

EFFECT OF FOLIAR FEEDING ON BELL PEPPER YIELDS
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INTRODUCTION/OBJECTIVES:

It has been shown in numerous studies that foliar applications of potassium nitrate can result in increased yields in tomato and cotton. A window of opportunity exists during fruit formation and development when root absorption of nutrients lags the plants requirements. Foliar applications shortly after bloom initiation have proven beneficial.

METHODS AND MATERIALS:

A randomized complete block, replicated test was established on a healthy, vigorously growing bell pepper crop. The stock solution for the foliar applications was prepared by dissolving 10 pounds of KNO_3 in 20 gallons of water. The limited solubility of KNO_3 prevented a more concentrated solution.

Three applications consisting of a 50% dilution of the stock solution were used to avoid possible phyto toxicity. Each application resulted in 2.30 pounds of K_2O or 1.95 pounds of K, per acre. The plots were sprayed by using a backpack sprayer at a rate of 20 gallons of solution per acre. All applications were made at two week intervals.

Pepper fruits were hand harvested as they became mature and their weights recorded. The grower supplied experienced workers who harvested only fruits that were mature and suitable for commercial markets. The first harvest occurred on June 29, 2012, the second harvest was on July 9, 2012, and the third harvest was on July 19, 2012. Data were subjected to an ANOVA statistical program to test for significant differences among treatment means.

TREATMENTS:

1. Untreated check
2. Two weeks post bloom
3. Four weeks post bloom
4. Six weeks post bloom
5. Two, four and six weeks post bloom

Site Location: Live Oak Farms, Minturn Road

Host Crop Variety: Baron

Plot Description and Size: Three rows by 25 feet long for each treatment, replicated five times.

Experimental Design: Randomized complete block

Fertilization: The grower's fertilization program consisted of:
Nitrogen – 225 lbs/a
Phosphorus – 75 lbs/a
Potassium – 125 lbs/a

Application Conditions:

First application:

Date: May 20, 2012
Time: 11:00 a.m.
Wind: Light from NW
Sky: Clear
Temperature: 82 F



May 20, 2012 - First foliar application to peppers occurred when plants were about 12 tall and had small fruits and several booms.

Second application:

Date: June 6, 2012
Time: 5:00 p.m.
Wind: NW 5 – 10 MPH
Sky: Clear
Temperature: 68 F



June 6, 2012 – Second application of KNO_3 was applied when the crop was fruiting well and growing vigorously.

Third application:

Date: June 22, 2012
Time: 7:00 a.m.
Wind: Calm
Sky: Cloudy
Temperature: 66



June 22, 2012 – Third application of KNO_3 was applied when the crop had large fruits and was nearing harvest.

ASSESSMENTS:

Phyto toxicity,
Yields at three harvest dates, 10 days apart.

RESULTS:

Table # 1 shows the total fruit yields in lbs/acre for all three harvest dates. Although there were no significant differences among treatment means, there was a numerical difference of 7129 lbs/acre between the untreated check and the treatment that received KNO_3 every two weeks for six weeks. Compared to the untreated check, the application at 6 weeks post bloom yielded next highest, gaining only 210 lbs/acre. This treatment was followed by the 2 weeks after post bloom application which yielded 1693 lbs/acre more than the untreated check. The 4 weeks post bloom application out yielded the untreated check by 2730 lbs/acre. The period of 4 weeks after first bloom is a small window of time when fruits are growing rapidly and resulting in a strong sink for nitrogen and potassium. The treatment that received applications at 2, 4 and 6 weeks post bloom had a few extra nutrients during the entire fruit set and development stage of growth, and gave the highest yields. Two weeks after first bloom appears to be too early, and six weeks after bloom seems to be too late, to provide extra nutrients when they are needed most.

These results are depicted in figures # 1a and 1b in a bar graph and a corresponding curve, respectively. They are very similar to the curve shown in figure # 2, which is the result of foliar feeding in cotton.

Table # 2 is the ANOVA for total pepper weights from three harvest dates. The probability value of 0.9 indicates that there were no significant differences among treatment means. The multiple range tests placed treatments with the untreated check yielding least and the treatment receiving three applications yielding highest.

A large amount of variation exists between replications of some treatments making detection of earliness difficult. The variability led to the lack of statistical significance at the required 95% confidence level.

Table # 1 – Total Pepper Yields From Three Harvest Dates and Average of Five Replications.

TREATMENTS	WEIGHTS (lbs/acre)	BOXES/ACRE (28 lb boxes)
1. Untreated check	55150	1970
2. Two weeks post bloom	56843	2030
3. Four weeks post bloom	57880	2067
4. Six weeks post bloom	55352	1976
5. Two, four and six weeks post bloom	62279	2224

Table # 2 – Analysis of Variance for Total Pepper Weights.

Analysis of Variance for Weights - Type III Sums of Squares

Source Sum of Squares Df Mean Square F-Ratio P-Value

MAIN EFFECTS

A:Treats 1.67795E8 4 4.19489E7 0.24 0.9095

B:Reps 1.37366E8 4 3.43415E7 0.20 0.9351

RESIDUAL 2.75751E9 16 1.72344E8

TOTAL (CORRECTED) 3.06267E9 24

All F-ratios are based on the residual mean square error.

Multiple Range Tests for Weights by Treats

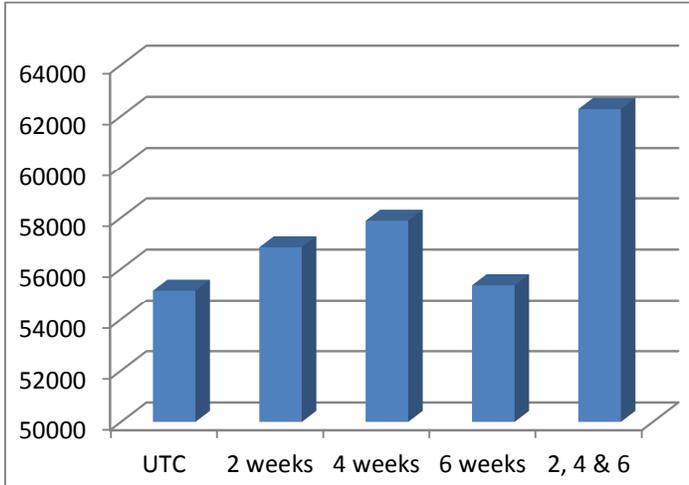
Method: 95.0 percent LSD

Treats Count LS Mean Homogeneous Groups

1	5	55149.6	X
4	5	55351.6	X
2	5	56842.6	X
3	5	57879.8	X
5	5	62279.4	X

Figures # 1a – Bar Graph Showing Relative Yields.

Lbs/acre



Lbs/acre

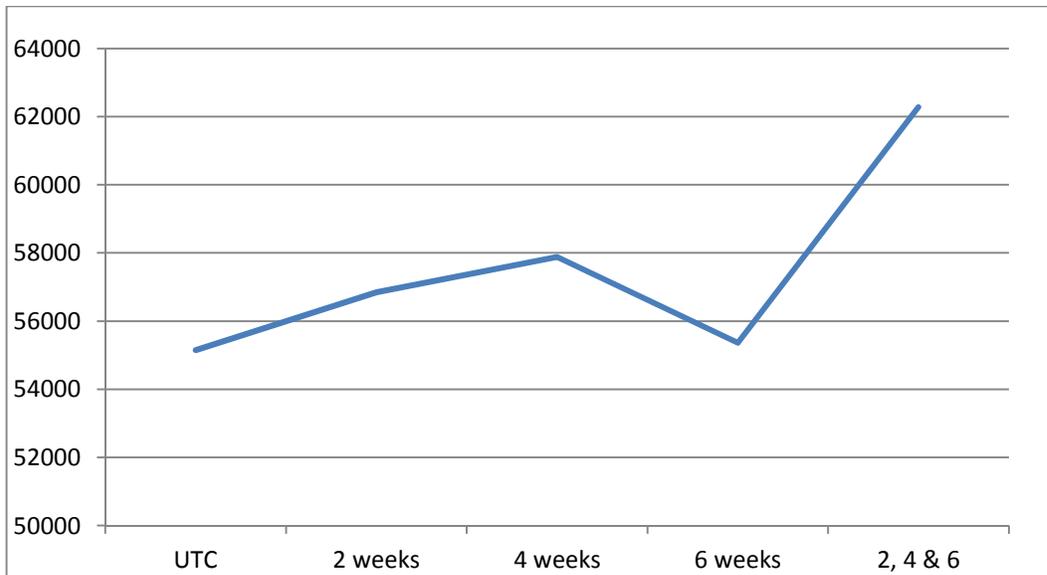
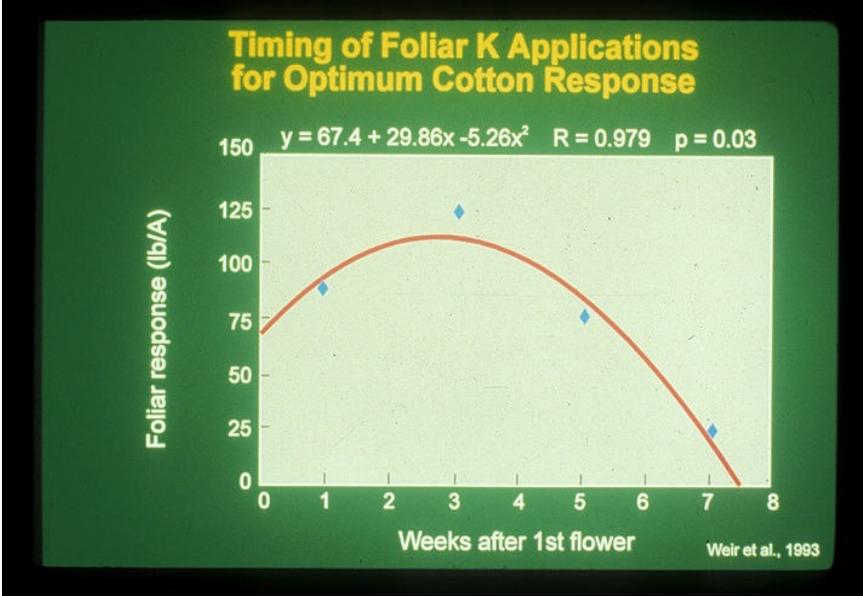


Figure # 2 – Typical Curve Showing Benefit of KNO₃ Shortly After Fruit Set.





June 29, 2010 – First Harvest and weighing peppers.



June 29, 2012 – One of the bins of peppers harvested



July 9, 2012 – Second harvest of pepper test



July 19, 2012 – Third harvest with light rain falling

CONCLUSIONS:

Figures # 1a and 1b, and figure # 2 are similar in that their yield curves peak at approximately three to four weeks after bloom. Applications prior to and after a period of fruit set and development have lesser effect on yields than during that critical period. Benefits of foliar feeding during the small window of opportunity are well known for cotton and tomato. These data indicate that pepper can also benefit in yields from foliar applications of KNO_3 since fruits are strong sinks for nutrients and plant root uptake can apparently be aided by timely applications of these nutrients.

Treatment means were not significantly different from one another, possibly due to variability in weights between replications. The study should be repeated to provide greater confidence in the findings.