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INSECT DAMAGE IN YOUNG EUCALYPT PLANTATIONS: AN INTRODUCTION

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INTRODUCTION

Of the enormous variety of insects associated with eucalypts in Australia, remarkably few species have become pests. Eucalypts are the food source for many different insect species, but major damage to trees is rare under natural conditions.

Eucalypts produce two types of foliage, juvenile leaves and adult leaves. Usually, juvenile foliage is produced on young trees less than two metres high. It tends to be rounder and softer than adult foliage, and has fewer defensive chemicals. Growing shoots on older trees produce adult leaves. Many insects prefer juvenile foliage because it is less protected, both chemically and physically. Leaves that replace previously damaged foliage tend to have characteristics which are intermediate between adult and juvenile leaves. They have also been shown to be more nutritious than adult leaves.

This is the first of a series of technical leaflets providing information and advice on potential insect pests in eucalypt plantations in New South Wales. The series identifies common insect pests and gives information on their biology and control. This leaflet explains why some insects become pests, how to minimise the impact of pests, and the importance of regular surveillance of insect activity within plantations.

FACTORS INFLUENCING INSECT ATTACK ON EUCALYPTS

The factors which enable high populations of insects to occur are not yet fully understood but local climatic conditions are very important. Climate influences insect numbers, tree health and the effectiveness of natural enemies. In natural forests large populations rarely continue for very long; either natural enemies regain control or they run out of suitable food.

Eucalypt plantations in Australia are more vulnerable to insect attack than "natural" forests. This is because an even-aged single species tree crop in a plantation can provide a vast food supply for local foliage-eating insects under some conditions while not fulfilling the needs of natural enemies. In addition, because of the high cost of establishing eucalypt plantations compared to natural regeneration, there is less tolerance for insects interfering with growth rates and a lower economic threshold for acceptable damage.

Figure 1. A healthy young seedling.
THE EFFECTS OF INSECT ATTACK IN PLANTATIONS

Significant tree death from insect attack in young plantations has been rare so far on ex-forested sites, but has been common in exposed rural plantings. Complete defoliation occurred and was repeated for two or more growing seasons before mortality occurred. Most eucalypts can cope with severe defoliation at least once, and recover after the insect population declines. Repeated defoliation can deplete a tree's reserves faster than they can be replaced by photosynthesis. More commonly, repeated partial defoliation will reduce desired timber growth rates. It also increases susceptibility to other pests such as wood-boring insects, termites and decay fungi, all of which reduce timber quality. This is particularly important if the planned timber product is pole or sawlog.

Eucalypt plantations are most vulnerable to insect attack in the first three to four years before canopy closure. In this phase, leaf-feeders are the main problem. After canopy closure, damage by wood-boring insects such as wood moths and longicorn beetles can become important. Yellow-tailed black cockatoos have caused considerable damage in some young plantations of flooded gum (Eucalyptus grandis) by tearing open stems in search of borer larvae.

Christmas beetles (Anoplognathus spp.) and some psyllids (Cardiaspina spp.), which feed mainly on mature leaves, can cause major damage but do not have the same potential to cause long-term detrimental effects as insects which destroy new shoots as well as mature foliage. In Tasmania, the chrysomelid leaf beetle Chrysophtharta bimaculata annually attacks the new shoots of young alpine ash and shining gum plantations and it has been necessary to use insecticides to control this pest.

The timing of defoliation is also important, because a tree's ability to recover depends on its level of energy reserves. For example, trees attacked by the autumn gum moth Mnesampela privata in autumn are more seriously affected than those attacked in spring or early summer. The "Eucalypt Insect Calendar" shows when the most serious pests are likely to attack trees.

REDUCING THE EFFECTS OF INSECTS

There are many reasons to promote vigorous growth in the first three years, but reducing the losses from insect attack is most important. Growers should encourage good root systems, rapid crown development, early formation of adult foliage and early canopy closure.

Slow growing, stressed or previously damaged young trees are more likely to succumb to insect attack in the long-term. Eucalypts are susceptible to stress from many sources, including competition from grasses, drought, frost, waterlogging, salinity and wind. A recent study, conducted by the Research Division, State Forests

Figure 2. Young eucalypt plantation on north coast of New South Wales.
of New South Wales, showed that although more foliage was eaten by insects on healthy river red gum, the impact of insect browsing was much greater on slow growing moisture-stressed trees. In general, vigorously growing eucalypts can outgrow the damage caused by normal populations of insects.

KEY FACTORS FOR RAPID TREE GROWTH

Detailed advice on successful plantation establishment is available from your local forestry office, advisory forester or plantation officers. To ensure rapid growth in the first few years and to reduce the effect of insect damage, the following factors are very important:

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<tr>
<th>Site selection</th>
<th>The proposed site for the plantation must be of reasonable quality. Water availability, seasonal rainfall, soil texture, structure and depth, site topography and prior use must be taken into account. Avoid waterlogged hollows, droughty soils or excessively exposed sites. Sites must be protected from wallabies and rabbits as far as possible for at least a year. Rapid growth during the first year reduces the impact of browsing by these animals.</th>
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<td>Species selection</td>
<td>This is influenced by local site conditions and the timber characteristics required for projected markets. Selection of an appropriate provenance is also important. Trial plantings are now identifying eucalypt species and provenances that are more resistant to particular pest insects. This information should be taken into account when selecting species.</td>
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<tr>
<td>Timing, preparation and planting</td>
<td>The timing of site preparation and planting is critical. Drought is the major cause of death of seedlings, so they must be planted when adequate soil moisture is available, using frost-tolerant species where necessary. Co-ordinate the timing between site preparation and the optimal size and condition of the planting stock. Optimal tree spacing should be considered in terms of desired growth rates, tree form and proposed silvicultural regime.</td>
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Figure 3. An example of very poor weed control in a young eucalypt plantation on the north coast.
MANAGEMENT

A high level of weed control is essential for at least the first two years. Competition from grasses and weeds is a major cause of retarded growth during establishment (Fig. 3). Many insect pests benefit from a tall dense swathe of grasses and weeds. Strict hygiene, such as the prompt removal of dead or dying trees, is strongly encouraged for the life of the plantation. Fertilisers are more effective when weeds are controlled at planting. Legumes are presently being trialled to determine their usefulness in nitrogen fixation and controlling grasses, erosion and some pests.

SURVEILLANCE

Regular surveillance and assessment of insect activity within the plantation is essential for effective pest control. Control must take place before economic damage occurs. There is no benefit in spraying almost leafless trees unless protection of young replacement foliage is a viable option. Seek advice on the cost effectiveness of control measures and recommended control strategies. This can vary greatly, depending on the species of insect, host species and age, time of year and environmental and cost restraints. If you are concerned about insect damage in a plantation obtain prompt advice from the local foresters associated with the plantation, or from officers of the Biology Section in State Forests' Research Division.

HOW STATE FORESTS RESEARCH DIVISION AND GROWERS CAN HELP

The Biology Section of State Forests Research Division has entomologists who can identify most pests of eucalypts and give advice on appropriate controls where these are necessary. Leaflet G1 provides information on collecting insects and forwarding them to Research Division.

However, much is yet to be learnt about growing eucalypt plantations on farms, and feedback from growers is essential. Every Joint Venture plantation is "experimental" in a very real sense, and maximum feedback from growers will help to minimise future problems.

Other technical leaflets in this series provide more specific information on known pests in plantations. Major pests are covered in Leaflets E2 - E8, and other known pests will be covered in future leaflets. A calendar showing the likely times of appearance of major pests is also available as a wall chart.

OTHER LEAFLETS IN THIS SERIES

G1 - Collecting insects for identification
E2 - Christmas beetles
E3 - Psyllids in eucalypt plantations
E4 - Leafblister sawflies
E5 - Eucalypt sawflies
E6 - Leaf beetles
E7 - Gumleaf skeletonizer
E8 - Autumn gum moth

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