California Agriculture. 1958. 12(6):4-5.

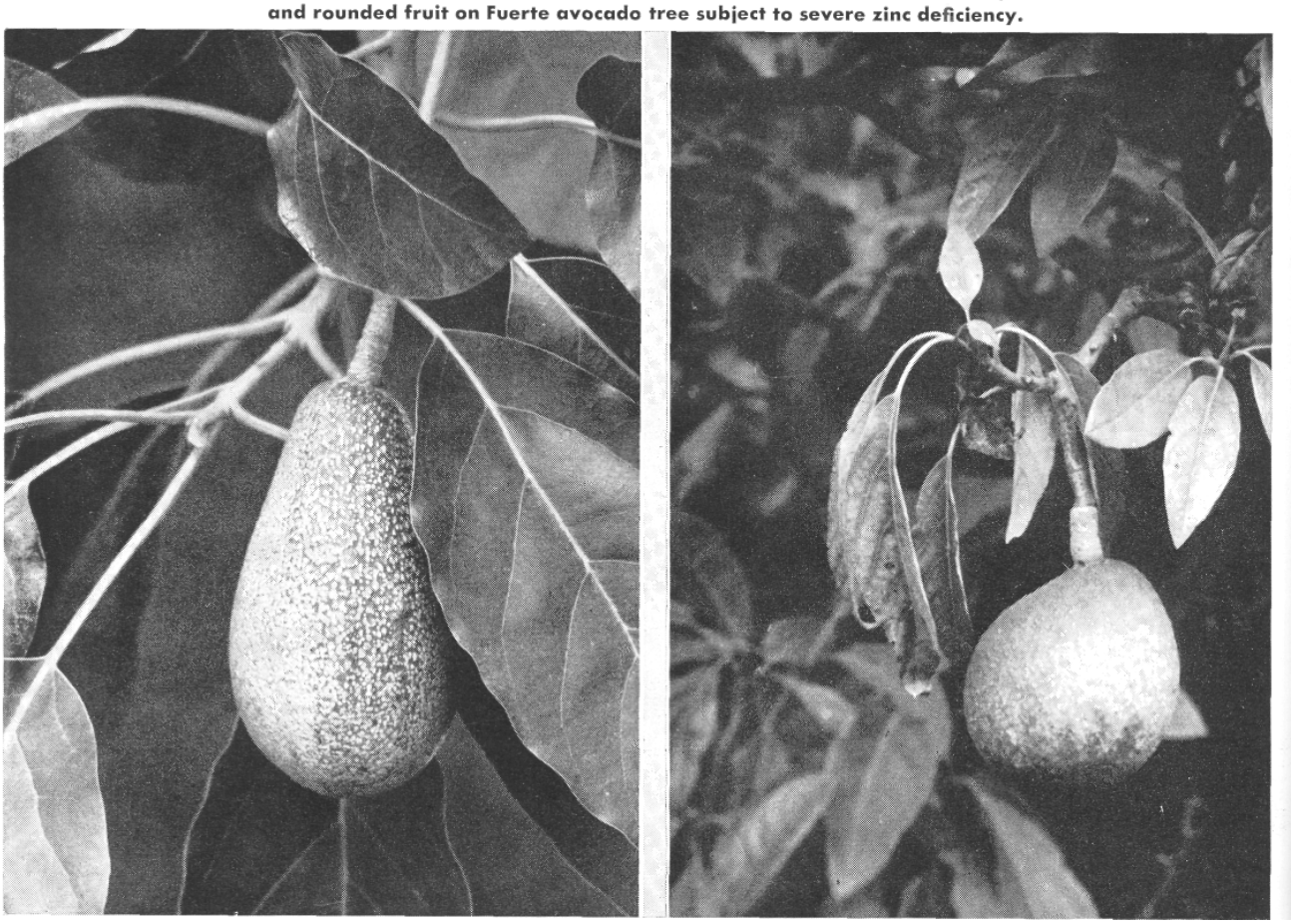
Zinc Deficiency in the Avocado

Application of zinc chelates to soils may solve the zinc problem in trees on land too steep for spray rig operation

E. F. Wallihan, T. W. Embleton, and Wilma Printy

Zinc deficiency of avocado trees—a problem common in California orchards—has retarding effects on tree growth, fruit production and in some varieties causes the fruit to be more round than is characteristic for the variety, which reduces the market value.

Left—Normal leaves and fruit on Fuerte avocado tree supplied with adequate amount of zinc. *Right*—Small, mottled leaves and rounded fruit on Fuerte avocado tree subject to severe zinc deficiency.



The standard practice for correcting zinc deficiency is periodic application of zinc sprays. However, some orchards are on slopes too steep for spray rigs.

Because laboratory experiments have demonstrated that chelated zinc is less readily fixed in soil than is zinc sulfate and moves downward from the surface more easily, field

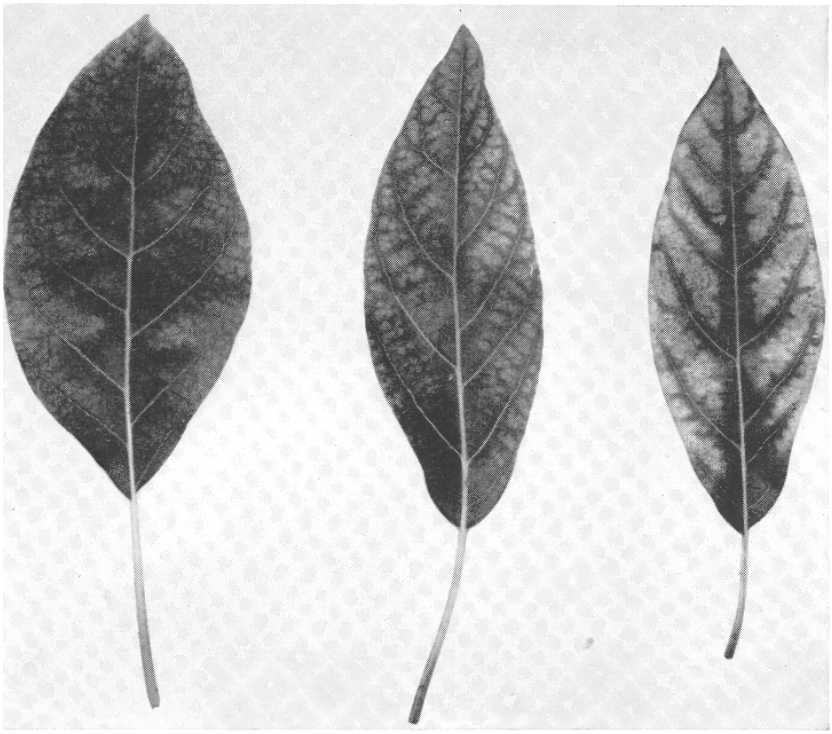
tests were made to find out whether zinc chelates are effective when applied to orchard soils. Emphasis was placed on Fuerte avocado orchards in San Diego County because many of them lie on steep slopes.

Results of the tests indicate that mild zinc deficiency of avocados can be corrected by application to the soil of about one pound of zinc chelate per tree. Rates as high as four pounds of zinc chelate per tree have been tried and no evidence of injury has been found.

Symptoms

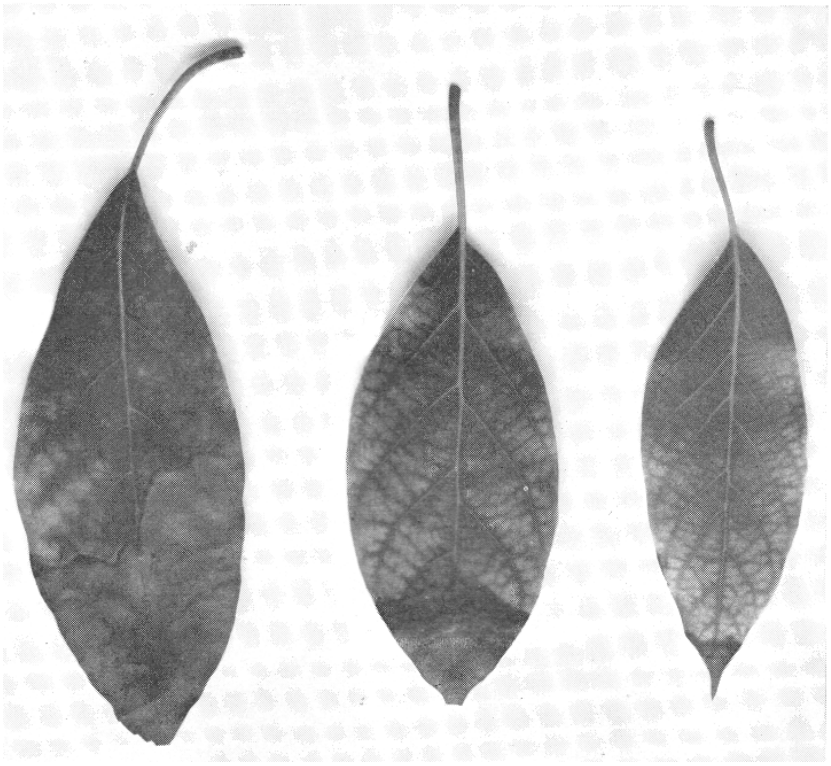
Generally, the leaf pattern that is characteristic of zinc deficiency—in the Fuerte variety—develops when the zinc concentration in the dried leaf falls as low as 15 ppm—parts per million. The lowest value found so far is 4 ppm. Leaf analysis proved to be an effective tool in this study.

It is possible to confuse the leaf patterns resulting from zinc deficiency with those associated with high concentrations of chloride in the leaves. In the case of chloride injury the mottling is more severe near the edges of the leaf than near the center. On the other hand, zinc deficiency results in a rather uniform mottling between the veins. Furthermore, chloride excess often causes tipburn of the leaves, sometimes even in the absence of apparent mottling.



Patterns on Fuerte avocado leaves resulting from zinc deficiency. Increasing severity from left to right.

Patterns on Fuerte avocado leaves associated with high concentrations of chloride. Increasing severity from left to right.



Another symptom in Fuertes that has been corrected by the zinc chelate treatments is the tendency for fruits to become quite round rather than the normal pear shape.

As is true with many plants, zinc deficiency causes abnormal development of growing shoots. The more severe stages result in stunted and misshapen leaves and twigs, a condition known as little leaf or resetting. Two or more applications of zinc chelate have been required —in some cases—to alleviate little leaf completely.

Chelates Tested

Two types of chelates and three methods of application were tested. NaZnEDTA — zinc ethylene diamine tetraacetate—and NaZnHEEDTA—zinc hydroxyethyl ethylene diamine triacetate —were applied dry to the soil under the trees; pressure injected in solution into the soil under the trees; and dissolved in irrigation water applied through sprinklers.

Both types of chelates and all three methods of application were effective. There is not enough information available to indicate the superiority of one material or method over the others. At present, application in irrigation water is favored because of its simplicity. The material is dissolved in water in a spray rig and pumped into the pipe line during irrigation. Other devices used for application of soluble fertilizers should be equally satisfactory for use with zinc chelates.

Duration of Effectiveness

The earliest treatments for which leaf analyses are available show that the application of one pound of ZnEDTA per tree—trees about six years old—raised the zinc content of leaves from 15 ppm to 50 ppm and completely eliminated visible deficiency symptoms. To date— two and one half years after treatment— the zinc concentration in leaves has not decreased and the trees remain free from zinc deficiency symptoms. Additional studies are being made to determine whether such durability can be generally expected.

Field experiments now in progress and others to be started are expected to provide more detailed information on the usefulness of various zinc materials for avocados and citrus, grown on various types of soils.

E. F. Wallihan is Associate Chemist in Soils and Plant Nutrition, University of California, Riverside.

T. W. Embleton is Associate Horticulturist, University of California, Riverside.

Wilma Printy is Senior Laboratory Technician, University of California, Riverside.