

Armillaria Root Rot

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Armillaria root rot, also known as shoestring root rot and oak root fungus, is one of the most common root diseases of trees and shrubs. It is known to attack a wide range of plants in landscapes, parks, and orchards.

Causal Agent

Armillaria kills tree roots and causes wood decay. The fungus lives as a saprophyte on stumps and dead roots for years when no susceptible tree roots are near. Once trees become diseased, the fungus cannot be eliminated from the tree; however, healthy mature trees can survive for many years by compartmentalizing infections.

If plants have died or are dying from *Armillaria*, additional infections of nearby susceptible plants are likely.

Symptoms

Symptoms of root disease can be expressed in several ways. A tree may die after a period of progressive decline in health or show a general deterioration in crown condition indicating root or root collar

problems. These symptoms usually become apparent during periods of drought or following several consecutive years of insect defoliation. In some instances, trees may not exhibit decline symptoms, but simply fall over due to decayed roots.

Diagnosis

Positive signs of *Armillaria* root rot are the presence of:

- 1) Honey-brown mushrooms that are: a) similar in appearance to the cultivated mushroom, b) near or at the base of the tree, c) usually in clumps and d) present in the fall or after cool periods with high rainfall (Figure 1).
- 2) Fan-like, whitish mat of fungal tissue (mycelium) and decayed wood which are found under the bark (Figure 2).
- 3) Rhizomorphs present under the bark or on exposed wood on stems and flare roots. These structures are an aggregation of fungal tissue (hyphae) that resemble black, flat shoestrings. Rhizomorphs can grow through the soil for distances up to ten feet and facilitate new infections. These structures transport water from the soil to the infected wood which aids in the decay process. It should be noted that rhizomorphs on the bark of healthy stem and root

Figure 1: Armillaria mushrooms



Figure 2: White, mycelial fan beneath bark.



tissue does not necessarily indicate that a tree has root rot. A potential indicator of *Armillaria* is resin, gum, or watery liquid issuing from the lower stem.

Disease Biology

Armillaria is usually a secondary invader of stressed trees. It can infect roots from infested soil or contact with diseased roots of other plants. It can spread rapidly through the roots of stressed trees. When soil or mulch is placed against the root collar and stem, direct infection of those tissues can occur due to the stress imposed by the buried root collar as well as the constant moisture against the bark.

If the health of the tree improves, further advance by *Armillaria* is arrested. During periods of stress, *Armillaria* can again colonize healthy root or root flare tissue. This scenario occurs throughout the life of a diseased plant until either it permanently compartmentalizes the infection or the fungus progresses into the root collar, girdles the stem, and kills the tree. On old and severely stressed plants,

other secondary invaders including borers, bark beetles and canker causing fungi can attack plants and contribute to their decline and death.

Management

Trees with advanced stages of *Armillaria* root rot are prone to wind-throw/root failure. Performing an advanced risk assessment is essential before determining any further treatment on diseased trees.

If an advanced risk assessment is performed and a tree is determined to be a moderate, high or extreme risk due to root decay, consider any options for pruning/crown reduction that would reduce the risk to a low level. Remember that radical pruning could impact tree health and increase the severity of root disease. Tree removal and replacement is another option where risk exceeds the client's tolerance.

An important part of disease management is the removal of nearby sources of infection, when possible. This entails removing infected stumps and major roots using a stump grinder or manual digging. Remove chips generated by stump grinding from the site and fill the hole with topsoil.

Root collar excavation, the removal of soil and mulch from the lower stem, is an important part of disease prevention. This can be done manually using hand tools or with air tools such as an AirSpade®.

Maintaining plant vitality is essential in preventing *Armillaria* root rot and arresting development on diseased trees. The following cultural practices are recommended:

- Avoid root and soil disturbances within the critical root zone of trees during development and site renovation.
- Irrigation: during periods of drought, provide supplemental irrigation to minimize moisture stress.

- Mulching: provide 2-4 inches of organic mulch over the critical root zone conserve soil moisture and moderate soil temperature to promote root and soil health.
- Prescription fertilization: maintain optimal fertility, pH and organic matter through treatments based on soil analysis. Applications of potassium phosphite may help promote a resistance response to infection.
- Pest and disease management: monitor for insect pests and diseases and have treatments applied as needed to prevent impacts to plant health.
- Root Invigoration: incorporating organic matter and *Trichoderma* fungi through the process of root invigoration may reduce future infections.



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