

# TACF Fact Sheet

## Phytophthora Root Rot:

*Tips to guard chestnut against this lethal disease*

### What is Phytophthora Root Rot?

Phytophthora root rot, also known as ink disease, is a disease that affects the roots of American chestnut and usually results in tree mortality. It is caused primarily by *Phytophthora cinnamomi*, a soilborne plant pathogen that is part of a group of microorganisms known as Oomycetes, which are fungus-like organisms but not true fungi. However, other species of *Phytophthora* may also be involved. It is thought that *P. cinnamomi* was introduced to North America in the late 1700s or early 1800s. There is substantial emphasis on breeding American chestnut for resistance to *P. cinnamomi* using the same backcross breeding methods that have been used to breed tolerance to *Cryphonectria parasitica*, the fungus that causes chestnut blight. This involves crossing American and Asian species of chestnut and screening progeny for resistance.

Phytophthora root rot occurs most commonly in southeastern U.S., where soils have high clay content and temperatures are warm to moderate. However, this disease can be found just about anywhere south of 40° N. latitude, from southern Pennsylvania and Ohio to Georgia, Alabama, Mississippi, and everywhere in-between. The disease occurs primarily at lower elevations because *P. cinnamomi* does not survive in soils that routinely freeze. However, *Phytophthora* root rot on American chestnut can occur in locations with fine- or coarse-textured soils and in various habitats—including forests, farm land, nurseries, and cultivated landscapes, as well as in valleys or hills.



Chestnut seedling infected with *P. cinnamomi* displays dark staining on roots and shoot.

### Identify the Problem

Phytophthora root rot symptoms on American chestnut seedlings often include: chlorosis (yellowing), wilting, and eventually necrosis of foliage, dead and decayed roots, and necrotic lesions advancing from the root-crown into the lower stem as seen in the photos. Note that unlike dieback from blight, a seedling that dies from *Phytophthora* root rot will not resprout because it is completely dead.

### Current Management of Phytophthora Root Rot

Phytophthora root rot is more pronounced in wet or poorly drained soils because saturated soils stress roots and allow *Phytophthora* spp. to produce motile, swimming spores, called zoospores, that are attracted to stressed roots. Therefore, to avoid problems associated with *Phytophthora* root rot, especially if you live in the south, remember these two important steps:

1. Plant seedlings in well-drained soil. Dry, sandy, or gravelly soils are best, and loamy soils are good. Avoid clay soils, soils that retain water, or locations that are prone to seasonal saturation or standing water. Consider planting trees on raised berms in heavier soils to help keep the root zone dry.
2. Irrigate only when needed and only with enough water to wet the root zone. In other words, water wisely and do not over-irrigate!



Classic symptoms of *P. cinnamomi* infection include chlorotic, wilting leaves and canopy dieback.

# Phytophthora Root Rot:

## *Tips to guard chestnut against this lethal disease*

Application of chemical fungicides can help prevent *Phytophthora* root rot on chestnut seedlings growing in locations where they might be at risk or may slow disease development if your chestnut seedlings show early symptoms of infection. Although there are a number of fungicides commercially available to manage *Phytophthora* diseases, only a few are labeled for use on chestnut trees, and most of these contain the active ingredient mono- and di-potassium salts of phosphorous acid or related phosphite compounds—including Agri-Fos, Allude, Fosphite, KPhite, and Reliant. The only other fungicides labeled for *Phytophthora* root rot on chestnuts are Subdue Maxx and Mefenoxam 2 AQ, which contain the active ingredient mefenoxam. However, these two products can only be used on non-bearing chestnuts growing in nurseries. Other fungicides effective against *Phytophthora* spp. may become available in the future. **(TACF does not endorse specific products. Always read and follow directions on all fungicides.)**

If fungicides are to be used:

- It is always best to apply fungicides before infection occurs and symptoms develop because these products usually will not cure disease after trees are infected.
- The active ingredient mono- and di-potassium salts of phosphorous acid and related phosphite compounds are fully systemic in plants, so they move both upward and downward in the vascular system. Therefore, fungicides that contain these active ingredients can be applied as foliage sprays, trunk sprays, trunk injections (on mature trees), root dips, and soil drenches. However, a foliage spray is the most common method of application on the labels of these products.
- The active ingredient, mefenoxam, only moves upward in the plant, so these products should be applied as soil drenches.
- Application of the fungicides mentioned above on chestnut trees are usually most effective when applied two or three times during the growing season. Applications should be made once in the spring and fall or once in the spring, summer, and fall, depending on the length of the growing season and the product being used.
- Foliage sprays can be used on plants of any age but should be applied after the leaves have fully expanded and matured. Spray to thoroughly wet the foliage.
- Trunk sprays are an efficient method to treat older, more mature trees. Applications are made directly to the trunks of trees — 6-7 feet above ground down to the soil surface. A bark penetrant, like Petrabark, can be used when trunk sprays are made to help move the fungicide into the tree where it can be transported systemically down to the roots.
- Soil drenches can be applied to trees of any age but are more economical with small trees. Foliage or bark sprays are more economical with larger trees because soil drenches are applied to cover the entire root zone. Therefore, large volumes are needed to drench around more mature trees.

## **TACF is developing trees with resistance to *Phytophthora cinnamomi***

There is a significant and ongoing effort to breed American chestnut trees that are resistant to *P. cinnamomi*. TACF is collaborating with Clemson University, the USDA Forest Service, and others to make this happen. Sources of resistance being used in this effort include advanced selections at our Meadowview Research Farms as well as new selections from the different chestnut-growing regions. Selected progeny are now pre-screened for resistance to *P. cinnamomi* before being transferred to backcross orchards to evaluate field performance. For more information about *Phytophthora* root rot or TACF's efforts to develop pathogen-resistant trees, please visit our website or contact us (information below).



Lake Allatoona, GA is one of many *Phytophthora* resistance breeding orchards where pre-screened seedlings are established and monitored long-term.