



Forest Pests and Diseases

Pests & Diseases of Radiata Pine

Radiata pine, being an introduced species, has relatively few serious insect pests and diseases. Plantations are monitored regularly for signs of insect damage or disease and appropriate action is taken if a pest or disease is detected. In addition, strict quarantine regulations exist to control the entry of new diseases or forest pests into Australia.

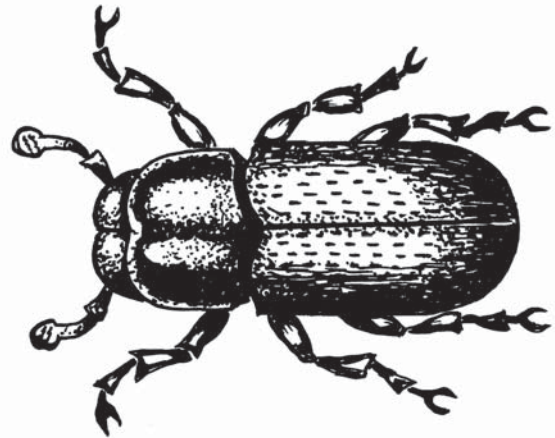
Despite this, several pests and diseases have been accidentally introduced into Australia and have become established in pine plantations. Major insect pests include:

Sirex Wood Wasp (*Sirex noctilio*)

The Sirex wood wasp is a major pest of pine trees. It is present in radiata pine plantations throughout all pine growing areas in south eastern Australia. Sirex has caused millions of dollars worth of damage and many millions have been spent on controlling it.

The female wasp bores holes into the tree and lays her eggs into the wood. At the same time, she inserts a toxic mucus and a pathogenic fungus (*Amylostereum areolatum*) into the wood. The eggs hatch and the larvae tunnel through the wood, feeding on the fungus which grows and spreads throughout the tree. The mucus and fungus block the flow of water and nutrients and kill the tree. The larvae pupate inside the tree and the adult wasp chews its way out through circular holes in the trunk.

Biological control programs, involving the release of several wasp parasitoids and a nematode have been very successful in keeping this pest under control. The nematode, *Beddingia siridicola*, is inoculated into trap trees and naturally-infested Sirex trees. It invades the Sirex larvae and the resulting Sirex adults are rendered sterile.



Bark Beetle

Bark Beetles (*Ips grandicollis*)

Bark beetles occur in most pine plantations, where they usually attack timber and branches left behind by logging operations. They may also attack dead trees or trees that have been weakened by drought or stressed in some way. In long dry summers, they may attack and kill living trees. The male chews a tunnel through the bark into the cambium of the tree and this is where the female lays her eggs. The eggs hatch and the larvae feed on the cambium tissue. The adult Bark Beetle carries a fungus (*Ceratocystis ips*) which grows in the sapwood resulting in a blue stain in the wood. This causes downgrading of the timber quality.

Bark beetles can be partially controlled by clearing up residues after trees have been felled. A biological control program, using wasp parasitoids introduced into Australia, has been used to control these pests.

Monterey Pine Aphid (*Essigella californica*)

A more recent introduction into Australia is the Monterey Pine Aphid (*Essigella californica*). This is now widespread throughout Australia. It is a sap-sucking insect and is associated with mild to severe defoliation. It is one of the

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causes of premature defoliation in pines (*other causes include drought and disease*). All ages of trees are affected and thinned forests seem to be more susceptible. Some trees are also thought to be genetically more vulnerable. The aphids attack the older needles first and this often results in tufts of the current year's needles being left on the tips of the branches. A biological control program involving the importation of a wasp parasitoid from North America is currently underway.

Pests and Diseases of Hardwoods

Eucalypts, being native to Australia, have evolved in association with a wide range of insects. In general this association is one in which trees and insects live together in a balanced relationship and only rarely do the insects build up to such numbers that they damage the trees. In plantations, where usually only one species of tree is present, the balance is much more delicate and outbreaks of insect 'pests' frequently occur. While there will always be some damage, it is only when this damage reaches an unacceptable level that a decision has to be made about whether to take action to control the insect concerned.

The aim is not to eradicate every individual pest insect but to keep pest insect population numbers down to a level where significant damage does not occur. For practical purposes, this level depends not only on the insect concerned, but also on the size of the trees, the part of the tree attacked, the duration and intensity of the attack and the time of year the attack occurs. If the damage is likely to cause considerable loss of growth, or perhaps death of trees, action is required to control the pest.

Plantation trees are particularly vulnerable during the first two or three years after planting.

Of the thousands of insects that feed on native trees, only a few have come to be regarded as pests. These include: wingless grasshoppers, spitfires (*sawflies*), autumn gum moth larvae, chrysomelid beetles, cockchafer and spring



Eucalypt Weevil

beetles, borers such as longicorn beetles, scale insects, psyllids and lerps. Damage may be to leaves (*leaf skeletonising, chewed leaves*), stems, roots or wood.

Several diseases cause spots and lesions on leaves which lead to premature leaf drop, dieback of twigs or branches and occasionally, death of the tree. Severe infections weaken plants and make them more susceptible to attack by insects such as borers.

Phytophthora (*Phytophthora cinnamomi*)

Phytophthora causes dieback of many native and introduced plants, including ornamentals, vines, fruits and vegetables, as well as forestry trees. It is listed as a key threatening process to Australian native species. A 'Threat Abatement Plan for Dieback caused by *Phytophthora cinnamomi*' has been developed at the national level, and South Australia has developed management guidelines to prevent the spread and minimise the effect of this disease on the environment. Phytophthora has been found in plantations in the central and southern Mount Lofty Ranges. Forestry practices (*e.g. avoiding moving infected soil from one plantation to another via vehicles and equipment*) are important in preventing the spread of this pathogen.



Forest Pests and Diseases

General Insect Control Measures

The control measures applied depend on the insect involved, as well as the extent of the infestation, and such factors as the age of the tree, etc. Many insect problems are only identified after severe damage has occurred and by this time it is often too late for control measures to be effective. Control measures include:

Cultural control - selecting species that are suitable for the site, growing several species of trees and not planting them too close together. A diverse range of plant species provides food and habitat for beneficial insects and insectivorous birds. Trees growing in unsuitable conditions may survive but will be under stress and are far more susceptible to attack by insects than healthy trees.

Natural or biological control - control of pests by the use of parasitoids, predators and pathogens. Parasitoids include wasps and flies. Predators include birds, spiders and other insects such as ladybird beetles, hoverflies, lacewings and assassin bugs. Pathogens include fungi, viruses and bacteria.

Physical or mechanical control - removing pests by hand and then destroying them. If scale is a problem, adhesive bands can be placed around the trunk of the tree to catch ants feeding on the honeydew. Ants prevent predators attacking the scale, so if they are kept away, predators can then have access to the scale.

Chemical control - it may sometimes be necessary to use chemicals to control insect pests. The type of chemical used and the timing of its application is critical. Insecticides should only be used when damage levels become unacceptable. Chemicals can be contact or stomach poisons (*which kill on contact or when ingested*) or can be systemic (*i.e. they are taken up by the plant, and insects subsequently feeding on the plant are killed*). Systemic insecticides are the most effective

chemicals to use against sap-sucking insects. All insecticides should be used with care as they may also kill natural insect predators and can be dangerous to people. It is important to identify what insect is present and the damage it is causing before using chemical control. It is also very important to only use chemicals that are registered for use against the pest that is being controlled, and to apply the chemical as per the label directions. Directions for use must be strictly followed and adequate safety precautions need to be taken when handling and using chemicals.

Integrated pest management (IPM) - is a combination of all the above methods of control and is the key to responsible management of insect pests and diseases.