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ANR-907

ALABAMA A&M AND AUBURN UNIVERSITIES

Armillaria Root Rot of Trees and Shrubs

Mushroom root rot, which is caused by fungi in the genus *Armillaria* is one of the principal causes of tree or shrub death worldwide in forests, commercial plantings, nurseries, and landscapes. At the present time, nine species of *Armillaria* are recognized.

In North America, *Armillaria mellea* or *A. tabescens*—noted agents of root rot or butt rot—can cause death of seedlings, saplings, and more mature trees or shrubs. These fungi may also act as secondary stress-related pathogens or cause decay of roots and lower stems of dead woody plants. In forested areas, Armillaria root rot is usually reported on conifers.

In the southeastern United States, Armillaria root rot has been reported on many different trees and shrubs such as peach; Japanese and red tip photinia; sand pine; arborvitae; camellia; dogwood; elm; grape; loquat; southern magnolia; silver maple; Russian olive; laurel, post, red, turkey, water, and willow oaks; loblolly pine; and pittosporum. In Alabama, *Armillaria*-incited disease is mainly found in areas where oaks and other hardwoods are or once were present.

Symptoms

Reduced shoot growth, leaf discoloration or dwarfing, stress-induced production of numerous small cones or fruit of poor quality, and limb dieback are symptoms often associated with Armillaria root rot. Severity of foliage symptoms depends on the size and age of the host as well as the extent of root invasion. Usually small trees and shrubs quickly succumb to this disease while large trees gradually decline and die over a period of 2 to 8 years. Infection of root systems of large trees may progress slowly over a period of 10 to 50 years. Other root fungi or environmental stresses may cause foliage symptoms similar to Armillaria root rot.

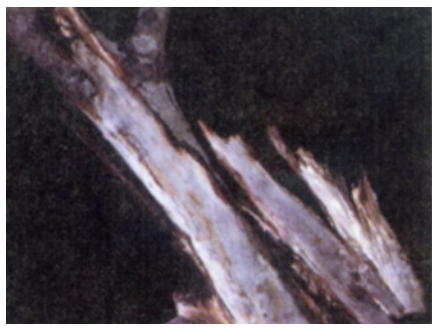
Oak leaf hydrangea collapse from Armillaria root rot.

Butt infections often become apparent when gum or resin oozes from cankers or cracks at or just above the root collar. Distinct semicircular, sunken lesions with cracked margins may be seen at or just above the soil line of trees and shrubs with a thin bark. Heavy resin or gum flows often develop from root collar cankers on some pines and stone fruit trees, respectively. Trees damaged by *Armillaria* may eventually be blown down by wind.

White, often fan-shaped fungal mats of growth (mycelium) under the bark, black threadlike fungal rhizomorphs, and characteristic mushroom clusters are diagnostic for Armillaria root rot. Fungal (mycelial) mats are often thin but may be up to 10 mm thick and are usually found at or just above the soil line. Sometimes they may extend several feet above or below ground on trunks or roots, respectively. Branched rhizomorphs, which are sometimes found on surfaces of infected roots, root collars, and surrounding soil, typically occur at the edge of mycelial fans. Flattened rhizomorphs may also form under the bark of the roots or root collar.

Crapemyrtle dieback from Armillaria root rot.

Mushrooms may appear in fall or early winter on or near the roots of diseased plants in clusters of several to 100. Dry fall weather often delays mushroom production until the following year. The common name, honey fungus, refers to the honey-colored cap of *Armillaria* mushrooms. Mushrooms may occur



Photinia lower trunk section showing white fungal mat of *Armillaria* fungus just beneath the bark.

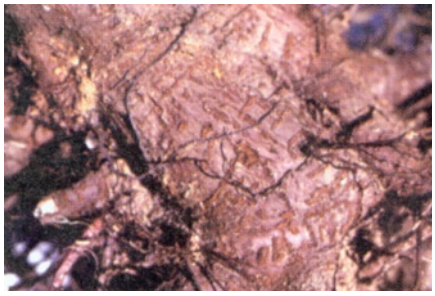
around host trees and shrubs lacking typical symptoms of this disease. In the absence of characteristic or distinctive fungal structures, culture isolations may be used for diagnosis of this disease.

Armillaria fungi cause a white rot decay of woody tissues. The wood of conifers is initially stained gray brown and appears water-soaked. As decay progresses, wood becomes yellow brown and stringy. A very wet, stringy texture develops with pale yellow flecking of the rotted wood. With hardwoods, wood becomes water-soaked, white yellow, spongy, and soft. Although white rot decay is characteristic of *Armillaria*, other fungi also cause this type of wood rot.

Disease Development and Spread

Armillaria fungi are common soil inhabitants and often live in association with their hosts with no apparent damage. These fungi can colonize the cambial tissues of roots of vigorous healthy shrubs and trees but are more likely to attack plants previously weakened by drought, insect- or disease-caused defoliation, mechanical (construction) injury to the trunk or roots, or any other factor that reduces plant vigor. if the host vigor improves, the fungus is often walled off or confined to a canker on the roots or root collar.

Infected tree roots are the major source of inoculum, but infected stumps are also survival sites and a source of *Armillaria*. Some *Armillaria* species only grow in close proximity to the roots while others grow freely through soil, forming networks of rhizomorphs



Black threadlike rhizomorphs of *Armillaria* on photinia collar and roots.

Armillaria species mushrooms growing on and adjacent to a declining oak tree.

which link colonized stumps to live trees. Many new infections are caused by rhizomorphs which branch off from infected roots and grow into nearby roots of healthy trees.

The rate of disease spread depends upon the *Armillaria* species involved, the amount of inoculum (infected tree roots or rhizomorphs), the distance between the inoculum and host, and the environment. Disease spreads most quickly in closely spaced plants. Wounds are believed to be important infection sites for weakly pathogenic species while virulent pathogens can penetrate into healthy tissues directly. *Armillaria* fungi will initially infect roots, then spread into the heartwood. From there, infection may extend outward into inner sapwood. Disease is often seen in plants established in areas formerly occupied by forest or orchards or in plants interspersed among infected trees.

Control

Good tree and shrub vigor is the best defense against mushroom root rot. in landscapes, recommended fertilization and watering practices should be followed to promote plant health and minimize the effects of stress on plants. Trees and shrubs should be planted on sites where they are best adapted for growth. Establishing plants off site eventually causes stress-related vigor loss which then increases susceptibility to attack by Armillaria fungi. Fungicides will not control this disease.

Uprooting stumps and root remnants is recommended as a means of slowing root rot spread to nearby healthy trees and shrubs. Mushroom root rot spread may be slowed on diseased trees by removing dead bark from the canker and exposing the root collar to air for several months. This practice is effective only) if the disease is caught early before the roots are seriously damaged.

If the site is known or suspected to have a history of mushroom root rot, establishing Armillaria-resistant plants is recommended. Ginkgo and tulip trees are reported to be among the more mushroom root rot-resistant woody plants. Other plants listed as resistant to Armillaria root rot include ash, bald cypress, boxwood, catalpa, cherry, Chinese elm, Chinese pistache, crabapple, cryptomeria, dawn redwood, eucalyptus, hackberry, holly, incense cedar, Leyland cypress maidenhair tree, maple, pine, privet, smoke tree, sweetgum, tree-of-heaven white fir, and wisteria.

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For more information, call your county Extension office. Look in your telephone directory under your county's name to find the number.

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