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

Bill Olson, K. Uriu, J. Pearson

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ABSTRACT

A trial was set up in a potassium-deficient walnut orchard in 1984 to compare the efficiency of various methods of applying potassium. All treatments including sprinkler-applied, drilled in applications, banded applications, and untreated showed a slight improvement in leaf K levels. Annual applications of 400 lbs. KCL/year can maintain adequate levels of K in walnuts but not enough to correct a deficiency in less than 5 years of continuous applications. 1000 lbs./A KCL is not enough to correct a deficiency and has lost its benefit after 4 years.

OBJECTIVE

To question the practice and 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. Also to evaluate the efficiency of this and other methods of applying potassium.

PROCEDURE

A trial was established to compare different application methods of dry potassium: 1) Jan. '84, 1000 pounds/acre potassium chloride drilled in every 3-4 years; 2) Each September starting in '84, 400 pounds/acre potassium chloride banded annually; 3) 400 pounds/acre potassium chloride injected through sprinkler system during each growing season, starting in '84; 4) 1500 lbs. KCL applied in 1986; 5) 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.

Leaf and soil analysis and visual symptoms are the initial measurements taken to reveal any benefits from the various application methods.

RESULTS

After 4 years of annual banded application of KCL and 5 years of annual sprinkler applied KCL leaf potassium levels have increased

as compared to untreated check trees (See Table). Treatments applied annually for 4 to 5 years to potassium deficient trees have finally corrected potassium deficiency in 1989.

Treatments applied to potassium adequate trees appear to be providing better benefit indicating that these low rates may be better suited for maintaining adequate potassium levels rather than correcting trees with potassium deficiency. The 1000 lbs. KCL/A rate applied in 1984 to K deficient trees did not correct K deficiency and may have lost its benefit in 1989; the 1500 lb. rate applied to deficient trees in 1986 continues to show good benefit.

CONCLUSION

Conclusion drawn about the efficiency of the K application methods tested indicate that foliar K sprays on walnuts appear to have no benefit; soil samples indicate that banded treatments penetrate the soil to deeper depths than broadcast treatments and as a result may be a better way to apply K; annual light applications of 400 lbs./A/year can maintain adequate K in the trees but won't correct a deficiency until applied annually for 4-5 years. 1000 lbs. KCL/A did not correct K deficiency and lost any benefit it had within 4 years. 1500 lbs KCL/A did correct K deficiency but these high rates increase the risk of chloride toxicity.

Applications and data collection will continue through 1990.

POTASSIUM-DEFICIENT TREES - % LEAF K

	Sprinkler 400 lbs KCL/A/Yr	Banded 400 lbs KCL/A/Yr	Drilled 1000 lbs KCL/A-1984	Banded 1500 lbs KCL/A-1986	Untreated Check
Pretreatment	.92	1.08	.88	.81	.86
7/85	.99	.82	.91	--	.80
7/86	.74	.86	.94	--	.71
7/87	.81	.88	.95	.93	.79
7/88	.92	1.07	.88	1.01	.75
7/89	1.40	1.29	1.05	1.25	1.09

PERCENT DIFFERENCE FROM UNTREATED

Pretreatment	+.07	+.26	+.02	-.06
7/85	+.24	+.03	+.14	--
7/86	+.04	+.21	+.32	--
7/87	+.03	+.11	+.20	+.18
7/88	+.23	+.43	+.17	+.35
7/89	+.28	+.18	-.04	+.15

POTASSIUM ADEQUATE TREES - % LEAF K

Pretreatment	1.38	1.30	1.41
7/85	1.25	1.26	1.12
7/86	1.09	1.23	1.02
7/87	1.07	1.27	1.13
7/88	1.12	1.38	1.16
7/89	1.55	1.57	1.44

PERCENT DIFFERENCE FROM UNTREATED

Pretreatment	-.02	-.08
7/85	+.12	+.13
7/86	+.07	+.21
7/87	-.05	+.12
7/88	-.03	+.19
7/89	+.08	+.09