Bacterial Wilt on Blueberry in Florida

FBGA Fall 2018 FBGA Meeting and Show

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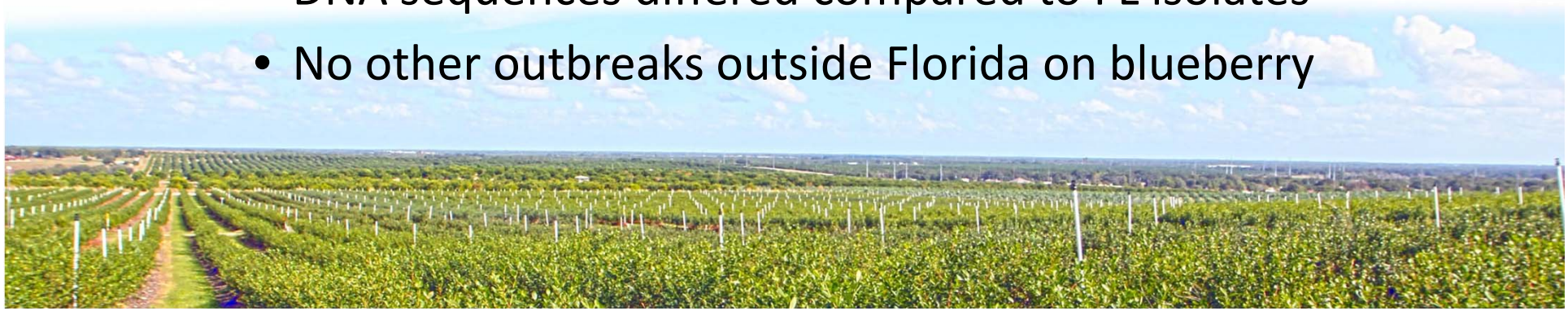
Bacterial Wilt

- Caused by *Ralstonia solanacearum*
  - Soil-borne bacterium with a wide host range
- Previously reported on blueberry only once (in New Jersey)
  - Cultivar Bluetta was affected
  - 20 year-old bushes rapidly died
  - Quarantine and eradication efforts ensued
    - DNA sequences differed compared to FL isolates
    - No other outbreaks outside Florida on blueberry



R. solanacearum

- Some strains are of regulatory significance
  - USDA APHIS regulation requires positives on any new host be reported to state and feds
  - Our strains are not of regulatory significance

Variety specific?

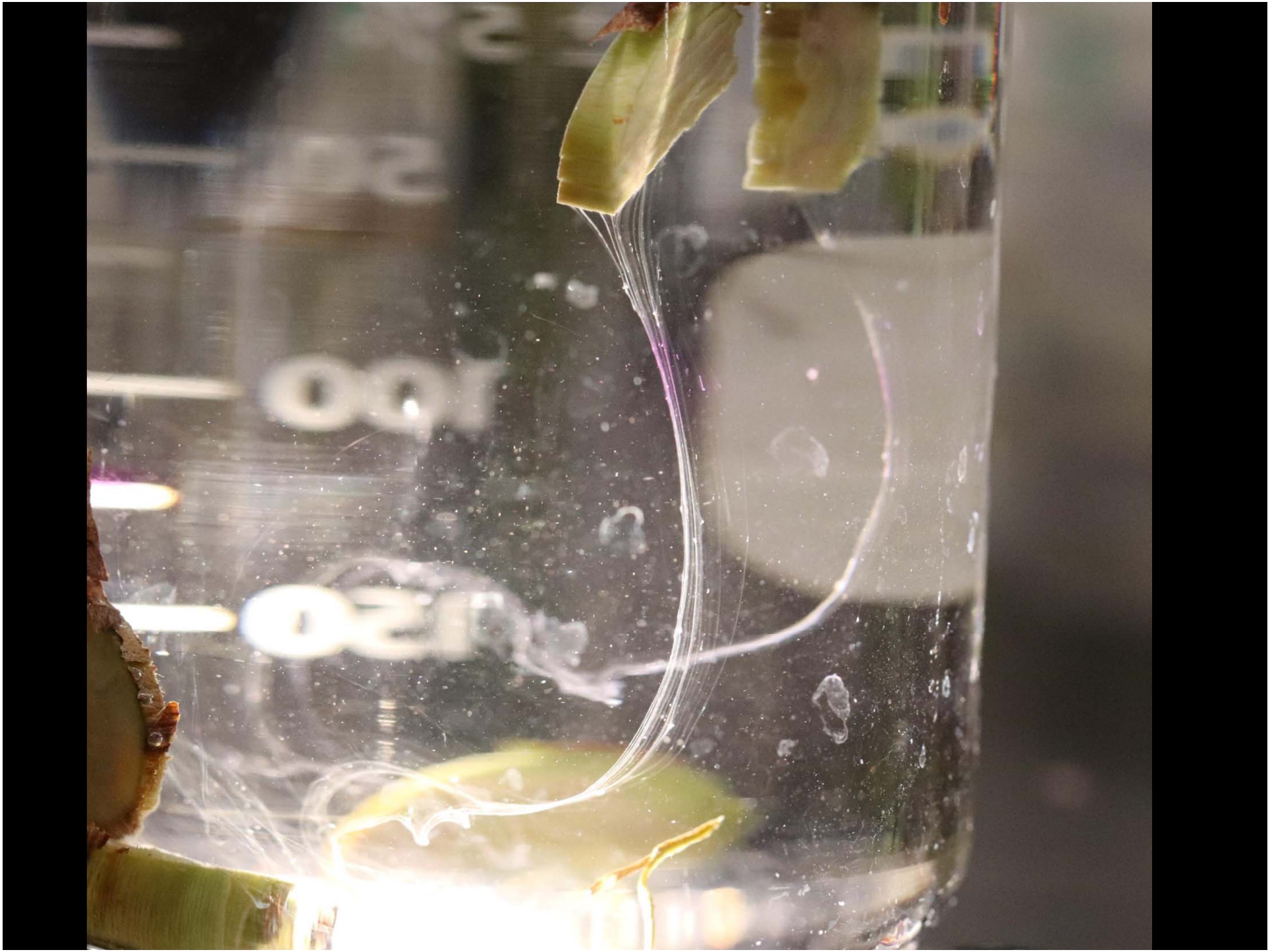
- Initial positives were all plants of the Arcadia variety, it remains the most severely affected
- Several other varieties from UF and other breeding programs have now been confirmed positive in the field.

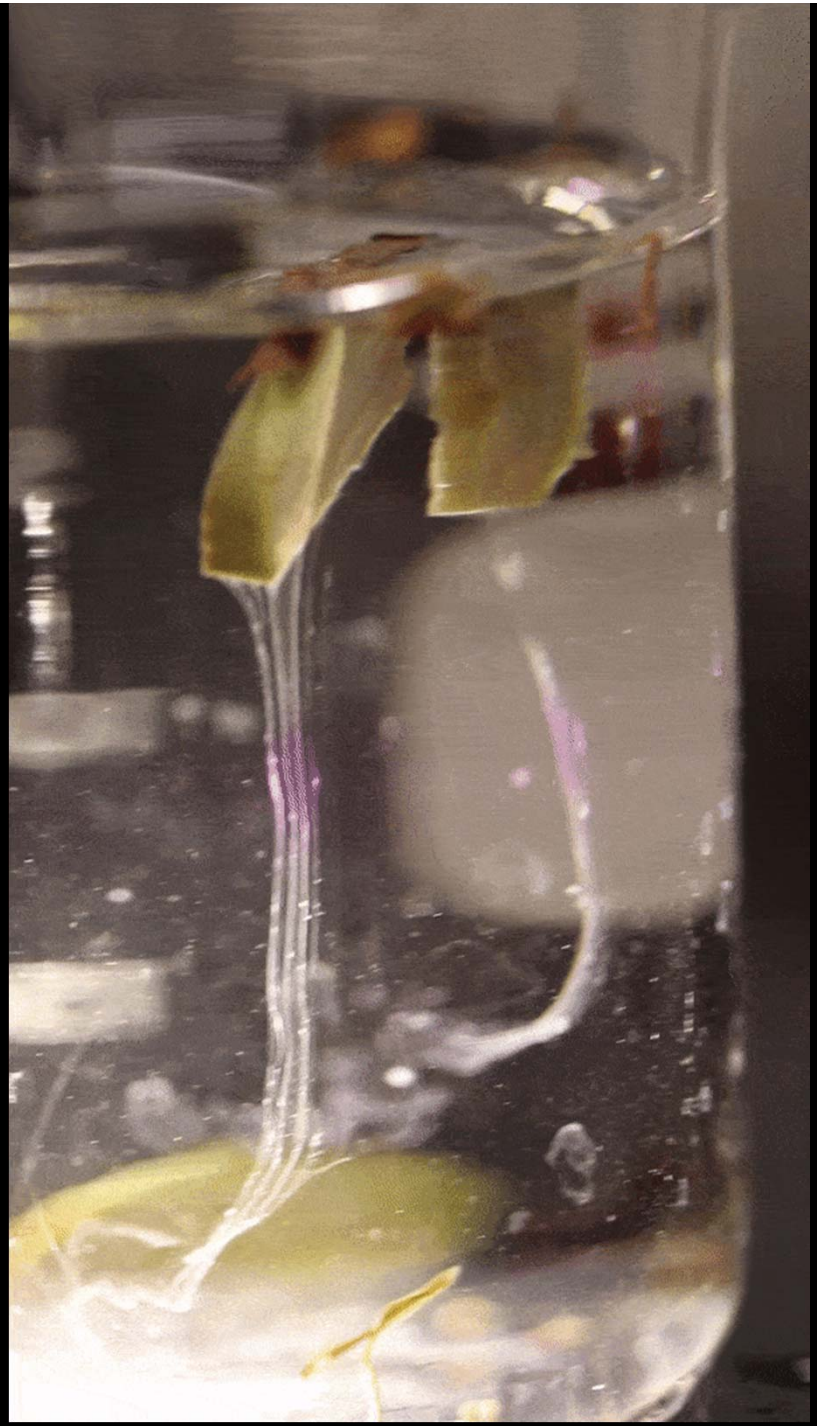
Variety specific?

- UF grad student Deanna Bayo's research has shown all 17 tested varieties including Bluetta are susceptible under high inoculum and conducive conditions

Symptoms

- Similar to bacterial leaf scorch (Xylella)
- marginal scorching of leaves, dieback, stem blight, plant death
- symptoms move down the row more rapidly than across
- Xylem of plants loaded with bacterial ooze clogging vasculature





Management

- Exclude the pathogen from your farm
  - Avoid movement of soil and water onto the farm
  - Sanitize equipment, tools
    - Early research suggests hedging may spread the pathogen
  - Do not use surface/recycled water for irrigation
  - Purchase clean, healthy plant material
    - Nursery plants are not suspected to be a contributor to spread at this time

Management

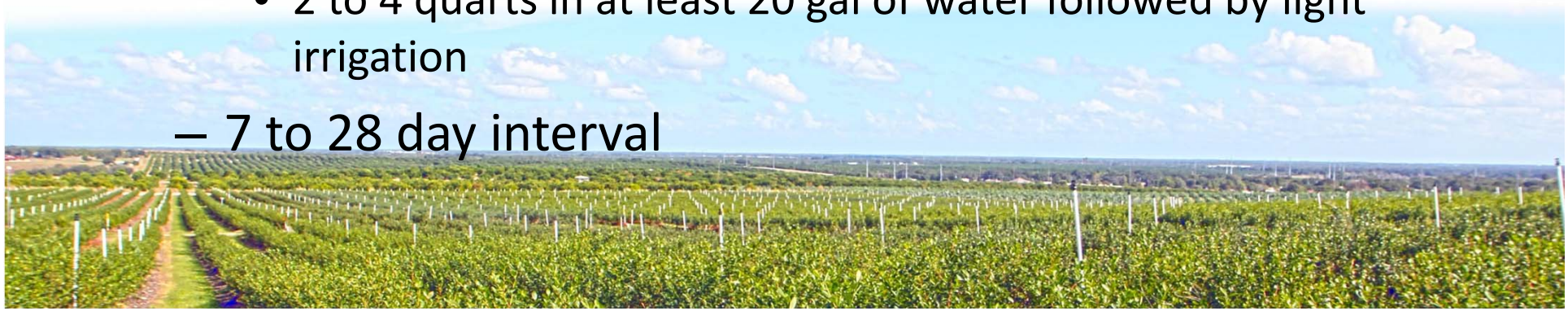
- Reduce inoculum
  - Remove infected plants and destroy them
    - The sooner the better, the more the better
  - Don’t pile them up next to irrigation ponds
- Plant varieties other than Arcadia where the disease is confirmed
  - protect Arcadia plants on farms where the disease is confirmed

Management

- Protection options
  - Very little data on blueberry
  - products labeled for Ralstonia control include some phosphonate materials
  - application is to the soil in drench, injection, or banded application with irrigation
    - apply to beds and drench pots prior to replanting
  - these methods were shown effective preventing infection of geranium grown in infested soil
    - they do not cure infected plants

Management

- EDIS publication: http://edis.ifas.ufl.edu/pp332
- K-Phite is an example product that is labeled for the disease and for blueberry
  - chemigation
    - 2 to 4 quarts in at least 200 gal of water per acre
  - drench
    - 2 to 4 quarts in at least 100 gal of water
  - banded application
    - 2 to 4 quarts in at least 20 gal of water followed by light irrigation
  - 7 to 28 day interval



Management

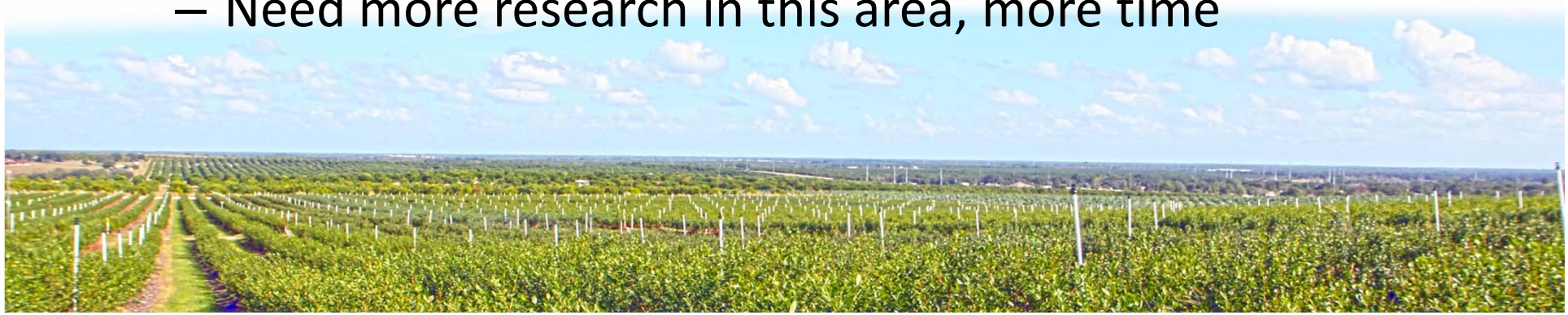
- Observations after two seasons: Is it working?
  - After the first year, “phyte” drenches seemed to have protected replants and drastically slowed spread in the field
  - Year 2, disease has continued to spread:
    - To new farms
    - Organic—there is no phyte option, containers have not stopped infection
    - Root injury due to insect feeding, including citrus root weevil, flathead borer, termites
    - Hurricane damage and excessive rain
      - A few additional plants in 2017 to 33% of 5 acres affected 2018

Management

- Propagation measures to prevent bacterial wilt in nurseries
  - Do not use surface water for irrigation
  - Use well or municipal water rather than ebb and flood systems, or monitor and sanitize water
  - Do not allow soil contact with cuttings (use benches)
  - Keep production areas free of weeds and other potential host plants, particularly solanaceous

Management

- Host plant resistance
  - Arcadia, Kestrel, Meadowlark, Myra, and Avanti are field positives confirmed, there will be more
  - Arboreum is susceptible. Research ongoing.
  - Resistance in other crop plants has had minimal impact where the disease occurs
    - Resistance hasn't held over time or in different areas
  - Screening protocols will be incorporated in the UF IFAS blueberry breeding program through ongoing collaborations
  - Need more research in this area, more time

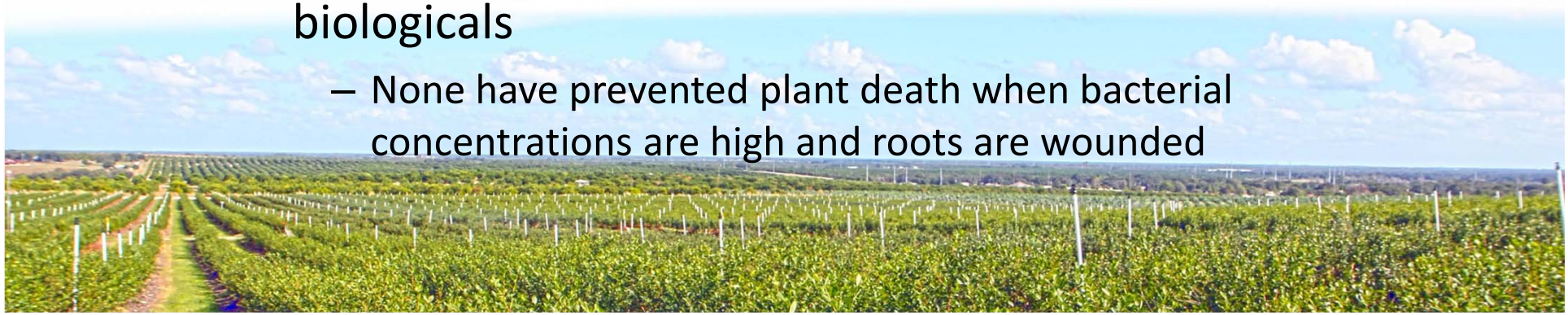


Management

- pH, rotation, cover crops
  - Extreme pH soil inhibits the bacterium Lowering pH to 4 or lower a possibility, plant effects? (Krewer)
  - Blueberry is a perennial crop so rotation is not an option
  - Co-cropping and cover cropping also are not viable options
- Biological control
  - We are testing a few of these, but not likely to be any silver bullets

Management

- Chemical and fumigation options
  - Broad spectrum fumigants like methyl bromide, chloropicrin, 1,3D, and botanicals (Thymol) can reduce nematodes and bacterial populations, but the bacterium survives at depths below the treated soil, these products are increasingly difficult to find/use and are very costly
  - Other chemical options are being explored
    - Peroxide, antibiotic, thyme oil extract, phytes, and biologicals
      - None have prevented plant death when bacterial concentrations are high and roots are wounded

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Research

- UF IFAS Extension, Research and Breeding Program are making coordinated effort
  - Doug Phillips, Extension coordinator
  - Phil Harmon, Ph.D. student Deanna Bayo
    - Cultivar screen, biological and chemical control options, pruning transmission
  - Dave Norman, Ph.D. student Crystal Conner
    - Screening Vacinium species—rabbiteye most resistant so far, RNA-seq targeting resistance genes for breeding
    - Rapid diagnostic system MinIon, EDNA for blueberry diagnostics
  - Patricio Munoz and team
    - Screening advanced selections where the disease is known to occur, developing screening protocols


algal stem blotch

Life Cycle

- Spores are produced on the red felt-like growth we can see
  - Zoosporangia are wind dispersed
  - Each zoosporangium can produce 8 to 64 zoospores
- Zoospores are produced when the sporangia get wet
- Zoospores germinate, infect and grow into thalli
  - Motile, swimming spores
  - Primary inoculum

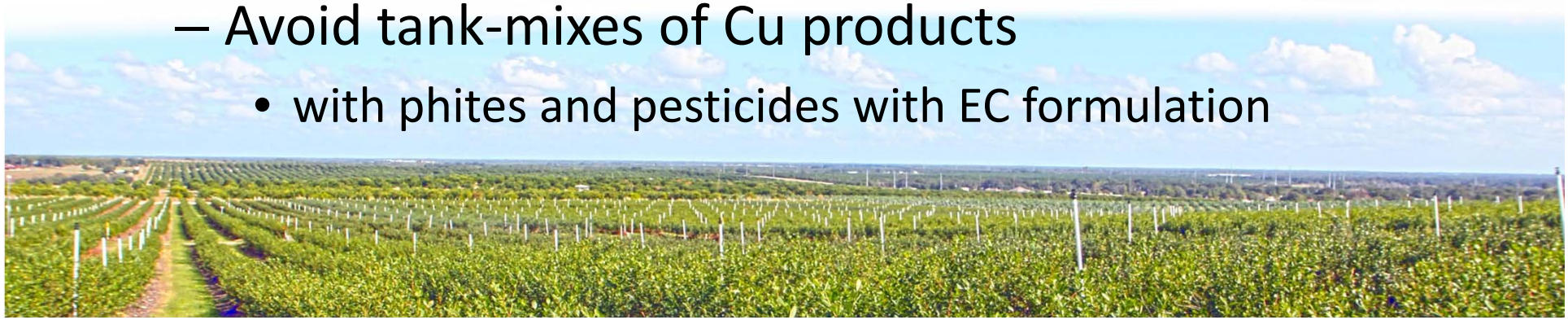
Brooks et al 2015. *Plant Disease* 99:740-753

Disease Cycle

- Spores are produced May through August
- Infections may take a full year to produce symptoms
- Cane infections persist and produce between 72,000 and 198,000 spores per square cm
- The algae likely gets in plants through wounds
- Disease is most severe on stressed plants

Managing algal stem blotch

- Copper fungicides may help
  - Two to four monthly applications in summer starting after harvest have been reported to keep the disease in check most years by growers
  - Where disease is known to be severe shorten intervals and reduce rates, stay within label
  - Kocide 3000 (also Kocide 2000) as well as several other products and formulations of copper
  - Avoid tank-mixes of Cu products
    - with phites and pesticides with EC formulation

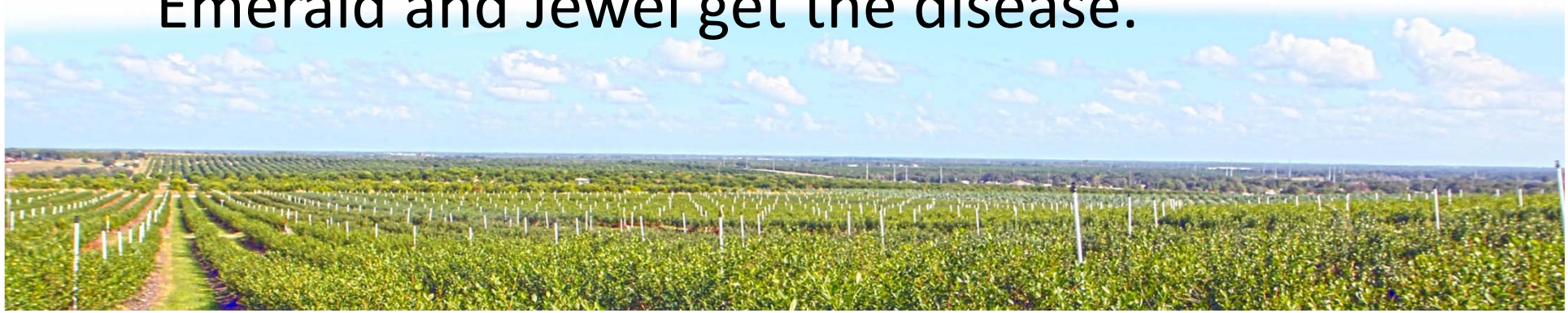


Management options

- Kocide 3000 is an example product
  - use rates on the label are 1.0 to 3.5 lb per acre on 7 to 28 day interval
  - follow label instruction for bacterial canker or Phomopsis twig blight and blueberry
  - Up to 28 lb total per acre per year
  - newly revised IPM guide has additional guidelines
- Growers report good results with many other Cu products:
  - Magnabond, Badge, Bordeaux mixture

Other methods?

- Phosphite fungicides applied for Phytophthora root rot management (but not immediately following copper) may help?
- Sprayers need to achieve good cane coverage
- Overhead irrigation will contribute to canopy wetness and disease
- Farthing, Primadonna, and older plantings of Emerald and Jewel get the disease.



Research

- Arboreum root stock?
  - Arboreum is susceptible
- Herbicides?
  - Several different products at standard and reduced rates were trialed 2018
    - Severe phytotoxicity from some treatments with no real promising prospects
- Culturing the algae?

Any Questions?

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