



Armillaria root rot

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*Armillaria root rot, also known as the honey toadstool or bootlace fungus, is a widespread and often destructive disease that can affect an extremely wide range of plants. Overseas, the disease is reported to be caused by *Armillaria mellea*. In Australia, however, a related indigenous fungus *Armillaria luteobubalina* is the most common cause of *Armillaria* root rot.*

Symptoms

Above-ground symptoms on infected plants are leaf yellowing, stunting, limb dieback and tree death. The most distinctive symptoms, found only on closer examination of affected trees, are rotted roots and stems, and creamy-white felt-like areas of fungal mycelium immediately below the bark of infected wood. Dark bootlace-like fungal strands (rhizomorphs) may sometimes be found growing through the soil and attached to the host roots. Occasionally, after an infected tree has died, honey-coloured clusters of toadstools grow from the base of the tree. These usually appear from May to July. The toadstools (the fruiting bodies of the fungus) have honey-coloured to deep brown caps covered with scales, whitish gills and yellow to brown stems with a pronounced ring or collar around the upper part of the stem.

Economic importance

Armillaria root rot affects all fruit trees, most native trees, ornamentals including rhododendrons and azaleas, and some herbaceous crops such as potatoes, rhubarb and strawberries. *Armillaria* root rots are found world-wide. Because *Armillaria* is pathogenic to native trees and can live saprophytically on dead stumps, it is often a problem in newly-cleared areas where crops or gardens are planted. When compared with other more common orchard diseases, *Armillaria* root rot is only of minor importance. However, in an affected orchard this disease can be most destructive, and effective control is very difficult.

Disease cycle

The fungus can spread in several ways, the most common being by root contact; the fungus grows from a diseased root into a healthy root via the point of contact of the roots. Rhizomorphs can grow from infected roots through the soil to roots of a nearby plant.

Airborne spores produced by the toadstools can be another method of spread, although these spores can only infect

dead or injured wood. Cultivation may also spread the fungus by moving diseased root pieces from infested sites into adjoining healthy areas.

The main sources of infection in orchards are infected, dying trees within the orchard, or dead stumps or root pieces persisting in the ground from an earlier planting that was infected with the disease, or from the original vegetation (trees in native forests are often infected with *Armillaria*). The disease often spreads radially from one tree to surrounding trees, and replants within the affected area usually die within a few years unless the site is treated (see below).

Control

When clearing and planting new ground:

- Ring-bark native trees and leave for at least six months before removing them, so that starch reserves in the tree are depleted. This lowers the chance of such trees becoming centres of infection.
- Rip the area thoroughly, and remove and burn all stumps and large roots.
- Leave the area under pasture for at least from two to three years to allow small roots to rot.

When treating slightly affected trees:

- Remove soil from around the butt and main roots to a radius of about 750 mm. A high pressure jet of water from a spray pump is a convenient way to remove soil from around affected trees. Cut out and burn diseased bark and roots, and paint cuts with a plastic paint. Leave the crown and roots permanently uncovered and do not replace soil during cultivation. This will halt the development of the disease, as exposure to air kills *Armillaria*.
- Remove and burn all badly affected trees, including roots.

Treatment before replanting severely affected trees:

- *Armillaria* can be controlled by soil fumigation. Control depends on the complete eradication of the fungus. To achieve this, the extent of infestation must be determined accurately and the entire area must be fumigated after suitable preparation of the soil.
- Map the affected area to find the extent of the infection within the orchard. Include all trees showing poor growth, all replants within the affected area plus

two rows of apparently healthy trees adjacent to the affected area. Trees can be checked for infection by exposing the roots and butts, as described above, and by removal of a small piece of bark from this region. On infected trees this will reveal a creamy-white mycelial fan. If rhizomorphs or mycelial fans are found on any apparently healthy trees, then adjacent trees should also be checked as well.

- Remove all the affected trees within the area, and as many roots as possible, and burn on the spot. Do not move this material from the site, or cultivate outwards from the affected area, as the disease spreads readily through infected roots and stems.
- Plant a cover crop to lower soil moisture during spring and summer before fumigation. The soil should have dried to a depth of 600-700 mm. This is important as the fumigant must contact deeply buried infected root pieces that could cause reinfection.
- Deep rip to at least 600 mm, then disc to a fine tilth.

- In late summer, while soil moisture is still very low, fumigate the affected area to a depth of 400 mm. Seal with polythene sheet for at least 24 hours. Do not fumigate soil that is closer than 2 m from surrounding healthy trees because this may kill them.
- Replant only when it is safe to do so - usually about one month after treatment.

For effective pest and disease control, correct diagnosis is essential. A commercial diagnostic service is available at the DPI PIRVic Knoxfield Centre. For further information, contact the Diagnostic Service. ph: (03) 9210-9222 or fax (03) 9800 3521.

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