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## *Evaluation of Foliar-Applied Controlled-Release Nitrogen Fertilizer in Pepper Production 99-08*

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### **Purpose**

This study was conducted to evaluate foliar-applied nitrogen solutions in pepper production. Various rates, timings and nitrogen sources were compared.

### **Material and Methods**

Plots were established in a Lakeland fine sand located at the Suwannee Valley Research and Education Center near Live Oak, FL. Pre-plant soil test analysis (Mehlich 1 extractant) results were: 76 ppm P, 21 ppm K, 24 ppm Mg, 335 ppm Ca, 1.66 ppm Zn, 0.18 ppm Cu, and 5.24 ppm Mn. Soil pH was 5.9 using a 1:2 (soil:water) mixture.

Soil was prepared and pre-plant fertilizer treatments (Table 1) were applied to plots. All pre-plant fertilizer treatments were made with 13-4-13 (N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O) including micronutrients. Pre-plant fertilizer was incorporated into the soil with a rototiller. Beds were formed on 5 ft centers and were fumigated with a mixture of methyl bromide and chloropicrin (98:2) at a broadcast rate of 400 lbs per acre. Drip tape was applied to the center of the beds and the beds were covered with black polyethylene mulch. The final beds were 24 inches wide and 6 inches high.

Pepper transplants, cultivar 'Camelot XR3', were planted on April 1, 1999. Two rows per bed were established with a 12 inch spacing between plants in a row. Each plot had 38 plants. All plots received fertigations of N and K<sub>2</sub>O using a commercial 8-0-8 (N-P<sub>2</sub>O<sub>5</sub>-K<sub>2</sub>O) solution. The first fertigation was on April 8, 1999. Early season fertigations were at a rate of 1.0 lbs N per acre per day. Mid season fertigations were at a rate of 2.0 lbs N per acre per day.

Treatments with foliar-applied nitrogen were applied using a CO<sub>2</sub> backpack sprayer with 8004 flat fan nozzles. Treatments were applied with water a spray volume of 39 gallons per acre. Application dates are listed in Table 2.

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Two petiole-sap analyses for nitrate-nitrogen were conducted (May 25 and June 14). Fruits were harvested on June 21 and July 1 and graded into categories of Fancy, U.S. No.1, and cull according to USDA grade standards. Counts and weights of each grade were recorded. Data was subjected to analysis of variance.

### **Results & Observations**

Fancy yields from two harvests ranged from 419 to 539 bu/A with no significant difference among any treatments (Table 3). Total marketable yields (Fancy and U.S. No.1) were in the range of 450-600 bu/A which is low for typical bell pepper yields after two harvests. No significant differences were detected for any grade category within the first harvest (early yield) or total yield.

Current University of Florida mulched pepper fertilizer recommendations suggest 20-40% of nitrogen be applied pre-plant in the bed and the remaining N fertigated beginning 3 to 4 weeks after transplanting. The objective of this study was to evaluate the potential role of foliar applications of controlled-release nitrogen in an overall nitrogen program in pepper. Foliar applied nitrogen treatments (Treatments 2-7) were not significantly better than Treatment 8 which received the same pre-plant and fertigated nitrogen, but no foliar applied nitrogen. Treatment 9 received the highest pre-plant N (100 lbs/A) but was not significantly better than any other treatment. High pre-plant N rates used in Treatment 9 are generally not recommended due to high risk of leaching in sandy soils.

Early season (May 25) plant petiole-sap nitrate-nitrogen was significantly higher in treatment 9 (Table 4) at 852 ppm  $\text{NO}_3\text{-N}$ . However, by June 14 plant petiole-sap nitrogen levels were similar in all treatments. Plant petiole-sap nitrogen was generally lower than recommended for the stage of growth on both dates.

Treatment 1 received only 75 lbs/A N during the entire season and it was supplied only via fertigations. In this study, additional pre-plant fertilizer or foliar applied nitrogen programs did not increase yield or quality of bell pepper. Sap nitrate-nitrogen levels on May 25 were significantly increased above those from Treatment 1 only in Treatment 9, where pre-plant nitrogen was in addition to the fertigated nitrogen.

The generally low yields in this trial may be due to overall low nitrogen levels in the plants as indicated by the low petiole-sap nitrogen levels. It appears mid-season nitrogen fertigations and foliar applied nitrogen treatments used in this experiment may have been insufficient to maximize sap N levels. Further research is needed at higher rates or more frequent timing of these treatments to determine if the foliar applied nitrogen treatments will benefit bell pepper production in this system.

**Table 1.** Description of pepper fertilizer programs for each treatment including pre-plant, fertigated, and foliar-applied nitrogen sources, rates and timing.

Treatment	Pre-Plant N (lbs/A)	Fertigated N (lbs/A)	Foliar Applied N <sup>z</sup>		
			Source <sup>y</sup>	Rate (quart/A)	Timing Interval (wks)
1	0	75	None	-	-
2	25	75	Urea Solution	3.0	2
3	25	75	HM9310	2.5	2
4	25	75	HM9716	2.0	2
5	25	75	Urea Solution	6.0	3
6	25	75	HM9310	5.0	3
7	25	75	HM9716	4.0	3
8	25	75	None	-	-
9	100	75	None	-	-

<sup>z</sup> Foliar treatments began three weeks after transplanting, resulting in 6 applications for treatments 2, 3, and 4; and 3 applications for treatments 5, 6, and 7.

<sup>y</sup> Urea stock solution was 3.4 lbs of urea per gallon of water, HM9310 was 25-0-0 and HM9716 was 28-0-0 (N-P2O5-K2O). HM9310 and HM9716 were solutions of controlled release nitrogen from Helena Chemical Company.

**Table 2.** Schedule for foliar-applied nitrogen treatments to pepper.

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<u>Date of Applications</u>	<u>Treatments Applied<sup>z</sup></u>
23 April	2, 3, 4, 5, 6, 7
6 May	2, 3, 4
13 May	5, 6, 7
18 May	2, 3, 4
4 June	2, 3, 4, 5, 6, 7
18 June	2, 3, 4
1 July	2, 3, 4

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<sup>z</sup> See Table 1 for complete description of treatments.

**Table 3.** Effects of several nitrogen fertilizer treatments on yield and quality of bell pepper in Live Oak, FL.

Treatment <sup>z</sup>	Total Yield (bu/A) <sup>y</sup>			Early Yield (bu/A)		
	Fancy	US No. 1	Cull <sup>x</sup>	Fancy	US No. 1	Cull <sup>x</sup>
1	457	72	129	320	0	95
2	443	64	327	322	0	297
3	460	48	145	359	0	114
4	476	51	147	369	0	117
5	452	70	168	324	0	123
6	539	58	166	373	0	124
7	538	51	160	386	0	126
8	479	65	138	334	0	98
9	419	31	197	291	0	157
Significance (P=.05) <sup>w</sup>	NS	NS	NS	NS	NS	NS

<sup>z</sup> Treatments are listed and described in detail on Table 1.

<sup>y</sup> One bushel of bell pepper weights 28 lbs.

<sup>x</sup> Culls were due to blossom-end rot.

<sup>w</sup> Treatments were not significantly different (NS) from each other at the 5% level.

**Table 4.** Pepper plant petiole sap nitrate-nitrogen levels on May 25 and June 14 for several nitrogen treatments.

Treatment <sup>z</sup>	Nitrate-Nitrogen (ppm)		
	25-May		14-Jun
1	496	b <sup>y</sup>	446
2	440	b	449
3	479	b	390
4	514	ab	553
5	480	b	424
6	519	ab	463
7	491	b	441
8	474	b	424
9	852	ab	570
Sufficiency Range <sup>x</sup>	1200-1400		800-1000
Significance (P=.05) <sup>w</sup>	*		NS

<sup>z</sup> Treatments are listed and described in detail on Table 1.

<sup>y</sup> Means within the column with the same letter are not significantly different from each other.

<sup>x</sup> Guidelines for fresh petiole sap nitrate-nitrogen for pepper at these stages of growth as reported by G. Hochmuth, Plant Petiole Sat-Testing, University of Florida Circular 1144.

<sup>w</sup> Significance reported at the 5% level (\*) or not significant (NS).