L. L. CLAYPOOL

Better Fruits

for the consumer

The various deciduous fruit industries in California are attempting to improve quality, flavor, and appearance of their products to attract more consumer dollars to their commodities.

One of the research programs associated with improvement concerns harvest maturity. The dessert quality of a peach or a plum may be greatly influenced by the maturity at which it is harvested. However, to harvest a fruit at the stage that gives highest dessert quality is not always possible, particularly if at this stage the fruit is not sufficiently sturdy to move through market channels. Continuing improvements in transportation and marketing facilities, however, have made it possible for the industry to harvest and ship fruits at a maturity stage that will more nearly result in maximum flavor quality.

Studies are being made of the physical and chemical changes that take place in fruits during maturation and the relationship of these to dessert quality, appearance, and marketability of fruits. The new fruit varieties being planted compound the problem. Some of these have such intense red surface color so far in advancement of proper maturity that the picker and shipper cannot tell when to market them. Various physical or chemical tests promise help in this situation.

The problem of maturity is confused by the constantly greater yields being produced per unit area of land. It seems that, under some conditions, at least, these tonnages have attained such magnitudes that the harvested fruit is of very poor flavor quality regardless of maturity.

A research program on fruit maturity during recent years has been helpful to both the fresh pear industry, in developing information from which maturity standards have been derived, and to the dried prune industry, in determining the proper time to harvest for best quality dried fruit. Research now underway on nectarines, freestone peaches, and plums promises to be helpful in improving the quality of products of those industries.

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Widespread Zinc Deficiency in California soils

Zinc deficiency has been common in citrus and other tree fruits in California for many years. More recently, it has been observed in annual field and vegetable crops. A study was set up to delineate the extent of zinc deficiency in California, and to develop means of predicting where it might occur..

Preliminary analyses of soils and plants from fields where zinc deficiency symptoms were observed indicated that zinc extracted by ammonium acetate-dithizone might be a useful measure of soil zinc available to plants. To test this method of analysis under a wide range of soil conditions in California, farm advisors cooperated in securing soils in which zinc deficiency was observed or might be expected. Chemical analyses and greenhouse assays were conducted on 50 soils, and preliminary field trials with zinc sensitive crops were established in certain locations.

In the greenhouse study, a standard procedure was developed in which sweet corn was grown in 1,600 grams of soil—6″ pots—using the five treatments in duplicate: nitrogen alone; nitrogen-potassium-phosphorus; nitrogen-potassium-phosphorus with five pounds per acre of zinc; nitrogen-potassium-phosphorus with 25 pounds per acre of zinc; nitrogen-potassium-phosphorus with 25 pounds per acre of zinc and other micronutrients. Purified chemicals were used, and the nutrient sources were: nitrogen as ammonium nitrate or ammonium sulfate; phosphorus and potassium as potassium dihydrogen phosphate; zinc and the other micronutrients as sulfates. At the pretassel stage, the plant tops were harvested, washed in acidified detergent solution, rinsed in demineralized water, dried at 158°F, weighed, ground, and analyzed for zinc by X-ray fluorescent analysis. After harvest, soil samples were taken and analyzed for zinc by the ammonium acetate-dithizone extraction method.

The extractable zinc of soils was closely related to zinc response of plants on the 50 soils studied in the greenhouse. Eighty-four percent of the soils which contained 0.55 ppm—parts per million—or less extractable zinc responded to soil applications of zinc sulfate. In contrast, 76% of the soils containing more than 0.55 ppm failed to respond to zinc applications.

Plant Uptake of Zinc

Soil-applied zinc increased the zinc concentration and total zinc uptake by plants in all soils studied. The uptake of zinc was consistently increased with increasing rates of applied zinc in both the low and high zinc soils. The total uptake of zinc by corn in the no-zinc

A typical response to soil-applied zinc sulfate—the three pots on the right received zinc treatments.

pots was much greater in the high group than in the low group, but the increase due to zinc application was similar in both groups. The average recovery of the applied zinc from the 5- and 25-pounds-per-acre rate was 9.1% and 3.4%.

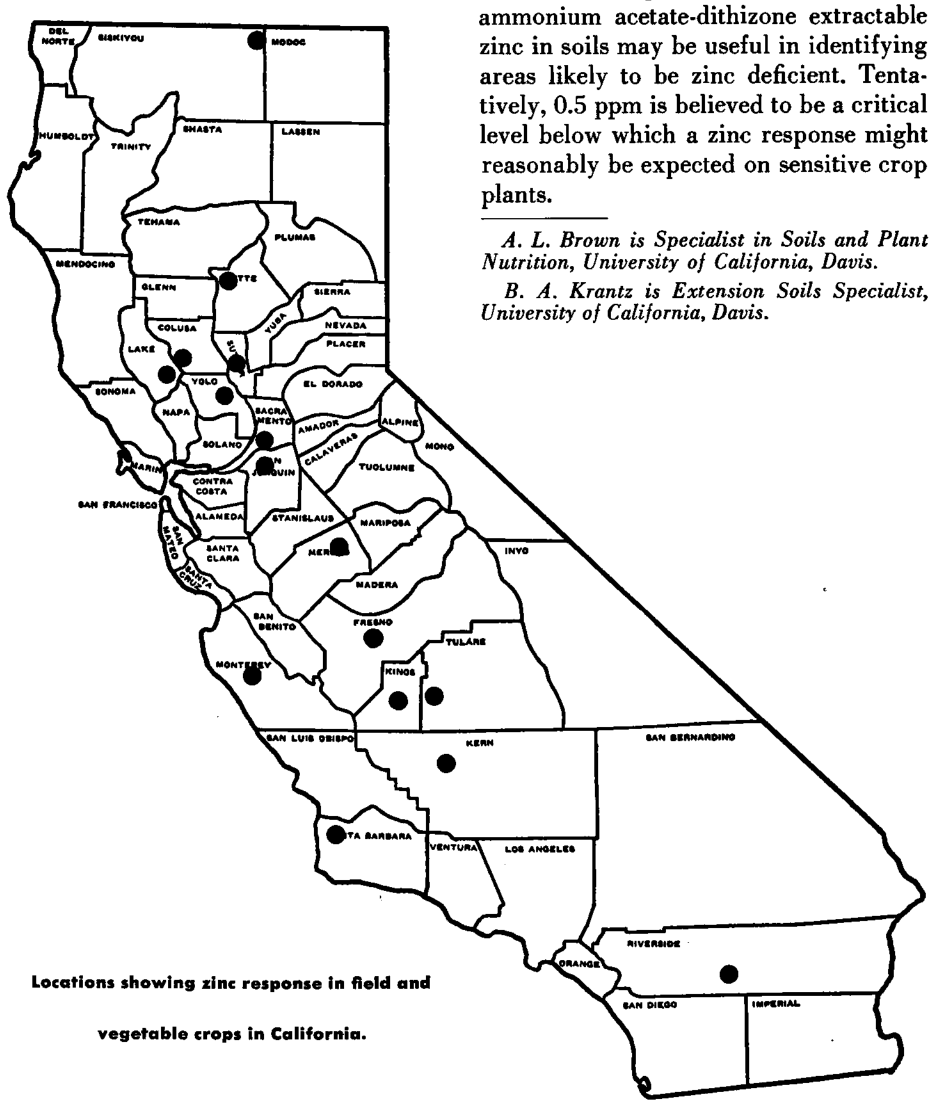
The zinc concentration was quite variable in the plant material grown in the no-zinc treatments. It ranged from seven to 31 ppm in the low-zinc soils, and 12 to 62 ppm in the high-zinc soils. With this great variability, zinc analyses of corn plants showed less promise than did soil analyses as a means of predicting zinc deficiency. It is possible, however, that a better correlation would be obtained if a specific plant part were analyzed. Zinc concentration in the plant was increased by zinc application regardless of initial level. The average increase of zinc from the 5-pounds-per-acre treatment was six ppm and 20 ppm from the 25-pounds-per-acre rate.

The increase in extractable soil zinc as a result of zinc application was similar for both the low- and high-zinc soils, and was quite consistent for the soils studied. Approximately 35% of the zinc applied to the soils remained as dithizone extractable zinc at the termination of the experiments.

Soil-applied Zinc

To study further the fate of soil-applied zinc, samples were taken from four fields where soil applications of zinc sulfate had been made. The results indicate that an appreciable amount of the soil-applied zinc may remain in the extractable form for several years. The residual effects of these zinc treatments upon plant growth are also still apparent.

Zinc deficiency was found under a wide range of pH—relative acidity-alkalinity—from 6.3 to 8.3. In the 50 soils studied, there was no apparent relationship between pH and extractable zinc. Likewise, there was no apparent relationship between soil pH and either response of plants to zinc application or recovery of applied zinc in extractable form after cropping.



Locations showing zinc response in field and vegetable crops in California.

Zinc deficiency symptoms or growth responses have been noted on several field crops, including sweet corn, field corn, tomatoes, cotton, sorghum, onions, beans, barley, and alfalfa. The visual deficiency symptoms are generally more apparent in the early stages of growth. Later in the growing season the deficiency symptoms and growth differences may disappear. Zinc deficiency usually occurs as spotty areas in fields. These are often related to removal of surface soil in land levelling.

Some crops show no obvious leaf symptoms for zinc deficiency. This makes the problem of diagnosing such areas, on the basis of plant growth, very difficult if not impossible. The amount of ammonium acetate-dithizone extractable zinc in soils may be useful in identifying areas likely to be zinc deficient. Tentatively, 0.5 ppm is believed to be a critical level below which a zinc response might reasonably be expected on sensitive crop plants.

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