Agriculture Notes

Psyllids and their control

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This Agriculture Note provides advice on the control of psyllids on native eucalypts in Victoria. This information is applicable both to plantation eucalypts and individual trees in private properties and roadside plantings.

Control of psyllids

Psyllids, whether on single farm trees, on roadside plantings, in natural forest stands or increasingly in eucalypt plantations, require monitoring and management prevent populations from reaching levels that may cause excessive defoliation, which leads to a decline in tree vigour and growth and, in extreme circumstances, tree mortality. The options currently available for psyllid control are:

- *direct control*, which involves the use of pesticides or physical control measures.
- *biological control*, concerns the actions of indigenous predators such as birds, various insects, spiders, mites and fungi in limiting pest populations.
- *cultural control*, applies to the tending and caring of trees to encourage healthy growth thus enabling them to be better able to withstand and recover from damaging attacks.
- *genetic control*, involves the selection of genetically resistant genotypes for use in plantings as well as the genetic manipulation of biological control agents to increase their efficacy against the target pest.

An important aspect in psyllid management is not only to consider when to implement control measures, but more importantly, when not to apply them. Any decision about whether or not to proceed with any of the controls outlined depends on a range of factors including:

1. the severity of attack
2. the prevailing climatic conditions (eg. drought) which may contribute to excessive loss of tree vigour/mortality, and,
3. the purpose for which the trees are being grown.

In the latter case, a commercial eucalypt plantation may require a more concerted control effort in order to maximise returns over short rotation times compared with trees in a roadside stand.

Recent studies have been undertaken into the effects of defoliation on height and diameter growth of plantation-grown *Eucalyptus globulus* (Tasmanian blue gum) and *E. grandis* (flooded gum). Results have indicated that a single defoliation in the spring, whether it be of the whole crown or of the upper and lower 50% of the green crown, has minimal impact on tree growth, whereas a similar single defoliation in autumn impacts adversely on tree growth.

As most psyllids tend to concentrate their initial attack on the older less vigorous lower canopy foliage, control may not be necessary providing that psyllid levels do not increase and start attacking the upper canopy. Further research is required in order to establish whether the results obtained for *E. globulus* and *E. grandis* are also applicable for *E. camaldulensis* (river red gum).

Direct control

The control of psyllid populations with chemical insecticides is a viable option only in plantation situations or on individual/small stands of trees where the spraying program is confined to a restricted area.

Spraying of outbreaks in extensive forest areas is not an option except in specific circumstances threatening large-scale tree mortality. This is because the spray may affect non-target insect populations including psyllid predators/parasites, and also the associated high costs and environmental concerns relating to pollution and risks to human health.

You should read the product label and follow all label instructions carefully before using any chemicals.

Chemical control can be conducted in two ways: the first involves the direct application of a contact or systemic insecticide to affected foliage, and the second being stem injection of systemic insecticides into the trunk of host trees.

In direct applications to the foliage, a single application of contact or systemic insecticides at low concentrations is usually effective for controlling two to three generations of psyllids. Repeat applications may be necessary for longer term protection, especially where new growth is prolific soon after spraying and the new foliage is attacked from outside the sprayed area.

Stem injection with systemics is impractical in large plantations or native forests due to the high numbers of trees involved and the associated labour costs. However, it may be appropriate where individual or small stands of

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trees in parks, gardens, roadside plantings or on farms are too tall for spraying from the ground, and where environmental constraints do not allow the spraying of toxic chemicals.

It is considered important to ensure that the timing of stem injection coincides with the egg-hatching period. Because stem injection requires an upward flow of the sap to translocate the insecticide into the foliage, treatments should be done preferably outside of drought periods when sap flow is minimal. A second injection two months later may be required especially where trees have large crowns causing the insecticide to be diluted.

Biological control

Indigenous predators such as birds, spiders, mites, certain insects (eg. wasps), as well as insectivorous predators, are some of the natural agents that assist in biological control of psyllids. Wasps of the genus *Psyllaephagus* have been identified in the control of low populations of psyllids, with their efficacy dependent on prevailing weather conditions.

However, at high psyllid densities during outbreaks, psyllid-specific predators have been found to be unable to make much impact on numbers. Other insects also contribute to natural control, but as with psyllid-specific predators, they are known to contribute only marginally to psyllid control.

Birds such as Willie wagtails and honeyeaters also assist in controlling psyllid levels. However, instances have occurred in Victoria and NSW where predating bell miners have reduced the overall efficacy of the insectivorous bird complex through their aggressive territoriality that caused the expulsion of more effective predating bird species from psyllid infested forest.

Cultural control

The use of cultural control involves the tending and caring of trees or the deliberate diversification of the flora through planting to minimise damaging pest outbreaks. Psyllid outbreaks can be minimised by interplanting non-susceptible eucalypts such as *E. globulus*, and shrubs as it encourages the influx of a wide range of predator species as well as increasing the spacing between susceptible trees. The establishment of mosaics of small monocultures may also be effective provided that blocks of resistant trees are planted adjacent to blocks of more susceptible trees.

Pruning and thinning may also assist in reducing psyllid levels when applied correctly. In *E. camaldulensis*, high levels of psyllids are often found on the lower branches of trees at the beginning of outbreaks. If these lower branches are removed after laying of eggs, damaging outbreaks may be averted.

In more severe cases, where large numbers of psyllids have established on some individual trees, indicating their susceptibility, such trees should be felled and burnt. Burning and thinning are best done when psyllid populations are still confined to a few highly susceptible trees during periods favourable to psyllid outbreaks .

Old open-grown psyllid-infested *E. camaldulensis* trees in pastures and paddocks, are best treated by pruning off about two-thirds of all major branches to encourage the growth of young, more resistant foliage, thereby rejuvenating the tree crowns.

Genetic control

Genetic control with the most chance of success in Australia involves the selection of eucalypt material displaying inherent resistance to psyllid attack in psyllid-infested plantations.

The genetic manipulation of biological control agents to increase their efficacy against psyllids is not currently considered a viable option. Psyllids are native pests already genetically attuned to the full compliment of local predator/parasite species and, the known biological control agents tend to be ineffective even when psyllid population levels are low.

Some eucalypt species hybridise, into genotypes with a marked resistance to insect attack eg. the hybrid cross between *E. torquata* (coral gum) and *E. woodwardi* (Woodward's blackbutt) is a tree displaying pronounced resistance to gum leaf skeletoniser.

Eucalyptus camaldulenis also hybridises well with a range of eucalypt species, although it is not known whether any of these hybrids are manifestly resistant to psyllids or other insect pests. Furthermore, insect resistance in a hybrid may be obtained at the expense of such characteristics as good form, growthrate and desirable wood properties.

Studies have been conducted to examine inter-provenance variation in *E. camaldulensis* foliage to a range of insect pests. The use of insect-resistant material is advantageous as it provides an alternative means of controlling pests such as psyllids without having to resort to pesticide applications.

Trials conducted at Seymour, Tatura and Tumut (NSW) in the early 1990's established that provenances of *E. camaldulensis* from Mannawarra and Silverton in the Lake Frome catchment and the Lake Bolac provenance were markedly more resistant to insect pests, including *C. retator*, than the local provenances to the trial sites near Seymour and Shepparton (Tatura).

While the mechanisms of resistance are not completely understood, it is thought that either the waxes on the leaf surfaces (as in the Mannawarra and Silverton provenances) or the thick hard leaves (in the Lake Bolac provenance) are possible factors responsible for the observed resistance.

The reasons why the local provenances from the trial areas were the most susceptible are not clearly understood, but it has been suggested, from the Seymour/Tatura/Tumut trials, that this may have been due to either the local insects being more adapted to the local provenances or, a lack of ecological equilibrium between insects and hosts in the highly disturbed agricultural landscape.

Integrated Pest Management (IPM) of psyllids

When deciding on control measures against psyllids, the most attractive approach is to use a combination of some or all of the four methods discussed above (a multipronged approach) where possible, rather than relying on a single method of control. For example, the repeated use of

chemicals against psyllids could conceivably lead to the target insects developing a resistance to the particular chemical used, thereby rendering it unsuitable. Or the application of only cultural controls, such as lower branch removal on susceptible trees may still not prevent damaging outbreaks developing if there is a steady influx of pest insects from outside the plantation.

A combination of:

1. chemical control timed to coincide with the egg-laying period and with minimum concentrations
2. cultural controls such as the timely removal of lower susceptible branches
3. the planting of small blocks of resistant species of eucalypts interspersed with more susceptible ones, and
4. the phasing into plantations of resistant (or less susceptible) eucalypt provenances to assist in either preventing or lessening the effects of damaging psyllid attack.

The methods selected will depend greatly on factors such as the stand types to be protected (eg. *E. camaldulensis* in commercial plantations, in windbreaks or in small shade-providing woodlots on farms) and the constraints imposed on their use. For example, chemical spray applications are not to be recommended in situations where stands of trees are adjacent to water supplies.

Further reading

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