

EVALUATION OF FOLIAR APPLIED NUTRIENTS IN SWEETPOTATO

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ABSTRACT: A research trial was established in Mississippi, Louisiana, North Carolina, and Alabama to evaluate a foliar nutrient management program recommended for sweetpotato by a Louisiana researcher. The evaluation concept was to determine the influence of the total program (all nutrients, rates, and timings) on sweetpotato production as one treatment and to examine each nutrient in the program alone as separate treatments. Preliminary results from Mississippi indicate that the addition of foliar nutrients does not increase marketable sweetpotato yield compared to a standard soil fertilizer program when all other management practices are equal.

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KEYWORDS: foliar nutrient, sweetpotato

MATERIALS AND METHODS: Field research was conducted in 2002 at the Pontotoc Ridge-Flatwoods Branch Experiment Station on an Adaton silt loam soil. Experimental design was a randomized complete block with four replications. Land preparation followed the order of disk cultivation, hipping, do-alled, fertilizer N-P-K (20-60-165 lb/ac), pretransplant application of 2 lb ai/ac Lorsban 4 EC (chlorophyrifos), and re-hipping. Transplanting occurred on June 26. Foliar nutrients Tracite 25-0-0 (fertilizer N-P-K), Trafix Zn (10% Zn), Tracite B (10% B), and Tracite 2-0-25 (fertilizer N-P-K) were applied as separate treatments (no tank mixtures) using a CO₂ backpack sprayer. All treatments included N-P-K fertilizer applied to the soil as part of land preparation. Treatment 1 was the untreated check which excluded foliar nutrients. Treatment 2 was 1 qt/ac Tracite 25-0-0 at 21 days after transplant (DAT), 4 qt/ac Tracite 25-0-0 at 30 and 60 DAT, 0.5 qt/ac Trafix Zn at 21 and 30 DAT, 0.375 qt/ac Tracite B at 21 and 30 DAT, and 4 qt/ac Tracite 2-0-25 at 60 DAT. Treatment 3 was 1 qt/ac Tracite 25-0-0 at 21 DAT and 4 qt/ac Tracite 25-0-0 at 30 and 60 DAT. Treatment 4 was 0.5 qt/ac Trafix Zn at 21 and 30 DAT. Treatment 5 was 0.375 qt/ac Tracite B at 21 and 30 DAT. Treatment 6 was 4 qt/ac Tracite 2-0-25 at 60 DAT. Prior to each application timing, sweetpotato plants that received the Standard soil and Total program treatments were visually examined for root development (fibrous or storage roots) and the number of storage roots per plant was recorded (data not shown). Leaf and petiole tissue samples were collected from the fifth node below the uppermost expanded terminal leaf (quarter size leaf) at 21, 28, 42, 56, 70, 84, and 98 DAT. Petiole data for lab analysis was not available for the first and second application dates due to the small plant size. Petiole NO₃-N and K analyses were conducted at the Pontotoc Ridge-Flatwoods Experiment Station utilizing Cardy portable electrode-based ion meters (Horiba, Ltd., Kyoto, Japan). The North Carolina State Soil Lab (NCSSL) also conducted analyses for petiole NO₃-N

and K content and several nutrients in leaf tissue. At 98 DAT (October 2), the center row of each plot (30 ft) was harvested. Sweetpotato root yield was determined for US No. 1, US No. 2, Canner, Cull, and Jumbo grades. Analysis of variance was conducted and means separated using Fishers Protected LSD ($\alpha=0.05$).

RESULTS AND DISCUSSION: Level of K in petioles measured by the Cardy meter was 2752 ppm for Trafrix Zn, which was greater than Tracite 2-0-25, the Total program, and Standard soil treatments (Table 1). The lowest petiole K level measured by the Cardy meter was for the Standard soil treatment compared to all other treatments. Levels of petiole K measured by NCSSL analyses were not different among treatments (Table 1).

Cardy meter measurements of petiole $\text{NO}_3\text{-N}$ levels were not different among treatments (Table 1). Petioles analyses conducted by NCSSL indicated that $\text{NO}_3\text{-N}$ level was higher for Tracite 2-0-25 compared to the Total program and Trafrix Zn treatments. Levels of Zn and B in leaf tissue were not different (Table 1). Petiole $\text{NO}_3\text{-N}$ and K measurements were not correlated with US No. 1 or US No. 2 grade sweetpotato yields. Petiole analyses conducted utilizing Cardy meter and NCSSL methods illustrate lower levels of $\text{NO}_3\text{-N}$ and P over time (Figure 1 and 2). Levels of P and $\text{NO}_3\text{-N}$ measured by Cardy meter and NCSSL methods were correlated at $R=0.72$ and 0.79 , respectively. These correlation coefficients suggest that Cardy meters could be used for in-field monitoring of sweetpotato $\text{NO}_3\text{-N}$ and K status.

Sweetpotato US No.1 grade yield ranged 114 to 168 bu/ac (Table 2). US No.1 yield of 168 bu/ac for Tracite B was greater than Total program and Tracite 25-0-0 treatments at 120 and 114 bu/ac, respectively. The highest US No. 2 yield was 147 bu/ac for Trafrix Zn, which was greater than 97 bu/ac Tracite 25-0-0. Canner yield was 106 bu/ac for the Standard soil treatment, which was greater than 81, 64, and 70 bu/ac for the Total program, Tracite B, and Tracite 25-0-0 treatments, respectively. Jumbo yield was higher with the Total program than any other treatment except Tracite 25-0-0. There was no difference in total marketable yield among treatments (Table 2). The percentage of US No. 1 roots was 41% for Tracite B, which was greater than 32% and 30% for Total program and Trafrix Zn treatments, respectively

Preliminary results indicate that the addition of these foliar nutrients do not increase marketable sweetpotato yield compared to a standard soil fertilizer program when all other management practices are the equal. Jumbo yield was highest with foliar treatments that included fertilizer nitrogen, which suggests rapid maturity or less root set per plant. Therefore, future research should investigate the effects of foliar nutrients on length of time to root maturity. In addition, the effects of growth regulators in combination with these foliar nutrients should be explored.

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Table 1. Average levels of sweetpotato petiole and leaf tissue nutrients over time among nutrient treatments in a foliar nutrient trial at the Pontotoc Ridge-Flatwoods Branch Experiment Station in 2002.

Treatment Number	Treatment	Rate	Application Timing	Petiole K Cardy meter	Petiole NO ₃ Cardy meter	Petiole K NCSSL ¹	Petiole NO ₃ NCSSL	Leaf Tissue B NCSSL	Leaf Tissue Zn NCSSL
		qt/ac	DAT ²	------(ppm) ³ -----					
1	Untreated			2246	692	27935	5820	53	30
2	Tracite 25-0-0	1.00	21	2554	665	31402	4438	59	25
	Tracite 25-0-0	4.00	30 & 60						
	Trafix Zn (10%)	0.50	21& 30						
	Tracite B (10%)	0.37	21& 30						
3	Tracite 2-0-25	4.00	60	2707	691	35040	4686	58	28
	Tracite 25-0-0	1.00	21						
4	Tracite 25-0-0	4.00	30 & 60	2752	715	32750	4344	59	27
	Trafix Zn (10%)	0.50	21 & 30						
5	Tracite B (10%)	0.37	21 & 30	2654	734	35053	5430	61	26
6	Tracite 2-0-25	4.00	60	2562	699	32344	6556	57	26
LSD (0.1)				183.3	100.5	7497.4	1872.2	16.8	6.6

¹ NCSSL = North Carolina State Soil Lab

² DAT = days after transplant

³ ppm = parts per million

Table 2. Sweetpotato grade yield for foliar nutrient treatments in a field trial located at the Pontotoc Ridge-Flatwoods Experiment Station in 2002.

Treatment Number	Treatment	Rate	Application Timing	US No.1	US No. 2	Canner	Jumbo	Total Marketable	Percent US No.1
		qt/ac	DAT ¹	------(50 lb bu/ac)-----					
1	Untreated			132	137	106	16	390	33
2	Tracite 25-0-0	1.00	21	120	100	81	56	356	32
	Tracite 25-0-0	4.00	30 & 60						
	Trafix Zn (10%)	0.50	21 & 30						
	Tracite B (10%)	0.37	21 & 30						
3	Tracite 2-0-25	4.00	60	114	97	64	44	320	35
	Tracite 25-0-0	1.00	21						
4	Tracite 25-0-0	4.00	30 & 60	126	147	87	18	378	30
	Trafix Zn (10%)	0.50	21 & 30						
5	Tracite B (10%)	0.37	21 & 30	168	141	70	8	388	41
6	Tracite 2-0-25	4.00	60	145	111	87	21	365	39
LSD (0.1)				48.4	49.5	20.8	32.5	95.8	8.7

¹ DAT = days after transplant

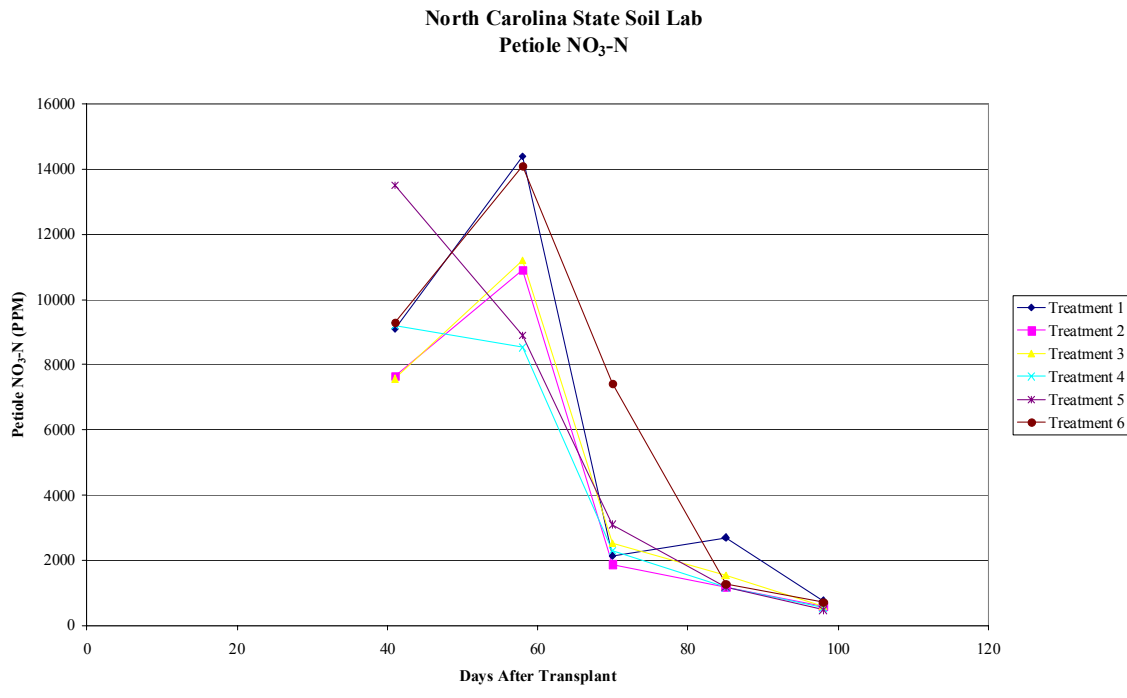
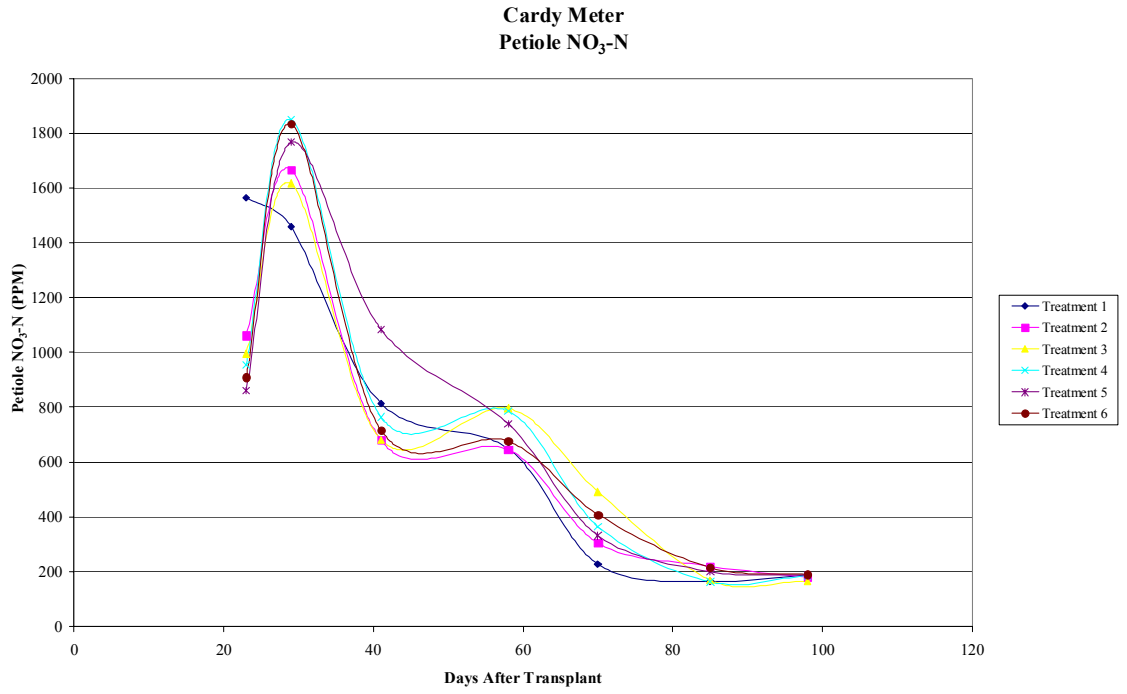


Figure 1. Levels of NO₃-N in sweetpotato petioles over time for different foliar treatments at the Pontotoc Ridge-Flatwoods Experiment Station in 2002.

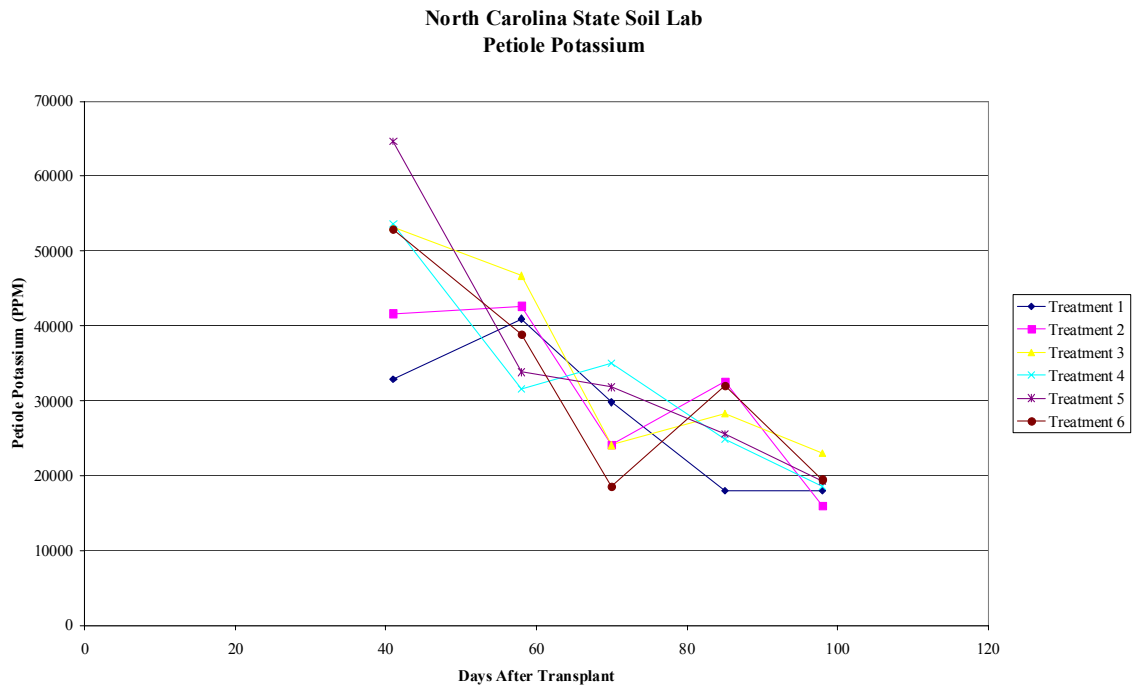
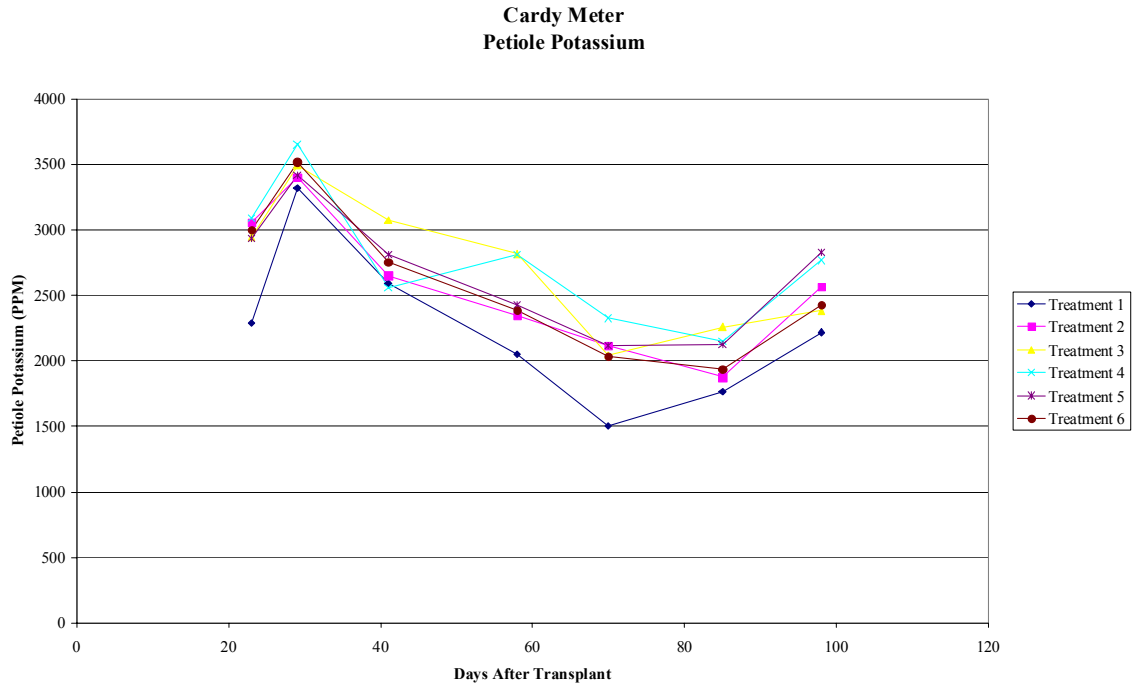


Figure 2. Levels of potassium in sweetpotato petioles over time for different foliar treatments at the Pontotoc Ridge-Flatwoods Experiment Station in 2002.