CALIFORNIA SCIENCE & ENGINEERING FAIR
2019 PROJECT SUMMARY

Name(s)

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Project Number

S1806

Project Title

California Avocados Harvested in the Golden State: Investigating Root Rot and Combating Phytophthora cinnamomi

Abstract

Objectives

In 2017, I observed that California avocado farmers lost over $50 million in crop damage due to root rot caused by Phytophthora Cinnamomi. I own a small grove of avocado trees that were dying with this disease which were confirmed by my local agriculture lab testing. I wanted to see if I could combate Phytophthora Cinnamomi with an eco-friendly treatment that stops the growth of root rot instead of using the harsh popular phosphorus acid treatments. This pathogen infects the roots of avocado trees, resulting in death of the entire tree. My goals were to disrupt the pathogen s life cycle by forcing it into dormancy prematurely by using soil amendments. Secondly to thermally inactivate the spores by elevating soil temperature using a solarized bed. Then promoting new root growth by using endomycorrhizal fungi to expand the hyphae root hairs to absorb nutrients.

Methods

I mixed soil amendment treatment of eggshells, coffee grounds, poultry manure, endomycorrhizal fungi and wood chips and spread it around 18 of my 36 avocado trees. I left 18 as a control group to see how the trees normally progress. Gypsum and eggshells provide calcium to improve soil porosity and cause spores to encyst prematurely. Poultry manure for nitrogen and coffee grounds help maintain a favorable pH. I installed black plastic tarps over my soil amendments to create my solarization beds, creating a greenhouse effect to increase soil temperature which thermally inactivates the Phytophthora Cinnamomi spores.

Results

I found that the Gypsum I put out supplied needed calcium that the trees needed. When I tested the soil samples from the trees that had been treated they came back negative for Phytophthora Cinnamomi. When I conducted the leaf analysis I saw a calcium build up from 1.6% in 2016 to 2.3% in 2017 which is good for fruit production. Avocado feeder roots are 25 centimeters below the tree and this allowed me to use a surface probe thermometer to measure the temperature variations.

Conclusions

I noticed that the root rot started to go away and that the leaves were starting to return back to the trees. There were new shoots that started to appear the second year that I did this project. When I added Endomycorrhizal Fungi around the roots I saw that the hyphae root hairs were longer bringing in more water and nutrients which makes the tree and its fruit bigger. In both 2016 and 2017 I saw that there was a 1000+ avocado gain between the 18 trees that were treated and the 18 that were not. When I had the soil samples tested again they were confirmed to be negative of Phytophthora Cinnamomi.

Summary Statement

My project shows an eco-friendly and comprehensive method to control and rid the recurrence of Phytophthora Cinnamomi that will kill my trees if left untreated.

Help Received

My mom helped me to conduct this experiment as she is a farmer and has a great amount of knowledge about farming trees.