Florida Department of Agriculture and Consumer Services
Florida Forest Service

FOREST AND SHADE TREE PESTS

Mushroom Root Rot

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SIGNIFICANCE

Mushroom Root Rot, caused by the fungus *Armillaria tabescens* (syn. *Clitocybe tabescens* and *Armillariella tabescens*), is a common and widespread disease affecting both conifers and hardwoods in Florida. This disease occurs statewide and has been reported on more than 200 species of trees and shrubs.

RECOGNITION

Fig. 1. Typical cluster of mushrooms of *Armillaria tabescens*. At right, cluster excavated and displayed to show common base and spore-producing gills under mushroom caps.

Affected plants can show one or more of a variety of symptoms, including: thinning of the crown, yellowing of foliage, premature defoliation, branch dieback, decaying roots, windthrow, and lesions at the root collar. Some host plants show symptoms of decline for several years before dying. Others die rapidly without any obvious prior symptoms.

Mushroom root rot can often be identified without laboratory diagnosis. Conspicuous clusters of mushrooms, (Fig. 1.) which sometimes appear near the base of infected trees, are the most easily recognized diagnostic indicators of the disease. These mushrooms are usually produced in the fall, but they can occur at other times as well. When fresh they are tan to brown, fleshy, with gills beneath the cap, and lacking a ring (annulus) around the stem.

While the presence of the characteristic mushrooms is a sure indicator of mushroom root rot, the lack of these fruiting bodies does not indicate the absence of disease. Mushrooms are not formed every year and they decay rapidly when they do appear. In the absence of the conspicuous mushrooms, the fungus can often be identified by the presence of characteristic sheets or mats of cream-colored fungal tissue (Fig. 2.) beneath the bark of infected roots and tree bases. These "mats" or "felts" are often perforated with small holes throughout.

Fig. 2. Root with bark removed, showing fungal "felt" of *Armillaria tabescens*.

Mushroom root rot is often confused with a similar disease, shoestring root rot caused by the closely related fungus, *Armillaria mellea*. This fungus has been reported in Florida, but much less frequently than A. *tabescens*. The two fungi cause very similar disease symptoms, but they can be distinguished from each other in the field by the following characteristics:

1) The stalks of *A. mellea* mushrooms have an annulus or encircling ring.
2) Usually the fungal mats of *A. mellea* are not perforated and they are often striated or fan-shaped at their margins.
3) *A. mellea* commonly produces dark brown to black root-like strands of fungal tissue ("shoestrings" or rhizomorphs) under the bark of the host plant or in the surrounding soil. *A. tabescens* very rarely produces rhizomorphs in nature.

INFECTION BIOLOGY

It is presumed that new infections are caused by airborne basidiospores disseminated from the gills on the underside of the mushroom, but this means of infection has never been demonstrated. *Armillaria* usually spreads locally by means of vegetative threadlike fungal strands (mycelia) growing from infected roots into healthy roots through points of root to root contact. Even after an infected plant is removed, mushroom root rot can create problems. The fungus survives saprophytically in stumps and dead roots remaining viable and infectious for many years.

Plants infected by *Armillaria* do not usually show any symptoms until the disease has disabled a major portion of the root system. The fungus can remain in the root system of the host plant for years, feeding on roots, but causing little obvious damage. As long as environmental conditions remain favorable and the host plant has a low level of stress, the loss of roots to decay may be offset by growth of new roots. However, if conditions change, the balance can shift, and the host may begin to show symptoms of decline. Often, death occurs rapidly before any other symptoms are observed. There are at least two explanations for the rapid decline of the host plant. First, changing conditions may favor the growth of the fungus, allowing it to flourish and spread rapidly throughout the root system and even into the lower stem of the host. Secondly, changing conditions may not favor the fungus directly, but may put the host into severe stress, which it is unable to handle with a partially disabled root system. Determining the correct scenario is probably impossible since the ultimate outcome is the same. After a host plant or tree dies, its entire root system may be quickly colonized by the fungus.

Tree mortality in natural settings is less common than in landscapes, where site disturbances have often injured roots and predispersed trees to infection. However, several times in the last several years we have been called to forest sites exhibiting unusually high levels of tree mortality. Typically the trees involved were upland oak species (i.e., turkey oak, southern red oak, laurel oak). In each case rapid tree death occurred in July or August during a wet summer preceeded by relatively dry years.

CONTROL

By the time trees or shrubs show visible symptoms of mushroom root rot, control is difficult if not impossible. Over the years many drastic control measures have been proposed and/or tried (i.e., surgical removal of infected material, soil replacement, soil fumigation), but their value is questionable. There is currently no known effective fungicide registered for treatment or control of mushroom root rot. Preventive means of control are more practical and effective.

Vigorous healthy plants are less likely to be affected by this disease. Practices which protect the host, reduce stress, and promote vigor are advised. Sanitation practices are also important. Prior to planting a healthy plant replacing one infected with mushroom root rot, remove as much of the dead stump and root system as possible. If possible, select a species which is less susceptible to mushroom root rot. Native plants, on their preferred sites, may be less susceptible than exotic species. Keep root damage to a minimum when transplanting trees and shrubs. Proper planting depth is critical. The root collar should not be planted too deep or piled high with mulch. Maintain good growing conditions (i.e., soil fertility, pH, moisture). Avoid too much or too little irrigation.

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