

BENEFITS OF GOOD ROOT HEALTH:

- Roots provide nutrients and water for strong healthy leaves, good shoot growth, flowering and fruit set, and fruit growth
- Without healthy roots, avocado trees grow poorly with small leaves, are susceptible to pests and diseases, produce poor crops of small fruit wasting water and fertilizer

INDICATORS OF POOR ROOT HEALTH (all or some of these can apply):

- Poor root health is most easily seen in an unhealthy canopy
- The canopy has small leaves with leaves starting green-yellow and becoming yellow when the trees are under stress
- Over time there are fewer and fewer leaves, small branches die-back leading to “skeletal trees”
- Trees stunted in size and failing to thrive
- Have obvious disease symptoms like dead, brown, and wilted leaves
- Carry poor crops of small fruit
- Feeder roots grow only in a small area under the tree and often have a diseased appearance
- Surface water may stay for a long time near trees in the grove after rain or irrigation
- The soil seems to be constantly wet
- The topsoil is in a thin layer low in organic matter



Avocado tree in an advanced state of decline

POOR ROOT HEALTH IS RELATED TO:

Wet Feet

- Avocado roots die if continuously wet and need a good supply of air in the soil
- Free draining soil is essential to bring air back into the soil after rain or irrigation
- Wet soils encourage diseases to grow and spread
- Soils that are compacted or have a hard pan have poor drainage

Disease

- *Phytophthora cinnamomi* - destroys feeder roots and if untreated can kill trees slowly or very quickly when soils are wet and poorly drained
- *Phytophthora citricola* - forms a canker or collar rot in wet soils and usually slowly kills the trees by ring barking
- Armillaria root rot - infects the roots leading to a slow or sudden decline with mushrooms produced at the base of the tree
- Verticillium wilt - is commonly a sudden die off of one part of the tree but the leaves remain attached turning brown

Treatment Damage

- Concentrated phosphorous acid used for root rot treatment causes a weeping canker at the site of treatment



Trunk canker caused by phosphorous acid treatment

INTEGRATED CONTROL:

Best root health is achieved using different control methods, some of which are outlined below:

Site

- Soil - break up compacted soil by deep ripping or pan breaking to improve drainage
- Drainage - improve using mounds, ridges, berms or drains to reduce wet areas
- Divert water flow - with drains or channels to slow the spread of root rot

Irrigation

- Do not over water - too much water can encourage root rot fungus to attack the feeder roots of healthy trees
- Monitor soil moisture - apply water according to what the trees need
- Root health is easier to manage with clean salt-free water
- Avoid over watering diseased trees

Hygiene

- Don't bring disease to the grove - plant only high health trees
- Don't spread the disease - root rot can be spread by infested soil: on shoes, machinery, and rodents; in drainage water; by poor harvesting practices
- Put up barriers to the advance of root rot, use copper fungicides foot baths

Cultural practice

- Apply gypsum as it contains calcium that can inhibit root rot and help strength the cell wall of the root
- Use mulch to increase the organic matter in the soil and helps to improve soil biology to suppress diseases
- Manage nutrition to increase the resistance of the roots against root rot allowing healthy trees to recover better from root problems
- Use pruning to create a better balance between the canopy and root system reducing stress
- Plant tolerant rootstocks that grow better when challenged by root rot but most cannot tolerate wet feet

Chemical control

- Fungicides - use registered products for acute and chronic diseases (<http://www.ipm.ucdavis.edu>)
- Application methods - there are a number of application methods, injection using injectors, trunk sprays with penetrant adjuvant, soil application



Avocado tree with a healthy canopy

FURTHER READING:

Phytophthora Root Rot, Lawrence J Marais, John A Menge, Gary S Bender and Ben Faber, [AvoResearch 2002](#)

Avocado Root Rot (Phytophthora Root Rot), Ben Faber, Akif Eskalen and Gary Bender, UC IPM Pest Management Guidelines 2008: Avocado, [UC ANR Publication 3436](#)

Avocado Diseases, Howard Ohr, Ben Faber, and Nigel Grech, California Avocado Society 1994, Circular No. CAS-94/1