

Phytophthora Identification and Sampling in Citrus Nurseries

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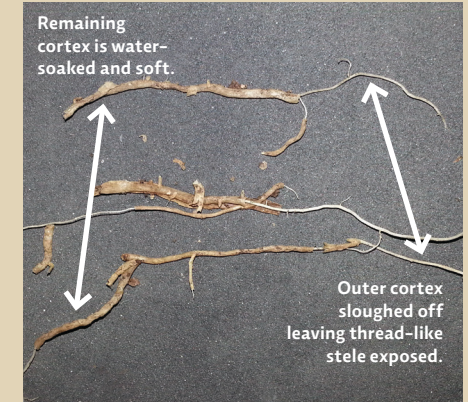
PHYTOPHTHORA SPECIES ARE IMPORTANT SOIL-BORNE, FUNGUS-LIKE PATHOGENS THAT ATTACK THE ROOT SYSTEMS, TRUNKS, AND FRUIT OF CITRUS TREES AT ANY AGE.

LEAF SYMPTOMS: Leaves may show yellowing (chlorosis) or wilting. Other diseases or disorders mimic the symptoms of Phytophthora (HLB, over-fertilization, or salt damage)

ROOT SYMPTOMS: Soft, water-soaked root cortex; cortex sloughs off (comes off to touch) to leave thread-like tips



HEALTHY ROOTS



INFESTED ROOTS



HEALTHY ROOTS—A DENSE, WOVEN MASS

Photo Credit: Diane Bright



INFESTED ROOTS—SPARSE AND DISCOLORED



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PHYTOPHTHORA SAMPLING PROCEDURES

SOIL COLLECTION

1. Select declining tree and label tree.
2. Sanitize hands and wear gloves.
3. Label sample bag.
4. Collect $\frac{1}{4}$ cup of soil from middle area of roots (if healthy root system) or from bottom of roots (if most roots have rotted away).
5. Seal sample bag.
6. Discard gloves and wash hands with soap and water.



Collect from middle of healthy root area.



Collect from bottom of weakened root area.



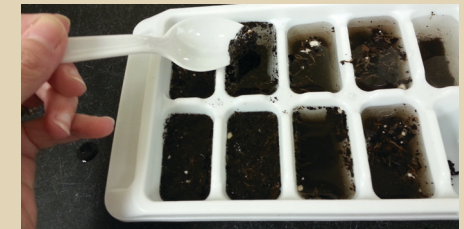
Soil sample in bag

SOIL TESTING

1. Stir or shake soil sample bag to loosen any clumps of soil. Fill each compartment of two ice cube trays $\frac{1}{4}$ full of soil sample.
2. Fill each compartment with water and stir. Skim off floating soil/potting medium with a plastic spoon.
3. Use a hole punch to make $\frac{1}{4}$ inch leaf disks. Place four citrus leaf disks into each compartment.
4. Incubate in dark room or cabinet at approximately 74°F for 48 to 72 hours.
5. Place leaf disks onto a slide with a drop of water and observe with microscope.
6. Use a compound microscope with a 400x magnification (10x ocular lens and a 40x objective lens) or a dissecting scope with 500x to 600x magnification to determine the presence or absence of sporangia (spore producing structures).



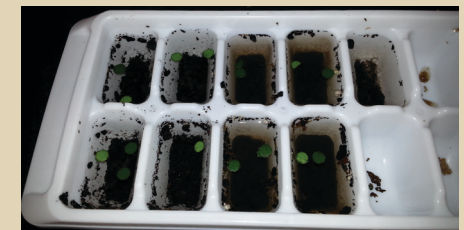
Fill ice cube tray sections with $\frac{1}{4}$ soil, and fill with water to rim.



Skim off floating soil/potting medium with a plastic spoon.



Use a hole punch to make $\frac{1}{4}$ inch citrus leaf disks.



Place four citrus leaf disks into each compartment.

DIAGNOSING PHYTOPHTHORA

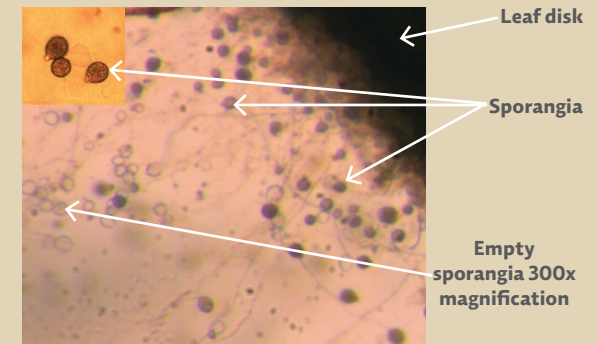
- There are two causal species of Phytophthora.
- *Phytophthora nicotianae* is the common cause of brown rot, foot rot, and root rot.
- *Phytophthora palmivora* causes brown rot and root rot in poor soils with high water tables.
- Knowledge of species and determining the type of sporangium are important for disease diagnosis.
- Properly dispose of infected plants.



P. palmivora sporangia are elongated and numerous.



P. nicotianae sporangia are round and numerous.



Leaf disk

Sporangia

Empty sporangia 300x magnification