

PRELIMINARY STUDIES ON THE USE OF RUBIDIUM AS A POTASSIUM TRACER IN PRUNES.

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PROBLEM AND ITS SIGNIFICANCE

Potassium is an essential nutrient, vital to the health of a mature, cropping prune orchard. Potassium fertilizer is significant annual expense for prune growers, and research to improve potassium fertilizer use efficiency should benefit prune growers. Unfortunately, a non-radioactive tracer for potassium research (such as ^{15}N used in nitrogen studies) does not exist, and changes in leaf nutrient concentrations don't always match changes in plant nutrient content. Without a tracer to follow current fertilizer uptake, researchers must rely on destructive, whole tree sampling to measure differences in tree nutrient absorption. This approach is expensive and time consuming. Tree crop potassium research would benefit from the development of practices to study potassium uptake and movement in the tree/orchard.

Rubidium is an element in the same chemical family as potassium, and has chemical properties similar to potassium. Rubidium has been used as a potassium analog in agricultural and natural ecosystems research for many years. It does not function exactly like potassium in plants and animals, but is non-toxic, relatively inexpensive and behaves similarly to potassium.

Rubidium occurs naturally in soils in amounts that are just a fraction of potassium content. In contrast, fertilizer potassium contains very little rubidium, so changes in plant potassium to rubidium ratios have been used as a means of measuring changes in fertilizer potassium content of plants – both trees and annuals.

We propose research to test the feasibility of using rubidium in prune orchards as a tool to assess root system activity at different times of the year and in different locations in the soil. In addition, we will evaluate the potential for use of potassium/rubidium ratios in future potassium research.

Objectives:

- 1) Learn how to use rubidium in experiments in prune orchards.
- 2) Evaluate the possibility of using a ratio of potassium to rubidium as a way of labeling tree potassium content and thus tracking apparent uptake of potassium fertilizer.

PROCEDURES

An experiment was set up in a commercial prune orchard in Sutter County to test rubidium as a potassium tracer. The experiment will test the hypothesis that adding gypsum to a band of potassium sulfate fertilizer applied to the soil under prune trees in the late fall or winter can increase potassium availability early in the spring following application. Five trees were treated with potassium + rubidium at a rate equivalent to 400 pounds of potassium sulfate per acre. Seven percent of the fertilizer was applied as rubidium sulfate (100 grams/tree). Five other trees were treated with the same amount of potassium/rubidium, and granular gypsum equivalent to 1000 pounds per acre was applied over the top of the potassium. Five other trees received just gypsum and no potassium. Five additional trees were identified as untreated control trees. They received no fertilizer.

Leaves and fruit will be sampled from all 20 trees at different dates through the 2010 growing season and analyzed for potassium, rubidium, and calcium.