

## Armillaria root disease

Several *Armillaria* species invade roots and basal stems of a number of woody plants. Some *Armillaria* species are more aggressive pathogens than other species.

### **Host Plants:**

Most hosts are woody plants and hundreds of trees and shrubs are susceptible. The vitality and age of host plants influences their ability to resist infection. In addition, seedling trees growing close to stumps of larger trees serving as a nourishment source for the fungus are vulnerable to infection.

### **Description:**

The above ground symptoms of Armillaria root disease on affected trees are those commonly associated with the sudden or moderate decline of weakened trees. These include progressive dieback of branches, reduction in shoot elongation and the size of leaves, pale colored foliage, premature fall color change, and the sudden browning of leaves in mid to late summer. Young trees are killed relatively soon after initial infection. However, Armillaria root disease may infect well-established trees for many decades without showing significant symptoms of infection until weakened by insect defoliation, persistent water shortage, competition for light and soil minerals, or other diseases. In addition to the symptoms noted above on broadleaf trees, infected conifers can develop chlorotic and reddened needles, as well as exude excess resin into the bark and wood from the root collar and lower stem.



**Left: Mycelial fan on pine.**



**Right: Rhizomorphs growing over mycelial fan on elm.**

Photos: (left) E. Hansen and (right) R. J. Stipes, *Diseases of Woody Ornamentals and Trees*. APS Press.

Signs include the presence of dark brown to black, flattened, string-like structures called rhizomorphs, and masses of flattened, white, cotton-like growth just under the bark. These signs are often evident at the base of the stem, in the roots, and in the soil around the roots of infected trees.

### **Disease cycle:**

The fruiting structures of Armillaria root disease are golden tan, gilled mushrooms that form in late summer and fall at the base of infected trees. The wind blows spores (basidiospores) from these mushrooms to nearby wounded stems or root collars. Yet the primary way Armillaria root disease spreads is via rhizomorphs and mycelia that pass from tree to tree directly through the soil and via root graft connection. Once the tree dies the fungus lives as a decomposer (saprophyte) on the wood and roots from the killed tree. From this food base the

fungus produces rhizomorphs that grow outward into the surrounding soil to infect roots of other trees. The fungus can also produce fruiting structures that push up through the soil surface and disperse basidiospores.

**Management strategies:**

Complete control is difficult; susceptible trees with strong vigor compartmentalize infections and generate new roots to compensate for those killed by the fungus. Maintain tree vitality with once or twice weekly soaking irrigation during extended dry periods, fertilization as low soil mineral levels warrant it, minimization of soil compaction in the root zone, and maintenance of a two to three-inch layer of well composted mulch over as much of the root zone as possible. Remove infected stumps and roots from sites where *Armillaria* root disease is a problem since they serve as a source of sustenance for the fungus. Little experimental evidence supports the effectiveness of fungicidal treatments, other than fumigating infested soil before replanting high value sites. There is evidence that conifer grown from seeds on a site where *Armillaria* was a problem had a higher rate of survival than similar sites with bare root transplanted seedlings, especially if water shortage was a problem. In addition, replanted trees growing outside their natural range may be more susceptible to the local species or strains of *Armillaria*, which they have not encountered before, or their increased susceptibility results from stress in environmental conditions to which they are not accustomed to growing. Renovate a site with local trees well adapted to growing on the site.

*Daniel H. Gillman, Plant Pathologist*

*UMass Extension Landscape, Nursery & Urban Forestry Program*

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