CHAPTER 7 - HEALTH

Considerable research has been undertaken in New Zealand on managing blackwood in plantations. This research has not been accompanied by a similar focus on health issues of the species. There is a wide range of pests and diseases on blackwood in Australia; relatively few of these are found in New Zealand. However, some of the insects present in New Zealand can cause significant growth loss and malformation. Furthermore, with the relative proximity of the two countries, increasing trade and travel, combined with the knowledge that small insects and fungal spores can readily be blown from Australia to New Zealand, it is likely that more blackwood pests and diseases could establish in the future.

Major Insect pests

Psyllids (*Acizzia acaciae*, *A. uncatoides* and *A. albizziae*)

The psyllids originate from Australia, and are one of the most common insects associated with blackwood (Fig 18). Eggs are mostly oviposited on newly developing foliage; however, at high population levels, eggs can be found on all parts of the plant.

Psyllids feed on the phloem of the growing shoots, chiefly sourcing nitrogen, and excreting waste sugars as honeydew. The honeydew is a suitable growth medium for sooty moulds, which enter the plant via puncture wounds made by the insect's feeding

mouth parts. The sooty moulds cause localized cell necrosis and shoot die-back, which results in multi-leadering. The combined effect of the psyllids and fungi is to reduce the vigour of the tree, and to bring the seasonal growth to a premature close.

By damaging the shoot tips psyllids *contribute* to malformation and multileadering.

When psyllids were controlled in trials involving the regular application of insecticide, tree height growth was increased by 40 to 50% compared to unprotected trees. However, malformation still occurs in response to shoot tip abortion. Other causes of this shoot tip death, which reduces tree growth, are discussed below. Psyllids are not the sole agent of malformation.

Psyllids are present throughout the year, with population peaks often in late spring, and at the completion of the growing season in autumn.

Figure 18: Psyllid (Acizzia acaciae) adult and nymphs on a blackwood stem.

They are more prevalent on trees on dry exposed sites, and less common in sheltered lightwells, and in areas of high rainfall. Psyllids are easily knocked off the trees by heavy rainfall.

Their natural predators, lacewings and ladybirds, are often found on blackwood, but in numbers too small to provide adequate control. Full control of pysllids by insecticides is possible, although impractical, because a monthly spray application would be required. Not only would this be costly, but most insecticide sprays also remove the natural predators present on the tree that control psyllids and other insect pests.

Seed source

Research efforts on the effect of psyllids on blackwood in New Zealand found no significant difference between six provenances of blackwood tested - neither in growth performance, health nor presence of malformation. However, there was significant tree to tree variation in these attributes.

Acacia leaf miner (*Acrocercops alysidota)*

This small acacia leaf mining moth is native to Australia. It lives in most acacia species present in New Zealand and on blackwood it can develop and burrow within the phyllodes (Fig 19). Larvae can also enter the stems and then can cause shoot dieback, and in doing so contribute to multileadering and malformation. Larvae are present in the field from November to May, and have multiple generations per annum.

Two species of eulophid wasp* , which are probably from Australia, appear to be keeping leaf miner populations under reasonable biological control in most years. Larvae feeding within phyllodes are parasitized by the wasp, but those that tunnel into the stems probably escape parasitism by the wasps.

* (*Diaulomorpha* sp. and *Cirrospilus* sp.)

Figure 19: Leaf miner attack on blackwood phyllodes.

Figure 20: Adult blackwood tortoise beetle

Blackwood tortoise beetle (*Dicranosterna semipunctata*)

This is a native Australian leaf feeding beetle, first discovered in Auckland in 1996. Since then it has spread to the far North, and south to at least Taupo. The current spread of blackwood tortoise beetle is unlikely to be restricted by climate, as it is found in the tablelands from northern New South Wales and south through to Victoria where the climate is similar to New Zealand's. In Australia, both adults and larvae are defoliators of phyllodinous acacias (however feeding trials in New Zealand indicate that adults will not feed on *A. longifolia)*.

The adult beetle is approximately 10 mm in length, with a dark brown shiny body (Fig 20). The slug-like larvae are black when small, turning to pale green when older. Both adult and larva eat scallop-shaped chunks out of edge of the phyllodes. Although it causes some defoliation, its effect on mature and vigorous blackwoods is less severe than was first thought likely. On young blackwoods its preference for phyllodes on the growing shoot tips can leave them bare at the end of the growing season, and might contribute to malformation. In Australia, two wasp parasitoids* have been found attacking the eggs of blackwood tortoise beetle. These are under investigation as potential agents of biological control in New Zealand.
* (*Neopolycystus* sp. and *Enoggera polita)*

Figure 21: Larvae and egg (top) of blackwood tortoise beetle

The Southern ladybird release.

The Southern ladybird (*Cleobora mellyi*) is native to Tasmania and South East Australia. It is commonly found on blackwoods, where it feeds on acacia psyllids.

It was released in several locations in New Zealand in the 1970s in the hope of controlling paropsis beetles in eucalypts. It survived in one location in the Marlborough Sounds, where it migrated into an adjacent valley and colonised a plantation of blackwoods. Since then it has spread through the sounds, to reach Picton.

In 2002, AMIGO received SSF funding for a release program. The work has been carried out by Dean Satchell. Insects were collected from the sounds and bred up. They have been released on 20 North Island sites. If it becomes established, the Southern ladybird could be a useful agent in the biological control of acacia psyllids. It might also help to control the tortoise beetle, by eating its eggs.

Lemon-tree borer (*Oemona hirta)*

The lemon tree borer is a native beetle that has been recorded from a wide range of native and exotic hardwoods, including blackwood. Damage is infrequent but when present this beetle can be a nuisance. Young larvae chew within and kill small twigs while older larvae eat out larger branches and also the main stem. Occasionally branches are girdled just beneath the bark, causing them to break off. If necessary, affected branches should be cut back to the stem.

Cicada (*Amphisalta* spp.)

Stem damage to young blackwood saplings can be caused by cicadas. The female cicadas place their eggs in herringbone scars which they carve by their ovipositors in small branches and stems (Fig 22). The scars do not occlude and the stems can subsequently break off (larval development later occurs in the soil). Damage is usually intermittent, but in certain years can be heavy. If severe, the trees are best treated by coppicing in the following spring.

Figure 22: Cicada damage on twig

Seed pests

The Australian beetle, *Storeus albosignatus* introduced into New Zealand has been recorded in seed from blackwood and several other acacia species. Little is known about the biology of *S. albosignatus*, except that anecdotal information from New Zealand nurseries indicates that occasionally large quantities of seed are infested. Apart from placing bags around pollinated flowers to protect seed set before attack occurs, there is no easy means to prevent infestation.

Seed Damage Assessments

In 1980 Forest Research staff assessed insect damage to blackwood seed. This unpublished report raised as many questions as answers. Seed was obtained from six localities in the North Island and three from the South Island; no damaged seed were found in the South Island material and only two of the North Island sites had damaged seed.

In 2001 an assessment of seven seedlots of New Zealand sourced seed held in the Forest Research seed store showed variable attack, ranging from none in the single South Island seedlot and between 2-49% damaged seed in the six North Island collected seedlots.

Minor insect pests

Pinhole borers (*Platypus* spp)

These tiny native wood-boring beetles have been known to make unsuccessful attacks on the trunks of blackwood, resulting in tiny holes in the trunk. Although the beetles die before boring deep into the trees, the quality of timber may be slightly affected.

Puriri Moth (*Aenetus virescens)*

Present only in the North Island, the native puriri moth can attack blackwood interplanted in indigenous forest. It is also present in exotic plantations but attack is less common in this environment. The larvae produce a 7-shaped tunnel in the trunk, where they remain for several years. Trees with diameter over 16 cm are less affected. Fortunately the damage they cause is minor, as the stem defects are localised and no worse than pruning stubs.

Fullers Rose Weevil (*Asynonychus cervinus*)

This pest is found commonly in the North Island. It attacks a wide range of plants and trees, and blackwood is no exception. Adult weevils feed on the leaves leaving ragged notches in the margins of the phyllodes, and the larvae feed on the roots within the soil. Obviously root damage is more difficult to locate than the adult feeding damage. It is not known whether such damage impacts upon the growth or form of trees.

Leaf rolling and leaf folding moths*

The larvae of a number of small sized moths, some native, and some from Australia, are found on many native and plantation trees throughout the country. They feed on a wide range of species, including blackwood. Generally they are not found in large numbers, but very occasionally may inflict noticeable damage to foliage. Some larvae will graze the phyllode surface, others will fold the phyllode over, some will web many phyllodes together before chewing them. Natural predators or introduced parasitoids tend to prevent populations from getting too high or remaining high for too long.

Generally these moths are not serious pests as they do not cause extensive dieback or subsequent malformation.

* (e.g., *Ctenopseustis obliquana, Epiphyas postvittana, Penthina doxasticana, Anarsia trichodeta, Dasypodia*)

Acacia tip borer (*Holocola sp. nr. triangulana*)

This small moth is from Australia, and may become a more serious pest of blackwood than the leaf rolling and leaf folding moths. This is because not only do the larvae scrape the phyllode surface leaving it brown, but they also burrow down into the growing tips. This can lead to tip dieback and subsequent malformation.

Miscellaneous insects

A number of other insects, native and from overseas, have been recorded on blackwood trees from time to time. Many of these have wide host ranges and will not build up to damaging levels on blackwood, when there is a choice of other tree species. Such insects may include: scales, thrips, crickets, mites, mealy bugs, bag moths, wood-borers and others.

Diseases

Figure 23: Rust damage on blackwood phyllode.

Rust *(Uromycladium robinsonii)*

Uromycladium robinsonii infects blackwood throughout the country, causing tiny foliage galls, sometimes causing death and loss of phyllodes and leaves. This is different from the large galls from other rust species present on some other acacia species. In severe infections, brown-black sunken cankers (up to 4 cm long) can develop on twigs and branches (Fig 23). Generally however, infection by *U. robinsonii* is of minor importance, although in Whakarewarewa Forest in the early 1980s crown loss of up to 80% occurred in a four year old stand. No method of control is known.

Heart rot fungi

Armillaria spp. have been recorded from blackwood in New Zealand. Attack can occur in trees of any age, causing mortality and root and butt log decay. *Armillaria* is thought to be responsible for the *sudden tree death* sometimes seen in blackwood plantations. Attack by these fungi is sporadic and not fully understood. Usually a single tree, previously showing good health, is affected. Sometimes one or more adjacent trees will later die. Anecdotally, trees in areas of poor drainage, often on clay soils, are more likely to be affected.

Armillaria spp. could be important, since they have the potential to cause considerable damage to the heart wood. No method of control is known.

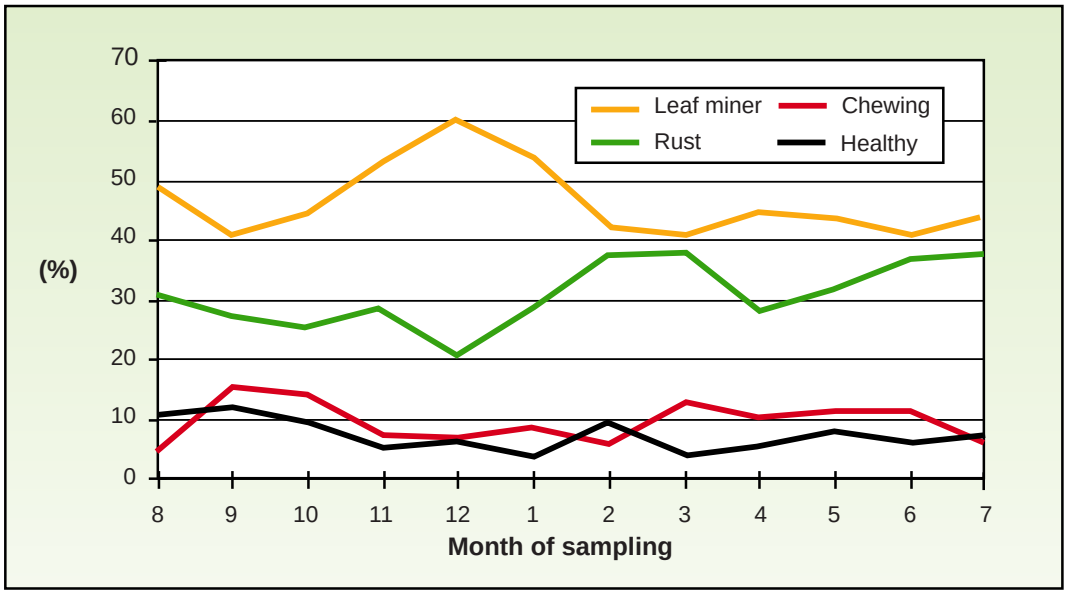
Animal damage

Most animal damage in New Zealand occurs when trees are young, i.e. less than 3 m tall. Anecdotal evidence suggests that possums prefer the juvenile foliage and will climb young trees, damaging the branches in the process as well as eating the foliage. More severe damage has been noted on possum “territorial” trees. Hares will selectively browse newly planted blackwood and animal control or protection is recommended. In Australia animal browsing by marsupials is a major source of plantation failure.

Health monitoring

Two phyllodes were collected from the top third of the crown from 24 dominant trees in the regime trial at Rotorua, every four weeks over a three year period (tree age 5-8 years) to assess changes in phyllode health over time (Fig 24). This monitoring showed that chewing and leaf miner damage were of minor significance in the top one-third of the crown. Never more than 20% of the total phyllodes sampled were affected by these. Rust was present throughout the period sampled, with usually about 30% of the phyllodes damaged, but the least attack appears to be in the driest period over summer.

Psyllids were only collected from two sampling collections: those in September 1992 and April 1994. During these collections, 4% and 12% of phyllodes were damaged by the psyllids respectively. However other psyllid damage was noticed in other areas of the trial. There could be a number of reasons for the lack of psyllid recordings over this particular assessment period and it may not be indicative of other sites.



Key Points

- Insect damage is present in all blackwood stands.
- Due to New Zealand's proximity to Australia, blackwood plantations will always be threatened with the establishment of new insect pests and diseases.
- Insects commonly establish without the parasitoids which control their populations in their natural environment, allowing them to become pests.
- The most damaging effect of insect pests on blackwood is their contribution to leader dieback, malformation and subsequent multileadering. They are therefore important in the early stages of plantation establishment.
- Well-sited, well-established and well-managed blackwood can produce excellent sawlog material, although growth reduction from insect pests during the rotation has not been quantified.
- Mature and healthy trees grown on good sites show little obvious insect damage.

Suggested reading:

Alma 1977.

Appleton 1998.

Appleton and Walsh 1997.

Appleton, Walsh, and Wratten 1997.

Appleton 1999.

Dick 1985.

Hosking 1978.

Kuschel 1990.

Milligan 1979.

Nicholas and Hay 1990.

Noyes 1988.

www.nzffa.org.nz