

## Effects of Chlorides in the Soil on Avocado Trees

**E. E. Thomas**

*Citrus Experiment Station, Riverside, California*

Talk given at Farm Bureau Field Meeting, Rancho Leucadia, Encinitas, 14, 1932.

The avocado tree is very sensitive to soluble salts. This is especially true of the chlorides, as calcium chloride, magnesium chloride, and sodium chloride under certain conditions may be toxic to avocado trees. Sodium chloride or common salt, speaking chemically, is not an alkaline salt. It is one of the so-called "white alkali" salts, but chemically it is neutral. The soils in this neighborhood are slightly alkaline, but most of the injury caused by soluble salts can be attributed to the chlorides in the soil solution. In this district and some others also, the chlorine was in the soil originally. It is also added to the soil in some places by irrigation water. The only practical method of removing sodium chloride from the soil is by leaching—putting on water and leaching it down through the soil, thus removing the salt. The chlorides are very soluble in water and they will go wherever water goes. Therefore, if you have sodium chloride in your soil and also have good sub-drainage for the removal of the drainage water, you can put water on and leach it out immediately providing the water will move through the soil. This, however, is not true of all salts. So, from this standpoint, you should be very glad that you have chloride present rather than black alkali or sodium carbonate.

Some of the speakers have told us of the work which Dr. Haas has done. He found in one place that avocado trees were injured by water which contained but 52 parts per million of chlorine. In this case the soil had poor drainage and the soluble salts did not penetrate into the subsoil below the root zone. Many irrigation waters contain more than 50 parts per million of chlorine. Not very many miles from here there are waters which contain more than 100 or even 200 parts per million of chlorine, but you can leach it out providing the water will move through the soil and you have some method of removing the drainage water.

There are many factors which must be considered in this connection. Avocado trees may be injured by a concentration of 100 parts per million of chlorine. On the other hand, trees growing on another soil with a concentration of 200 parts per million of chlorine may be in fine condition. This may possibly be accounted for by a difference in the amount of nitrogen in the two soils. The various ions or salts in the soil are less toxic in the presence of a sufficient supply of nitrogen. Sulphates appear to be less injurious than chlorides which are chiefly responsible for tip-burn.

I am not a drainage expert. Mr. W. W. Weir of the College of Agriculture is our drainage man and he informs me that in a number of districts the soil can be drained by putting in drain tile. When the drains are installed you can add water and leach out the sodium

chloride.

One thing you must remember in irrigating your soil, especially in a sandy type where you may have chlorine present, is to keep up the water supply in the soil. For example the light sandy loam soil in Dean Palmer's grove will contain in the neighborhood of 10 per cent of moisture at field capacity and the soil solution at this point might contain 100 parts per million of chlorine. Should the soil moisture be reduced to 5 per cent, the concentration of chlorine in the soil solution would be doubled and this might be above the danger point. You must maintain enough moisture in the soil to keep the salts diluted to less than the danger point, and put on enough water at one time to leach the salts to levels below the main mass of feeding roots.

**Mr. France:** I might state that on this particular ranch, which was tile-drained last year, we have found by several analyses that the salt usually runs from 75 to 90 parts per million and sometimes as high as 300 parts per million.

**Question:** If you leach salt out, do you wash away your fertilizers?

**E. E. Thomas:** Yes, but perhaps you should remove the salt anyway. Some soluble nutrients will go out with it and these will have to be replaced. One point which I wish to make in this connection is that it isn't necessary to have absolutely pure water for leaching. In fact, it is better to have water that does contain some soluble salts. Calcium salts in particular may granulate the soil and leave it in better condition for leaching.

**Question:** Has anybody analyzed the irrigation water in Vista for chlorine?

**E. E. Thomas:** Yes, we have analyzed that irrigation water. In fact we have analyzed several of the "impounded water" supplies in the County and in no case have we found salt really detrimental. However, many of the well waters in this part of the county show salts running from 250 to 300 parts per million and the chlorine in these may sooner or later prove injurious to avocado trees.