



Readers' Note

This document is part of a larger publication. The remaining parts and full version of the publication can be found at:

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

Updated versions of this document can also be found at the above web address.

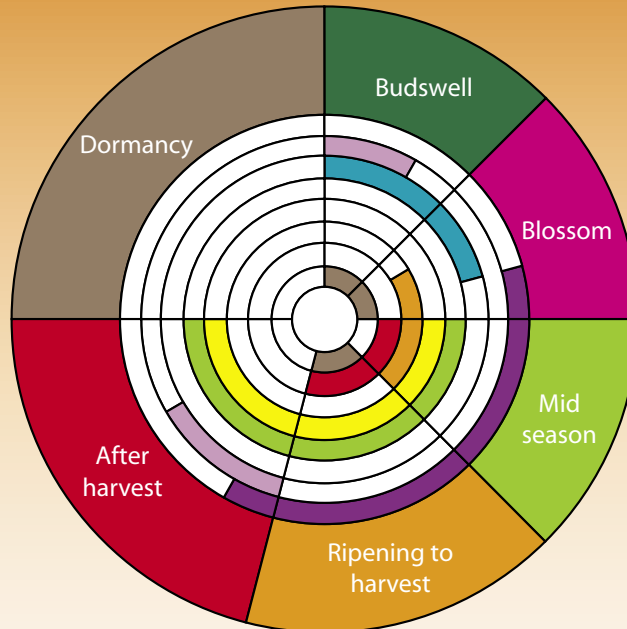
This document is subject to the disclaimers and copyright of the full version from which it is extracted. These disclaimers and copyright statements are available in the appropriate document at the above web address.

Pest and disease fact sheets











Summary of pest and disease monitoring times

Summerfruit disease monitoring times

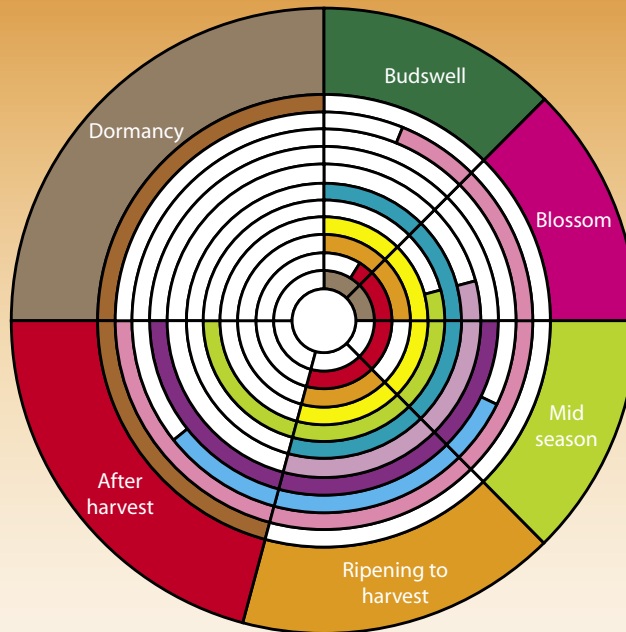


What to monitor







- Fruit
- Flowers
- Leaves
- Twigs and branches
- Whole tree












	Brown Rot and Blossom Blight	Page 27
	Freckle	Page 40
	Leaf Curl	Page 50
	Silver Leaf	Page 80
	Rust	Page 70
	Bacterial Spot	Page 18
	Bacterial Canker	Page 14
	Shot Hole	Page 77

Summerfruit insect pest monitoring times



What to monitor

-  Fruit
-  Flowers
-  Leaves
-  Twigs and branches
-  Whole tree
-  Trap

	Plague Thrips	Page 65
	Western Flower Thrips	Page 65
	Lightbrown Apple Moth	Page 53
	Peach Aphids	Page 23
	San José Scale	Page 74
	European Earwigs	Page 37
	Fruit Flies	Page 43
	Two-Spotted Mite	Page 84
	Carpophilus Beetle	Page 32
	Oriental Fruit Moth	Page 57
	Peach White Scale	Page 63

Bacterial canker

Pseudomonas syringae pv. *syringae*
Pseudomonas syringae pv. *morsprunorum*

IPDM quick facts

Sample unit: Whole tree

When to monitor: Early to mid-budswell

How often: Check fortnightly

When to monitor: After harvest but before leaf fall

Action level: If present

Weather should also be considered when determining action levels.

Take action if the block has been infected during the last two seasons and:

- it has been wet and windy in autumn and early winter (before and during leaf fall)
- limbs have been damaged by pruning, hail or wind during early dormancy
- there has been rain during the growing season (this spreads the disease)
- wind-driven rain and hail rip leaves off and damage bark when cankers are active.

Causes and consequences

Bacterial canker is caused by the bacterial pathogen *Pseudomonas syringae* pv. *syringae*. *Pseudomonas syringae* pv. *morsprunorum* also causes the disease and is present in Australia. This disease can affect all tree parts. It is a major problem in all summerfruits.

Economic losses result from a reduction in fruit yield, and from branches or whole trees dying.

Symptoms

Trunks and branches

The bark is killed, and when the sunken surface bark is removed the underlying bark tissue is orange to brown, often with a strong, sour smell. Copious amounts of gum may exude from the trunk and bark cankers. Dead areas of tissue become sunken as surrounding areas of healthy



tissue continue to grow, resulting in the typical canker. These symptoms are similar to those caused by other summerfruit diseases. The differences between these diseases is outlined in Table 6; page 93. Peach trees can carry cankers that are not visible externally but weaken the tree throughout its life.

There is often extensive suckering following infection.

Shoots

Soft new shoots wilt and die back from the tips and turn brown. Cankers can form on shoots as a result of infection through the leaf scar (where leaf was attached).

Buds

Dormant buds become brown and fail to break. Behind the bud, an area of dead tissue develops on the shoot. This area may be sunken and appear brown and damp underneath.

Flowers

Infection in spring causes flowers to turn brown and die. This symptom is easily confused with blossom blight caused by the fungal pathogens *Monilinia fruticola* and *Monilinia laxa* (page 27). If fungicide applications for blossom blight are not effective it is possible that the disease is actually bacterial canker (also known as bacterial blast).

Leaves

On younger leaves infection appears as water soaked spots. As leaves age, the spots turn brown and drop out, giving a 'shot-hole' effect. Other symptoms can occur, such as thin, narrow, often rolled yellow leaves, particularly on peach and plum trees.

Fruit

Infection causes sunken spots with dark centres and sometimes underlying gum pockets.

A serious regional issue during the last 10 years in:

- Adelaide Hills
- Riverlands
- Manjimup/Donnybrook
- Swan Hill
- Perth Hills
- Sydney basin



Dead limbs can be seen on trees infected with bacterial canker

Prevention

Choosing species and varieties

All species of summerfruit are susceptible to bacterial canker. Apricots are more susceptible than peaches, nectarines and plums. Therefore, in orchards prone to bacterial canker infection, avoid planting apricots.

Orchard management

Avoid any damage to trees during the highly susceptible autumn period. Protect trees from wind-driven rain. Avoid overhead irrigation. Avoid using high nitrogen fertiliser rates in mid- to late summer, as this will encourage late season growth, and the soft tissue will become infected as the cankers become active. Do not damage trees when moving equipment around the orchard, particularly around headlands. Paint tree butts with white acrylic paint to prevent wounds caused by sunscald. Avoid planting in shallow, coarse and/or acidic soils, as these soils favour disease development.

Monitoring

When to look

There are two critical times for monitoring for bacterial canker (see chart overleaf).

Look carefully at marked monitoring trees soon after leaf fall. Observation at this time is useful, as it is easier to observe limb lesions. Observe marked monitoring trees carefully at weekly intervals for approximately 3 weeks after leaf fall. This will help to plan for next season. Examine your other trees during your walk between the marked trees. Pruning can also be done at this time. Pruning out cankers is effective only when there are relatively few of them.

Budswell		Blossom		Mid Season	Ripening to Harvest	After Harvest	Dormancy
				Cankers become dormant		Cankers form and develop	
Bud death noticeable		Occasional leaf infections					
MONITOR							

Carefully monitor marked trees weekly from early to mid-budswell for bud death. Also consider the amount of rain that has fallen during the growing season, as rain spreads the disease through the orchard.

What to look for

When monitoring the orchard, look for rough cankers with amber-coloured gum. Sometimes gum is not produced, but when the bark is peeled back the flesh of the tree is fermented, brown and sour smelling. Look particularly hard around crotches.

Bacterial bud dieback (bacterial blast) looks similar to blossom blight caused by the fungus *Monilinia* (page 27).

A monitoring form for this disease is included on page 131.

Appropriate action

Action threshold

If canker is seen (see chart at top of following page).

Pruning

In badly affected orchards avoid pruning in winter when cankers are active. Winter pruning will spread the disease. It is recommended that:

- pruning should be delayed, possibly until as late as bud burst. This is particularly the case for young non-bearing trees and apricots, which are highly susceptible, or
- pruning should be done after harvest, well before leaf fall.

Bacterial canker can also be spread by pruning implements. Prune areas in the orchard with bad canker problems last, and be sure to disinfect pruning implements frequently in an effective disinfectant (such as a 1 in 10 solution of household bleach). If you are pruning out discrete cankers on limbs, ensure the cut is at least 15 cm below the visible lesion.

Prune so that the weight of a heavy crop isn't likely to split the tree at the crotch. Splits create sites for canker infections.

Paint large pruning wounds with white acrylic paint, particularly where canker has been a problem.

In all but the mildest of infestations, pruning should be considered supplementary to a thorough spray schedule.

Remove badly infected young plantings

Don't neglect young trees (less than 4 years old). Winter is a good time to assess whether recent plantings have bad bacterial canker infections. Pay particular attention if there has been hail. Treatment depends on the severity of the problem. If the problem is small to moderate, treat young trees as you would mature trees. If the problem is serious, consider pulling out the affected trees and planting healthy ones. Seriously infected young trees are unlikely ever to do well and will be a source of infection for the rest of the orchard.



Active bacterial canker on a peach tree



Assess disease level in the orchard

Quantify the number of trees with the disease in your orchard every winter. Examine 20 trees in each hectare and record the number with bacterial canker. This allows you to determine whether your control strategy is working and plan for next season.

Control four-legged pests

Wounds are prime sites for bacterial infection as well as for a number of other diseases. Try to minimise rabbit, hare and wallaby damage. Young trees can be severely damaged from early May through to late August. Place apple or plum prunings around headlands—these are very attractive to pests and help to divert them from trees. Scatter a fresh lot of prunings every 2 or 3 weeks. Another option is to cover the trunks with aluminium-coated paper. Staple the paper around the tree, foil side out. Plastic guards are also available commercially. Sound netting fencing may keep pest animals out.

Protective spray program

Where conditions favour the disease, or disease levels during the last dormancy indicate heavy disease pressure, a full schedule of protective copper bactericide applications is recommended. This disease has the potential to seriously reduce yield, and under conditions conducive to this bacterium a conservative approach is warranted.

Thorough spraying is essential. Aim to get the best possible coverage of the limbs.

A spray schedule for this disease can be found on page 137.

Spot spray copper oxychloride if

- the tree splits at the crotch
- trees are damaged by animals (e.g. hares, wallabies) when cankers are active.

Fungicides applied for fungal blossom blight will not control bacterial bud dieback. If fungicides have been applied without effect, there is a possibility that the problem is bacterial—pay close attention to early copper applications next season.

More information

Some of the information provided in these references comes from other countries (marked †). Always remember that the biology of pests and diseases and the tactics used to control them vary subtly from country to country and will change with time. Be particularly cautious with pesticide recommendations. If a pesticide is not recommended in this manual (page 137) you must check that it has current registration in your State and abide by the conditions of that registration, as specified on the pesticide's label. ALWAYS READ THE LABEL.

Dick J, Wood P (1998) *Bacterial Diseases of Stone Fruit*. Farmnote 98/91. Agriculture Western Australia. Available through the DAWA website, www.agric.wa.gov.au

Bacterial spot

Xanthomonas arboricola pv. *pruni*

IPDM quick facts

Sample unit: *Inspect whole trees*

When to monitor: *Early budswell to mid-blossom*

How often: *Weekly*

Action level: *If present.*

Weather should also be used to determine action levels

Take action if the block has been infected during the last four seasons and:

- *it has been wet between blossom and petal fall*
- *if early season infections have occurred and conditions have been windy and wet during the growing season (secondary infections).*

Causes and consequences

Bacterial spot is caused by the bacterial pathogen *Xanthomonas arboricola* pv. *pruni*. Losses can occur directly from infection of fruit. Up to 50% of the fruit on susceptible varieties may be unsaleable. Extensive defoliation and twig dieback result in stunting and gradual loss of leaders from season to season.

Symptoms

Buds

Expanded buds become blighted and may fail to unfurl.

Leaves

Leaf spots appear in spring as greasy or water-soaked angular areas (partly confined by leaf veins). Spots dry to a light tan, then darken with age, becoming dark brown to black. As the leaves expand, diseased tissue separates from surrounding healthy tissue and may drop out to give a shot-hole symptom. This is easily confused with fungal shot-hole caused by the pathogen

Wilsonomyces carpophilus, but the bacterial spot disease can usually be recognised by the oily sheen and sharp angles of the young lesions.

The spots often join, and where infection is heavy, affected areas become pale yellow-green or reddish. Extensive spotting results in ripping and tattering of the leaves. Premature defoliation may occur.

Stems

Small greasy lesions appear on the rapidly growing young branches in early spring. They become elongated, depressed and tan. Cracks may form in the lesions and develop into open cankers from which gum exudes. Cankers may also develop during summer after leaf symptoms are well developed.



Bacterial spot on young plum fruit



Bacterial spot leaf lesions on plum (A) and peach (B)



Plum fruit infected by bacterial spot. Note the water-soaked appearance of lesions.

Stem cankers are rarely larger than 1 or 2 cm but, if numerous, they may cause shoot distortion or dieback.

Fruit

Lesions appear in late spring as circular greasy spots that become sunken and darken as the fruit enlarges. The centre of each spot frequently

cracks and may ooze gum. Roughened cork tissue develops on the edges of lesions as the fruit continues to expand.

Plums develop fewer, larger lesions, whereas peaches and nectarines develop numerous small spots, sometimes with deep cracking and pitting.

A serious regional issue during the last 10 years in:

- Adelaide Hills
- Goulburn Valley
- NSW southwest slopes
- Perth Hills
- Alstonville
- Riverlands
- Granite Belt
- Swan Hill
- Tasmania
- Sydney Basin

Prevention

All bacterial diseases are difficult to control once established, and it is therefore important that



Peach fruit infected by bacterial spot

you are vigilant in preventing the disease from entering your orchard.

Choosing species and varieties

Bacterial spot affects all summerfruit. The most serious symptoms occur on plums. Although no varieties of plum are resistant, some are more susceptible than others (Table 2). Buy and plant only vigorous, disease-free trees from a reputable nursery.

Table 2. Susceptibility of plum varieties to bacterial spot

Name	Susceptibility†
Autumn Giant	1
Blackamber	1
Durado	1
Friar	1
Roysum	1
Stirling	1
Tegan Blue	1
Queen Rosa	2
Queensland Red Ace	2
Red Beaut	2
Casselman	3
Ruby Blood	3
Santa Rosa	3
Satsuma	3
Bellerosa	4
Black Santa Rosa	4
Kelsey	4
Simka	4
Donsworth	5
Earlisweet	5
Mariposa	5
Narrabeen	5
Radiance	5
Wilson	5

† Rated from 1 (very susceptible) to 5 (less susceptible)
 Information courtesy of the Queensland Department of Primary Industries and Fisheries

Orchard design

Orchards in exposed locations are more vulnerable to attack by the disease than those in sheltered situations. Avoid low-lying sites with poor air and soil drainage.

Overhead irrigation is a serious obstacle to disease control. Avoid irrigation systems that wet the leaves. Plant windbreaks because they reduce the chance of spread by windblown rain. However, dense windbreaks can block the spring and summer breezes that dry trees. Therefore, make sure that the undergrowth at the base of the windbreak allows some gentle air movement.



Dieback due to bacterial spot stem lesions

Pruning and shaping trees

Pruning to allow thorough spray penetration and more rapid drying of the canopy helps to reduce the severity of the disease and increases tree vigour. Do not prune or tree train during wet weather. Pruning of visible disease cankers is of little value in controlling the disease.

Maintaining soil fertility

Trees under nutrient stress or stress caused by the presence of other diseases or insect pests are more susceptible to bacterial spot infection. Therefore it is advisable to maintain high levels of soil fertility and use a good pest management program.

Prevent the introduction of new disease.

Destroy nearby feral or neglected *Prunus* trees, as they can act as reservoirs for the disease. Avoid planting new blocks near blocks that have the disease.

Monitoring

Bacterial spot spreads quickly through an orchard and can cause serious losses. Symptoms occurring early in the season are often difficult to detect. Monitoring is therefore difficult and in some cases ineffective. The presence of the disease indicates that early disease control is necessary next season.