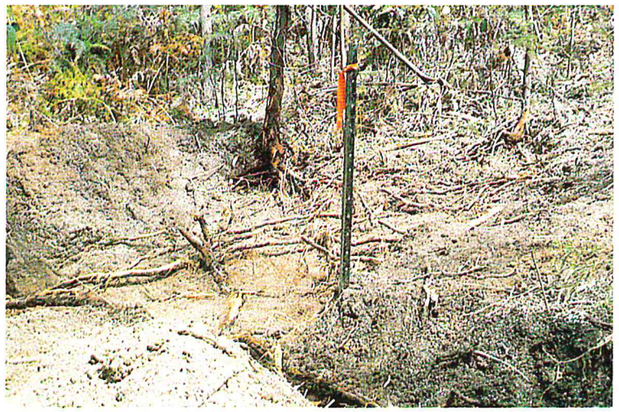

Fig. 3. *Roots exposed to show connections between trees.*

Fig. 4. *Victoria Mill Reserve, Mt. Cole, with patches of dead trees killed by* Armillaria luteobubalina.

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Armillaria dieback : A disease of native and introduced trees.

Fig. 1. *An unusually large clump of fruiting bodies, showing various stages of development.*

Notes from the Von Mueller Institute, State Forests & Lands Service, Conservation, Forests & Lands.

ARMILLARIA DIEBACK : A DISEASE OF NATIVE AND INTRODUCED TREES

Armillaria root rot fungus, unlike some familiar pests and diseases, occurs naturally in many eucalypt forests. This aggressive pathogen has so far seriously damaged about 2000 ha of intensively managed, mixed species forest in the Mt. Cole and Wombat forests of the Ballarat and Geelong regions. It attacks many species of eucalypts and wattles, and has been recorded on many types of introduced trees and shrubs growing in parks and botanical and domestic gardens.

RECOGNITION

The fungus can kill trees and shrub species of any age and has a very wide host range. Young trees and seedlings may, over a period of a few weeks, suddenly wilt, the leaves fall off and the foliage becomes sparse. They die within 3-6 months of the onset of the first symptom. Larger trees, especially those with a sizeable trunk, die very slowly. The initial symptom of sparse foliage and branch dieback may continue for up to 3 years before the remaining foliage begins to wilt, the leaves turn down and the trees die. Other diseases and environmental disorders can produce similar symptoms so check that armillaria infection is present by examining a tree showing advanced disease symptoms.

Remove some of the inner bark at the base and look for fan-shaped creamy-white fungal sheets (Fig. 2). Often the bark tissue around the fungal sheets turns chocolate brown in colour. In many cases small white flecks of fungal tissue surrounded by brown discolouration in the bark also appear. Between April and early June the fungus produces the fruiting bodies (mushrooms) shown in Fig. 1 at the base of some trees and stumps. These can be quite large, with caps between 4 and 15cm in diameter on stalks up to 25cm long. Their colour can vary from yellow-brown to yellowish olive.

Some species of Armillaria produce specialised rope-like structures called rhizomorphs, dark in colour and up to 3mm in diameter. Don't expect to find them, as the species causing damage here has been identified as *Armillaria luteobubalina,* one which rarely develops them in these drier forests, or in trees infected in parks and gardens.

DAMAGE

Unlike the well-known cinnamon fungus, *Phytophthora cinnamomi*, Armillaria does not infect soil. It spreads from a woody food base, which may be a tree or a stump, or even a small piece of infected root. The root systems of many trees in these forests are connected (Fig. 3), so the fungus can move from its food base into the roots of a healthy tree. If the tree is close to a large food base its chances of rapid infection and death are increased.

As the fungus spreads into uninfected roots the white fungal sheets grow rapidly through the root's cambial zone, between the bark and the wood. After reaching the base of the tree they keep growing until the stem is girdled. In some eucalypts like messmate stringybark, *Eucalyptus obliqua,* they can extend through the bark for some distance up the tree. The sapwood rots and the tree may respond by weeping kino or gum. The bark at the base often splits.

A tree with white sheets under the bark and mushrooms at the base is seriously infected.

CONTROL

Control of this pathogen is difficult. By the time symptoms are obvious the disease is well advanced and little can be done to save affected trees. Treatment of stands to prevent further spread depends on isolation or removal of the food base.

How practical is it to remove or isolate the food base on an infected site? Removal of stumps and dead trees, and ripping to break up connections between root systems are expansive operations but they have been used in a trial established at Mt. Cole in 1978. Conventional clearfelling with and without ripping around stumps is being compared there with whole tree pushing, again with and without ripping. Pushed trees and stumps have been removed from the site.

Areas treated had been chosen carefully so that three had a high level of infection, as indicated by disease symptoms, and three were less severely infected. Seedlings of messmate stringybark (*Eucalyptus obliqua*), Victorian blue gum (*Eucalyptus globulus ssp. bicostata*) and radiata pine (*Pinus radiata*) were planted and their survival and health have been monitored since.

We will need much more time to properly judge the effects of each treatment. However, the fungus has been active during the first six years and has killed more and more seedlings each year on the heavily infected sites. Patches of dead seedlings have now appeared. Messmate stringybark has suffered most, with losses six to seven times greater than those for Victorian blue gum or radiata pine.

If, and when, differences between treatments can be firmly established, recommendations for site preparation to restore infected areas will be possible. There is little doubt at this stage that the solution will be an expensive one.

Once a tree is infected in a home garden or park there is virtually nothing that can be done to save that tree. However, measures may be taken to stop it infecting other trees. In light sandy soils it may be possible to cut the tree down, remove the bole and dig out the smaller root pieces. Replanting the area immediately with other tree species is not recommended. If possible small herbaceous plants may be grown for 6-12 months over the spot occupied by the tree before replanting with another tree. During that period the infected site should be kept well watered to encourage decomposition of residual root pieces.

Trenching around diseased trees has been attempted but is rarely successful because by the time the foliage symptoms appear the disease has spread to adjacent healthy-looking trees. Hence when attempting to trench around an infection a border of healthy trees has to be included around the diseased trees.

The trench could be dug to a depth of 30-60cm (depending on soil) and a thick, double sheet of black plastic used to form a barrier around the area. The trench can then be filled.

If you suspect that you have found evidence of the fungus please let us know by contacting Dr. Geoff Marks (03-651 1740) with details on location, species vegetation/forest type and area of affected forest.

FURTHER READING

Kile, G.A. 1981 *Armillaria luteobubalina:* a primary cause of tree decline and death in mixed species eucalypt forests. Aust. For. Res. 11:63-77

Kile, G.A., R.O. Squire and J.G. Edgar 1982 An armillaria root rot control experiment in the Mount Cole State Forest, Victoria. 1. Establishment and progress report. Forests Commission Victoria. Res. Branch Rep. 197. 30pp. (unpubl. rep.)

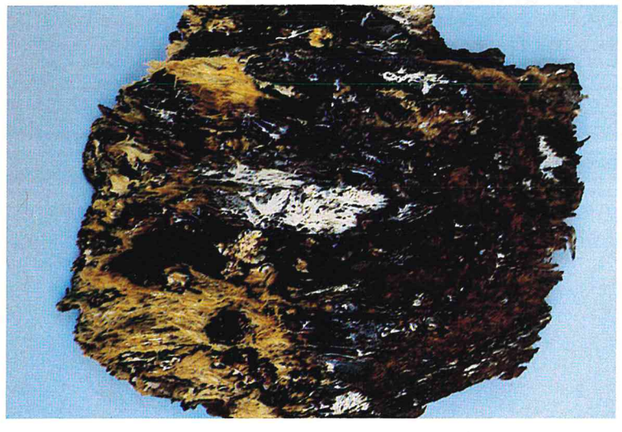

Fig. 2. *Fan-shaped fungal sheets under the bark of an infected tree.*