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PLANT PETIOLE SAP TESTING FOR NITROGEN AND POTASSIUM IN SWEET CORN GROWN ON MINERAL SOIL

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Abstract. **A spring fertilizer trial for sweet corn (*Zea mays* var. rugosa Bonaf.) was conducted on a Myakka fine sand. A soil test (Mehlich-1) taken before fertilizer was applied indicated P to be very high (120+ ppm) and K to be low (26 ppm). Four rates of N (0, 75, 150, and 225 lb/acre) and four rates of K (0, 50, 100, and 150 lb/acre) were applied in all combinations with one-third broadcast and the remainder in two side dress applications. Plant N and K were measured by sampling the most recently mature leaf petioles 27, 40, and 49 days after planting with Cardy ion specific meters (Spectrum Technologies, Inc., Plainfield, IL). Five to six petioles were necessary for sufficient sample size. Additional petioles were collected and analyzed by the University of Florida's Analytical Research Laboratory, Gainesville, to compare results with field sap tests. Harvesting for yield was 67 and 70 days after planting. Ear length, diameter, average weight, tip fill, and husk cover were not different for the 150 and 225 lb/acre of N. Marketable yield varied, but was generally higher when N rates were higher.**

The 1994-95 Florida sweet corn (*Zea mays* var. rugosa Bonaf.) crop was valued at $105.3 million (Geuder and Pugh, 1996). The average yield for the state was 312 42-lb crates per acre on 36,900 acres. About 70% was produced on organic soils in the Everglades and Zellwood regions. However, significant production occurs on sandy soils, and with the possible loss of the Zellwood organic soils (about 20% of the state's production), more production may be moved to the sandy soils.

Nitrogen (N) fertilization is necessary for growth and optimum sweet corn production, especially on sandy soils. Sweet

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corn growers apply 105 lb N per acre (Economic Research Service, 1991). But this may be low for sandy soils since this average included organic soils which usually receive lower amounts of N. Early work on sweet corn fertility conducted in California showed that 100 lb N per acre resulted in about 80% of maximum yield (Tyler et al., 1964). Yields increased with up to 200 lb N per acre. In New York, processing sweet corn yields were maximized with 125 lb N per acre (Smith et al., 1964). In Florida, sweet corn yields were highest on sandy soils when 100 to 150 lb N per acre was applied (Robertson, 1962, Hochmuth et al., 1992). Research review of N rates for sweet corn shows a heavy dependency of fertilizer rates on the soil type. In Quincy, Florida, a rate of 125 lb N per acre was nearer to the optimum than the 200 lb N rate (Rhodes, 1990). Studies in Gainesville, Florida, showed yields increased quadratically for N rates between 50 and 200 lb per acre (Rudert and Locascio, 1979). Current Florida recommendations for N and potassium (K) for sweet corn grown on sandy soils are 150 and 120 lb per acre, respectively (Hochmuth and Maynard, 1996). The study reported here was conducted to determine if testing N and K in the sweet corn plant at different stages of growth would relate to the amounts of N and K fertilizer applied and to marketable yield of sweet corn.

Materials and Methods

This experiment was conducted in the spring of 1996 at the Central Florida Research and Education Center, Sanford, on a Myakka fine sand. Soil test (Mehlich 1 extractable) found phosphorus (P) to be very high (120+ ppm), K low (26 ppm), magnesium (Mg) high (76 ppm) and a 6.8 pH. Metalachlor at 1.5 lb ai was applied preplant incorporated for weed control. One third of the N and K and all (120 lb per acre) of the P was applied broadcast by hand and the remainder in two side dress applications. Four rates of N (0, 75, 150, and 225 lb/acre) and four rates of K (0, 50, 100, and 150 lb/acre) were applied in all combinations with four replications.

Plots were four rows wide (10 ft) by 15 ft long arranged in a randomized complete block design. A supersweet sweet corn cultivar ('XP-7', courtesy of Agrisales, Inc., P. O. Box 2060, Plant City, FL) was planted 25 Mar. 1996 and replanted 12 Apr. 1996 due to 4.23 inches of rainfall (Mar. 11.19, Apr. 1.86 inches total). The second one-third application of N and K was applied at replanting. Plants were thinned to 7 inches 24 Apr. 1996.

The first sap test was taken when the plants were between 4 and 8 inches tall 9 May 1996 (27 days after planting, DAP).

Table 1. Nitrogen (N) rates and sweet corn yield and several quality measurements at Sanford, FL, spring 1996.

	Yield	Ear				
N lb/acre	Crates/ acre[z]	Wt. (lb)	Husk cover[x]	Tip fill[w]	Length	Width
225	326 a[y]	0.7 a	4.5 a	5.0 a	7.1 a	1.9 a
150	252 b	0.7 a	4.4 a	5.0 a	7.1 a	1.8 a
75	48 c	0.6 b	2.8 b	2.9 b	4.3 b	1.1 b
0	0[v]	0.0	0.0	0.0	0.0	0.0

[z]Expressed as 42-lb crates.
[y]Mean separation in columns by Duncan's Multiple Range Test, 0.05 level.
[x]Husk cover: 1=protrudes; 5=wrapped tightly, completely covered.
[w]Tip fill: 1=at least 1 inch unfilled; 5=full at top.
[v]No marketable yield for 0 N, therefore, no data.

Table 2. Nitrogen (N) rates and leaf-N on three dates for sweet corn, Sanford, FL, spring 1996.

	Days after planting					
	Cardy (ppm NO_3-N)[z]			Lab (% TKN)[x]		
N lb/A	27	40	49	27	40	49
225	802 a[y]	535 a	193 a	4.5 a	3.3 a	3.7 a
150	780 a	346 b	169 b	4.2 a	3.0 a	3.0 a
75	474 b	128 c	140 c	3.4 b	2.4 b	2.4 b
0	138 c	77 c	127 c	1.7 c	1.6 c	1.4 c

[z]Cardy ion specific meter, Spectrum Technologies, Inc., Plainfield, IL.
[y]Mean separation in columns by Duncan's Multiple Range Test, 0.05 level.
[x]University of Florida's Analytical Research Laboratory, Gainesville, total Kjeldahl nitrogen.

The last one-third of N and K was applied the next day. Sap testing was accomplished by sampling the upper most fully expanded leaf, removing a 4-inch section of the petiole nearest the base, placing them in a garlic press, and squeezing to express sap to be placed onto Cardy ion specific meters (Spectrum Technologies, Inc.) for direct readings of nitrate and K. Five to eight petioles were necessary for sufficient sap samples. Additional sap test data were collected at 40 DAP (layby) and 49 DAP (silking). Harvesting for marketable yield was 67 and 70 DAP. Ear length, diameter, average weight, ear tip fill, and ear husk cover were measured. Petioles were also collected, dried, and ground for analysis by the University of Florida's Analytical Research Laboratory at Gainesville.

Results and Discussion

Yield increased with N rate and there was no marketable yield with 0 N rate (Table 1). Highest marketable yields occurred with the highest N rate (225 lb/acre). There was no difference between the top two N rates (225 and 150 lb/acre) for average ear weight, husk cover, ear tip fill, ear length, and ear width (diameter). Due to rainfall (4.23 inches) replanting was necessary and the initial fertilizer application (N and K) may have been leached. This would in effect have reduced the N rates to 0, 50, 100, and 150 lb/acre and possibly a similar reduction in K rates.

Cardy measurements for sap nitrates declined seasonably with higher readings with the higher N rates (Table 2). The analytical lab results for %TKN (total Kjeldahl nitrogen) had a similar trend as the sap test. There was no difference for the 150 and 225 lb N rate.

Table 3. Potassium (K) rates and sweet corn yield and several quality measurements at Sanford, FL, spring 1996.

	Yield	Ear				
K lb/A	Crates/ acre[z]	Wt. (lb)	Husk cover[x]	Tip fill[w]	Length (inch)	Width (inch)
150	228 b[y]	0.7 a	3.8 b	4.2 b	5.8 b	1.5 b
100	155 c	0.6 b	3.7 b	4.2 b	5.8 b	1.5 b
50	270 a	0.6 b	4.5 a	4.8 a	7.0 a	1.8 a
0	183 c	0.6 b	3.6 b	4.1 b	5.9 b	1.5 b

[z]Expressed as 42-lb crates.
[y]Mean separation in columns by Duncan's Multiple Range Test, 0.05 level.
[x]Husk cover: 1=protrudes; 5=wrapped tightly, completely covered.
[w]Tip fill: 1=at least 1 inch unfilled; 5=full at top.

Table 4. Potassium (K) rates and leaf-K on three dates for sweet corn, Sanford, FL, spring 1996.

	Days after planting					
	Cardy reading (ppm K)[z]			Lab (%TKN)[x]		
K lb/acre	27	40	49	27	40	49
150	4919 a[y]	3581 a	2438 a	3.8 a	2.2 a	2.1 a
100	4328 a	3300 a	2394 a	3.5 a	2.2 a	2.1 a
50	3550 b	2863 b	2181 a	2.8 b	2.0 ab	1.9 a
0	2263 c	1931 c	1792 b	1.6 c	1.5 b	1.5 b

[z]Cardy ion specific meter, Spectrum Technologies, Inc., Plainfield, IL.
[y]Mean separation in columns by Duncan's Multiple Range Test, 0.05 level.
[x]University of Florida's Analytical Research Laboratory, Gainesville, total Kjeldahl nitrogen.

There was not a clear yield response to K rates (Table 3). The 50 lb/acre of K gave the highest yield. That rate also was significantly better for husk cover, ear tip fill, ear length, and ear width. The highest rate of K had the greatest average ear weight. K in the sap declined seasonally and was generally higher with the higher K fertilization. At 49 DAP, there was no difference for sap K for the top three rates of K fertilizer (Table 4). The analytical lab results showed a similar trend.

Conclusions

Sweet corn tissue N concentration increased with N rate up to 150 lb/acre. Yield increased with each N rate increase. Cardy meter readings taken in the field and %TKN from analytical lab results followed similar trends for N concentrations. Tissue-K concentrations as measured by a Cardy meter or an analytical lab procedure tended to increase with K fertilization, but a clear response to K fertilization for sweet corn yield and other ear quality factors was not found.

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APPLICATION OF UNPROCESSED URBAN PLANT DEBRIS DIRECTLY TO LAND: FIELD OBSERVATIONS

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Abstract. **Urban plant debris (UPD) was taken directly from yard trash collection routes in Alachua County, Florida and applied at rates of approximately 200 tons per acre to a field that is in a melon/livestock forage rotation. Applying unsorted UPD to land without any sorting, grinding, or composting is an uncommon means of handling this portion of the urban waste stream. Because of the unique nature of this approach to UPD utilization, observations made at the field site during the 1.5 years following initial application were documented. Three forage crops have been produced since initial incorporation of the UPD material. The presence of large woody debris 1.5 years after UPD application would likely interfere with planting of watermelon [*Citrullus lanatus* (Thunb.) Matsum. & Nakai]. However, the farmer anticipates planting melons 2.5 years after UPD application. About nine months after UPD application, decomposing yardwaste supplied enough N and other nutrients to produce a 2.5-ton dry weight sorghum-sudangrass (*Sorghum bicolor* L. Moench. × *Sorghum vulgare sudanense*) forage crop. However, there were indications that N mineraliza-**