COMPARING PETIOLE ANALYSES WITH FIVE NITROGEN TREATMENTS

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The purpose of this study was to monitor petiole nitrates from five nitrogen treatments and to correlate the results with yield and quality, and with the University of Arizona recommendations.

Sugar beets grown in the Salt River Valley have a period of rapid growth followed by slow growth during the winter months and followed by a period of rapid spring growth prior to harvest. Petiole analysis is often used as a tool to help establish the amount of soil nitrogen and to make conservative recommendations based on the nitrate level in the soil and plant.

Soil and petiole samples were collected according to the fertilizer recommendations of University of Arizona Soils Specialist, Dr. Martin Openshaw. A soil sample was analyzed prior to establishment of the trial, followed by petiole samples in November, March, April, and May. These data are illustrated in Table 1. Because of the semi-dormancy of the beets during the winter period, petiole nitrates do not reflect the true soil conditions. Although several sampling dates were selected in the spring, only the earliest sampling would be used to make a recommendation because the spring sidedress should be made by mid-March.

TABLE 1

PETIOLE NITRATE READINGS FOR FIVE SELECTED NITROGEN TREATMENTS FROM REPLICATED FERTILIZER EXPERIMENT AT SACATON

TREATMENT	PREPLANT N 9/10	SIDEDRESS 11/30	PETIOLE READINGS IN PPM NO_3-N 11/20	3/1	5/1
0	0	0	1750	2500	1325
75N	0	75N	1500	2450	1325
125N	50N	75N	2950	2750	1550
150N	0	150N	1000	3250	1875
200N	50N	150N	2950	3350	2150

There is an interesting comparison of petiole nitrates in Table 1, between treatments having no preplant but with 75 or 150 lbs/acre of nitrogen sidedressed in November as compared to the same treatment with 50 lbs/acre of nitrogen preplant. The spring petiole samples show a sharp increase in petiole nitrates for treatments with preplant while treatments having only a fall sidedress were steadily declining. This would suggest that the preplant treatment was more of a factor in regulating spring petiole readings than the actual amount of nitrogen applied. We do not have an explanation unless it is related to the two separate patterns of growth and development of the plants for each treatment. At any rate, the understanding and knowledge of these influences on petiole nitrates is essential if we are to use petioles as a guide to fertilizer recommendations.

The initial soil analysis showed only 6 ppm in the test area. According to Dr. Openshaw's tables this soil type would have required 60 to 80 pounds of nitrogen preplant.

The three zero preplant treatments show about 1,500 ppm in November, as compared to 2,800 ppm with treatments having 50 lbs. of nitrogen preplant. The guidelines of Dr. Openshaw recommended 120 to 150 pounds of nitrogen for the zero nitrogen treatments and about 80 pounds of nitrogen for treatments already having 50 pounds of nitrogen preplant. Both of these recommendations were in the optimum range of yield and quality in Table 1. The petioles taken March 1st indicated no additional nitrogen was required for these treatments, as was the case where additional nitrogen significantly reduced sucrose.

These data correspond with last year's where the recommendations of Dr. Openshaw again appeared to be in the optimum range.

Because of the rapid changes that can occur with petioles, we would suggest more than one sample be taken for the fall or spring.

Experience, however, along with all tools available are essential before accurate recommendations can be made.

A second fertilizer trial was established at the factory farm on November 12, and harvested July 16. Urea and an 18-46-0 mix were applied preplant and ammonium nitrate was sidedressed on April 1st. The trial was established in a randomized block design with plots 4 rows wide and 50 feet long with four replications. The results of this trial appear in Table 3.

Table 3

A COMPARISON OF PREPLANT NITROGEN AND A NITROGEN PLUS PHOSPHATE MIX ON YIELD AND QUALITY OF NOVEMBER PLANTED SUGAR BEETS CHANDLER, ARIZONA

PREPLANT	SIDEDRESS	S/A	T/A	S %
50 N	75 N	3.888	28.8	13.5
0	150 N	3.808	28.0	13.6
50 N	150 N	3.753	27.8	13.5
150 Lbs 18-46-0 (27N)	75 N	3.632	28.6	12.7
0	75 N	3.624	25.7	14.1
300 Lbs 13-46-0 (54N)	75 N	3.485	26.4	13.2

Preplant: November 12
Sidedress: April 1

The soil analysis indicated 68 pounds of nitrate nitrogen in the top foot and 24 pounds of nitrate in the second foot. Phosphate was medium at 18 ppm.

The results do not show any advantage of the preplant phosphate over single nitrogen treatments. No significant differences appear among any

treatments in yield or quality. Sugar percent was very low and may be accounted for due to a heavy rain occurring in July which significantly reduced sugars on all plots at the factory farm. It is interesting, however, that yields averaged about 27 tons per acre for November planted beets. Perhaps the best treatment would be a preplant treatment without sidedressing.

A third fertilizer trial was established at the factory farm on December 12, and harvested July 16. Urea and an 18-46-0 mix were applied preplant with ammonium nitrate sidedressed on April 1, on all treatments. The treatments were replicated three times in 4 row strips. The results of this study are summarized in Table 4.

Table 4

A COMPARISON OF SEVERAL PREPLANT FERTILIZER TREATMENTS ON YIELD AND QUALITY OF DECEMBER PLANTED BEETS CHANDLER, ARIZONA

PREPLANT	SIDEDRESS	S/A	T/A	S %	N
350 18-46-0 (60N)	75 N	3.167	20.3	15.6	1.0
175 18-46-0 (30N)	75 N	2.699	17.3	15.6	1.0
Urea 30 N	75 N	2.258	14.2	15.9	1.0
0	75 N	2.128	12.9	16.5	1.0

On March 11, the 350 pound rate of 18-46-0 looked significantly better in vigor than any treatment in the test followed by 175 pounds of 18-46-0. Urea alone appeared stunted in comparison. These observations were reflected in root yield with the 18-46-0 treatments showing significantly higher root yields. Sucrose percentages were surprisingly high in comparison, but the trial area was very sandy.

The soil analysis in this field showed very low nitrate residuals with only 12 pounds of nitrate nitrogen in the top foot and 20 pounds in the second foot. Phosphate was moderate at 18 ppm.