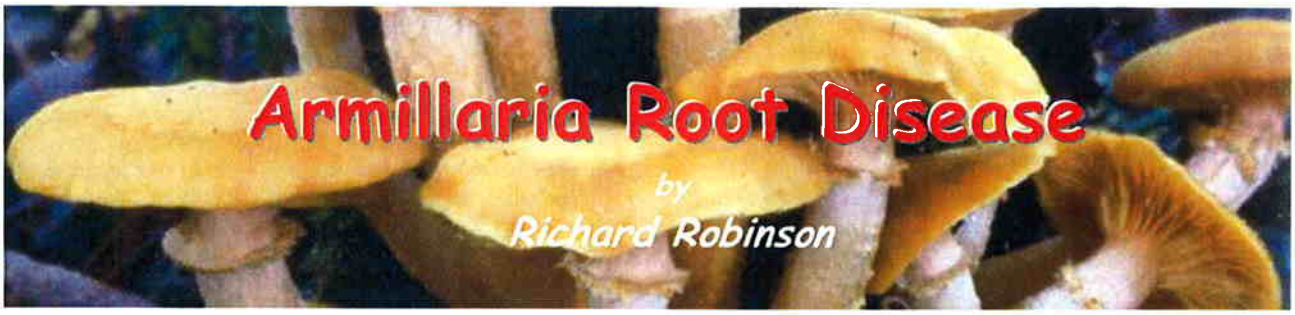

Armillaria luteobubalina, the Australian honey fungus, is a pathogen that attacks and kills the roots of susceptible trees and shrubs, causing a root rot. It spreads from host to host by root contact. The disease is referred to as armillaria root disease. In recent years, reports of armillaria root disease, killing trees and shrubs in backyard gardens have increased. When investigated, infection is usually traced to stumps or the roots of infected trees that were left following clearing of the bush when towns or new suburbs were established.

The honey fungus is indigenous to southern Australia, and in the South-West is common in all forest, woodland and coastal heath communities. In undisturbed environments armillaria root disease is generally not the primary cause of death in healthy forest or woodland trees but more usually it kills trees weakened by competition, age-related decline or environmental stress and disturbance. In gardens and parks, however, the honey fungus can become a particularly aggressive pathogen. The list of susceptible hosts is extensive and is likely to include all native shrub and tree species as well as all introduced species.

Recognising the disease

Usually the disease is not detected until the final stages, the first signs are generally seen in the autumn when a cluster of yellow mushrooms appear at or near the base of infected trees or shrubs. Even at this stage the plant may still appear to be healthy. When the pathogen spreads from the roots to completely girdle the base of the plant it then dies quite suddenly. Removing the bark from infected roots exposes a characteristic white fungal material often forming fan-shaped mats on the surface of the wood. Eventually the roots develop a white stringy rot, which can become very wet and soggy.

Mushrooms are usually produced in clusters . The light yellow caps are 3.5 to 9 centimetres across and have a dense covering of small black to brown scales near the centre that feel like a cat's tongue when you rub a finger across them. The gills are white at first, then turn cream, and finally develop yellow or rusty spots on their edges and sides. The stems are usually robust and about eight to 15 centimetres or more tall. The upper stem has a ring just below the cap and a blush of pink colour. Scattered or thick scales may cover the surface of the lower part of the stem.

Honey mushrooms growing from the infected roots of a rose bush

A cluster of honey mushrooms

Brown to black scales on the cap surface

Fan-like fungal mats under the bark

Management of the disease

Chemical control of armillaria root disease is not feasible. Chemicals that have been used to eradicate or control the fungus are now banned because they are highly toxic and dangerous to use. Disease control relies on a combination of inoculum (infected material and material with the potential to become infected) reduction and good garden management that results in healthy vigorous plants and trees capable of tolerating and thus limiting spread of the disease.

- ***Removal of inoculum***

Once an infected tree dies, the honey fungus survives in the dead wood of the roots and stump. On a large tree it may survive for decades. Disease management should be directed towards limiting the buildup of inoculum in order to reduce the disease spreading into replanted trees and shrubs. The most efficient method of achieving this is through removal of all infected material from the soil. For small trees and shrubs this is feasible, albeit with a bit of hard work. Stump grinding followed by removal of roots with a machine such as a backhoe may be necessary following the removal of moderately large trees. Good hygiene is essential in preventing the spread of *Armillaria* into healthy parts of your garden. Infected material should be destroyed and not transported to another site. Do not use wood chips from infected material as mulch.

- ***Create physical barriers***

In the case of large trees that are killed, stump and root removal may not be an option. However, digging trenches, lining them with plastic sheeting and then backfilling can isolate infected areas by creating physical barriers. The trench needs to be about 1-1.2 m deep. Be sure to locate drains and underground wiring before you start digging.

- ***Modify or delay planting***

If isolating large stumps with trenches is not possible, then a change in the type of plants you grow may be necessary. Remove as much small root material as possible, especially in the area between the large primary lateral roots that radiate from the stump. These areas can be planted with herbs or annuals as long as the roots of the new plants do not contact the infected stump roots. Alternatively larger areas that are infested may be turned into lawn or left unplanted for as long as possible.

- ***Avoid transplanting or unnecessary tree removal***

Avoid transplanting shrubs from infected areas as they may also be infected and introduce the disease to another part of your garden. The disease can be present but not active on the roots of healthy trees, so if you know you have armillaria root disease in your garden then cutting down apparently healthy trees should also be avoided. The fungus will rapidly spread throughout the resulting stump and roots to create a source of infection for new and neighbouring trees and shrubs.

- ***Biological control***

Recently some success has been achieved by the introduction of competitive wood decay fungi into infected stumps, or by the application of biological fungicides based on an antagonistic fungus called *Trichoderma*. Many species of fungi rot dead wood and thus compete with *Armillaria* for food resources within newly formed stumps or in the roots of recently killed trees. There are several species of native wood decay fungi that are able to colonise stumps more rapidly than the honey fungus and the artificial introduction of these species into stumps may limit the amount of inoculum. *Trichoderma* is a naturally occurring soil fungus and is capable of inhibiting the activity of *Armillaria* by producing anti-fungal compounds. Both methods have shown some success, but not consistently.

Don't be discouraged by the diagnosis of armillaria root disease in your garden, but be prepared to manage your garden in order to live with it. By careful planning the chance of disease spreading to your healthy trees and shrubs can be reduced, and as your trees get older they will become more tolerant.

Richard Robinson is a Research Scientist in Forest Pathology and Fungal Ecology, at the Department of Conservation and Land Management, Manjimup. He can be contacted on 9771 7997 or e-mail: richardr@calm.wa.gov.au