Fertilizer Results on Sugarbeet in the Hereford, Texas Area

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Received for publication July 29, 1968

In order to establish some guide lines for fertilizer recommendations to sugarbeet growers in the Hereford, Texas, area, it was necessary to design and carry out a testing program. Beet quality is easily adversely affected by excess nitrogen rates, especially in a climate which does not cool off in the fall as rapidly or markedly as it does in the northern states. Therefore, the program was designed to indicate those rates of nitrogen which would be most likely to give the highest yield while sacrificing the least sugar and purity. The objective of this paper is to report the results of these tests.

During 1966, the treatments were as follows: Three methods of application, *viz.*: 1. All material broadcast before listing up the beds; 2. All material chiselled into the center of the beds; 3. All materials chiselled in the bed 4″ off center. Three rates of nitrogen, *i.e.*, 100, 175 and 250 lbs per acre, were applied.

Table 1.—Results of nitrogen and phosphorus application using several methods and rates on three farms near Hereford, Texas. 1966.

Treatment	Acre yield: Gross sugar Lbs/A	Acre yield: Net roots Tons/A	Percent sugar	Percent* purity	No. roots 100′ row
Farm H	3980	14.25	14.0	93.2	94.6
Farm J	4845	20.23	12.0	—	153.8
Farm B	7571	29.32	12.9	90.9	136.5
Nitrogen 100	5407	20.38	13.35	92.58	134.0
Nitrogen 175	5530	21.43	13.02	92.20	128.0
Nitrogen 250	5458	21.95	12.55	91.51	123.0
Method I	5490	21.61	12.86	92.0	115.4
Method II	5514	21.34	12.99	92.3	136.9
Method III	5392	20.82	13.07	92.0	132.6
LSD .05 nitrogen, methods & farms	219	.83	0.28	0.79	7.2
Phosphorus 50	5410	21.00	13.00	92.0	129.2
Phosphorus 100	5520	21.52	12.94	92.2	127.5
General mean	5466	21.26	12.97	92.1	128.3
	Significance of calculated variance ratios				
Among farms	**	**	**	**	**
Among N rates	NS	**	**	*	NS
Among methods	NS	NS	NS	NS	**
Between phosphorus rates	NS	NS	NS	NS	NS

* Thin juice purity Method of Brown & Serro, as reported in Proc. Am. Soc. Sugar Beet Technol. 8: 274.

[1] Agronomists, Holly Sugar Corporation, Sheridan, Wyoming and Hereford, Texas, respectively.

The N source was ammonium nitrate. Two rates of phosphate, 50 and 100 lbs per acre of P_2O_5, were derived from triple superphosphate. There were four replications at three locations in randomized block design. The results of the test are shown in Table 1. Planting date was March 10, 1966 and harvest dates were October 24 and 26, 1966.

The treatments for the 1967 test were as follows: Four nitrogen rates, 75, 150, 225 and 200 lbs per acre, derived from ammonium nitrate. Three phosphorus rates, 0, 50 and 100 lbs per acre of P_2O_5 with triple superphosphate as the source. There were four replications arranged in random blocks at three locations.

The data which were collected are shown in Table 2. The beets were planted about March 20, 1967 and harvested November 2 - 4, 1967.

Table 2.—Results of nitrogen and phosphorus application using rates of application on three farms near Hereford, Texas. 1967.

Treatment	Acre yield		Percent[1] sugar	Percent[1] purity	No. roots[1] 100′ row
	Gross[1] sugar Lbs/A	Net[2] roots Tons/A			
Farm I	7492	28.260	13.26	89.06	159.0
Farm II	4492	21.758	13.76	90.86	165.6
Farm III	8189	32.202	12.73	88.05	84.5
Nitrogen 75	6556	24.394	13.57	89.98	137.7
Nitrogen 150	6795	25.504	13.57	89.88	139.8
Nitrogen 225	6774	25.918	13.16	89.00	133.1
Nitrogen 300	6752	26.560	12.76	88.44	135.0
Phosphorus 0	6664	25.482	13.25	89.50	137.4
Phosphorus 50	6817	25.918	13.27	88.88	137.8
Phosphorus 100	6664	25.395	13.26	89.58	133.9
General mean	6725	25.592		89.32	136.4
LSD .05 farm	332	0.66	0.24	0.700	8.43
.01 farm	440	0.87	0.32	0.926	*11.14
LSD .05 N rates	NS	0.76	0.28	0.807	NS
.01 rates	NS	1.009	0.36	1.067	NS
Calc. "F" farms	**	**	**	**	**
N rates	NS	**	**	**	NS
Calc. P_2O_5 rates	NS	NS	NS	NS	NS

Notes: [1] There were no significant interactions among treatments.

[2] On Farm I, 225 lbs N yielded the greatest. On Farm II there were no differences due to N applied. On Farm III 150 lbs N yielded more than the other treatments. There were no other significant interactions.

Before fertilization, soil samples were taken at the three locations, and the results of the tests are shown in Table 3[2].

[2] We wish to express our appreciation to the Texas Agricultural Extension Service and Texas A. & M. University for the soil analyses.

Table 3.—Soil analyses. Fertilizer trials. Hereford, Texas. 1967.

Field	% OM	Pounds per acre		
		P	K	N as NO_3
I - 1	1.4	>132	>1000	51
I - 2	1.25	86	>1000	18
II - 1	1.25	25	>1000	2
II - 2	1.10	15	>1000	2
III - 1	1.22	7	>1000	40
III - 2	1.20	7	>1000	136

pH - 7-8; Ca - 4-5 tons

The data from both years show wide differences in all categories among farms. The lower yield and sugar of 1966 are a reflection of the heavier disease incidence during that season, curly top and *Cercospora* leaf spot.

The very low yield of Farm II, 1967 data, was due to two severe hail storms.

Differences among nitrogen rates followed the usual pattern of decreasing quality factors with increasing rates of nitrogen, and increasing tonnage with increasing nitrogen rates. It is practically and statistically significant that gross sugar did not increase with increasing nitrogen rates. This lack of effect of the increasing N rates was probably due to the high fertility status of many of the farms in this area, where large amounts of commercial fertilizer have been used for years in the production of high market value crops such as onions, lettuce, potatoes and other vegetable crops.

In the 1966 test, the only difference which could be assigned to the method of application was that broadcasting all of the fertilizer materials before listing up the beds caused a marked reduction in the stand of beets. This may have been due to a salinity factor; although it was not a sufficient reduction to cause a yield effect, it could become important in the case of planting to a stand.

In the 1966 test, there was a significant interaction among the nitrogen rates within the three farms, when measuring both gross sugar and tonnage. Farm J had significant decreases in gross sugar due to increasing nitrogen rate. This decrease amounted to about 600 lbs gross sugar per acre.

Farm H showed a significant increase in gross sugar and tonnage with each increment of added nitrogen. Farm B showed the highest yield with the 175-lbs rate and a decrease with the 250-lbs rate of nitrogen.

The planting and harvest dates at all locations were within one week of each other, both in 1966 and 1967.

There were no other significant interactions in the 1966 test.

In the 1967 test, there was only one significant interaction. This was among nitrogen rates within farms when measuring tons of roots. Farm I showed the most tonnage with the 225-lbs rate of N. Farm II showed no differences due to applied N. Farm III showed the highest yield with the 150-lbs rate.

There seemed to be a trend for a beneficial effect from 50 lbs of P_2O_5 per acre, and on Farm B (1966) a significant increase in tonnage was shown by the 50 lb rate over the zero rate.

Summary and Conclusions

Fertilizer tests were conducted in the Hereford, Texas area during the years 1966 and 1967. These tests were concerned with rates of nitrogen and phosphorus application.

Large variations in production were apparent among farms.

The highest yield of sugar per acre was attained with a rate of nitrogen of between 150 and 200 lbs of N per acre, although there were variations within the farms.

Rates of phosphorus tested did not have any effects on the variable measured, although there seemed to be an indication that at least 50 lbs per acre would be beneficial in some cases.

Acknowledgment

The writers wish to express their gratitude to the Texas Agricultural Extension Service and Texas A. & M. University and particularly, Dr. Art Onken, Assistant Agronomist and Mr. Harvey Walker, Assistant Agronomist, for their very considerable effort in designing the tests, applying the materials and consulting on the results. Without this service, the work would not have been done.