



Preventing *Phytophthora* Crown Rot in Large California Almond Orchard

Challenge

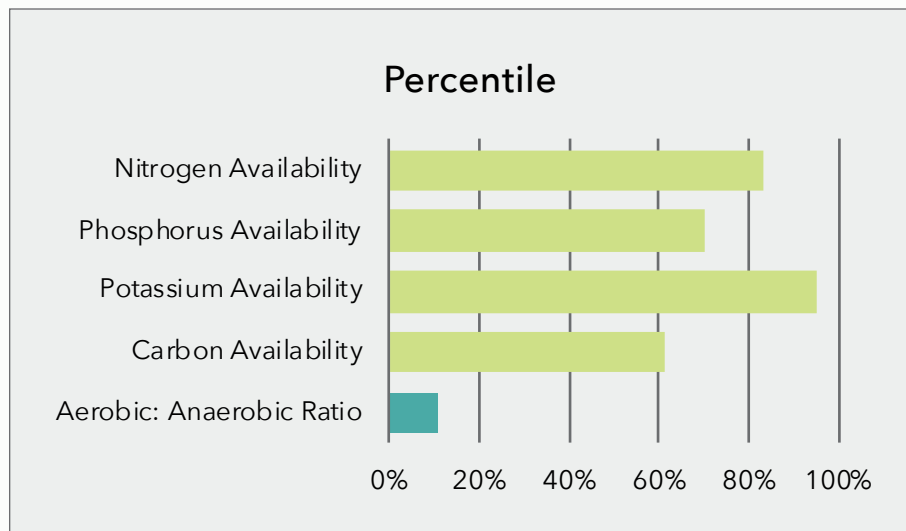
The incidence of *Phytophthora* Crown Rot has increased dramatically over the last five years in tree orchards across California. Lower quality soils are often at the highest risk and once disease symptoms are visible it spreads aggressively. When a large almond producer came to Trace Genomics to test their orchard the objective was clear, find if they had the disease and if so identify management practices to mitigate their risks. The Orchard Manager had run other tests, including the ELISA, but because this test is not species-specific their results were inconclusive.

Solution

The Orchard Manager worked with Trace Genomics to perform a soil analysis of pathogen and soil health levels. The orchard was able to identify and quantify the levels of different *Phytophthora* species in their orchard's blocks including:

- ▶ *Phytophthora cinnamomi*
- ▶ *Phytophthora cactorum*
- ▶ *Phytophthora cambivora*
- ▶ *Phytophthora cryptogea*
- ▶ *Phytophthora nicotianae*
- ▶ *Phytophthora parasitica*

Trace identified and quantified the different *Phytophthora* species in each sample and found high levels of *Phytophthora cambivora* in trees that were not showing symptoms. This factor was compared to the soil health indicators where Trace's analysis found the aerobic to anaerobic ratio was low. These values are associated with waterlogging.



Beyond *Phytophthora* the analysis measured other soil borne pathogens and identified low, non-harmful, levels of *Pythium*, *Verticillium*, and *Armillaria*. The soil health indicators showed normal nutrient and carbon cycling as well as normal oxygen levels.

Result

As a result of Trace's soil analysis the orchard managed the harmful species before *Phytophthora* Crown Rot was visible in their trees. Equipped with the findings, the Orchard Manager modified the irrigation schedule and adjusted the Metalaxyl levels to reduce inoculum levels in the soil. The orchard will continue to monitor the non-harmful pathogens (*Pythium*, *Verticillium*, and *Armillaria*) over the next season. Through these actions, the orchard prevented their risk of disease and protected their yield.