

## Importance of Soil Aeration for Avocado Roots

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Avocado seeds are relatively easy to germinate in sand or soil. They may also be sprouted by placing them in tap water while supported in the neck of a bottle, or may be sprouted in sand or soil and early transferred to a bottle of tap water. If the neck of the bottle is wide, the seed is supported by means of nails, glass or wooden pegs inserted in a circular position in the seed. The root and stem begin growth at about the same time. At first the root is white in appearance and is covered with spongy tissue for better root aeration. Soon the roots darken and begin deteriorating. Frequent renewals of the tap water which contains certain salts ultimately fail to prevent root tissue breakdown.

Sometimes minute, green-colored water plants (algae) develop on the roots and inside surfaces of the bottle. When the water receives sufficient light the algae thrive and in turn help to maintain the roots in excellent condition. It is known that green algae in the light carry on the processes of food making and while they give off carbon dioxide gas into the water continually in the light as well as in darkness, they give off considerably more oxygen than carbon dioxide when they are in the light. It is no doubt this oxygen supply, among other things, that invigorates the root growth.

If we keep out algae by darkening the bottle with black paper or place the sprouted seed in a hole in a board that covers a pan of culture solution, the roots grow for a time, but soon are injured despite the supplying of adequate supplies of plant food (fertilizer salts) in the culture solution.

I have some avocado plants growing through boards, coated with Valspar, with the roots growing in 5-gallon capacity enameled pans containing all of the salts considered essential for healthy growth. It was found that unless oxygen or air (which contains oxygen) was passed into the solution to displace some of the carbon dioxide given off in the respiration of the roots, that the roots only survived for a short time. This was followed by a new lot of fresh rootlets which put out back of the injured portions whenever the top put out a new cycle of growth. This injury to the roots was overcome by passing air into the solution in a fine stream through a capillary tube.

One seedling of the Spinks variety has now reached a basal trunk circumference of 3 inches and the top has attained a height of over 6 feet, with a spread of about 5 to 6 feet. The roots have out-grown the 5-gallon capacity of the pan and this plant has been transferred to a 10-gallon capacity crock.

Obviously none of us hope to grow our avocado trees in solutions. But the success achieved in growing them in solutions at the Citrus Experiment Station in contrast to the failure in growing avocado trees in permanently wet poorly drained soil should cause us to ask the question "Why the difficulty in the field?" No doubt the factor of aerating the solution in these artificial cultures is also of importance in the field. We cannot bubble oxygen or air into the soil with a tube but we can so practice the proper use of irrigation

water so that with adequate drainage and use of water by the tree, air may be drawn into the soil. Covercrops may be utilized as an aid in keeping soil moisture and soil gases on the move. Avocado roots require abundant aeration for healthful growth.