

Program Area: Root Zone Problems

Project Number and Title H991 : Potassium nutrition of fruit crops in relation to root and soil properties.

Project Leader: R. M. Carlson

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

Work in Progress:

The computer model for predicting downward movement of potassium in soil profiles is being tested by comparison of predicted distribution of potassium in layered columns of soil with the distributions found in laboratory experiments with soil columns.

The chemical analysis of soil and leaf samples taken from the potassium sulfate - gypsum trials are being completed. The data will then be analyzed to determine the effectiveness of gypsum in displacing potassium downward to the root zone.

A field experiment based upon predictions from the computer model has been initiated in the Zumwalt orchard near Colusa. The main purpose of this experiment is to confirm the usefulness of the computer model in predicting the field situation and to supply a basis for adjustment of the model to meet the field situation if this is necessary.

Experiments Completed:

A root growth study in glass front boxes and a pot experiment in the greenhouse dealing with potassium availability in relation to distribution of potassium in the root zone have been completed. These experiments show

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that roots have no difficulty growing through soil that is high in exchangeable potassium (in contrast to high exchangeable sodium soil which kills the roots), and that potassium seems to be as available from a concentrated form as when it is dispersed through a larger volume of the root zone. These experiments were done with seedlings and need to be followed up with field work involving mature trees.

Work Planned:

At least two more field experiments based upon computer model predictions need to be established to test the model for the field situation.

The possibility of expanding the model to include sodium and ammonium ions will be explored. If this can be done, it will allow prediction of development of alkali soil problems in relation to water quality and water management practices and may be of assistance in managing nitrogen fertilization.

Additional laboratory work on availability of potassium as a function of soil temperature and release of potassium to available forms from soil minerals is contemplated.

Major Accomplishments: Development of a computer model for prediction of behavior of fertilizer potassium.

Evaluation of Project: The project is progressing at near the anticipated rate. It will now move into a phase of applying theory in the field.

Publications or Reports: Oral reports given on Prune Day 1971 and 1972.

Carlson, R. M. and J. R. Buchanan. Potassium-Calcium-Magnesium Ion Exchange Equilibria in some California Soils. Submitted to Soil Science Society of America Proceedings for Publication.