

Prevention and Control

There are no chemicals registered for control of ARD. In areas of high-value plantings, diseased trees should be removed, including stumps and roots. In forested areas, preharvest surveys should include observations on the number and size of ARD root disease centers. As a guideline, if more than 10 disease centers are found per hectare, stand-thinning in subsequent regeneration is not recommended.

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Text: K.I. Mallet
Illustration: D. Lee
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Natural Resources Canada
Canadian Forest Service
Northwest Region
Northern Forestry Centre
5320 - 122 Street
Edmonton, Alberta
T6H 3S5

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Armillaria root disease



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Distribution and Hosts

Armillaria root disease (ARD) or Armillaria root rot is found on many different plant and tree species throughout the forested areas of the world, including western Canada. This disease is incited by a fungus and primarily occurs in forest trees. It is also found in parks and occasionally in shelterbelt and urban tree and shrub plantings. It is one of the most economically important diseases of hard pines (lodgepole, jack, Scots, and red), spruces (white and black), firs (balsam and alpine), Douglas-fir, larch, birch and poplars (aspen and balsam) in the forests of the prairie provinces. Seedlings as well as mature trees can be damaged by ARD.

Symptoms and Damage

Trees with ARD might or might not show external symptoms. The fungus often causes a yellow stringy-rot in the roots or butt of a tree that will not be immediately obvious from outward appearances. Tree growth can be reduced and often a stress crop of cones are produced on conifer trees. Infected conifer trees will often exude resin from their roots and base. Dying trees' foliage becomes discolored and drops off. Needles on dying pine trees first turn yellow-green and then red before falling off. Spruce needles often become a dull green (but not red) before they fall off. A white mat of fungal mycelium (tissue), found beneath the bark in the roots or in the root collar, is characteristic of ARD.

Armillaria species produce fruiting bodies (mushrooms) in late August and early September. The mushroom is often referred to as the "honey mushroom." It has a light-brown cap with tiny black hairs, white gills, and a conspicuous ring around the upper stem. *Armillaria* mushrooms are found around the base of infected trees. The mushrooms

produce spores that might affect the spread of the fungus.

In forest stands the disease will often kill trees either singly or in patches known as disease centers. These disease centers will continue to grow in size as the disease spreads outward over time. Trees whose foliage appears healthy but have rotten roots can be hazardous in campgrounds or around buildings because they are susceptible to wind-throw.

Causal Agent

Armillaria root disease is caused by several closely related species of *Armillaria*. There are three species of *Armillaria* in the prairie provinces (*A. calvescens* [Bérubé and Desserrault], *A. ostoyae* [Romagn.] Herink, and *A. sinapina* [Bérubé and Desserrault]). *Armillaria ostoyae* is the most prevalent and destructive of the three. It has been found on conifer and hardwood tree species. *Armillaria sinapina* is more-commonly found in poplar trees, but has been found on conifers. *Armillaria calvescens* has only infrequently been found in Saskatchewan and Manitoba on both conifers and hardwoods.

Armillaria species enter the tree through the root system either by rhizomorphs, a shoe-string-like structure, or by root-to-root contact with a diseased tree. Once inside the tree, the fungus can grow quickly through the root system and kill the tree or slowly decay the wood in the root. After a period of time, rhizomorphs grow out into the soil from the infested piece of wood.

Armillaria can survive in roots and stumps for long periods of time (up to a decade or more). Some root disease centers have been estimated to be more than 400 years in age.