COMPARISON OF EFFICIENCY OF POTASSIUM APPLICATION METHODS TO WALNUTS INCLUDING INJECTION AND DISTRIBUTION THROUGH SPRINKLERS

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ABSTRACT

Two trials were set up in potassium deficient walnut orchards to compare the efficiency of various methods of applying potassium. One in 1984 on a clay loam soil, the other in 1987 on a sandy loam soil. All treatments including sprinkler applied, drilled, semi broadcast band, and banded applications, as well as the untreated showed improvement in leaf K levels over time. Annual applications of 400 lbs per acre KCL maintained adequate K levels but was not enough to correct deficiency on the clay loam soil. On the sandy loam soil annual applications of 400 lbs/A of KCL corrected K deficient trees after two years. On the clay loam soil a single application of 1000 lbs/A of KCL did not correct deficiency and lost its benefit after 4 years. In both orchards single applications of 1500 lbs/A corrected deficiency after one or two years.

OBJECTIVE

1) To question the belief that potassium applied with water and held in the water film is more available to tree roots and, therefore, the application of potassium through sprinkler systems is a desirable way of maintaining good potassium status in the tree.

2) Also to evaluate the efficiency of this and other methods of applying potassium.

PROCEDURE

On a clay loam soil a trail was established to compare different application methods of dry potassium: 1) Jan. '84, 1000 lbs/A KCL drilled in once; 2) Each November starting in '84, 400 lbs/A KCL banded annually; 3) 400 lbs/A KCL injected through sprinkler system during each growing season, starting in '84; 4) 1500 lbs/A KCL banded in 1986; 5) 1500 lbs/A KCL banded 1986, 87, 88 and 400 lbs/A banded in 89; 6) untreated check.

The injection of KCL is accomplished with four irrigations during the growing season, each irrigation receiving 100 lbs. of KCL. Dry KCL is being dissolved in water for the injection. Liquid KCL was considered but was found to be too expensive.
Banded applications are made on two sides of the tree 6 feet from the trunk. On the sandy loam soil compare the following treatments applied with Ranchero Spreader: 1) 400 lbs/A KCL banded annually on 2 sides of tree; 2) 400 lbs/A annually out center of spreader in row center making semibroadcast band—one pass/row center; 3) 1600 lbs/A banded once; 4) Untreated check.

RESULTS

On the clay loam soil and on potassium deficient trees it took five years before the 400 lbs/A/Yr. rate of KCL corrected potassium (K) deficiency. During those 5 years banded applications showed better uptake than sprinkler applied applications.

The 1000 lb. rate applied once in 1984 showed only slight improvement and did not correct K deficiency. The 1500 lb. rate applied once or repeatedly beginning in 1987 showed immediate and continued improvement in K leaf levels.

On the trees adequately supplied with potassium banded applications of 400 lbs/A/Yr. maintained this adequacy better than sprinkler applied applications for the first four years. After that both methods provided high levels of K. High levels of chloride were found only when 1000 lbs/A KCL was drill applied and when 1500 lbs/A KCL was applied three years in a row. July leaf analysis results from this trial are summarized on Figure 1. This report concludes this part of this trial.

On the sandy loam soil, all treatments, including the untreated showed adequate leaf K levels after two years. After three years the check trees were again K deficient. Results are summarized on Figure 2.

CONCLUSION

On the clay loam soil and with K deficient trees KCL rates below 1500 lbs/A did not provide correction until applied repeatedly for 5 years.

On trees adequately supplied with K a maintenance application of 400 lbs KCL/A/Yr. maintained adequate K levels. Banded treatments maintained this adequacy better than sprinkler applied applications.

This method of maintaining good K status on an annual basis is cost effective and should be preferred by growers rather than spending a large sum of money every 4 or 5 years on a mass application and then perhaps creating a chloride toxicity problem with the mass application.
On the sandy loam soil the annual, as well as the mass dose application, provided excellent correction of K deficiency the second year after application. Of particular interest is the semi broadcast band applied in one pass per tree center. This method of application, which worked well on this soil, cuts equipment time and labor in half providing additional savings. This part of the trial will be continued for two more years.

![Graphs showing % Leaf K and % Leaf CL over years](image-url)
Fig 1 Trial 1

% Leaf K (July) - Poor K Status Trees

% Leaf K - Good K Status Trees

- Sprinkler - 400 lbs KCL/A/YR
- Band - 400 lbs KCL/A/YR
- Drilled - 1000 lbs KCL/A/84
- Band - 1500 lbs KCL/A/86
- Band - 1500 lbs KCL/A/86,87,88;400lbs-89
- Untreated

% Leaf CL