

EFFECT OF SOIL EROSION ON THE SUSCEPTIBILITY OF AVOCADOS TO ROOT ROT IN THE FALLBROOK AND ESCONDIDO AREAS

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The apparent relationship of soil erosion or loss of topsoil to the occurrence of root rot in avocado plantings in California has been noted for many years. This has been especially clear on eroded upland soils formerly planted to grapes in the vicinity of Escondido, and to similar soils planted to olives in the vicinity of Fallbrook, in San Diego County. These crops had been grown without irrigation, and intensive clean cultivation was practiced for weed control and moisture conservation.

Surveys conducted by the Soil Conservation Service indicated that these soils had suffered moderate to severe erosion and loss of topsoil during the time they were planted to these crops. (1, 3) These soils were identified as members of the Fallbrook and Las Posas series.¹ Moderate erosion was defined as a loss of 25 to 75 percent of the original topsoil; severe erosion as a loss of more than 75 percent of the original topsoil and a portion of the subsoil.

It has been suggested that the apparent susceptibility of avocados to root rot on these eroded soils might be due to their general loss of tilth and fertility, to their loss of organic matter, or to depletion of their available phosphorus. The latter seems particularly plausible because of the success of applications of superphosphate in the treatment of littleleaf disease of pines on eroded, phosphorus-deficient soils in New Zealand, reported by Newhook. (6) This disease is attributed to the infection of pine roots by *Phytophthora cinnamomi*. However, heavy applications of superphosphate to root rot affected avocado trees on moderately eroded Las Posas soils in the vicinity of Escondido have produced generally negative results.

Studies by Bingham and Nelson (2) have shown that avocado roots are extremely sensitive to sodium, and were injured when irrigation water with a sodium adsorption ratio (SAR) in excess of 4 was applied to avocado roots in sand cultures. They concluded that avocados growing in soils with more than 4 to 5 percent exchangeable sodium might be similarly injured.

Nettleton and his associates (5) have found that exchangeable sodium exceeded these injurious levels in the lower subsoil of a typical Fallbrook soil not significantly affected by erosion, and throughout most of the profile of an irrigated Fallbrook soil. Loss of 75 percent of the surface soil—the Ap and A12 horizons—would increase the average exchangeable sodium in the surface foot of the latter from 5.25 to 7.58 percent.

The author has found a high positive correlation between maximum exchangeable sodium in the subsoil and the incidence of root rot in the Fallbrook area. (4) Since most

feeder roots of avocados occur in the surface foot of soil, an increase in this magnitude in the percent of exchangeable sodium in the surface soil might be expected to cause considerable injury and to significantly increase their susceptibility to attack by *Phytophthora*. It therefore seems reasonable that this may account for the high incidence of root rot on such eroded soils in the Fallbrook and Escondido areas.

¹The Fallbrook soils are classified as *Typic Haploxeralfs*, and the Las Posas soils as *Typic Rhodoxeralfs*, according to the present U.S.D.A. taxonomy. (7)



Figure 1. Remnants of root rot affected avocado trees removed from a severely eroded Las Posas soil, formerly planted to olives.

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