California Avocado Society 1972-73 Yearbook 56: 51-53

FERTILIZATION OF AVOCADO TREES

C. D. Gustafson
University of California Farm Advisor, San Diego County

Avocado trees, like other plants, require mineral nutrients for growth and production. These nutrients are obtained from the soil by the root system of the tree. After a tree has grown in the soil for some time, certain of these mineral nutrients may become depleted or, for other reasons, the roots may be unable to obtain enough to supply the trees. It is then necessary to apply fertilizers to overcome these deficiencies.

Fortunately, avocado trees are good foragers and are able to obtain adequate amounts of the elements needed for plant growth without too much fertilization. On certain types of soils, however, fertilizers must be applied to provide nitrogen, zinc and possibly some other of the required nutrients.

"Give avocado trees only what fertilizer they need, no more," is a good rule to follow. The latest technique in learning what avocado trees need is leaf analysis. Leaf analysis will tell you the level of nitrogen, phosphorus, potassium, calcium, magnesium and other nutrients present in the leaf.

Spring cycle leaves taken from trees in the fall months are subjected to a chemical test in the laboratory. The nitrogen percentage is the most reliable figure, and that of which most is known, in relationship to production. If this percentage in the leaf is between 1.6 and 2.0 percent it indicates that sufficient nitrogenous fertilizer has been applied.

Leaf analysis, coupled with a knowledge of what fertilizer has been used and tree observation, affords the grower the best method of determining the fertilizer needs of the tree.

NITROGEN

Nitrogen is the most widespread deficiency in California avocado orchards. Nearly all orchards require some nitrogen fertilization each year in order to maintain normal yields.

The amount of nitrogen required by avocado trees will vary as to variety and age. The following is a guide to a schedule of dosages of nitrogen material per tree needed by the Fuerte variety of various aged trees: First year, 1 tablespoon of commercial fertilizer (such as ammonium nitrate) each third irrigation; Second year, ⅛ pound of elemental nitrogen in split applications each year; Third year, ¼ pound of elemental nitrogen in split applications each year; 4 to 5 years, ½ to ¾ pound of elemental nitrogen each year; over 5 years, 1 to 1½ pounds elemental nitrogen each year depending upon soil, tree vigor, cover crop, etc. This is where leaf analysis can help determine the correct amount needed.

Hass trees need more fertilizer than Fuertes, probably twice as much.

Nitrogen can be best applied in a chemical form. Materials such as calcium nitrate (15 percent N), ammonium nitrate (33 percent N), urea (42-45 percent N) are materials which can be used in a good fertilizer program. The most commonly used one is ammonium nitrate. Reasons for this are that it is usually the cheapest source of nitrogen per pound of actual nitrogen and the material leaves no residue. The material is composed of ammoniacal nitrogen and nitrate nitrogen and will be broken down into the form most readily available to the avocado tree.

A change, or rotation, of materials every two years is suggested. A program which could be followed is: two years with ammonium nitrate, two years with urea and the fifth year with ammonium phosphate. The use of phosphate is more of an insurance against the possibility of a future deficiency than an actual present need.

Nitrogen may be applied either once or twice a year on mature trees. February and July are good months to spread fertilizer. It is not recommended to fertilize during the blossom and fruit setting period of March through June.

Nitrogen deficient trees will show leaves a light green in color. Extreme cases show yellow veins with very pale green areas between the veins. Growth and yield are reduced.

ZINC

Zinc deficiency, usually referred to as mottle leaf, occurs commonly on avocado trees. It is the one micronutrient element most often recognized as being deficient. This deficiency causes reduced tree vigor and lower yields, and if it is not corrected the tree may die from lack of zinc.

Symptoms of mottle leaf are light yellow areas between the veins starting at the margin of the leaf and extending to the midrib and base, small and narrow leaves, pear-shaped fruit becomes oval to round and smaller than normal, terminal growth is a "feather duster" type, twigs die back and defoliation occurs. This deficiency is easily corrected either by a foliage spray or, in some soils by soil application.

The foliage spray can be made at any time during the year but for maximum effectiveness early spring is recommended. Foliage sprays: Formula # 1, 3 pounds zinc sulphate (36% metallic zinc), 2½ pounds hydrated lime or soda ash and 100 gallons of water. Formula #2, 2 pounds zinc oxide and 100 gallons of water. Also, recent trials show 1 pound of zinc sulfate (36% zinc) per 100 gallons water to be an effective spray.

Application of zinc may also be done by aerial spraying from a helicopter or fixed-wing aircraft. The following formula and dosage can be used: #6 $ZnSO_4$ (36% met. Zn) per 20 gallons of water per acre. (Equals 2.16# met. Zn/Ac.).

Soil application with zinc sulphate (36 percent metallic zinc) may be used with good results on acid-type soils. Soil application is suggested for orchards where spray rigs do not have access, such as crowded tree conditions and steepness of land. Soil treatment gives a slower response than the foliage spray but has a longer lasting effect. Soil application will be effective up to five years while spraying must be done on an annual or every-other-year basis.

Effectiveness of zinc placed on the soil depends upon the type of soil, soil pH and rate

of application. The more coarse and open the soil, the quicker the response. On clay-type soils, the period before any correction is noticed will be about one year after application. Soil applications on alkaline soils are seldom effective.

Application of zinc on the soil can be done at any time during the year. The following is a table of dosages for various aged trees zinc sulfate containing 36 percent metallic zinc.

Age in Years	Dosage
2	0.7 lb. zinc sulphate per tree
5	2.0 lb. zinc sulphate per tree
7	2.6 lb. zinc sulphate per tree
10	3.3 lb. zinc sulphate per tree
15	5.3 lb. zinc sulphate per tree
20	6.7 lb. zinc sulphate per tree

Method of application is to place the material in a band about two feet wide on the dripline of large trees. For smaller trees use a proportionately narrower sized band.

Maintaining a supply of zinc to the tree will prevent deficiency from occurring. Avocado trees supplied with sufficient zinc remain in a healthy condition.

Phosphorus and potassium may be used in a fertilizer program, but they are not recommended. The avocado seems to require relatively small amounts of these elements and it has no trouble obtaining them from local soils. Heavy applications of these nutrients can cause deficiency of other important nutrients which avocados need.

Phosphorus and potassium are not lost in the soil through leaching, therefore, it is unnecessary to keep applying these materials each year. Good judgment and care should be used if phosphorus and potassium are applied.

IRON

Iron deficiency does not occur generally in California. In areas where avocado trees are planted in calcareous soils, iron deficiency will usually be evident.

Symptoms of this problem appear on the leaves, and in severe cases, defoliation and twig die back takes place. Leaf symptoms show a pale green to yellow color between the veins and veinlets. Veins remain green. As the deficiency increases the area between the veins becomes yellow to whitish in color and the veins lose their green color. Leaves will be smaller, completely chlorotic and show marginal and tipburn in severe cases.

Control or correction of this deficiency is not always possible. High limestone (calcium carbonate) in the soil limits the utilization of iron by the plant. Mexican and West Indian type rootstocks are more tolerant to high lime soils than are Guatemalan rootstocks. Iron chelate materials have given variable results. Treatment is expensive. An application of a chelate, ¼# - ½# per mature tree in May or June is suggested. This can be done annually.