

Armillaria root rot of citrus trees

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Background

Armillaria root rot is caused by various species of the fungal pathogen *Armillaria*, predominantly *Armillaria luteobubalina*. The disease is most common in coastal NSW citrus orchards, where clearing of native eucalypt forests has left infected roots, but has been known to occur occasionally in inland orchards. All commonly grown citrus cultivars are susceptible.



White fan-shaped mycelial mats are found under the bark.

Symptoms

The *Armillaria* fungus damages the root system, affecting either single trees or small groups of trees.



Clusters of mushrooms grow from infected roots in autumn.

The disease is often observed moving along the tree row, progressing from tree to tree as the infected roots of one tree come into contact with the next.

Above-ground symptoms are generally not seen until the disease is well established in the root system and trunk. The root infection induces a slow decline that involves the whole canopy when a major part of the root system is infected. Initially leaf and twig dieback may be observed, progressing to death of major limbs and eventually death of the entire tree depending on the proportion of the root system that is infected.

Infected roots are slightly spongy. Characteristic white fan-shaped mycelial mats can be seen growing on the wood when the rotting bark is peeled back. Freshly infected roots have a strong mushroom smell. The wood of infected roots is rotted by the fungus, becoming either white and powdery or wet and jelly-like with black bands. Black bootlace-like strands called rhizomorphs can occur on the root surface, partially embedded in the bark, or may occasionally be seen growing on the surface of roots ahead of the infected area or into the surrounding soil.

The fungus survives in the soil until the infected root breaks down. The infection spreads when new roots come into contact with infected roots or rhizomorphs. Survival of the fungus depends on how long it takes the infected root to break down in the soil.

Clusters of mushrooms (the fruiting bodies of the fungus) grow from the infected roots at the base of the tree during humid, moist conditions in autumn. The mushrooms are brownish or honey coloured on top and creamy-white underneath. Numerous spores are produced that may be seen as a dusting of white over nearby weeds and soil.

There is some evidence that the incidence of the disease is higher in unusually wet seasons due to an increase in the activity of the fungus. The disease is most severe in sandy or lighter soils. Citrus trees weakened by drought or other stress factors may be more vulnerable to *Armillaria* infection.

Control

Land should be cleared of stumps and roots, from native vegetation or old orchards, well before planting new citrus trees to reduce the amount of inoculum in the soil. Bulldozing followed by deep ripping has been found to be most effective. Affected trees can be isolated by deep trenching to reduce the risk of infection spreading between trees, but this is not a practical option in a commercial orchard.

The productive life of a tree can be extended if treated in the early stages of infection by pruning low hanging branches and removing soil from around the butt to expose the structural roots to sunlight and air. The diseased roots and bark should be cut out and the cut surfaces treated with quick-drying water based plastic paint.

The impact of the disease on the tree can be reduced by not allowing fruit to ripen on the tree.

Soil fumigation has been used, but is only effective where deep penetration can be achieved. Where there is a high incidence of infection the most effective long term solution is to remove all of the trees, including all stumps and large roots and leave the area fallow for at least one year before replanting.

References

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