

Tree-Growth Cycle: Basis of Avocado Management

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WHAT IS THE AVOCADO TREE-GROWTH (PHENOLOGY) CYCLE?

- The seasonal-growth changes that consistently occur, within a year, are:
 - Flowering
 - Shoot growth
 - Root growth
 - Fruit set
 - Fruit growth
 - Harvest



FLOWERING



SHOOT GROWTH



QUALITY FRUIT

WHY ARE TREE-GROWTH CYCLES IMPORTANT?

- They enable understanding of – and indicate – tree problems, leading to greater grower innovation in tree management
- They show competitive interactions among various tree components
- They establish ideal timing for cultural-management activities



DYNAMIC NATURE OF THE TREE-GROWTH CYCLE:

- A **two-year cycle**, as avocado trees tend to alternate bear
- The amount of fruit in the current year results from cumulative influences throughout the previous two years
- Crop load, shoot growth and flowering are interrelated
- Timing – and duration – of phenological events can change annually and depend on tree history

APPLYING THE TREE-GROWTH CYCLE TO MANAGEMENT DECISIONS:

- The objective is to manage the difference between “on-crop” and “off-crop” years
- Correct timing of cultural-management activity will provide the optimum balance among: **shoot growth, fruiting** and **root growth**
- Good fruit set and growth requires enough leaves (the factory) and root growth (raw materials’ supply route) to feed the fruit growth
- To prepare for good crops, the tree needs to accumulate raw materials (**sugars** and **starch, water, minerals** and **chemicals**), prior to the next growth stage
- When a portion of the tree is actively growing, it acts as a “sink” for the raw materials
- The tree parts with the most growth are the “primary-sinks,” which have priority over other tree parts, when receiving raw materials
- Sink strength changes annually; in an “off-crop” year, the tree will mainly flower and fruit, while in an “on-crop” year, it will mainly grow



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- A key horticultural skill is knowing proper application amounts of raw materials and when to adjust such materials, in relation to primary sink
- Correct cultural-management timing, in relation to the growth cycle, is critical for:
 - *Water management*
 - *Root-rot control*
 - *Fruit quality (calcium uptake)*
 - *Pruning*
 - *Cincturing*
 - *Fertilizer*
 - *Harvest strategy*



MULTIPLE SHOOT-GROWTH CYCLES OCCUR SIMULTANEOUSLY:

- Each year can appear as a series of separate tree-growth events; in reality, the tree-growth cycle represents a combination of shoot-growth cycles occurring simultaneously
- The challenge, for the grower, is to establish the correct balance among various shoot-growth cycles, ensuring the tree always has good cropping potential

EXAMPLE - CORRECT TIMING OF PHYTOPHTHORA CONTROL:

- Examine the growth cycle, and identify when roots are the primary sink
- Roots are the primary sink, when little shoot growth, flowering or fruit development occurs
- Generally, two optimal-control times exist, per year

EXAMPLE - FRUIT QUALITY & OPTIMIZING CALCIUM-FERTILIZER APPLICATION:

- Review the growth cycle, and determine when fruit is the primary sink
- The tree takes up calcium and moves it through the water stream
- The first 6-8 weeks represent the fruit's critical period for accumulating calcium. During this timeframe, fruit have stomata that allow water to move easily through the fruit and calcium to be deposited

EXAMPLE - MANAGING SHOOT GROWTH, WHEN COMPETING WITH FRUIT SET:

- During flowering, a fine balance exists between resources used for fruit set or shoot growth
- Excessive nitrogen can tip the balance to shoot growth, at the expense of fruit set
- Examine the growth cycle, and identify when shoot bud break and flowering occur. This determines the ideal time to avoid high-nitrogen applications