Salinity Management Of Avocados

KEY SALINITY FACTS:

Salinity is the term for the amount of salts found in soil or irrigation water.

- Avocado trees are highly sensitive to salinity
- Irrigating with salty water, without proper leaching, leads to salt build-up in soil
- Soil-water salinity is higher than irrigation-water salinity
- Salinity reduces yield, tree size, photosynthesis, root growth and scorches and yellows leaves
- Physical and biological properties of rootstock and soil determine the tree's salinity response
- Salinity is managed through correct irrigation and soil-leaching practices
- Salinity requires constant management
- The top six inches of soil are the most important when managing salinity, as avocado trees have a shallow root system

SALINITY SYMPTOMS:

- Tip burn
- Poor root growth
- More compact soils, with poor soil drainage

SALINITY PROBLEMS:

- Salts reduce water uptake
- Chloride and sodium cause toxic effects:
  Yield loss of 12% for every 35.5ppm of chloride in irrigation water
  Photosynthesis reduction
  Decline in fine-feeder roots, before leaf damage evident
  Reduced nutrient absorption
  More compact soil, reducing the soil's drainage and aeration

***HEALTHY LEAVES:** A tree with little tip burn.*

***UNHEALTHY LEAVES:** Tip burn on leaves.*

WHAT IS SALT?

Salt is comprised of various compounds that dissolve in water; primarily sodium chloride, magnesium and calcium sulfates, bicarbonates, potassium chloride and other chemicals.

HOW IS SALINITY MEASURED?

- Dissolved salts are measured by the electrical conductivity (EC) of the water
- 1 EC (dS/m) is equal to about 640ppm salt

TO MEASURE SOIL EC:

- Collect soil samples at different depths; mix with pure, distilled water at 1-to-2 ratio
- Add ⅓-ounce soil (10g) to ⅔-ounce (20mls) water, mix, and allow salt to dissolve
- Measure the EC with a salinity pen, and multiply by eight, for total soil EC
- **See http://edis.ifas.ufl.edu/ss118**

California Avocado Commission

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BEST PRACTICES TO MANAGE SOIL SALINITY AND OPTIMIZE WATER USE:

- Monitoring salt levels and leaching effectively
- Good cultural practices:
  Salt-tolerant rootstocks
  Low-salinity irrigation water
  Soil leaching
  Good irrigation practices
  Proper irrigation equipment
  Gypsum applications

IRRIGATION FACTS/TIPS:

- Irrigation water can add large amounts of salt to soil
- Water with 500ppm salts, applied at 4-acre feet - per season - adds 5,420 pounds of dissolved salts to the soil. At a chloride component of 100ppm, 2,200 pounds of sodium chloride will be added to the soil
- Yield reduces rapidly, as chloride increases in irrigation water
- Effects of chloride toxicity show up under water stress conditions
- Avoid short, frequent irrigation cycles, as salts are not leached
- Avoid prolonged saturated soils, or standing water, that leads to root rot
- Optimal irrigation - to achieve good root distribution - requires uniform water application and mass, in a large, low-EC zone, under trees
- Drip irrigation is not ideal for managing salinity in hot, dry weather, as it only supports roots in a narrow zone of low EC soil

LEACHING FACTS/TIPS:

- A sign of poor soil leaching is a tree displaying water stress, despite wet soil
- Soil water of about 4 EC, or TDS of 2000, is too salty, as water will leave roots
- Effective leaching requires monitoring soil water to determine irrigation volume and duration
- Generally aim to use a 10-20% leaching fraction at each irrigation, to maintain a root-zone salinity of soil water below EC 2
- Leaching fraction is the amount of additional irrigation water needed to maintain the correct salinity; this, however, depends on salt levels in irrigation water
- Appropriate leaching amounts depend on irrigation water salinity and target root-zone salinity. Leaching can be estimated using the information at the link: **http://ucce.ucdavis.edu/files/filelibrary/5049/773.pdf**

FURTHER READING:

Salinity Management in Avocado Orchards, **David Crowley**, University of California, Riverside, California Avocado Society 2008, Yearbook Volume 91, Pages 83-104

Irrigation, Water, Salinity and Crop Production, **Stephen Grattan**, University of California, Davis, In Water Quality Planning Reference Sheet, 9.10, **http://anrcatalog.ucdavis.edu**, Publication 8066