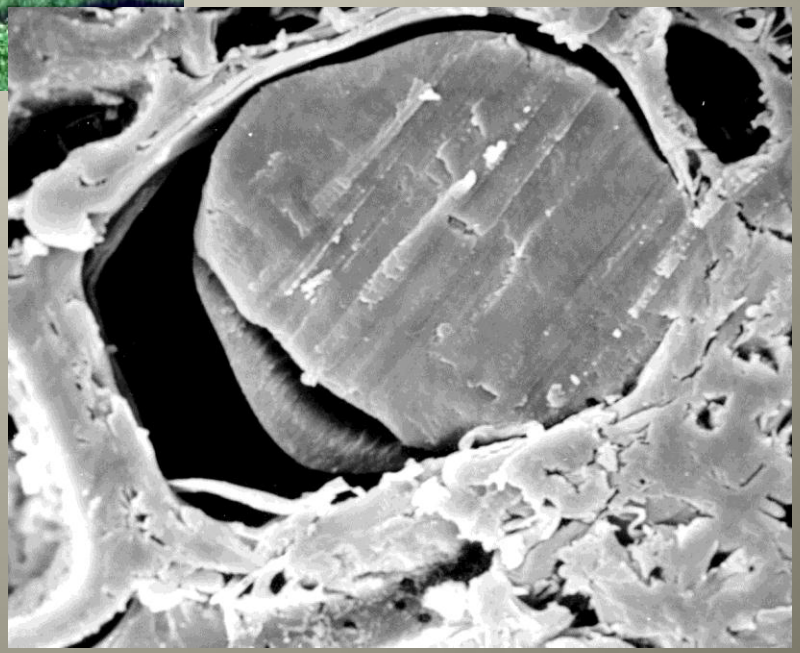
Yes, Citrus Blight is Still Around

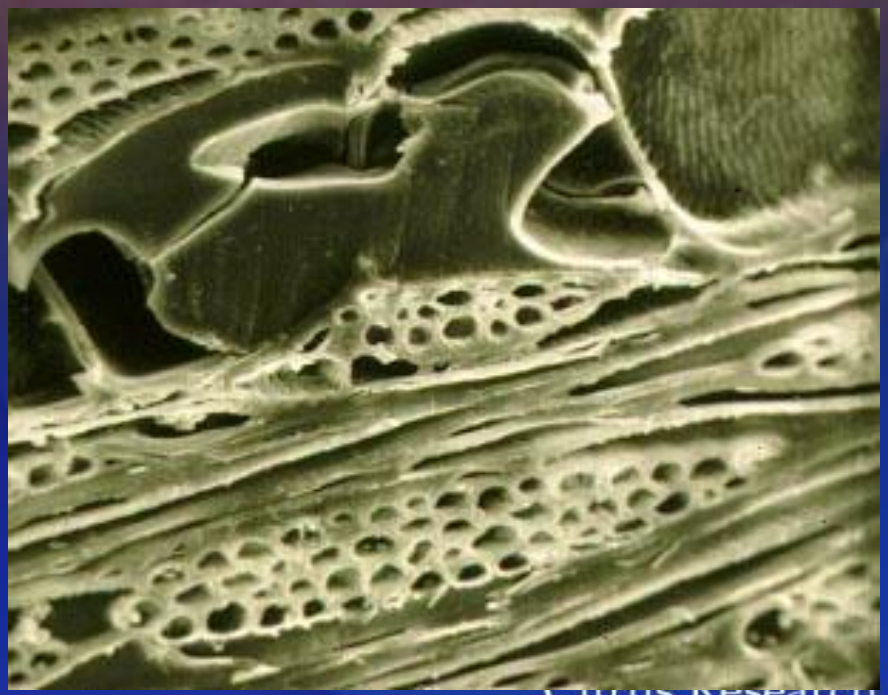
- Known in Florida for over 100 years
- Problem in Florida in the 1970's with increase in rough lemon rootstock
- Thousands of trees become unproductive every year, resulting in losses in excess of $60 million annually

Symptoms

- Mild wilt with a grayish cast to the foliage
- May have a zinc deficiency symptom in some leaves
- Rapid decline with leaf drop, twig dieback, off season fruiting and small fruit
- Trees seldom die
- Trees affected when grove is 68 years old
- Random distribution

Symptoms





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Citrus Research and Education Center

Names

- Blight
- Sand-hill decline
- Young tree decline
- Road-side decline
- Declinio in Brazil

World Distribution

- Florida, South Africa, Australia, Brazil, Argentina, Costa Rica, Venezuela, Colombia, etc.
- Not found is Mediterranean type climates such as Spain, Italy, California etc. Why?

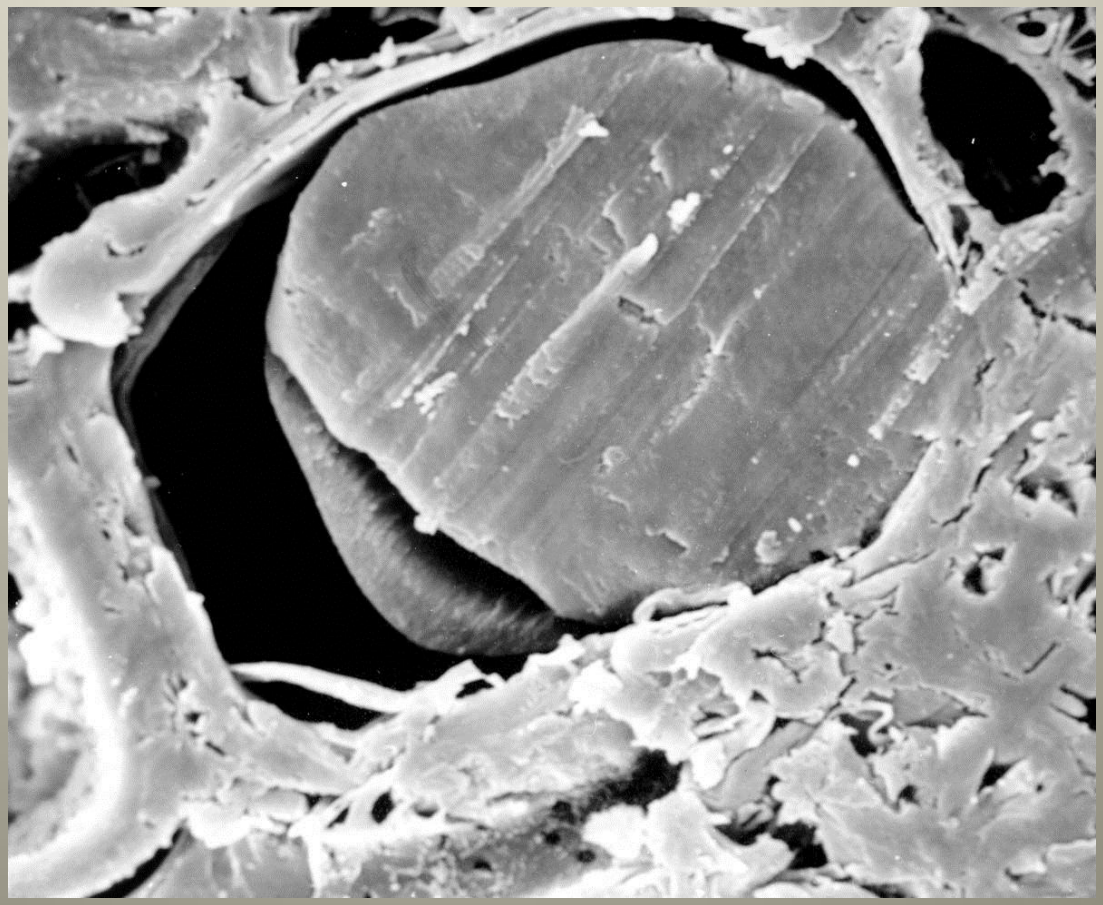
Susceptibility

- Related to rootstock. Rough lemon is the most susceptible with Carrizo, Rangpur lime, Swingle and Cleo also susceptible.
- Sour orange and sweet orange are the most tolerant only becoming affected at advanced ages; both have other problems (CTV and Phytophthora)

Diagnostics

- Water uptake in blight trees shown to be reduced with water uptake tests (water bottles)
- Zinc analysis of the wood was significantly higher in blight trees
- **Water uptake tests using syringe infections shown to be diagnostic**
- Pathogenesis related proteins higher in blight trees, mainly p12 protein (12 kDa)

- Amorphous plugging also is diagnostic

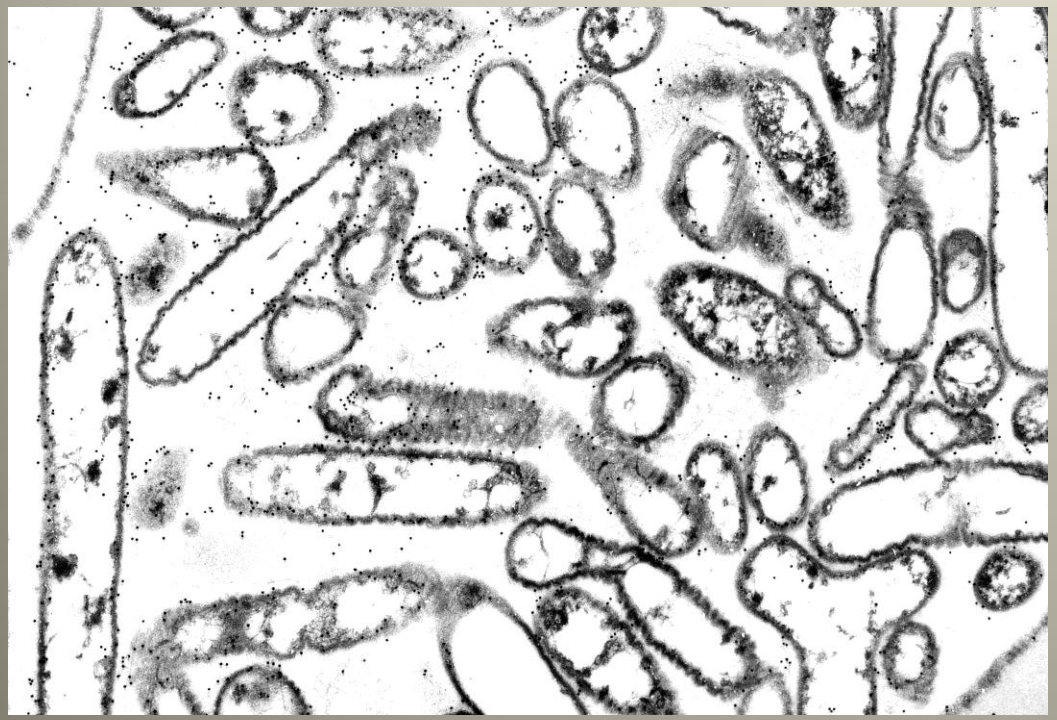


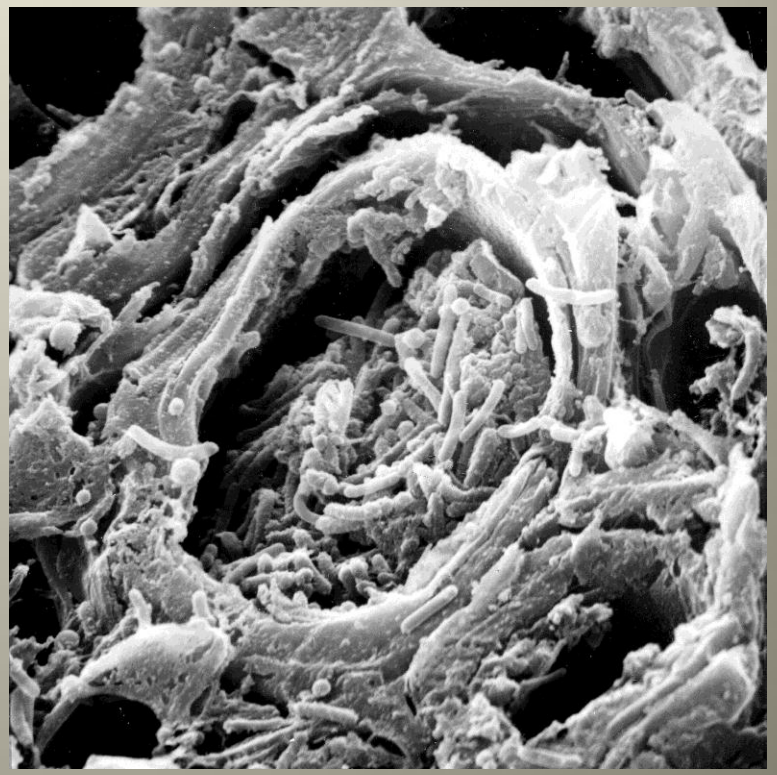
Searching for the Cause

- Thought to be caused by mineral problem but not proven or reversible
- Soil types thought to be the cause – not proven
- Pseudomonads in the soil proposed as the cause
- Pierce's disease XLB endemic in Florida and was found in sharpshooters from blight affected trees and reported in citrus trees

- Control of sharpshooters reported to reduce the incidence of the disease; maybe something else controlled
- Transmission of a suspected XLB to range of plants including citrus was negative/PD found in blight trees
- Electron microscopy for XLB in blight-affected trees and in sharpshooters was negative
- Cytological comparisons of known XLB diseases with blight were dissimilar

- Citrus variegated chlorosis: Phytopathology, 1991,1994,1995





- Tetracycline injections first thought to reduce the disease but later found not to affect it; XLB ruled out
- *Fusarium* thought to be the cause; later proved not to be involved
- **Root grafting experiments with blight shown to transmit the disease tree to tree and with root pieces – Done in Florida & Brazil**

Where are We Now?

- Control is use of tolerant rootstock but those available are not useful for other disease reasons
- No causal agent proven, but appears to be a graft transmissible agent (virus?)
- New sequencing technologies will help. Current no funding on this disease

Citrus Blight Research

- Characterization of the causal agent
- Diagnostics
- Control/Management

How do we discover the causal agent?

- Metagenomics, Deep sequencing or Next Generation Genomics
- Metagenomics is the study of the genomic content in a complex sample
- two primary goals of this approach are to characterize the organisms present in a sample and identify what roles each organism has within a specific environment

- Hartung and Brlansky: Sequencing: Funded by USDA, ARS
- Wang: Deep sequencing (Illumina): Funded by CRDF “Characterize the causal agent of citrus blight through metagenomic approaches and the effect of HLB on citrus blight diseased trees”