	271.2	20.94	94.00	matt ballse (8 slifsT)
	140	5,702	18.63	270.3	21.11	93.98	vd .om 127 mus odl 1A
	160	6,003	18.81	275.1	21.86	94.34	136
	180	5,755	18.74	274.3	21.02	94.38	143
	200	5,842	18.82	275.6	21.20	94.39	154 and 154 and 16 arras
109 201	00 FT.	RWSA	SUGAR	RWST	TONS/A	% CJP	HARV.
BEI	ETS PER	T) (1001	%	n lest (10	niation nitroge		100' AT
S	TAND:						BEETS/

This convincing data has been reputted to our growers and they have reviewed it with some stepping in Last tear, according to our records, growers at Monitor applied an average 102

MONITOR SUGAR COMPANY TYPE: HIGH POPULATION

Table 4NITROGEN TESTS -- 1963 TO 198854 LOCATIONS

GM	6,549	225.8	16.90	23.47	93.93	11.37	96
160+	6,141	211.0	16.13	23.20	92.91	15.09	90
150	6,303	214.4	16.26	23.91	2 93.17	14.74	91
120-140	6,568	224.0	16.70	24.11	93.64	13.87	95
80-100	6,713	229.3	17.03	23.93	94.06	10.61	99
50-70	6,728	226.8	17.28	23.42	94.33	9.36	100
10-40	6,772	233.7	17346	23.25	94.59	7.81	101
0	6,615	241.5	17.47	22.45	94.80	8.13	
N	RWSA	RWST	SUGAR	ACRE	% CJP	N	POP.
LBS.	APUNC		%	TONS/	- 60°	AMINO	

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VARIANCE OF TTEST

	5 CI2 -	" A.2.407	12/01				
011				16.43	0.129		
	T1 20		Table 5				
				COMPANY			
	14 40	HIGH POPUL	LATION NIT	ROGEN TEST	131,0		
	94.99			18.10		BEETS/	
RATE &	2340	%	2/3/			100' AT	
STAND	RWSA	SUGAR	RWST	TONS/A	% CJP	HARV.	
100 LBS. N	6,754	18.08	263.2	25.59	94.25	106	
125 BEETS			Table 8				
100 LBS. N	6,946	18.34		25.60	95.00	149	
175 BEETS			A TIMOS HO				
130 LBS. N	6,677	18.06	263.2	25.36	94.30	116	
125 BEETS							
130 LBS. N	6,813	18.22	267.3	25.50	94.59	141	
175 BEETS							
150 LBS. N	6,672	17.82	258.2	25.84	94.08	112	
125 BEETS		25 26		10.24		04	
150 LBS. N	6,647	17.97	261.8	25.40	94.31	148	
175 BEETS	24.63	22.38	278.9	10.24	0.212	10.1	
GM	6,752	18.08	264.2	25.55	94.42	081	
LSD (5%)	N/S	N/S	11.2	N/S	.63		
CV %	8.04	2.53	3.24	6.70	.51	7.79	
	EL.I	10.8		04.5			

Table 6 1992 MONITOR SUGAR COMPANY TYPE: HIGH POPULATION NITROGEN TEST AVERAGE OF TWO LOCATIONS

60 90 120	6,049 5,977 6,183	19.94 19.69 19.65	297.1 290.9 288.7	20.47 20.65 21.48	95.02 94.65 94.41	5.77 6.21 6.47	144 138 146	
150	6,293	19.31	283.4	22.25	94.41	7.20	141	11-0
GM LSD (5%)	6,126 N/S	19.65 N/S	290.0 N/S	21.21 N/S	94.62 N/S	6.41 N/S	142 N/S	-05
	15.00							100
100	SE TT		56 (S 1	able 7				

NITROGEN TEST LOW POPULATION AVERAGE OF 3 TESTS

						BEETS/
LBS.		%				100' AT
N	RWSA	SUGAR	RWST	TONS/A	% CJP	HARV.
60	6,229	18.43	274.8	22.64	95.31	110
90	6,335	18.30	271.9	23.23	95.17	106
120	6,175	17.97	264.9	23.27	94.84	106
150	6,123	17.69	259.3	23.57	94.64	106
GM VITE I	6,216	18.10	267.7	23.18	94.99	107
LSD (5%)	N/S	N/S	N/S	N/S	N/S	N/S
	932 15		RV(ST 1			
	94 25		263.2			100 LBS M
			Table 8	3		2T3B8 241
2/0.1	00.20			TEST	6,246	
		F	HIGH POPUL			
	04_30	A	VERAGE OF	5 TESTS		91.22hJ 07.1
						BEETS/ CALLORI
LBS.		%				100' AT
N SIL	RWSA	SUGAR	RWST	TONS/A	% CJP	HARV. ALL DET
60	6,040	19.24	286.0	21.26	95.01	147
90	6,109	19.03	279.6	21.98	94.53	145 M 21 021
120	6,212	18.94	278.9	22.38	94.62	147
150	6,230	18.56	271.0	23.16	94.28	144
GM	6,148	18.94	278.9	22.20	94.61	146
LOD (SOL)				a second second	a serie as fills	
LSD (5%)	N/S	N/S	N/S	N/S	N/S	N/S

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