2000

Weevil management in orchards and vineyards looks promising

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Research and monitoring undertaken by Agriculture Western Australia is showing that the management of weevils in Western Australia's orchard crops and vineyards is improving. A number of alternative management strategies are being implemented, and future research will assess the effectiveness of non-chemical approaches to weevil management. Stewart Learmonth reports.

Weevil damage

Apple weevil, garden weevil and Fuller's rose weevil have affected the quality and health of the State's orchard crops and vineyards since being accidentally introduced to Western Australia.

Both adults and larvae damage fruit trees and grapevines. Adults of all weevils can defoliate crops. Apple weevil adults can also ringbark stems of young trees – killing the growing tip. In addition, they can ringbark fruit pedicels, which results in cosmetic damage, reduced fruit size and fruit fall.

Weevils also chew fruit. Garden weevil adults voraciously attack any young part of a fruit tree or vine, which can kill growing tips, grape bunches, young apples and nectarines, as well as scar fruit.

Fuller's rose weevil adults can cause havoc to irrigation systems by laying egg masses in mini-sprinklers and drippers.

Weevil larvae are soil-borne and feed on the roots of ground-floor plants found in orchards and vineyards. They also feed on the roots of fruit trees and grapevines, which can result in the death of young plants or the loss of vigour in mature plants.

A range of weevils occur in orchards and vineyards - from left - apple weevil, garden weevil, whitefringed weevil (minor pest), Fuller's rose weevil (minor pest in vineyards), vegetable weevil (non-pest). (Above top)

Weevil larvae - from left - apple weevil/garden weevil, whitefringed weevil (minor pest), Fuller's rose weevil (minor pest in vineyards), vegetable weevil (non-pest), cockchafer (non-pest). (Above bottom)

Garden weevils can scar fruit on vines and fruit trees, as can be seen here in grapes (far left), nectarines (middle) and apples (near left).
Progress on weevil management

Chemical control

Synthetic pyrethroid insecticides are registered for weevil control by butt-drenching, which means applying a coarse jet of insecticide solution into the crotch and butt of trees or vines. For grapevines and avocados, there is also foliar spraying, and for orchards where Fuller’s rose weevil is a pest, there is foliar spraying with azinphos methyl and carbaryl.

Butt-drenching is labour-intensive and requires monitoring to get the timing right. Agriculture Western Australia has been conducting research to find alternative, effective and less labour-intensive methods.

Ground-floor food sources

An alternative management strategy to chemical control has been to eliminate alternative food sources for weevil larvae. Observation and supporting research defined some of the ground-floor plants that were favourable, and recommended that weeds such as sorrel, capeweed, dandelion, soursob, plantago and dock be removed (see Figure 1).

Pot trials indicated that clovers were poor food plants for weevil larvae and may in fact help reduce weevil numbers. However, more research on undesirable food plants will be required before recommendations can be made on the most effective ground covers for weevil management.

Figure 1 – The survival and growth of garden weevil larvae after being placed for nine weeks in pots sown to sorrel, canola, oats, carrot and subterranean clover: (a) per cent survival, (b) average dry weight in milligrams and (c) average head capsule width in millimetres.
Sticky bands

In South Africa, the home of the garden weevil, sticky bands on the butts of trees and vines are used to prevent weevils from accessing crop canopies. A tablegrape grower in Western Australia has adopted this method successfully. While labour-intensive, sticky bands avoid the need to use broad-spectrum insecticides. Unfortunately, the bands have not been so effective in controlling the other major fruit tree pest, apple weevil. For this pest, the sticky bands have been found to delay, but not prevent weevils from accessing canopies.

Birds

Research at Agriculture Western Australia's Stoneville Research Station on garden weevil in an apple orchard showed that birds could reduce pest numbers and damage to fruit (see Figure 2). A number of grape growers in the Manjimup area have fox-proofed their vineyards, and stocked them with birds such as guinea fowl, bantams, chickens and turkeys. Mobile cages and cages with self-opening doors are just some of the innovations being developed to make the use of birds easier.

Sprinkler types

The blocking of mini-sprinklers by egg-laying Fuller's rose weevil was examined in a trial which compared most common types of sprinklers. It was found that only sprinklers with certain features were susceptible and should not be used in infested orchards.

Figure 2 - The abundance of garden weevil adults in trunk-monitoring bands on trees either excluded from birds by cages or uncaged (open) in an orchard stocked with turkeys, chickens or guinea fowl in separate partitions; at Stoneville Research Station, Perth Hills, 1996-97 season.
Prospects for weevil management

New initiatives in a recently completed national project, supported by the Horticultural Research and Development Corporation (HRDC), provide hope for reduced reliance on insecticides.

The main approaches to be pursued in the new HRDC-supported project involve the use of a new strain of insect-parasitic nematodes. This new strain, referred to as JB1/X1, has been shown to be very effective in laboratory pot trials (see Figure 3). Further, in demonstration trials in weevil-infested horticultural crops in Manjimup in the 1999-2000 season, infection of weevil larvae was observed. Future trials will involve better methods of nematode application, in combination with manipulating the plant composition of the ground cover.

Other activities to improve weevil management will involve alternative approaches to insecticide use. This will include examining the application methods of insectigation, and dripline drenching by orchard sprayers.

Biology studies on apple weevil show they do not lay eggs until some considerable time after emergence. Therefore, a second application of insecticide in late summer, to control apple weevil adults before they lay eggs, will be examined to determine if longer-term pest suppression can be achieved.

Much effort has also been undertaken in the area of baits to kill weevil adults at the time of emergence. No effective bait has been identified as yet, but work in the United States on a similar weevil has had some success using baits, and will be used to further this aspect of weevil management in Western Australia.