#UNIDOS contra o GREENING

Fundecitrus
CIÊNCIA E SUSTENTABILIDADE
PARA A CITRICULTURA

Consequences of Root Damage by HLB

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UF UNIVERSITY of FLORIDA
IFAS
Citrus Research and Education Center

Topics for discussion

- HLB induced root loss and root growth
  - Implications for root health management
- Rootstocks, root loss, and considerations for new plantings

Fibrous root loss due to HLB

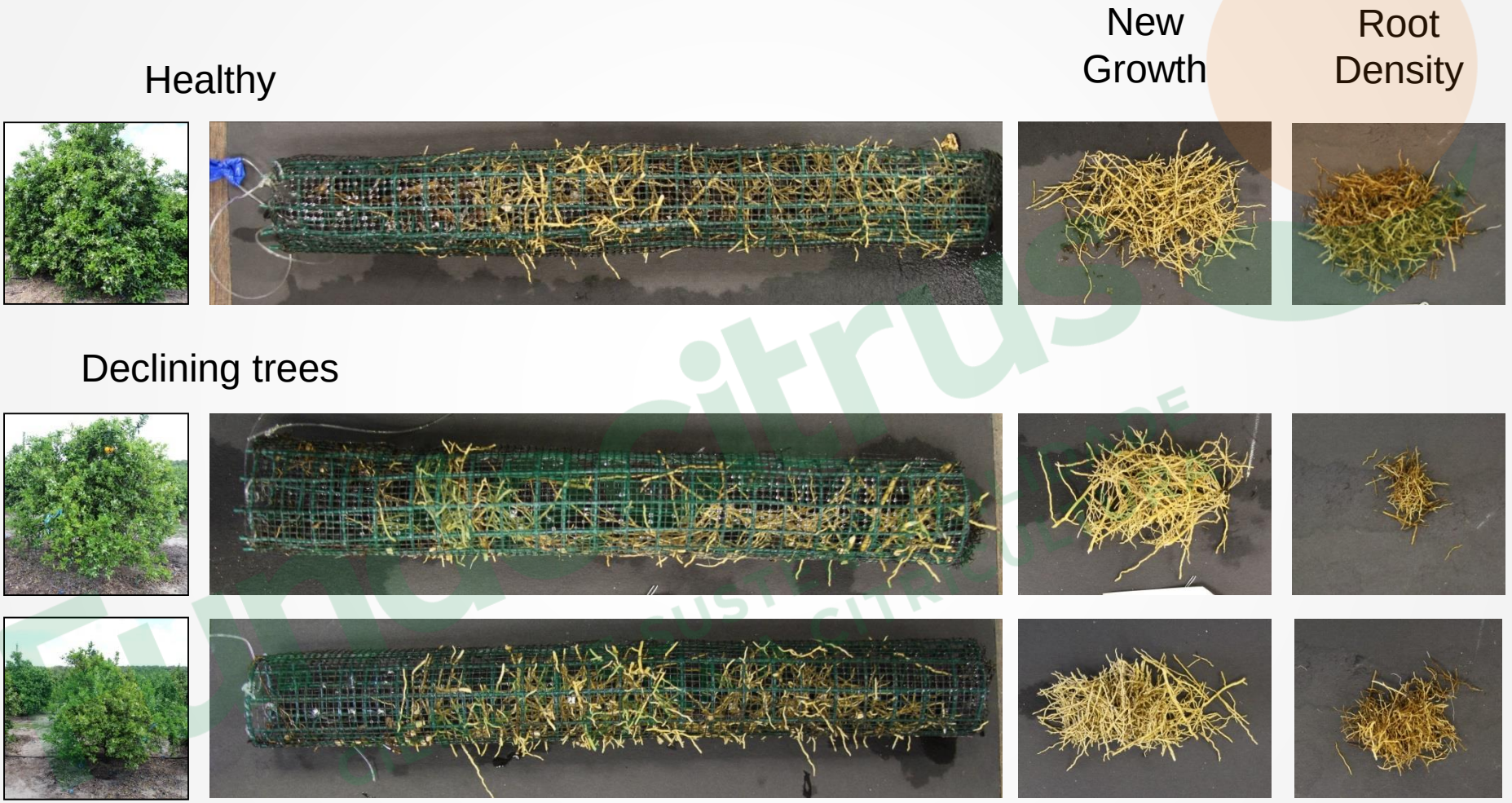
- **Early Phase**

30-50% root loss - before canopy symptoms develop

- **Late Phase**

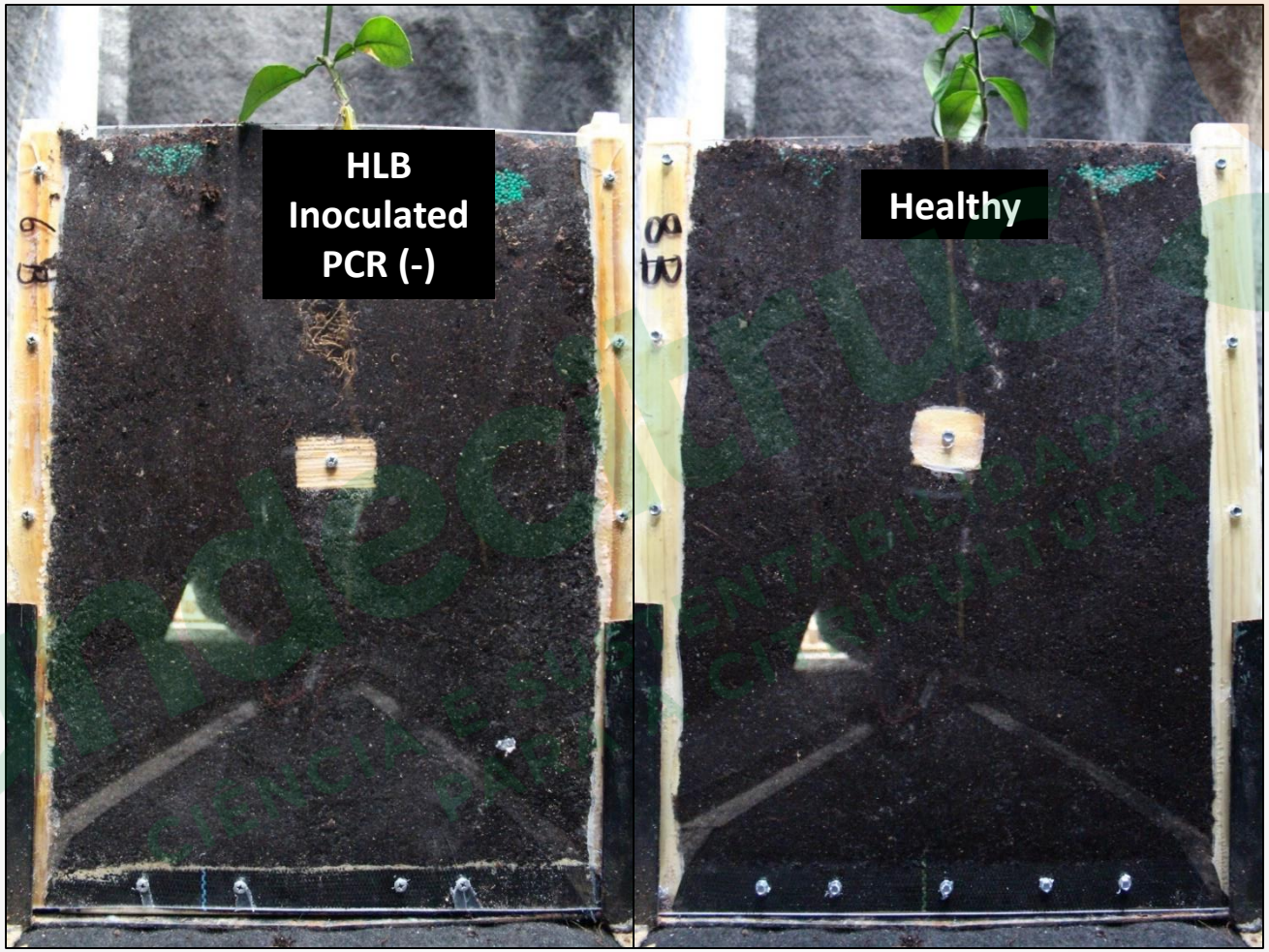
>70% root loss – as visible canopy decline begins

New root growth not inhibited in HLB affected trees: indicates declining trees are in a “survival mode”

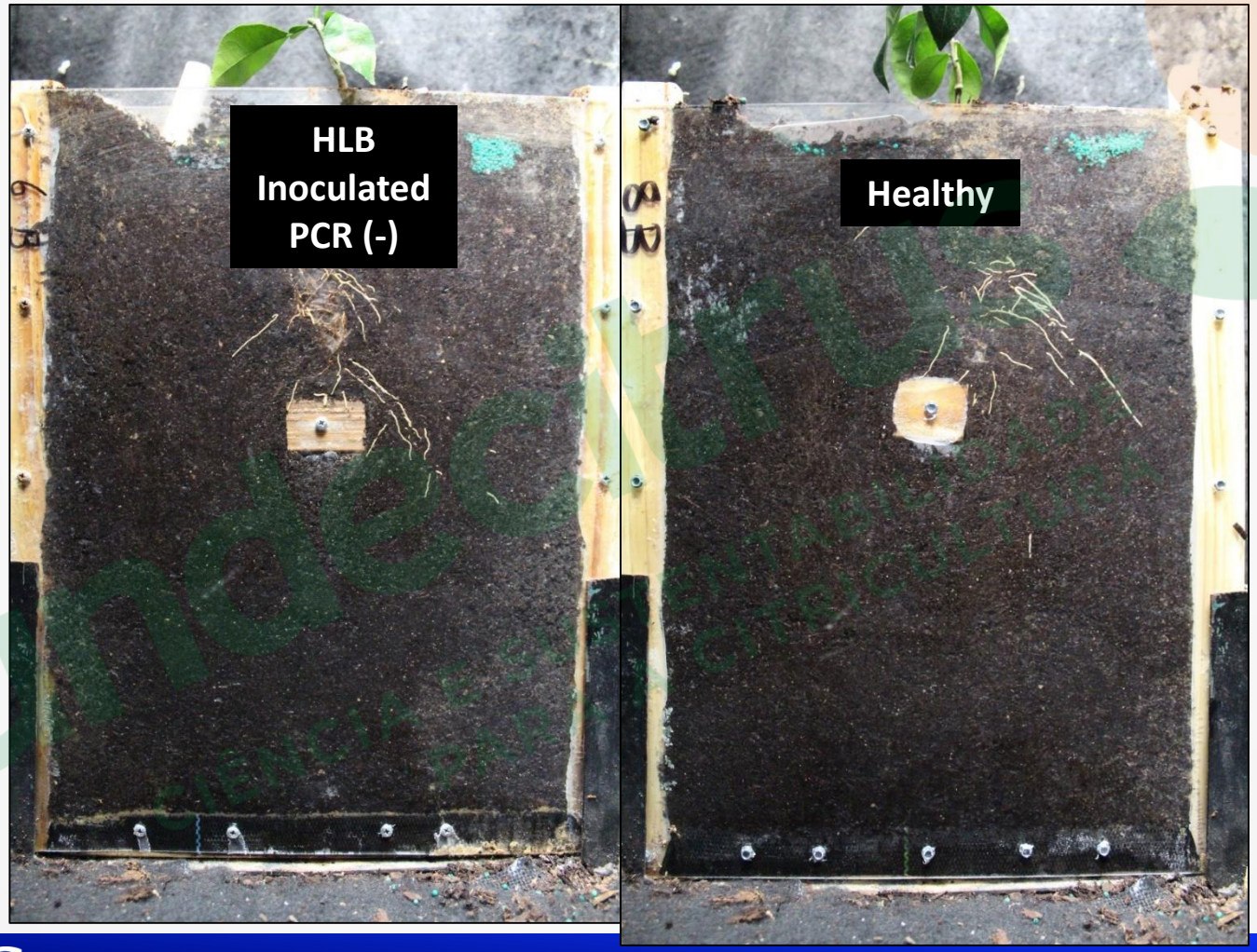


Root growth & loss can be viewed in rhizoboxes

Inoculated with CLas October 2015



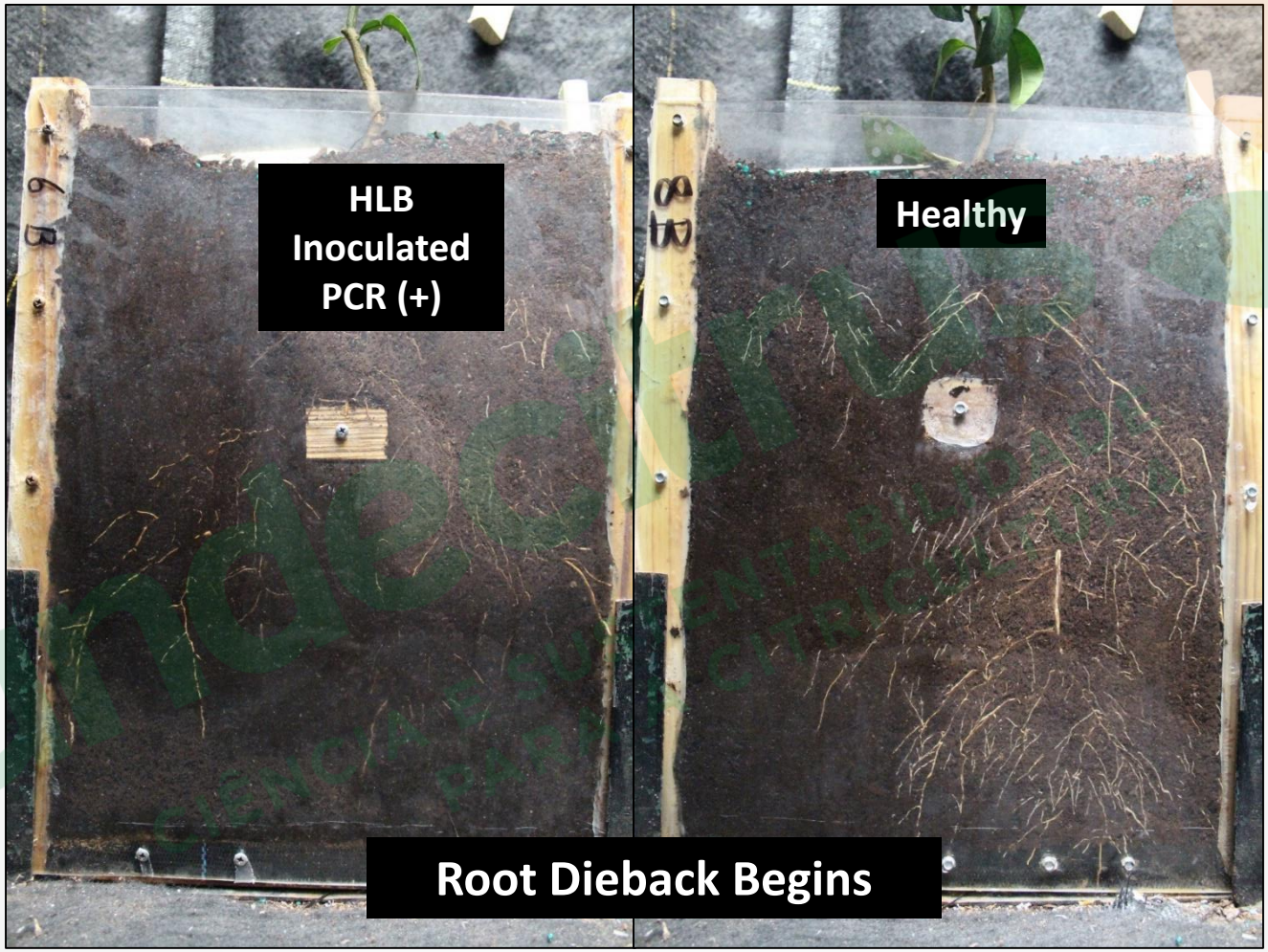
Month 1



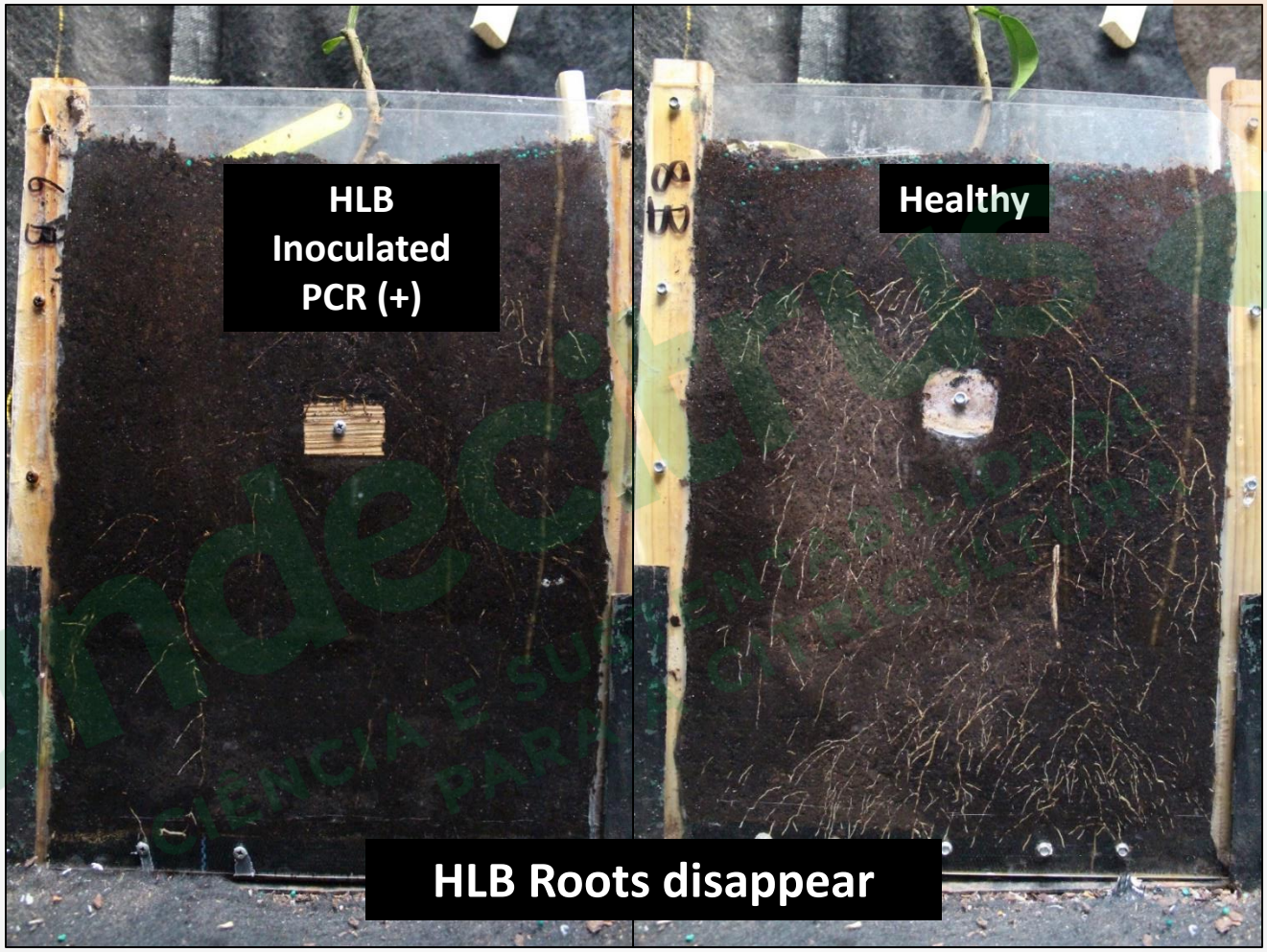
Month 2

Month 3

Month 7



Month 8



Consequence of root loss

- Root growth is stimulated by CLas infection
- Root turnover is increased
- Root lifespan is decreased
  - From 9-12 months → 4 months
- Large investment in roots
  - Carbohydrates used for root replacement
  - Diverted from leaves and fruit

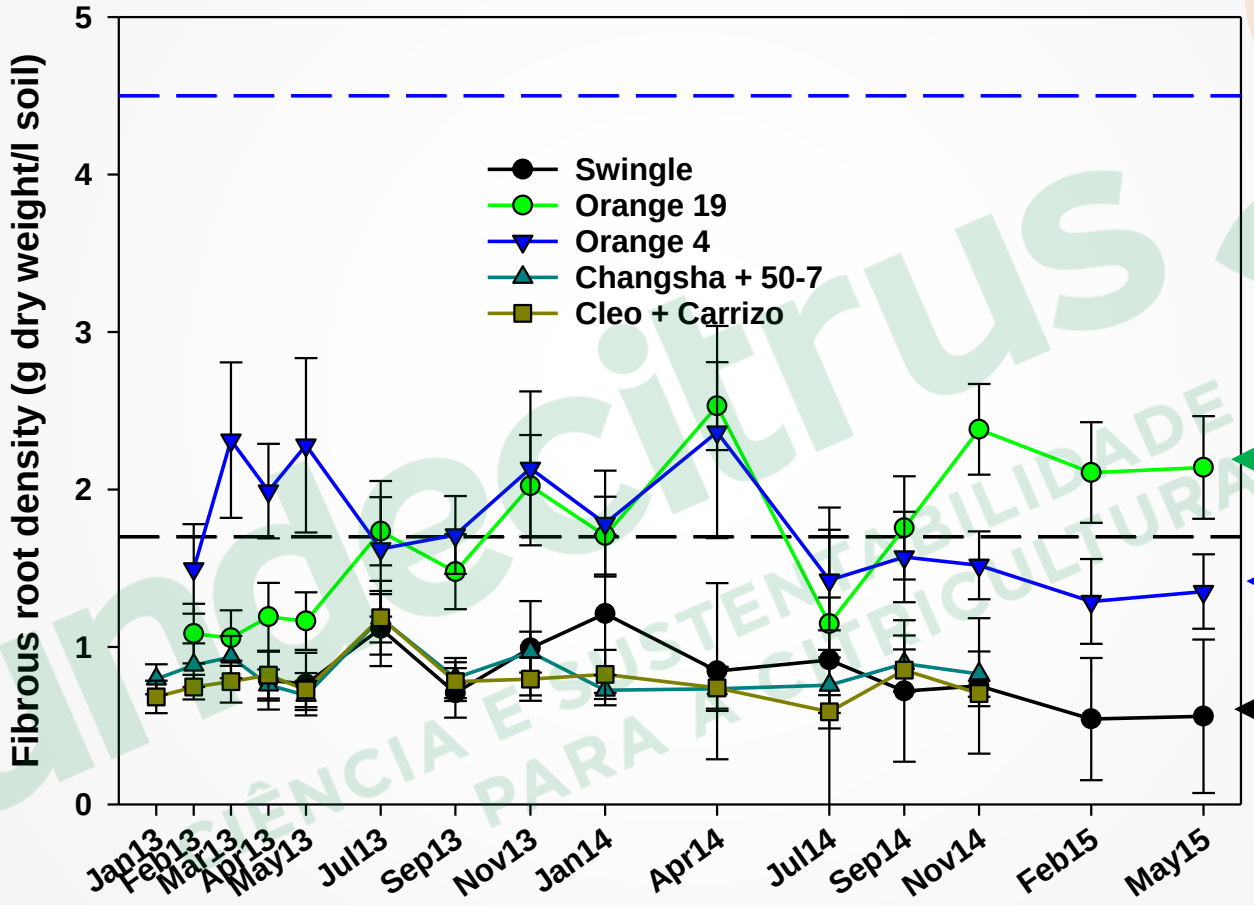
Management implications

- Root growth stimulation by HLB leads to premature leaf and fruit drop
- “Stimulating” root growth does not sustain yield
- Better to sustain root longevity
  - Minimize stress on roots
  - Provide optimal environment to maintain roots
  - Management depends on rootstock, soil type, pH, drainage, irrigation, water quality (bicarbonates) in planting site

New Rootstocks: Can they contribute?

- Roots of all rootstocks are infected with CLas (tested >17 rootstocks)
- Do new rootstocks maintain larger root systems?
- Can they delay early or late phase root loss?
- New rootstocks are under evaluation in UF-CREC field trials in Central FL

Two rootstocks differing from Swingle



Two rootstocks differing from Swingle

Higher root density (UFR-2)

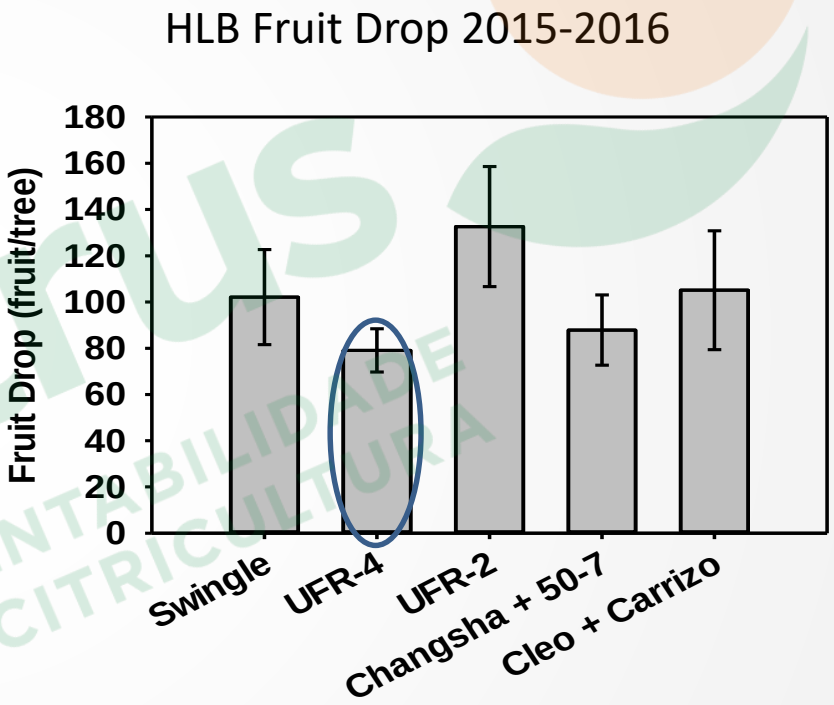
- Early phase
  - Maintains functional root density
  - High photosynthate cost to grow roots
- Late phase
  - 70-80% root loss
  - Sudden canopy decline
- More roots isn't the answer

Roots density increasing (UFR-4)

- Early phase
  - Root gain instead of root loss
  - Canopy decline slower
  - Is productive life extended?
- Late phase
  - Delayed canopy decline due to delayed root loss
- Greater root longevity?

Potential for rootstocks to express tolerance to HLB

- Greater root longevity (density) for water and nutrient stress tolerance
- What is the yield benefit?
  - Reduced preharvest fruit drop



Can New Rootstocks Help?

- Commercial rootstocks have root loss similar to Swingle

  e.g. Cleopatra, Sour orange, Carrizo, Volkamer lemon
- One new rootstock (UFR-4) increased root mass during early phase HLB
- Potential for improvement over current rootstocks?
- Currently recommend planting existing rootstocks best adapted for the soil and site conditions

Summary - Root health and HLB

- Must consider whole tree when managing HLB
  - Canopy and roots interact throughout the year
- Target root function and root longevity in management
  - Adjust for limited root uptake capacity – timing and duration of irrigation/fertigation
  - Reduce other stresses on the root system
- Management needs to be site specific
  - Rootstock, soil, water quality, drainage, pests, pathogens