A sustainable solution to protect the century-old tradition of Colorado peaches from replant syndrome

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Problem:

Replant Syndrome (RS)

- Globally relevant disease
- Reduced tree fruit growth
- Resulted from repeated monoculture
- Abiotic factors contribute
- Soil borne pathogenic microorganisms

Solutions:

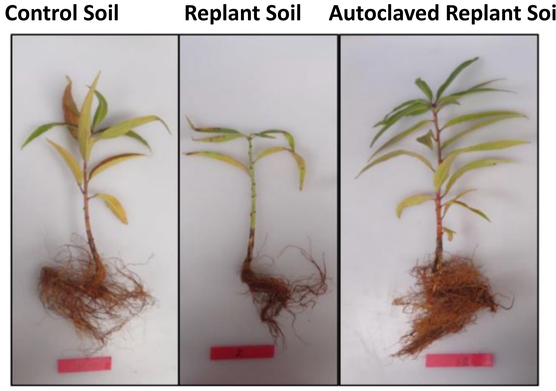
1. Soil Disinfection

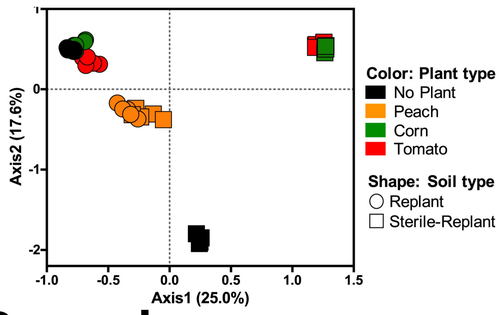
- Technique to reduce microbes in soil
- Field: Chemical fumigation or solarization
- Greenhouse: Steam autoclave

2. Rotation/Cover Crop

- Cover crop is grown to promote soil health
- Different crops have different benefits

Previous Study:



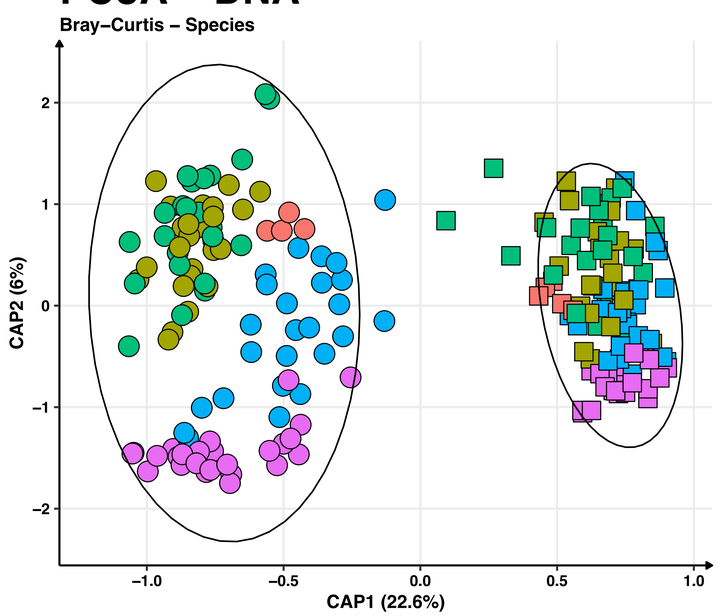


Procedure:

- Grew four different crops corn, tomato, fescue, and alfalfa in autoclaved and non-autoclaved RS soil from Grand Junction, CO
- Greenhouse experiment
- Reincorporated cover crops into the same soil
- Planted RS susceptible Lovell peach saplings
- Sequenced using Oxford Nanopore MinION

Main Findings:

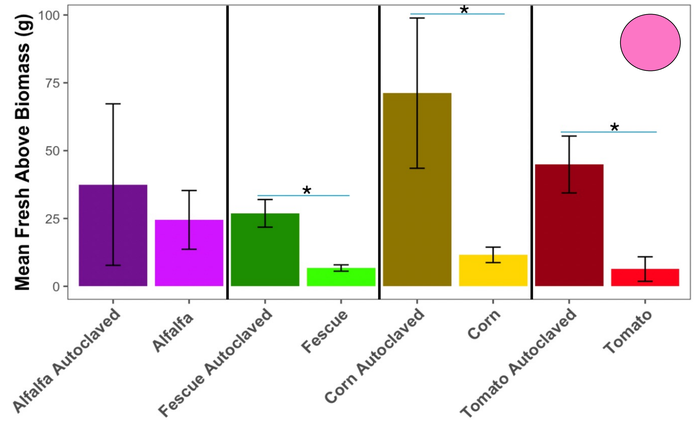
PCoA – DNA



- Cover crop biomass increased in autoclaved soils
- Autoclaving Soils induced a Microbial shift
  - Increase in thermophilic bacterial phyla
  - *Fictibacillus* spp. with nematicidal activity
- Peach tree biomass was higher in non-autoclaved soils
  - No plant controls show no difference with soil Tx
  - Autoclaved and non-autoclaved soils remain separated
- Beneficial bacteria like *Bacillus megaterium*, *Gaiella occulta*, and *Nitrospira japonica* were lost due to autoclaving soils supported a moderate disinfection technique

Results:

Aboveground Biomass by Disruption and Crop Treatment



Peach Dry Biomass by Disruption and Crop Treatment