MT-7F

ANNUAL REPORT TO PHOSPHATE AND POTASH INSTITUTE

DECEMBER 1988

TITLE: Interaction of Drip-applied Potassium with Soil Nutrients.

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OBJECTIVES:

This study was designed to determine the effects of continued application of potassium fertilizers to tart cherries through drip irrigation. Variables included:

a. Potassium source (KCl, KNO_3, and K_2SO_4).

b. Potassium rate (0, 0.35, 0.7, and 1.4 kg K_2O per tree).

c. Duration of treatment (one, two, or three years).

Specific objectives included:

1. To determine the effects of K application on tart cherry fruit production, fruit set, fruit quality, and tree growth.

2. To evaluate interactions between applied potassium and chloride and soil nutrients such as calcium, magnesium, phosphorus, and micronutrients.

RESULTS:

1. Fruit production and tree growth.

At low to moderate K rates, drip irrigation was a practical and efficient means of K application. In 1988, fruit yield, fruit set, and shoot growth benefited from the lowest rate of K (0.35 kg K_2O per tree), but higher

K rates were generally detrimental. High rates of K resulted in high foliar K levels and, when KCl was the source of K, high foliar Cl levels.

2. Nutrient interactions.

The third year of K application through drip irrigation continued to demonstrate differences in tart cherry response to K source. The higher rates of K_2SO_4 and KNO_3 increased leaf K to a greater extent than did KCl. This was apparently due to the presence of excess chloride ion in the soil.

As in previous years, KCl did not inhibit Ca and Mg uptake to the extent seen with K_2SO_4 and KNO_3.

Leaf analysis for Cl in 1988 is not yet complete. We expect this information to aid in drawing additional conclusions from this research. A more complete report will be submitted when all data are available.

CONCLUSIONS:

Yield response to K rate differed from 1987 to 1988, while the relationship between leaf K levels and yield remained constant. Yields were higher in 1988, but a lower rate of K_2O was necessary for in maximum yield in 1988 (0.35 kg K_2O per tree) than in 1987 (0.7 kg K_2O per tree), indicating a carryover effect in the soil or in the tree. However, the optimum leaf K level for maximum yield (approximately 1.5%) was the same in both years.

The choice of K source may influence management decisions. The apparent interference of Cl with K uptake is an important consideration when leaf K levels are used as a diagnostic aid. KCl is generally not recommended as a source of K for fruit trees because of Cl toxicity, and results of this research supported this recommendation.

Potassium application through drip irrigation should be cost-effective, depending upon the price of fertilizer and the return for the crop. In 1987, K application resulted in an increase of approximately 8 kg fruit for each kg K_2O applied, and in 1988 the return was approximately 10 to 1. A return of \$0.15 - \$0.25 per pound of tart cherries and a K_2SO_4 fertilizer cost of \$0.20 per pound of K_2O would mean that a grower would receive \$8 to \$10 for each \$1 spent on fertilizer.

Application of K through drip irrigation must be done with caution, as excess application will result in depressed yields and lowered fruit quality. Use of leaf analysis in conjunction with K application is recommended.