



Readers' Note

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<http://www.dpi.nsw.gov.au/agriculture/horticulture/stone-fruit/summerfruit-ipdm>

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Six steps to controlling summerfruit pests and diseases



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These steps are outlined in Table 1 and in the text that follows.

Table 1. The six steps to successful control of summerfruit pests and diseases

Step 1	Set up and maintain your orchard to minimise pests and diseases (page 3).
Step 2	Start the season with a plan (page 4). Getting started: <ul style="list-style-type: none"> • Which blocks am I going to manage using IPDM? • How much time will I need to devote to monitoring? • How do I set up my orchard for monitoring? • What equipment do I need? • Which pests and diseases are likely to cause problems? • How much damage am I willing to accept before I control my pests and diseases?
Step 3	Monitor (page 7). <ul style="list-style-type: none"> • Know the life cycles of your pests and diseases and their predators. • For each pest and disease use the most effective monitoring technique. • Keep good records.
Step 4	Take action only if you need to (page 8). <ul style="list-style-type: none"> • If damage has reached an unacceptable level, control the pest or disease responsible with the most appropriate management action.
Step 5	Evaluate your season (page 9). <ul style="list-style-type: none"> • Immediately after the season use your records to make a list of which pests and diseases were troublesome. • Record which management actions were most effective.
Step 6	Plan for next season (page 10). <ul style="list-style-type: none"> • Prepare to be more vigilant in monitoring the pests and diseases that caused problems. • Take ineffective management options out of your schedule. • Decide whether more blocks can be managed using IPDM.

Step 1: Set up and maintain your orchard to minimise pests and diseases

Source your planting material from a reputable nursery

Choose planting material from nurseries that supply virus-tested budwood and rootstock seed. Nurseries that supply bud-wood grafted from commercial orchards should be avoided, as they can give no guarantee as to the disease status of their trees.

Choose your site carefully

Healthy trees have fewer pest and disease problems. Maintaining tree health is easier if the best soils, aspect and topography for tree growth are part of the orchard plan.

Topography can have an effect on the prevalence of pests and diseases in the orchard. Valleys and south-facing slopes are prone to frost, and this can damage tree bark, providing an entry point for diseases such as bacterial canker. In summer, valleys tend to trap humidity and trees can become prone to diseases such as rust. Valleys also tend to have poor drainage and are more prone to soil-borne diseases such as *Phytophthora*. Plum rootstocks are less prone to disease problems associated with poor drainage and should be considered as an option.

Where native vegetation is cleared to establish a new orchard, clear as many roots as possible before planting. Native vegetation harbours the disease *Armillaria* root rot.

Rest replant sites for up to 4 years to avoid replant disease. A good option during this rest period is to plant a 'hot' *Brassica* crop. Replant disease is generally a syndrome caused by a number of organisms and is therefore difficult to control. Planting between the old rows, rather than on top of them, has been shown to be effective in some cases. A rootstock different to the one previously used in that block should be planted.

Choose varieties that are more resistant to the pests and diseases in your region

The predominant reason for favouring a particular variety will be its market acceptability. Other issues are secondary but will contribute to the profit from that planting. The susceptibility of that variety to pests and diseases is an important secondary issue.

Typically varietal information supplied by nurseries to industry contains very little

information on disease susceptibility. However, if you ask the nursery operator they will often know the disease susceptibility of the varieties they are supplying.

Where it is practical, orchardists should consider using varieties that mature at different times to those in neighbouring blocks. Many pests and diseases attack during specific growth phases (e.g. green peach aphid, blossom blight). Spread of the pest or disease throughout the entire orchard is impeded if certain blocks are resistant because of their stage of maturity.

The use of nematode-resistant rootstocks is also recommended where nematodes are known to be a problem.

Manage the orchard floor to minimise pests and diseases

Managing ground cover is an important component of the control of some pests and diseases in summer fruit orchards.

Pests such as western flower thrips can be managed through careful ground cover management (page 65).

Remove alternative hosts

Certain pests and diseases have broad host ranges and can therefore move to an alternative host when the summer fruit host is unavailable. Pests and diseases can also use alternative hosts as 'stepping stones' to spread within the orchard.

Of particular concern are viruses, which can originate from common orchard weeds and affect the productive performance of trees without causing obvious symptoms.

Very little Australian research has been conducted in this area, but it is almost certain that weeds act as reservoirs for pathogenic viruses. Prunus necrotic ring spot virus causes symptoms ranging from asymptomatic yield reduction to tree death. It has been implicated in peach rosette and decline virus disease in Victoria. This virus is transmitted by pollen from host to host. Its host range includes rose, raspberry and blackberry and is expanding and may include other weed hosts.

Rutherglen bug (*Nysius vinitor*) commonly moves from docks to summer fruit orchards as its weed host dries out.

Training, pruning, thinning and fertilisers

Training systems that provide open canopies result in greater air flow and shorter drying times. Consequently, disease incidence tends to be lower.

Training systems that minimise pruning and, subsequently, pruning cuts (disease entry points) result in fewer problems from bacterial and fungal cankers.

Although benefits can be gained through opening up the canopy through pruning and training, orchardists need to be aware of the problems that may arise from sunburn in warmer areas. Sunburn can result in bark cracking and splitting and predispose the tree to fungal infections.

Pruning should:

- remove water shoots
- remove diseased tissue
- open the canopy to allow air movement and better spray penetration.

Selective pruning to remove diseased tissue during the production season has been shown to reduce the incidence of disease in the following season (e.g. silver leaf; page 80). Pruning to open the canopy allows more rapid drying, greater airflow and more effective pesticide coverage.

Water shoots should be regularly removed, as their soft vegetative growth provides a haven for sap-feeding pests such as black peach aphid.

Fruit thinning results in larger fruit. A secondary consequence of thinning is the removal of a sheltered habitat that provides a haven for insect pests and diseases. In crowded canopies, tight fruit clusters do not allow adequate spray penetration. Because some early season damage does not become apparent immediately, it may be possible to delay thinning until insect pest and disease damage is visible.

Flush-feeding pests, such as aphids, are attracted to new growth. Reducing nitrogenous fertiliser application early in the season reduces new growth and aphid infestation.

Step 2: Start the season with a plan**Which blocks am I willing to use IPDM on?**

Start small! No one likes to take risks. IPDM usually involves a reduction in the number of pesticide sprays applied. A well-run IPDM system will not result in more pests or diseases, but until you have gained some experience there is a risk. By reducing the number of pesticide sprays you run the risk of more pests and diseases and greater financial loss. Therefore, it is a good idea to introduce IPDM gradually.

In the first season, use IPDM on a low-value block. It would be best if this block is relatively large, but if a large block isn't available a small block will do.

Most IPDM management strategies work best on larger blocks or even across whole orchards and even regions. Using a small block to start means that you don't get the full benefit from IPDM. As you gain confidence and IPDM spreads across the whole orchard, pest and disease control will become easier.

How much time should I spend monitoring?

Do I have time to monitor my orchard thoroughly? Should I hire a consultant or scout?

Make an honest decision. To be successful, IPDM will take up a significant amount of time.

IPDM will not be successful unless the person doing the job is willing to devote a reasonable amount of time to monitoring. Monitoring should never be deferred because of other commitments: IPDM nearly always fails because monitoring loses priority at peak times. Be realistic—if you don't have enough time to do the job properly, hire a consultant.

For a beginner, as a rough guide, the time needed will be:

- 15 to 20 minutes per hectare every 7 to 14 days at peak times.
- It will take several months for an inexperienced person to monitor confidently and accurately.

For an experienced person the time needed will be:

- 10 to 15 minutes per hectare every 7 to 14 days at peak times.

It is useful to have someone you can share problems and experiences with (a mentor). This should be someone who you can e-mail

photographs to quickly or take samples to on the same or the next day. A reliable diagnostic service is essential. Incorrect identification can be costly in many ways.

If you are using a consultant to monitor your orchard and you don't think IPDM is working, make sure that they are spending at least this recommended length of time in your orchard.

What pests and diseases are likely to cause problems this season?

The most effective way to control pests and diseases is to anticipate which ones are likely to cause a problem and be ready to control them. Make a list of the pest and diseases that have been in your orchard over the last four seasons. As a general rule **if a pest or disease hasn't been seen for four seasons it shouldn't be necessary to monitor for it.** Pests and diseases that have caused financial losses should be given priority. If pests and diseases have been present but haven't caused losses, then include them on the list, but it may not be necessary to do anything about them in the coming season.

Pest and disease lists will vary from orchard to orchard and probably from block to block and in some cases are linked to climatic conditions.

The chapters in this manual that outline strategies for individual pests give an indication of where these pests have become a problem in Australian summerfruit production regions. It's important to also be aware that pests and diseases react to the weather.

Become familiar with the life cycles of your pests, diseases and beneficial organisms.

Find out all you can about the pests and diseases that attack your orchard.

- When can you expect them to occur?
- What do they look like (particularly early, before they've had a chance to do serious damage)?
- When is the most effective time to control them?

The pest and disease fact sheets in the following chapters provide this information for the most common pests and diseases of the Australian summerfruit industry.

You should also become familiar with the beneficial organisms that are likely to become more common in your orchard as you convert more and more blocks to IPDM.

What are my action thresholds for each pest and disease?

An action threshold is the point in time at which monitoring indicates that the financial loss caused by a pest or disease is unacceptable. At this point something must be done to control the pest or disease. If a pest or disease isn't costing you money or causing other problems, why waste time, money and effort controlling it?

In this manual there are three types of action thresholds

- 1 The pest or disease is present on a certain percentage of leaves, fruit, bark (the sample unit; page 12).
- 2 The pest or disease has caused damage on a certain percentage of sample units.
- 3 The weather is conducive to the development of the disease or large populations of the pest.

But how do orchardists know when pest or disease damage has reached this point?

- Very little research has been done on the relationship of damage to economic loss.
- The level of acceptable damage will vary from orchardist to orchardist.
- The level of acceptable damage will vary from year to year, depending on the market.
- For some pests or diseases it's too late by the time you see damage.

The key to deciding on a reasonable action threshold is to keep good records.

- What pests or diseases have been problems in the block over the last 2 to 5 years?
- How much damage have they done?
- What control measures were used and how much did they cost?
- Did the control measures work?

A lot of this information will be recorded in your spray diary. You can keep the few extra details required for IPDM in a hard-bound diary in your office.

This manual provides approximate action thresholds for the most serious pests and diseases of the Australian summerfruit industry. These are suggested starting points and may not suit you. Modify them to suit your enterprise, review whether they worked after two or three seasons, and then revise them up or down.

Preparing the orchard for monitoring

In IPDM a 'block' is a group of trees that are fairly uniform in terms of physical characteristics, variety and tree age. It is an area that is managed

Step 3: Monitor

Monitoring pests and diseases: two types of monitoring

Most IPDM systems monitor only the presence of pests and beneficials and the damage they cause. In many cases, by the time pests or damage are seen financial losses have already occurred. By monitoring the weather that is conducive to the development of pest infestations or diseases, action can be taken earlier.

Monitoring for weather that is favourable for pests or diseases

Some pests or disease quickly become damaging after weather that favours their development. Most diseases of summerfruit become obvious only after they develop in conditions that suit them. In general, by the time these organisms can be seen, serious damage has been done to the crop. Fortunately these organisms tend to respond to weather in a predictable way.

By carefully monitoring the weather, it is possible to apply management before these organisms become a problem. The pest and disease fact sheets in this manual give the weather that favours the development of such organisms and indicate when to apply management.

Monitoring for the presence of pests and diseases

Populations of some pests and diseases can be seen before they can grow to cause serious damage. For these organisms, regular monitoring is a useful way of deciding when to apply a management strategy. The pest and disease fact sheets in this manual tell you what to look for when you monitor, and they give an approximate action threshold.

Sample units

A sample unit is the item on which you are most likely to detect low populations of pests or diseases. A sample unit can be:

- a whole trees
- a portion of the tree (e.g. the sample unit for two-spotted mite is leaves, and for blossom blight, blossoms)
- a trap (e.g. for western flower thrips and fruit fly)
- the weather (e.g. it is possible to anticipate diseases before they are visible).

In this manual, the most appropriate sampling unit for each pest and disease is listed in the

'IPDM quick facts' section at the beginning of each pest and disease fact sheet.

When to monitor

In general, blocks should be monitored every 7 to 14 days throughout the season from budswell to after the harvest–peak season. In some cases it will be necessary to monitor for specific problems more frequently. Where an orchard has susceptible varieties, a history of infestation/infection, and weather favourable for the problem to develop, monitoring should be done at least weekly. These danger periods are dealt with in the sections about specific pests and diseases.

Some pests and diseases can also be detected during the dormant period (e.g. brown rot, San José scale). Therefore, a less regular monitoring schedule at that time of the year is also advisable. In most cases monthly monitoring during dormancy is sufficient.

Action thresholds

An action threshold is the point at which monitoring indicates that an orchardist must take action to avoid economic damage. This manual suggests action thresholds for each of the major pests and diseases of the Australian summerfruit industry. Some orchardists are willing to accept more damage than others; therefore, action thresholds will vary from orchardist to orchardist. We suggest that the action thresholds in this manual should be regarded as a starting point and reviewed at the end of each season.

What to look for?

The pest and disease fact sheets provided in this manual give descriptions of the most serious pests and diseases of the Australian Summerfruit industry. Consult these when monitoring your orchard. They provide details of:

- sample units
- when to monitor
- danger periods
- action thresholds
- what to look for
- prevention and management of the pest or disease.

If you are unsure about which pest or disease you're dealing with, all State Government primary industry departments provide diagnostic services (Fees may apply; contact the service for details before submitting samples—see page 133).

Keep good records

Good management of pests and diseases saves money. The only way to evaluate your pest and disease management is to keep good records. A review of pest and disease management should

be done at the end of each season. By looking at your monitoring records (pages 130-132), your spray/management records and your pest management costs, you will be able to see what your best IPDM options are.

Step 4: Take action only if you need to**When pests or diseases reach the action threshold, control them*****How will I control pests that have reached the action threshold? What is the appropriate action?***

A pest or disease that reaches the action threshold must be controlled. There is usually a range of management options for controlling pests and diseases. IPDM asks you to consider which is the most appropriate in the context of the whole orchard over a period of seasons. This is 'appropriate action'.

In many cases, appropriate action will involve the application of a chemical pesticide. Pesticides can harm the natural enemies of orchard pests and pathogens and cause secondary problems (see the chapter on biological control; page 101).

Management options other than pesticides should always be considered. If a pesticide is the only option likely to be effective, always consider the pesticide's effect on beneficial organisms such as predatory mites. Cheaper chemicals may **not** be the most economical option if they kill beneficial organisms and extra money needs to be spent in controlling pests. This manual contains a spray schedule for Australian Summerfruit (page 137). This schedule is a guide to the most effective options suitable for IPDM.

This manual also outlines other management options for the most serious pests and diseases of the Australian summerfruit industry.

Step 5: When the last of the fruit is sold, evaluate your season**How much damage was done by each specific pest or disease?**

Keep accurate records of pest and disease incidence in your orchard during the season. Monitoring forms for diseases (page 131) and insect pests (page 132) are included in this manual. These forms can be modified to suit your orchard by including only the pests and diseases that are likely to cause you a problem. Keep your records for 10 years. The more historical information on your orchard that you have, the better the decisions you're likely to make.

Losses caused by pests and diseases that generally affect leaves or branches (e.g. silver leaf or two spotted mite) are more difficult to assess than those affecting fruit. Keeping accurate records of the percentage of trees affected and comparing these to previous seasons' is the only way that management action can be evaluated.

Examine rejected fruit regularly in the orchard after picking and in the shed. Determine the major reason why the fruit wasn't packed. Some

pests and diseases can be very obvious in the orchard but really don't cause major problems. More effort than is needed is sometimes put into controlling these problems than other, less obvious—and perhaps more damaging—pests and diseases.

What was done to control each pest and disease and was it effective?

After reviewing losses due to specific pests and diseases, think about how you tried to control that problem during the season. For example, for pesticides, estimate the total volume of pesticide applied for each pest or disease (spray records will provide this information); the price of the pesticide; and the total cost of control, including application time (labour) and running and maintenance of equipment.

More accurate records allow for better decision-making, and the overall objective of IPDM is to find the best management options.

Step 6: Plan for next season

For all of the blocks you have in your IPDM program it is important to do a pest and disease management review at the end of each season.

The best way to improve your pest and disease management is to look at what you've done and put more emphasis on the things that worked and find alternatives for those that didn't.

A plan for next season should include each insect pest and disease you think you may have to control. Answer some questions:

Do I need to do anything?

Has the pest or disease caused a problem in my orchard during the previous four seasons?

- 1 Yes. Formal monitoring will be needed. Control may be needed, depending on the results of monitoring.
- 2 No. Only casual monitoring will be needed. Specific control measures will probably not be needed next season.

Do I have all of my preventive management strategies in place?

If the pest or disease was a problem last season, start by carrying out some preventive management. Often prevention reduces the number and severity of problems encountered during the season. This manual contains suggested preventive management strategies for the most serious pests and diseases of the Australian summerfruit industry.

What is my plan for each pest and disease that has been a problem recently?

Planning on the run usually doesn't work; plan well in advance.

Have you been happy with the management options you've used for each pest and disease in the past? Look at your records and consider:

- Did it work?
- Was it cost effective?
- Did it cause secondary problems, such as mite outbreaks?
- Did it cause any other problems? Health, disposal problems?
- Residues?

Consider alternatives

Even if something is working well, there may be an even better alternative. If for any reason you're not happy with some aspect of pest and disease management, change it. Be conservative to reduce risk: trial major changes to your pest and disease management on small, low value blocks before using them more generally.

This manual provides a number of pest and disease management options for the major insect pests and diseases of Australian Summerfruit.

Can more blocks be put under IPDM?

Consider switching more blocks to IPDM if:

- pest and disease losses in IPDM blocks are no higher than those in other blocks, and/or
- pest and disease losses in IPDM blocks are no higher than they were before conversion to IPDM.

