

Pest and disease monitoring methods for apple and pear orchards

Monitoring the populations of pests, diseases, weeds, and beneficial organisms such as predators and parasitoid wasps is an important component of implementing integrated pest, disease and weed management in orchards. It does not need to be onerous or time consuming.

The methods outlined below provide guidelines (other than trapping) that should be read in conjunction with the [monitoring calendar](#) and the [monitoring record sheet](#).

Use of these guidelines will help to standardise record keeping and allow advisors to easily interpret and compare what is happening in your orchard. Not all the listed pests or diseases will be present in your orchard, region, or state. They have been included to allow national applicability of the information.

Deciding on where to sample in your orchard

Modern plantings commonly use trellised trees that are closely planted within the rows. However, there are many productive orchards that were established with free-standing trees at wider spacings.

In the following text the term 'tree' is interchangeable with 'panel of trellis trees' because in trellised blocks it is not easy to move around each individual tree and a single side of a typical 10m panel of trellis is roughly equivalent to the circumference of a free-standing tree planted at 5.4-6m spacing within the row.

Most orchards have discrete blocks that are capable of being treated as management units. It is recommended that each block is sampled

independently to allow for differences in micro-climate, varieties, age, and history from previous seasons.

How many blocks you sample is up to you but the results from each block should be recorded on separate worksheets.

Within a block it is preferable to select trees at random each time you conduct monitoring.

Random sampling gives each tree an equal chance of being selected and ensures that a representative sample of the entire block is taken.

Five sample trees selected randomly each time is sufficient if you monitor each week.

It is important to remember these trees are samples and as you walk from one sample tree to another, you should develop sufficient situational awareness to notice if your sampling results reflect your overall impression of the tree health in the block.

Suggested monitoring methods

There are four general categories of sampling based on the use of five trees selected at random each date that you conduct monitoring.

These have been designed to allow monitoring of multiple pests or diseases with the one sample and are:

- 20 flower clusters (four clusters x five locations on the tree) per tree.
- One-minute inspections per tree.
- 10 randomly selected leaves per tree
- 100 randomly inspected fruit per tree.

You do not need to use all four categories each time you monitor. For example, flower clusters are only inspected from pink bud to petal fall and the 100 fruit inspections are only conducted mid-January, late February or early March, and in the week before harvest.

20 Flower clusters/ tree to monitor Apple dimpling bug (ADB) and thrips

Place a white 1-4 litre plastic ice-cream container underneath a shoot with at least four flower clusters immediately above the container.

Tap the clusters from above with your hand three to four times in quick succession. Count and record the number of bugs caught in the container.

Do this in five different locations on each of the sample trees. The bugs will be more active in warmer weather and could fly out of the container, so it is preferable to do this sampling in the morning.

Thrips will also be dislodged into the container using this technique, so also look for and count thrips.

If thrips are present and Western flower thrips are known to be present in your district you can collect some of the thrips into a specimen jar, so you can have them identified later.

Flower tapping is only conducted between pink in apples, or finger bud in pears, and petal fall.

However, if Western flower thrips are identified in your samples you should continue to monitor throughout the growing season by using blue sticky traps to indicate if the thrips build up as the fruit matures. Feeding and egg-laying at this stage will cause russet.



One-minute inspection/tree

As you spend one-minute walking around a tree, or along a panel of trellised trees, count and record the number of Budworm (*Heliothis*), Looper, Pear slug, Lightbrown apple moth (LBAM) larvae, weevils, and mealybugs you see.

During the same inspection look for:

- presence of diseases such as scab, powdery mildew, and alternaria on leaves and fruit and bitter rot on fruit.
- presence of Lacewings, Hoverflies, and Ladybirds.

You can use the same sample to score the severity of Woolly apple aphid (WAA) infestations using the following scoring system:

- 0= nil WAA colonies observed
- 1= trace infestation (<5 small colonies)
- 2= light infestation (>5<10 per cent of tree)
- 3= moderate infestation (>10<25 per cent of tree with large colonies)
- 4= severe infestation (>25 per cent of tree with large colonies)

The same scoring system can be used to indicate the level of parasitised Woolly apple aphid colonies.

10 leaves/tree

This technique is used to determine the percentage of leaves infested by mites and their predators, as well as Leafhoppers/ Canary fly and mealybug crawlers.

If Two-spotted mites (TSM) are the main pest mite in the orchard, then 10 leaves can be

randomly selected from about 1.5-1.8m above ground from the inner canopy.

If European red mite (ERM) or Bryobia mite are the dominant species then sampling should start at first bloom on pears or pink on apples, and leaves should initially be sampled from the outer parts of the canopy.

If TSM and ERM/Bryobia are present, then the 10-leaf sample should include leaves from both the inner and outer canopy.

There is no need to count the number of mites or eggs per leaf. A simple presence/absence for each leaf is sufficient. The number of leaves with mites present can be converted to percentage of leaves infested which in turn can be used to calculate the cumulative leaf-infested days throughout the season.

The most important consideration is not the number of mites per leaf, because the level of damage depends more on the percentage of infested leaves and how long they have been infested.

Presence/absence of predators can be scored using the same system and the same leaves used to score mites.



100 randomly inspected fruit/tree

Randomly select 100 fruit, starting near the top of the canopy and working downwards.

For free-standing trees inspect 25 fruit from each of four sides of the tree. For trellised trees inspect 25 fruit from each of four trees within a panel.

The fruit do not need to be picked but should be carefully inspected without excessive lifting or twisting that would dislodge the fruit.

Simply record presence or absence of the target damage for each fruit and then calculate the percentage of damage attributed to each pest or disease.

Fruit damage assessments should be conducted in mid-January (after natural fruit drop), one week before harvest of early varieties harvested in February or in late February-early March for later varieties, and for late varieties again about a week before harvest.

Codling moth damaged fruit detected in these samples could be removed from the tree and carefully cut open to collect the larvae if they are still present.

The age of the larva can be determined by measuring the width of the head capsule and noting the colour (black or brown) of the head capsule to identify the larval instar. Once the instar is determined, reference to a development chart will indicate how many degree-days ago the larva hatched from the egg. *See table over page.*

Trapping

In addition to inspection of leaves and fruit for presence of pests and diseases, traps can be used to detect and attempt to quantify adult insect populations. A wide variety of traps, lures and deployment protocols exist.

Instar	Approx. head width (mm)	Head capsule colour	DD from egg hatch
I	0.3	Black	0-88
II	0.5	Brown	84-151
III	0.8	Brown	125-216
IV	1.25	Black	205-363
V	1.6	Brown	248-452

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