48. Armillaria Root Rot

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Fungi of the genus *Armillaria* are common facultative parasites on more than 600 plant species throughout the world. Root diseases caused by these fungi are responsible for considerable economic damage, especially within plantations, orchards, or vineyards. Many forest conifers and hardwoods, as well as ornamental shrubs and trees, are susceptible to these pathogens.

Hosts and Distribution

Armillaria occurs sporadically throughout the Great Plains. This disease has been reported on over 25 plant species widely planted in landscapes and windbreaks. Some susceptible plants commonly grown in the Great Plains are: boxelder, paper birch, Peking cotoneaster, Tatarian honeysuckle, apple, ponderosa pine, Scots pine, *Quercus* sp., *Prunus* sp., and other members of the rose family (Rosaceae).

Figure 48-1. Chlorotic foliage of ponderosa pine infected with *Armillaria*.

Symptoms and Signs

Crown symptoms resemble those of other associated root disorders: reduced height growth, chlorotic foliage, premature foliage drop, dieback, and mortality (fig. 48–1). One or more of these symptoms may be present on a single tree. In addition, hosts infected at the root collar may have external basal resinosis or gummosis.

Armillaria produces a characteristic cream-colored mycelial fan beneath the bark, in the cambial zone, on roots, and at the root collar (fig. 48–2). Rhizomorphs, tough shoestring-like structures made up of hyphae that darken with age, may be found on root surfaces, in adjacent soil, or under loose bark (fig. 48–3).

The most positive signs of *Armillaria* infection are the production of fruiting bodies (fig. 48–4), and their characteristic appearance in culture. *Armillaria* produces an edible, honey-colored mushroom in small to large clusters on living and dead hosts or on soil near buried wood. This mushroom may be present from late summer through fall if moisture is adequate. *Armillaria* mushrooms may be identified by their honey-yellow caps, 1–5 inches across; fine, cinnamon-colored erect hairs over the cap; white spores; and a persistent ring or annulus on the stem. A yellow-capped variant is often observed on hardwoods; a pinkish-brown variant is common on conifers.

Disease Cycle

During favorable late summer or fall weather, *Armillaria* may be a prolific spore producer. However, unlike many other decay fungi, the spores of *Armillaria* rarely initiate disease. *Armillaria* spreads primarily as vegetative mycelium, either by root-to-root contact or by rhizomorphs.

Rhizomorphs can grow considerable distances through the soil, and initiate parasitic infections or saprophytic colonization. When a rhizomorph encounters a host root or root collar, it adheres to the bark surface. Subsequently, by direct pressure and enzymatic action, mycelial strands colonize susceptible host cambium and initiate canker formation. These cankers usually do not progress into lethal infections on healthy, vigorous hosts, but remain quiescent until the host dies naturally, the host vigor decreases significantly, or the host is overwhelmed by numerous parasitic attacks. Successfully attacked hosts usually do not die until infections girdle the root collar cambium.

Following successful parasitic infection, *Armillaria* begins saprophytic colonization of woody tissues beneath infected cambium. In some conifers and hardwoods, *Armillaria* causes wood decay without parasitic cambial infections. In this latter case, *Armillaria* does not

appear to kill trees directly, but may predispose them to windthrow.

Damage

Young trees are most likely to be killed by *Armillaria*. Trees 15 to 20 years old are more tolerant to parasitic attacks. *Armillaria*, in general, is not damaging unless hosts are under unusual stress, such as by extended droughts, competition for light and nutrients, insect attacks, or infections by other root pathogens.

Control

Control of root diseases over extensive acreage is seldom possible without considerable effort and cost. Valuable ornamental, shade, and orchard trees, adjacent to infected trees, may be protected by careful removal of infected stump and root material from the soil. Chemicals have been used to sanitize infested soil and wood, but only professional chemical applicators should apply these chemicals near healthy trees.

Planting immune or highly resistant species is the most promising and long lasting approach to Armillaria root rot control. Lists of resistant plants that are well adapted to a locale can be obtained from local extension agents or from the reference by Raabe and McCain (1967).

Make sure planting stock is disease-free. Reduce foliage so crowns are in balance with root systems. Prepare the planting site adequately. In general, to minimize the impact of root diseases, maintain host vigor through adequate and timely applications of water and fertilizers.

Figure 48-3. Rhizomorphs of *Armillaria* on root surface under bark of host.

Selected References

U. S. Department of Agriculture. Index of plant diseases in the United States. Agric Handb. 165. Washington, DC: U. S. Department of Agriculture; 1960. 531 p.

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Figure 48-2. Mycelial fans of *Armillaria* in cambial zone of ponderosa pine.

Figure 48-4. Large fruiting bodies of *Armillaria* on bark at root collar of ponderosa pine.