

## **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