

Program Area Root zone problems

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Objectives To study the movement of fertilizer potassium in soil to determine the best means of correcting potassium deficiencies in tree crops.

Work in Progress The current work falls into four categories:

- (1) A study of the ion exchange equilibrium of potassium, calcium and magnesium with soil colloids.
- (2) Use of a computer model to predict distribution of fertilizer potassium in soil profiles. The model, which is based on the results of the study of ion exchange equilibria, allows predictions of potassium distribution in soil after various types of fertilizer applications. It also allows comparison of the behavior of different soil types. We expect that results obtained here will suggest more efficient fertilizer practices.
- (3) Fertilizer trials are underway in several commercial orchards. These trials are designed to test the use of gypsum as an aid in obtaining deep penetration of potassium in heavy textured soils.
- (4) A study of the influence of amino acids on relative uptake of potassium and magnesium by plants is nearly completed. The objective of this study is to gain more information about the effect of nitrogen fertilization practices on potassium nutrition.

Experiments Completed

- (1) A study of the influence of the exchangeable calcium to magnesium ratio in soil on the availability of potassium to rooted Marianna cuttings showed that potassium availability (at constant extractable soil potassium) decreased as the calcium to magnesium ratio decreased if the magnesium exceeded the calcium. This suggests that the high magnesium content of some of the Sacramento Valley soils may be partly responsible for low potassium availability.
- (2) The ion exchange equilibria studies have resulted in new equilibrium equations which in turn have allowed the successful development of a computer model to simulate the behavior of potassium in soil. The results from the model agree with the experiment. The employment of this model should give us new insights into fertilizer management programs.

Work Planned

- (1) Extension of ion exchange equilibria studies to characterize all of the important orchard soil types.
- (2) Studies with the computer model on mode of fertilizer application and soil type to determine the most promising approaches to fertilizer management.
- (3) Greenhouse studies to determine availability of fertilizer potassium as a function of distribution in soil (i.e. concentrated bands vs. uniform distribution.)
- (4) Field trials to test new approaches resulting from above.

Major Accomplishments Development of the computer model which in minutes allows the attainment of information that would require months to do experimentally.

Evaluation of Project The basic work of setting up the approach to the study of fertilizer potassium problems has been successfully accomplished. The project is now entering a phase which should yield much information useful for resolving field problems.

Publications or Reports None for 1970.