

# Pome & Stone Fruit Orchard Spray Guide 2003/04 (Apple, Pear, Nashi, Peach, Nectarine, Plum, Cherry and Apricot).

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The product trade names in this publication are supplied on the understanding that no preference between equivalent products is intended and that the inclusion of a product does not imply endorsement by Department of Agriculture over any other equivalent product from another manufacturer. Any omission of a trade name is unintentional.

**ALWAYS READ THE LABEL** - Users of agricultural (or veterinary) chemical products *must always* read the label and any Permit before using the product, and strictly comply with the directions on the label and conditions of any Permit. Users are not absolved from compliance with the directions on the label or the conditions of the permit by reason of any statement made or not made in this publication. Refer to your chemical re-seller, chemical company, Australian Pesticides and Veterinary Medicines Authority or Department of Agriculture if you are unsure about chemical registrations or chemical residues (especially if the fruit is being exported).

Parts of the chemical use pattern quoted in this publication are approved under Permit(s) issued by the Australian Pesticides and Veterinary Medicines Authority (APVMA) and in force at the time the publication was prepared. Persons wishing to use a chemical in the manner approved under Permit should obtain a copy of the relevant permit from APVMA and *must* read all the details, conditions and limitations relevant to that Permit, and must comply with the details, conditions and limitations prior to use.

Recommendations were current at the time of preparation of this material.

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**NOTE:** In the following spray option tables, if an active ingredient has more than 5 trade names for a registered use then the Common Trade Names listing defaults to “Various trade names”. Check with your chemical supplier for a registered product.

## 1. Pesticide safety

There are many national and State government bodies, and private enterprise groups, involved in managing a range of issues relating to the safe use of pesticides. The following information includes the areas of responsibility and contact details for them.

### 1.1 Australian Standards

A Standard is a published document which sets out technical specifications or other criteria necessary to ensure that a material, or method will consistently do the job it is intended to do.

There are many Australian Standards that are of benefit to the orchard industry of Western Australia when dealing with chemicals. One in particular is AS 2507-1998 '*The storage and handling of agricultural and veterinary chemicals*'. This standard covers topics such as design and construction of chemical storage areas; operational and personal safety with chemicals; emergency chemical management; waste disposal and decontamination of chemical containers.

For further information on this Australian Standard and others, contact Standards Australia Customer Service Centre:

Standards Australia

GPO Box 5420, Sydney, NSW 2001  
Tel: 1300 654 646; Fax: 1300 654 949  
(8.00am - 8.00pm Eastern Standard Time, Mon-Fri)  
E-mail: [sales@standards.com.au](mailto:sales@standards.com.au)  
Internet: <http://www.standards.com.au>

### 1.2 Organochlorine chemical residues

Orchards and old orchard sites are often contaminated with organochlorine pesticides such as dieldrin, heptachlor and DDT, which break down only slowly in the soil. There is a danger that grazing animals, particularly cattle and poultry, will become contaminated with these pesticides resulting in meat and/or eggs high in chemical residues.

In addition to the risk posed by organochlorines, there may also be risks of pesticide residues in grazing animals from other pesticides. These may have been used in the past or are currently being used for pest control in the orchard. Some examples of pesticide risk include poultry feeding on contaminated garden weevil adults or on baits used to manage wingless grasshoppers.

Consult an Agriculture Protection Officer from the nearest office of the Department of Agriculture if there are any queries on pesticide residue risks to grazing animals.

### 1.3 drumMUSTER and chemCLEAR

**drumMUSTER** is the collection scheme for non-returnable rigid metal and plastic containers used in the packaging of crop protection and animal health products. drumMUSTER is funded by a levy of 4 cents per litre or kilogram on crop protection and on-farm animal health products sold in non-returnable chemical containers over 1 litre or kilogram in content.

Primary producers deliver empty, cleaned containers to drumMUSTER collection centres on designated collection days. Participating local councils run these collection centres. The drumMUSTER levy pays for trained staff to inspect and process cleaned containers for re-use, recycling, energy recovery or other environmentally approved methods. Unclean and partly filled containers will not be accepted.

Containers, which are designated for multiple use (such as refillable ones) or to minimise waste (such as water-soluble packaging) are not subject to the drumMUSTER levy. This gives farmers a choice: **either** to buy crop protection and animal health chemicals in environmentally friendly containers not subject to the levy, or to buy chemicals in containers with the drumMUSTER sticker and return the empty, cleaned containers to drumMUSTER collection centres.

For further information on drumMUSTER contact: Bevan Henderson (WA)  
11 Lakeview Drive, Gidgegannup WA 6083  
Tel: (08) 9574 6409 Fax: (08) 9574 6680  
Mob: 0429 089 780  
E-mail: [lakehse@inet.net.au](mailto:lakehse@inet.net.au)

The **chemCLEAR** agreement between the National Farmers' Federation (NFF), the National Association for Crop Protection and Animal Health (Avcare) and the Veterinary Manufacturers and Distributors Association (VDMA) involves the cooperative collection and disposal of all future unwanted registered agvet chemicals. chemClear collections are ongoing and will continue after the once off initial ChemCollect collections. chemClear will not accept agvet chemicals that are part of a return scheme by manufacturers, or a callback scheme between the Australian Pesticides and Veterinary Medicines Authority (APVMA) and manufacturers, chemClear is funded by the farm chemical manufacturers.

For further information on chemClear contact: Avcare Limited  
Locked Bag 916 Canberra, ACT 2601  
Tel: (02) 6230 6399  
Fax: (02) 6230 6355  
E-mail: [info@avcare.org.au](mailto:info@avcare.org.au)

#### 1.4 ChemCert Australia

ChemCert Australia (formerly Farmcare Australia) provides essential training courses in the selection, handling, application and disposal of agricultural and veterinary chemicals. It instructs the chemical user in effective and safe working practices for the growing of residue-free produce. The course covers such topics as:

- The product label
- Personal and environmental safety
- More informed choice of chemical use
- Application options
- Calibrating boom sprayers and mistblowers
- Using pesticides in an integrated pest management program
- Minimising spray drift
- Record keeping and storage
- Employer liability and duty of care

For some pesticides, they are available only to orchardists who have completed a ChemCert training course.

For further information on ChemCert contact:

ChemCert WA  
Terry O'Beirne -Executive Officer  
88 Westview Street, Scarborough WA 6019  
Tel/Fax: (08) 9341 5325  
E-mail: [farmcarewa@bigpond.com.au](mailto:farmcarewa@bigpond.com.au)

## 1.5 Withholding periods and Maximum Residue Limits (MRLs)

Use of agricultural chemicals may leave residues of the chemical in/on fruit. The level of residue that remains at harvest is dependent on the chemical, the formulation, the application rate, method of application, time and number of treatments, use of adjuvants, the interval since the last application and climatic conditions.

Limits for these residues are determined in various countries by health authorities. These limits are called MRLs and are set to prevent consumers from taking in excessive residues. Orchardists have the responsibility to ensure that fruit they sell do not exceed MRLs for the chemicals they apply.

Label rates for horticultural chemicals have been calculated so that, provided the label rate is followed and withholding periods observed, Australian MRLs are not exceeded. The withholding period for a particular pesticide is the minimum time between when the crop is last sprayed and when it is picked. This withholding period may vary for different crops. A withholding period of seven days means that the grower must wait for seven days between the last application of the pesticide before the crop is picked. Growers applying chemicals at the correct rate and observing the withholding period before harvest should produce fruit with residues lower than the MRL for Australia.

Orchardists involved in production of fruit for export should be aware that other countries may have different or no MRLs for chemicals used in Australia. If the importing country has a lower MRL than the Australian MRL, longer withholding periods or changed rates of application may be necessary. If the importing country has no MRL set for a chemical used in Australia, that chemical should not be applied to the crop as any detectable residue on the fruit will be unacceptable.

Growers exporting fruit should contact their exporters before spraying to ensure that MRLs in the export markets are not exceeded.

## 1.6 Responsibilities of WA Government agencies

### 1.6.1 Department of Agriculture

Department of Agriculture is responsible for:

- i. *Aerial Spraying Control Act 1966*. This act controls the aerial spraying of agricultural chemicals and is currently under review.
- ii. *Agricultural Related Resources Protection (spraying Restriction) Regulations 1979*. These regulations control the spraying of some hormone herbicides near sensitive crops (e.g. grapevines and tomatoes) and currently are under review also. The use of such herbicides near less sensitive crops such as pome fruit and citrus orchards are not controlled by the regulations, but landholders and spray contractors should exercise a "duty of care" when spraying. For further information see:

Farmnote No. 61/99 "Hormone herbicides: What you should know before you spray".

- iii. *Agricultural Produce (Chemical Residues) Act 1983*. This act was created to deal with agricultural chemical residues in raw agricultural produce. In the late 1980s, this act was used to manage the movement of cattle affected by organochlorine residues.

### **1.6.2 Department of Environmental Protection**

The Department of Environmental Protection is responsible for the *Environmental Protection Act 1986*. This Act contains general provisions that make it an offence to pollute. This is not defined further as it is left to the court to decide the extent of pollution in a particular case. Previous cases have included excessive clearing of vegetation as pollution, as well as the 'traditional' examples of, say, chemical contamination of a river.

Contact details: Department of Environmental Protection  
PO Box K822, Perth WA 6842  
Tel: (08) 9222 7000 Fax: (08) 9222 7099  
E-mail: <http://www.environ.wa.gov.au>

### **1.6.3 Department of Industry and Resources**

The Explosives and Dangerous Goods Division of the Department of Industry and Resources is responsible for the *Explosives and Dangerous Goods Act 1961*. This act deals with substances likely to cause hazards to people or the environment (e.g. explosion risk, flammability, corrosiveness, and toxicity).

Contact details: Department of Industry and Resources Western Australia  
Explosives and Dangerous Goods Division  
Postal and street address: 100 Plain St, East Perth WA 6004  
Tel: (08) 9222 3333 Fax: (08) 9222 3525  
Internet: <http://www.doir.wa.gov.au>

### **1.6.4 Health Department of Western Australia**

The Health Department of Western Australia is responsible for:

- i. *Health (Adoption of Food Standards Code) Regulations 1992*. These regulations deal with pesticide residues in foodstuffs.
- ii. *Health (Pesticides) Regulations 1956*. These regulations control the use and disposal of pesticides.
- iii. *Poisons Act 1964* and *Poisons Act Regulations 1965*. This act and the regulations are concerned with the possession, sale and use of poisons in Western Australia.

Contact details: Health Department of Western Australia  
Street address: 189 Royal St., East Perth WA 6004  
Postal address: PO Box 8172 Perth Business Centre,  
Pesticide safety section (i & ii) - Tel: (08) 9383 4244 Fax: (08) 9383 1819  
Telarmacy section (iii) – Tel. (08) 9388 4999  
Internet: <http://www.health.wa.gov.au>

### **1.6.5 WorkSafe**

WorkSafe Western Australia is the Western Australian State Government agency responsible for the administration of the *Occupational Safety and Health Act 1984*. Enforcement of this Act occurs through WorkSafe Western Australia inspectors. Where inspectors become aware of non-compliance with the law they may issue verbal directions, improvement or prohibition notices, or commence prosecution action.

WorkSafe Western Australia has a WorkSafe Plan assessment system that assists enterprises to measure the extent to which the employer's general duty of care under the *Occupational Safety and Health Act 1984* is being implemented. The WorkSafe Plan measures five key elements:

- Management commitment
- Occupational safety and health planning
- Consultation
- Hazard management
- Training

Each of these five elements of the safety management system is assessed and scored using a standard that describes the performance expected for that element. Organisations can use WorkSafe Plan to assess and improve occupational safety and health performance at any time.

Organisations, which achieve specified performance outcomes, are eligible to receive WorkSafe Plan certificates of achievement.

For further information about WorkSafe Western Australia and the *Occupational Safety and Health Act 1984* contact:

WorkSafe Western Australia  
5th Floor, 1260 Hay Street  
WEST PERTH WA 6005  
Tel: (08) 9327 8777 Fax: (08) 9321 8973  
Postal Address: Locked Bag 14, Cloisters Square, Perth WA 6850  
E-mail: [safety@docep.wa.gov.au](mailto:safety@docep.wa.gov.au)  
Internet: [www.safetyline.wa.gov.au](http://www.safetyline.wa.gov.au) / [www.docep.wa.gov.au](http://www.docep.wa.gov.au)

## 1.7 Safety to bees

Bees are likely to be affected by insecticides if they are foraging on flowers. The flowers may be in the crop or on ground cover at the time of spraying. Some insecticides have very low toxicity to bees and can be applied even when the bees are foraging. Other short residual insecticides will be safe to bees if applied in the evening or at night when the bees are not foraging. A few insecticides remain toxic to bees for a long time after application.

Foraging bees may bring contaminated pollen or nectar back to the hive. This is fed to the house bees, which then feed the larvae and queen: in this way the whole colony may be killed.

Symptoms of bee toxicity vary:

1. there may be a sticky mass of bees dying in front of the hive,
2. bees may move very slowly,
3. bees may exhibit strange and aggressive behaviour.

The insecticide carbaryl is very toxic to bees and carbaryl contaminated pollen may remain toxic for up to eight months when stored in the hive.

## 2. Chemical labels and material safety data sheets (MSDS)

A chemical label is a legally binding document. To use a product other than in the manner specified on the label is illegal. In special cases a product may be used in a manner different to that specified on the label by obtaining a permit for minor off-label use from the APVMA.

Off-label permits will only be issued:

- for minor uses
- for a specified period of time
- if the chemical is currently registered for other uses
- if there are no alternatives
- if being used on food products, a maximum residue limit (MRL) has already been established (refer to section 1.5).

For enquiries on permits for minor off-label uses, contact:

Australian Pesticides and Veterinary Medicines Authority.  
PO Box E240, Kingston, ACT 2604  
Tel: (02) 6272 5852 Fax: (02) 6272 4753  
E-mail: [contact@apvma.gov.au](mailto:contact@apvma.gov.au)

A searchable register of minor off-label permits is available on the web at the APVMA site.  
<http://www.apvma.gov.au/permits/permits.shtml>

MSDS are available for each chemical to supplement the information provided on the chemical label. They are not part of, nor a substitute for the chemical label. **Any farm chemical handled or stored on a property must have an up to date MSDS available on the premises in a known location.** The *Occupational Safety Regulations 1996* (see section 1.6.5 WorkSafe) requires that a MSDS be supplied at the first sale of that hazardous chemical and thereafter upon request. Also, the MSDS of a chemical must be shown to any persons employed on that property, prior to using the product. These may be available to be downloaded from chemical company websites.

## 3. Pesticide application

### 3.1 Canopy spraying

The good work of monitoring for pests to decide on the need for and timing of pesticide application, and correct selection of a pesticide to control the pest, will be negated by poor application technique. When using pesticides to control pests and diseases, and herbicides to control weeds, it is essential that these be applied safely and effectively.

Incorrect spray application can result in major pesticide wastage or phytotoxicity. Pesticide wastage or over-spraying may result in residues that exceed the maximum residue limit (MRL), is costly and detrimental to the environment.

Correct calibration of a sprayer is essential to apply the chemical at the label rate and to get maximum efficiency of coverage of the target.

Some principles of good spray application are:

- **Sprayers should be calibrated correctly at least once per season - best done at the start of the season.**
- The main factors affecting good spray application are: **air volume and direction, tractor speed and droplet size.**
- The objective is to **replace the air in the canopy** with droplet-laden air from the sprayer. Placing balloons on the far side of the row and checking that they move when the sprayer is driven past will indicate if replacement of air is occurring.
- The **ground speed** of the tractor and sprayer has to be selected so that the air in the canopy is completely replaced.
- **The aim is to select nozzles and an operating pressure to maximise the droplet spectrum in the range 70-250 microns. More than 50% of the droplets should be in this range for canopy spraying.**
- **Measure the output from each individual nozzle. Replace any nozzle that varies more than 10% from the manufacturer's specifications.**
- Maintain records of **calibrations, which will include such details as the different blocks, tractor speed, nozzle configurations and pump pressure for future reference.**
- **Spray calibration kits** for low profile airblast sprayers are available from the following offices of the Department of Agriculture, Western Australia : Bunbury and Manjimup. For other sprayer types, consult the manufacturers' guidelines.

### 3.1.1 Choice of equipment

Several factors may influence your choice of equipment. A sprayer should be selected which is suited to the size and density of the crop to be sprayed.

Equipment presently available includes airblast (both low profile and tower), airshear and controlled droplet application (rotary atomiser) types. These all have various advantages and disadvantages.

Low profile airblast sprayers are currently the most widely used sprayer type. It is important to note that a low profile sprayer's efficiency is reduced in the top section of trees greater than 5 metres in height.

**Besides the sprayer, the other important choice of equipment is the nozzles. As mentioned previously it is important to achieve at least 50% of the droplets in the range of 70 – 250 microns. Droplets smaller than 70 microns are highly susceptible to loss through evaporation and drift. Droplets greater than 250 microns are highly susceptible to loss through run-off. The workshop manual, "Efficient pesticide use in orchards," available from the Manjimup Horticultural Research Institute contains tables of the different spray nozzles used and their droplet spectrums at selected operating pressures.**

The above information was part of a three-year research project, "*Pesticide reduction in pomefruit towards 2000*," (Project No. AP 97011). This project was funded by Horticulture Australia Limited (HAL) and the Apple & Pear Australia Limited (formerly AAPGA) in association with the Queensland Department of Primary Industries. If more detailed information is required on spray application, consult the workshop manual "Efficient pesticide use in orchards".

### 3.1.2 Application volume

High volume (dilute) spraying has been the conventional application volume in pome and stone fruit orchards. In recent years more growers are adopting low volume (concentrate) spray application in their orchards. The advantages of low volume spraying include:

- reduced pesticide wastage through less run-off
- reduced spraying time (less tank refills)
- potential to use lower pesticide rates.

There are some important considerations when choosing low volume spraying:

- accurate sprayer calibration is essential (less margin for error)
- pesticide labels must be interpreted correctly
- many pesticide labels specify high volume application only.

Recent research into spray application supports the use of low volume application in apples and pears. The final report of the Horticulture Australia Limited project “Improving spray application in apples and pears” (Project No. AP 95026) by Peter G. Cole, David A. Riches and Helen French, clearly demonstrates the advantages and disadvantages of low volume spraying.

**A. To calculate the high volume application rate use the following formula:**

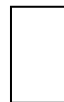
$$\text{Litres/hectare} = \frac{\text{Tree row volume} \times \text{Spray volume factor}}{1000}$$

To do this calculation you must first understand some of the terminology.

**TRV(cubic metres) = Tree Row Volume = amount of tree canopy per hectare**

For a vase tree the TRV= tree height (m) x tree width (m) x length of row per hectare (m)

**Vase tree is assumed to be rectangular**



**Central leader tree is assumed to be triangular**



For a **central leader tree** the TRV is only half that of a vase tree.

$$\text{The length of row per hectare(m)} = \frac{10,000}{\text{row spacing (m)}}$$

Row Spacing (m)	Length of row per hectare(m)
4	2,500
4.5	2,222
5	2,000
5.5	1,818
6	1,667

**SVF** = Spray Volume Factor = the number of litres of spray retained by 1000 cubic metres of canopy when it is sprayed to the point of run-off.

**SVF** was developed by Shell Chemical Aust. Pty Ltd.

### SVF for Deciduous Trees

<b>Dormant</b>	=	<b>75 L</b>
<b>Light Foliage</b>	=	<b>100 L</b>
<b>Medium Foliage</b>	=	<b>125 L</b>
<b>Dense Foliage</b>	=	<b>150 L</b>

### EXAMPLE

Calculation of the litres of spray required per hectare for **high volume application**, for vase trees.

Tree Height (m)	=	3
Tree Width (m)	=	2
Row Width (m)	=	5
SVF (Medium foliage)	=	125

$$\begin{aligned} \text{Step 1} \quad \text{TRV(m}^3\text{)} &= \text{Tree height} \times \text{tree width} \times \text{length of row per hectare} \\ &= 3 \times 2 \times \frac{10,000}{5} \\ &= 12,000 \text{ m}^3 \text{ per hectare} \end{aligned}$$

$$\begin{aligned} \text{Step 2} \quad \text{Litres/hectare} &= \frac{\text{TRV}}{1000} \times \text{SVF} \\ &= \frac{12,000}{1000} \times 125 \\ &= 1500 \text{ litres per hectare} \end{aligned}$$

**B. To calculate the low volume application rate:**

To use low volume the amount of water used per hectare is decreased by a factor, e.g. by half, but the amount of product applied per hectare is the same. If the application volume is halved it is referred to as 2 X concentrate. In the Example, if we went from high volume at 1,500 litres per hectare to 2 X concentrate we would apply only 750 litres per hectare. If the pesticide label states a rate of 1 kg / hectare then at the high volume application rate the 1 kg of product would be added to 1500 litres of water. If the same product was applied at 2 X concentrate ( i.e. 750 L/ha) then the 1 kg of product would be added to only 750 litres of water.

The registration of most chemicals has been done using high volumes. In other words the rate is expressed as an amount per 100 litres and the manufacturer recommends that the spray is applied to the point of run-off. **To be eligible to use low volume application the label must quote a rate per hectare or at least specify that it can be used as a concentrate spray.**

For low volume spraying to become more widely adopted it will require the registration trials for new pesticides to include low volume applications to determine the performance of the product under such conditions. Also growers need to be well informed on low volume spraying as there is less margin for error in applying concentrated pesticides with low water volumes. Nozzles and spray heads must be accurately calibrated for the canopy size and shape, chemical and water rates must be properly calculated and pesticide labels must be interpreted correctly to ensure the appropriate rate is applied.

### **3.2 Calibrating a boomspray for herbicide application**

To calculate the output of your boomspray use the following steps:

**1. Determine ground speed.**

Select a suitable gear and engine revs.

Record the time taken to travel 100 metres.

Use the following formula to calculate the speed in km/hr:

$$\text{Speed (km/hr)} = \frac{\text{Distance (m)} \times 3.6}{\text{Time (sec)}}$$

$$= \frac{100 \times 3.6}{90}$$

$$= 4 \text{ km/hr}$$

**2. Measure nozzle output.**

Set the pump pressure. A pressure below 200 kPa will reduce spray drift.

Measure the output of each nozzle for one minute.

Any nozzle that varies by more than 10% from the average output should be replaced.

**3. Measure the effective spray width of the boom.**

**4. Use the following formula to calculate the output in litres/hectare.**

$$\text{Sprayer output (L/ha)} = \frac{600 \times \text{Total output of all nozzles (L/min)}}{\text{Spray width (m)} \times \text{Ground speed (km/hr)}}$$

(Note: 600 is a conversion factor which converts km/hr to m/min and L/min to L/ha).

**EXAMPLE**

Total output of nozzles = 3 L/min (3 x 1.0 L/min).

Spray width = 1.5 m

Ground speed = 4 km/hr

$$\begin{aligned} \text{Sprayer output (L/ha)} &= \frac{600 \times 3}{1.5 \times 4} \\ &= 300 \text{ L/ha.} \end{aligned}$$

**4. Pesticide resistance****What is pesticide resistance?**

All pest and disease populations have a very small number of individuals that are resistant to a given pesticide. Frequent use of the same pesticide kills susceptible individuals but leaves the resistant ones and so selects a strain of the pest or disease that contains an increasing number of resistant individuals. Once this resistant proportion reaches a critical level, the lack of control ultimately renders that pesticide useless. This is known as resistance.

**What pesticides are prone to resistance?**

All pesticides (herbicides, insecticides, miticides and fungicides) are prone to resistance but miticides and some of the fungicides are the most at risk.

Resistance has occurred in almost every miticide since the 1950s. Fortunately two new groups of miticides were released in the 1990s. The first of these is the pyrazole compounds (Pyranica®, Sanmite® and Acaban®) but resistance was detected as early as 1997 in Western Australia and subsequently in South Australia and Victoria in the 1999/2000 season. The second group, containing abamectin (Vertimec®, Sorcerer®) was released in 1997. Miticides can be grouped according to their chemical composition or activity group.

**Miticide Groups:**

<b>Insecticide group</b>	<b>Some Trade Names</b>	<b>Active Ingredient</b>
3A	Talstar	bifenthrin
6A	Vertimec, Sorcerer & others	abamectin
10A	Acaban	fenpyroximate
	Calibre	hexythiozox
	Pyranica	tebufenpyrad
	San-mite	pyribaden
12A	Torque	fenbutatin oxide
13A	Secure	chlorfenapyr
14A	Omite 300W	propargite
1B	Folimat	omethoate
	Supracide	methidathion
2B	Kelthane	dicofol
	Masta-mite	dicofol + tetradifon

Many of the new generation fungicides are developed for a specific disease and have a very specific mode of action. This means that they often have only a single-site activity. Many of the older fungicides have multi-site activity and as a consequence the newer fungicides are more prone to diseases developing resistance to them.

If the same fungicide is used repeatedly we allow the resistant spores to multiply until almost all of the spores are resistant and unaffected by the fungicide. Often when a disease becomes resistant to a particular fungicide it is resistant to other fungicides in the same activity group.

Fungicides can be grouped according to their chemical composition or activity group. These are listed in the table below. All fungicides in this table except Group Y are at significant risk from the development of resistance.

### Fungicide Groups :

Group	Activity group	Active ingredient	Some Trade Names
A	benzimidazoles	benomyl	Benlate
		carbendazim	Bavistin, Goldazim, Spin.
		thiabendazole	Tecto
B	dicarboximides	iprodione	Rovral
C	DMI's ( demethylation inhibitors)	difenoconazole	Bogard
		fenarimol	Rubigan
		flusilazole	Nustar
		hexaconazole	Anvil
		imazalil	Fungaflor
		myclobutanil	Systhane
		penconazole	Topas
		triforine	Saprol
H	hydroxy-pyrimidine	bupirimate	Nimrod
I	anilinopyrimidine	cyprodinil	Chorus
K	strobilurin	kresoxim-methyl	Stroby
		trifloxystrobin	Flint
Y	multi-site activity	captan	Captan
		copper fungicides	Blue Shield, Kocide, Cuprox.
		dithianon	Delan
		mancozeb	Dithane M45, Manzate DF.
		metiram	Polyram DF
		sulphur	Brysulf, Sufolac, Kumulus.
		thiram	Thiram
		zineb	Zineb
		ziram	Fulasin DF

## How do I avoid or delay resistance?

All new pesticide products have resistance management strategies included on the label. It is important that pesticides are applied using the correct dilutions and application rate and that the resistance management guidelines given on the label are followed.

Some of the key factors to avoid or delay resistance are:

- **Predators** – there may be the opportunity to introduce predators for pest control or suppression. This may reduce the pest to a level where a pesticide is not required or reduce the number of sprays required. Also be aware of any other pesticides that are harmful to predators, either natural or introduced.
- **Cultural control methods** – using such techniques as orchard hygiene e.g. destroying fallen fruit (Medfly), can reduce the pest population and subsequently reduce the pesticide exposure.
- **Pest monitoring** – this will determine when a pest or disease is present and help decide whether a spray is required, and if required, the optimum time to apply it.
- **Pesticide use** – many pesticides are listed to be used only a specific number of times in a season. Some miticides should only be used once per season. If multiple sprays are required then alternate between different activity groups. This applies to fungicides used for post-harvest treatment when the post-harvest treatment should not be from the same activity group as the last field treatment. The activity group (Chem Class) of all the pesticides registered for use in orchards are in the spray options tables.

Avcare have developed Pesticide Resistance Management Strategies and Activity Group Identification to assist in reducing the development of resistance. Further information about Avcare or Resistance Management Strategies can be obtained from their office:

Avcare Office

Postal Address: Locked Bag 916 CANBERRA ACT 2601

Residential Address: Level 2 AMP Building, 1 Hobart Place CANBERRA ACT 2600

Tel: (02) 6230 6399 Fax: (02) 6230 6355

E-mail: [info@avcare.org.au](mailto:info@avcare.org.au)

## 5. Integrated Pest Management (IPM) and Integrated Fruit Production (IFP)

Integrated Pest Management (IPM) is a pest management system that aims to identify and prevent pests from reaching economically damaging levels through two or more control options. Control options may include biological, cultural, physical or chemical methods. IPM involves correct pest identification, understanding its biology, its symptoms or damage to the host plant, monitoring, timing and control.

Integrated Fruit Production (IFP) is the adoption of economically, environmentally and socially sustainable practices in the production of fruit. Such practices would be expected to be implemented from site selection for an orchard, through fruit production on orchard to post harvest handling. A draft of guidelines for IFP in apples has been produced - Horticulture Australia Limited project # AP98062 National Integrated Fruit production Guidelines for Pome Fruit, Chief Investigator, David Williams, Dept. Natural Resources & Environment, Tatura, Victoria.

## **6. Organic agriculture**

### ***Major markets want organic products***

Multi-billion dollar organic markets are reported to be the fastest growing sector of the food industry in the USA, Japan and a number of European countries. World-wide markets for organic foods are estimated to be worth US\$11 billion and have displayed growth rates of 20 - 30% per year for the past 5 years. The main markets are USA (US\$4.5 billion), Western Europe (US\$4.5 billion) and Japan (US\$1.4 billion). Europe and Japan are the fastest expanding markets with USA and New Zealand producers the fastest to respond to these market demands.

### ***What is modern organic farming?***

Modern organic farming is a whole farm management system where biology and balanced soils are developed to give sustainable yields without chemicals or forced growth.

Successful organic farmers design whole farm *integrated management* strategies to optimise the interaction between different farm activities. Close observation and understanding of biological processes, together with good management, substitute for high amounts of chemical and fertiliser inputs.

Balanced biologically active soils, with enhanced organic matter content and humus formation, are the basis of sustainable organic farming. Maintaining good soil structure allows crop roots to exploit large volumes of soil for moisture, air and nutrients. Soil biological processes release nutrients for plant uptake without the use of highly soluble fertilisers.

Integrated weed control without the use of herbicides gives good results with timely management. Techniques include soil improvement, rotational cropping, control grazing, green manuring, pasture topping, mechanical cultivation and harrowing.

Pest and disease management also relies on an integrated approach to minimise vulnerability to pest or disease problems. Healthy balanced plant growth tends to be resilient to attack. A wide range of permitted substances can be used in extreme events.

### ***Consumers care about production methods***

Consumer demand, in the highly differentiated food markets of Europe, Asia and North America, is growing for food and agricultural products that are perceived to be healthy and have low impact on the environment. A willingness to pay a premium for such products is apparent where products carry a verifiable assurance they are safe, nutritious and produced using systems that care for the environment. Products certified as organic or biodynamic are increasingly perceived as providing such assurances.

### ***Certified Organically Grown - production, processing and labelling standards***

Australia has a well-regulated system for organic and biodynamic production and processing that has gained a good international reputation. The “National Standards for Organic and Biodynamic Produce” administered by AQIS, form the minimum mandatory requirements for export of products labelled as “organic” or “biodynamic”. These standards are implemented by seven independent AQIS accredited certification organisations, who conduct whole farming system inspections and ensure a comprehensive record keeping system is in place to allow trace back and verification of inputs used, management practices, yield and sales.

Contact details of the seven AQIS accredited certification organisations are as follows:

BFA ( <i>Biological Farmers of Australia</i> ) .....	Tel: (07) 4639 3299
Demeter ( <i>Biodynamic Research Institute</i> ) .....	Tel: (03) 5966 7333
<i>Eco-Organics of Australia</i> (tea tree oil only) .....	Tel: (02) 6625 1500
NASAA ( <i>National Association for Sustainable Agriculture Australia</i> ) .....	Tel: (08) 8370 8455
<i>Organic Food Chain</i> .....	Tel: (07) 4637 2600
OHGA ( <i>Organic Herb Growers of Australia</i> ) .....	Tel: (02) 6622 0100
OVAA ( <i>Organic Vignerons Association of Australia</i> ) .....	Tel: (08) 8562 2122

Interested growers or processors should contact the above organisations to discuss the criteria for organic or biodynamic certification, specific certification needs, export market destination requirements, the costs, procedure and timing before certification can be granted.

### ***Australia already exports organic products***

The Australian organic industry is relatively small and undeveloped, worth about \$200 -250 million, however, good opportunities exist to capture a share of rapidly expanding markets. The main organic or biodynamic exports from WA include: wheat, flour, noodle, barley, oats, beef, and wine to Japan; apples, avocados and wool to Europe; and a range of fruits and vegetables to Singapore and Malaysia.

### ***Expanding opportunities with a sustainable direction***

Modern organic or biodynamic farming is one way to assure your farming system satisfies the safety, health and environment demands of many future consumers. WA now has a number of experienced, practical organic and biodynamic farmers with expanding market opportunities, who are willing to promote the development of best practice in modern organic farming systems.

**The Department of Agriculture, Western Australia ‘Organic Farming Project’ aims to increase the export opportunities for organic agricultural products by working with producer groups and processors to assist the development of production and processing systems to meet the demands of expanding clean and organic export markets.**

For further information about this project contact:

Department of Agriculture, Western Australia  
3 Baron-Hay Court, South Perth. Western Australia. 6151  
Postal Address: Locked Bag Number 4, Bentley Delivery Centre WA 6983  
Tel: (08) 9368 3333 Fax: (08) 9367 2625 - Horticulture Section

## **7. Quarantine issues**

### **7.1 HortGuard®**

HortGuard® is an initiative of the WA Government to protect the \$600 million horticultural industry from major pests and to minimise risk of chemical residue in produce.

*The goal of HortGuard® is to minimise the risk of damage from exotic vertebrates, invertebrates, diseases and weeds and chemical residues on the horticultural industry’s production efficiency, international market competitiveness and profitability.*

HortGuard® focuses on the following key strategy areas:

- threat identification and risk assessment
- barrier quarantine
- surveillance network
- emergency response
- containment, eradication and management
- research, development and communication

HortGuard® links with existing industry and Department of Agriculture activities such as:

- Australian Quarantine and Inspection Services and Western Australian Quarantine Inspection Services
- monitoring and information services of the extensive agribusiness, agronomic and reseller network
- activities of landcare groups and individual growers
- Department of Agriculture's extensive threat identification, risk assessment, surveillance, control and eradication programs
- research programs on breeding disease resistance plants, insects which threaten the horticultural industry and integrated pest management systems
- on-farm and company-based quality assurance programs such as the SQF2000<sup>CM</sup> system

Contact for an orchard incident is:

Department of Agriculture

**EXOTIC PLANT PEST AND DISEASE HOTLINE: Phone 1800 084 881**

Other **Emergency** contacts can be found at the following web site.

[http://agweb/plants/app/contacts/app\\_security.htm](http://agweb/plants/app/contacts/app_security.htm)

For enquiries about HortGuard contact:

Co-ordinator  
Andrew Reeves

HortGuard® Initiative  
Department of Agriculture  
PO Box 1231 BUNBURY WA 6231  
Tel: (08) 9780 6224 Fax: (08) 9780 6136  
E-mail: AReeves@agric.wa.gov.au

## **7.2 Neglected orchards**

The 'Neglected Orchards and Vineyards Activity' in Department of Agriculture is aimed at reducing the risk posed to commercial orchards and vineyards by diseases and pests which may be harboured and spread as a result of poor management of trees and vines.

Orchardists can assist in this process by reporting obviously neglected orchards and vineyards in WA to the Department of Agriculture via:-

**Western Australian Fruit Growers' Association Inc.**

Chief Executive Officer

Rob McFerran

MP 96, Market City,

280 Banister Rd, Canning Vale 6155

Tel: (08) 9455 2075 Fax: (08) 9455 2096

Email: [wafga@bigpond.com](mailto:wafga@bigpond.com)

Reports must be in writing and include the following information:-

1. Address/location of neglected orchard or vineyard
2. Proximity to nearest commercial orchard or vineyard
3. Name of owner of neglected orchard or vineyard if possible
4. Name and contact details of person or group reporting

An inspector will visit the property within 14 days of receipt of a written report.  
The result of the visit will be communicated within another 14 days.

## **8. Industry contacts and technical information**

### **8.1 Department of Agriculture Offices**

<b>South Perth</b>	Street Address: 3 Baron-Hay Court, South Perth WA 6151 Postal Address: Locked Bag Number 4, Bentley Delivery Centre WA 6983 Tel: (08) 9368 3333 Fax: (08) 9367 2625 - Horticulture Section
<b>Albany</b>	444 Albany Highway, Albany, 6330 Tel: (08) 9892 8444 Fax: (08) 9841 2707
<b>Bunbury</b>	North Boyanup Road (PO Box 1231), Bunbury WA 6230 Tel: (08) 9780 6100 Fax: (08) 9780 6136
<b>Busselton</b>	1 Queen Street, Busselton WA 6280 Tel: (08) 9752 1688 Fax: (08) 9752 3877
<b>Carnarvon</b>	South River Road (PO Box 522), Carnarvon WA 6701 Tel: (08) 9956 3333 Fax: (08) 9941 8334
<b>Esperance</b>	PMB 50, Esperance WA 6450 Tel: (08) 9083 1111 Fax : (08) 9083 1100
<b>Geraldton</b>	283 Marine Terrace (PO Box 110), Geraldton WA 6530 Tel: (08) 9956 8555 Fax: (08) 9921 8016
<b>Kununurra</b>	Frank Wise Institute, Durack Drive (PO Box 19), Kununurra WA 6743 Tel: (08) 9166 4000 Fax: (08) 9166 4066

<b>Manjimup</b>	Manjimup Horticultural Research Institute South Western Highway (Locked Bag 7), Manjimup WA 6258 Tel: (08) 9777 0000 Fax: (08) 9777 0001
<b>Mount Barker</b>	Railway Station (PO Box 118) Mount Barker WA 6324 Tel: (08) 9851 2706 Fax: (08) 9851 2709
<b>Northam</b>	Lot 12 Old York Road (PO Box 483), Northam WA 6401 Tel: (08) 9690 2000 Fax: (08) 9622 1902

For further information on these and other Department of Agriculture Offices (including a map of where the office is located in the state) please visit the internet at <http://www.agric.wa.gov.au>

## 8.2 Orchard industry associations

### Contacts

#### **Western Australian Fruit Growers' Association**

Chief Executive Officer  
Rob McFerran  
MP 96, Market City,  
280 Banister Rd, Canning Vale 6155  
Tel: (08) 9455 2075 Fax: (08) 9455 2096  
Email: [wafga@bigpond.com](mailto:wafga@bigpond.com)

Industry Development Officer  
Allan Hill  
MP 96, Market City,  
280 Banister Rd, Canning Vale 6155  
Tel: (08) 9455 2075 Fax: (08) 9455 2096  
Email: [wafga@bigpond.com](mailto:wafga@bigpond.com)

#### **Apple and Pear Australia Limited (Formerly Australian Apple and Pear Growers Association)**

Chief Executive Officer  
Jon Durham  
Tel: (03) 9329 3511 Fax: (03) 9329 3522

#### **State Representative**

Dianne Fry  
MP 96, Market City,  
280 Banister Rd, Canning Vale 6155  
Tel: (08) 9455 2075 Fax: (08) 9455 2096  
Email: [wafga@bigpond.com](mailto:wafga@bigpond.com)

#### **Horticulture Australia Limited (HAL)**

Pome Fruit Industry Manager (Marketing)

Howard Moxham

Email: [howard.moxham@horticulture.com.au](mailto:howard.moxham@horticulture.com.au)

Pome Fruit Industry Manager (R&D)

Dan Ryan

Email: [dan.ryan@horticulture.com.au](mailto:dan.ryan@horticulture.com.au)

Level 1 50 Carrington Street, Sydney 2000

Tel: (02) 8295 2300 Fax: (02) 8295 2399  
Email: [info@horticulture.com.au](mailto:info@horticulture.com.au)  
Website: <http://www.horticulture.com.au>

Useful Contacts Website: <http://www.perthmarket.com.au/associations.htm>

### 8.3 Orchard reference material and further reading

#### Fruit industry reference material

*WA Fruit Grower*, published monthly by Brendon Cant & Associates. Editor: Eammon Conaghan.  
Tel. (08) 9385 7779 Fax. (08) 9385 7776. E-mail: [eammon@iinet.net.au](mailto:eammon@iinet.net.au)

*Tree Fruit (Now Including Pome Fruit Australia)* published monthly. Editor: Nick Morenos.  
Tel. (03) 9740 7136 Fax. (03) 9740 7196. E-mail: [fruittree@fruittreedia.com.au](mailto:fruittree@fruittreedia.com.au)

**Department of Agriculture Farmnotes and Bulletins available from:  
Department of Agriculture, Locked Bag No. 4, Bentley Delivery Centre WA 6983.  
Tel. (08) 9368 3333 Fax. (08) 9368 1205**

Broughton, S. and De Lima, C.P.F. (1999). *Recognising exotic fruit flies likely to enter WA*. Farmnote No. 63/99, Agdex 411/26, Agriculture Western Australia, Perth..

Broughton, S. and De Lima, C.P.F. (1999) *Control of Mediterranean fruit fly in commercial orchards*, Bulletin No. 4385, Agdex 203/614. Agriculture Western Australia, Perth.

Davis, P. (1994) *Pest snails and slugs of Western Australia*, Farmnote No. 112/94, Agdex 622, Department of Agriculture, Perth.

Davis, P. (1994) *Control of pest snails and slugs*, Farmnote No. 113/94, Agdex 622, Department of Agriculture, Perth.

Doepel, R.F. (1984) *Armillaria root rot*, Farmnote No. 90/84, Agdex 200/633, Department of Agriculture, Perth.

Emery, R. (1990) *Wingless grasshoppers and their control*, Farmnote No. 62/90, Agdex 622, Department of Agriculture, Perth.

Fisher, D. and Learmonth, S. (1998) *Garden weevil in vineyards*, Farmnote No. 25/98, Agdex 242/622, Department of Agriculture, Perth.

Fisher, D., Hawley, K. and Piper, T. (1999) *Hormone herbicides: What you should know before you spray*, Farmnote No. 61/99, Agdex 682, Department of Agriculture, Perth.

Learmonth, S. (1988) *Identifying soil insect pests – beetles*, Farmnote No. 75/88, Agdex 611, Department of Agriculture, Perth.

Fisher, D. and Learmonth, S. (2001) *African black beetle in vineyards*, Bulletin No. 4500, Agdex 241/622, Department of Agriculture, Perth.

Rees, D., van Schagen, J. and Postle, T. (1995) *European earwigs threaten high-yield crops*, Farmnote No. 9/95, Agdex 100/622, Department of Agriculture, Perth.

Deciduous Fruit Project (2003) *Common pests of summer fruit in Western Australia*, Bulletin No. 4585, Department of Agriculture, Perth.

**Chemcert Publications available from:**

**ChemCert WA Incorporated, 88 Westview Street, Scarborough WA 6019.**  
**Tel. (08) 9341 5325 Fax. (08) 9341 5325**

Evans, D. (ed) (1999) *Farmcare Chemical Users Training Manual – 3<sup>rd</sup> Edition*, The Board of Management Farmcare Australia (WA) Incorporated, Perth.

**Pocket guide available from:**

**Department of Primary Industries (Agriculture Victoria) Information Centre,**  
**8 Nicholson Street, PO Box 500, East Melbourne VICTORIA 3002.**  
**Tel. (03) 9637 8325 Fax. (03) 9637 8150**

Malipatil, M.B., Medhurst, A.K., Bates, V.I. and Williams, D.G. (1996) *Pests of Stone Fruit and their Predators and Parasitoids – a pocket guide*, Agriculture Victoria.

**Department of Primary Industries Queensland, DPI Publications, GPO Box 46, Brisbane, QLD 4001.**  
**Tel. 3239 3967 Fax: (07) 3239 3501**  
**Email: [books@dpi.qld.gov.au](mailto:books@dpi.qld.gov.au) or [infopest@dpi.qld.gov.au](mailto:infopest@dpi.qld.gov.au)**

Llewellyn, *et al.* (2002) *The Good Bug Book 2<sup>nd</sup> Edition*, Australasian Biological Control Inc. Queensland.

DPI (2003) *Infopest*, Department of Primary Industries, Brisbane, March 2003

**The University of Queensland, The Centre for Pesticide Application and Safety, Gatton College QLD 4345.**  
**Tel. (07) 5460 1291 (07) 5460 1283**

Hamilton, K. (ed) (1998) *PESKEM*, The University of Queensland, Gatton College, QLD.

#### **8.4 Orchard industry Websites**

Australian Bureau of Meteorology - [www.bom.gov.au](http://www.bom.gov.au)

Australian Quarantine & Inspection Service – [www.aqis.gov.au](http://www.aqis.gov.au)

Biological control sites – [www.beneficialbugs.com.au](http://www.beneficialbugs.com.au) and [www.goodbugs.org.au](http://www.goodbugs.org.au)

Bugs for bugs – [www.bugsforbugs.com.au](http://www.bugsforbugs.com.au)

Commonwealth Scientific and Industrial Research Organisation (CSIRO) – [www.csiro.au](http://www.csiro.au)

Department of Agriculture Western Australia - [www.agric.wa.gov.au](http://www.agric.wa.gov.au)

Department of Primary Industries (Agriculture Victoria) – [www.dpi.vic.gov.au](http://www.dpi.vic.gov.au)

Faculty of Agricultural and Natural Sciences (University of Adelaide) – [www.waite.adelaide.edu.au](http://www.waite.adelaide.edu.au)

Horticulture Australia Limited – [www.horticulture.com.au](http://www.horticulture.com.au)

Infopest – [www.dpi.qld.gov.au/infopest](http://www.dpi.qld.gov.au/infopest)

Australian Pesticides and Veterinary Medicines Authority –  
<http://www.apvma.gov.au/permits/permits.shtml>

Noxious Weeds – [www.weeds.org.au](http://www.weeds.org.au)

NSW Agriculture – [www.agric.nsw.gov.au](http://www.agric.nsw.gov.au)

Queensland Department of Natural Resources – [www.dnr.qld.gov.au](http://www.dnr.qld.gov.au)

Queensland Department of Primary Industries (DPI) – [www.dpi.qld.gov.au](http://www.dpi.qld.gov.au)

Rural Press Limited (RPL) – [www.rpl.com.au](http://www.rpl.com.au)

South Australian Research and Development Institute (SARDI) – [www.sardi.sa.gov.au](http://www.sardi.sa.gov.au)

Standards Australia – [www.standards.com.au](http://www.standards.com.au)

Tasmanian Dept Primary Industries – [www.dpif.tas.gov.au](http://www.dpif.tas.gov.au)

USA Environmental Protection Agency – [www.epa.gov](http://www.epa.gov)

United States Department of Agriculture – [www.usda.gov](http://www.usda.gov)

WorkSafe – [www.safetyline.wa.gov.au](http://www.safetyline.wa.gov.au)

## **9. Diagnostics service - AGWEST Plant Laboratories, WA**

Contact and dispatch details:

Complete the relevant Pest Diagnosis Submission Form. Available on AGFAX 1902 990506.

- Weed Identification Submission Form – Document No. 20362
- Insect Identification Submission Form – Document No. 20363
- Sampling for Horticultural Disease Diagnosis Form - Document No. 20365
- Horticultural Plant Disease Diagnosis Submission Form – Document No. 20366
- Service Fees for AGWEST Plant Laboratories – Document No. 20367

Dispatch samples with completed submission form in free **MAILWEST** envelopes (and deposit at participating post offices) or by the fastest available dispatch service. *For specific instructions on sampling, packaging, delivery of specimens and fees please contact each laboratory before collecting samples.*

**AGWEST Plant Laboratories**  
**"URGENT PLANT/PEST SAMPLES - KEEP COOL"**  
**Department of Agriculture**  
Express Post: **Locked Bag No. 4 BENTLEY DELIVERY CENTRE WA 6983**  
Courier: **3 Baron-Hay Court SOUTH PERTH WA 6151**

Internet: <http://www.agric.wa.gov.au/agency/agwest/plantlabs/>

Telephone: (08) 9368 3721

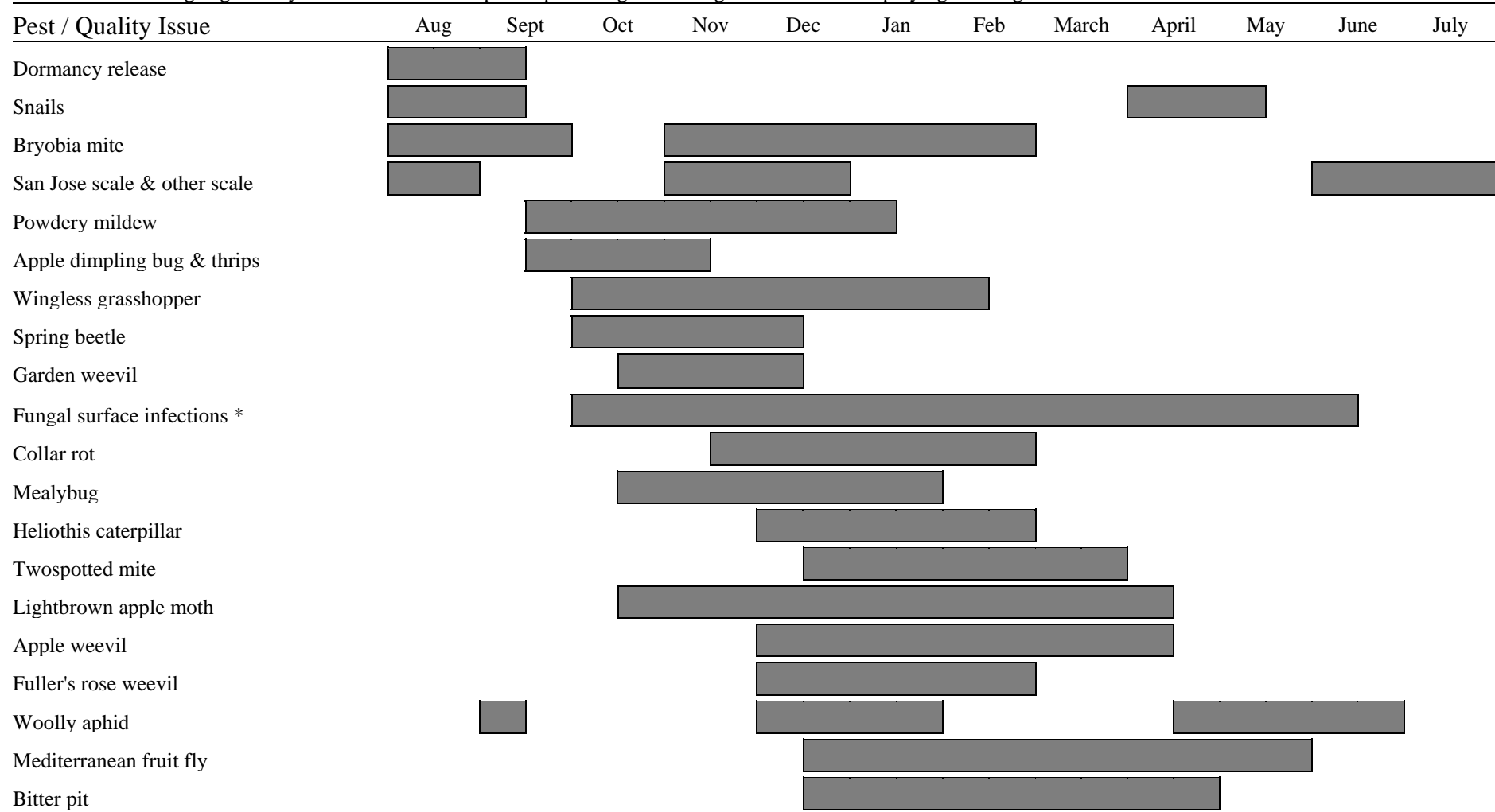
Fax: (08) 9474 2658



## 10.1 APPLE PEST AND DISEASE MONITORING AND TREATMENT CALENDAR

Not all these pests will occur in your orchard

**NOTE :** This is a guide only. The pest status of each pest varies across fruit growing districts; monitor to avoid unnecessary or poorly timed spraying.  
Monitoring is generally most effective in the period preceding and during the best time for spraying / baiting.



\* Fungal surface infections include: Bitter rot, fly speck, sooty blotch and target spot.

■ Best time for spraying and baiting

## 10.2 Apple Spray Options

Reference source : Infopest, March 2003

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments
Dormant	<b>Snails</b>	copper sulphate	unspecified	Bluestone + wetting agent	NA	Soil and butt spray only.
		copper	molluscicide	Escar-Go	1	
		methiocarb	1A	Mesurool Snail & Slug Bait	7	Apply to ground only, place bait close to tree trunk.
		metaldehyde	molluscicide	Various trade names		
		silicate salts + copper	unspecified	Socusil Snail Repellent	NA	Apply prior to flowering. Do not spray foliage.
	<b>Dormancy Break</b>	fatty acid esters	unspecified	Waiken	NA	Apply 35 to 50 days before budbreak would normally occur. Useful as a pre-treatment to chemical thinning in apples as it will compact flowering.
Late dormancy to green tip	<b>Bryobia Mites</b>	winter spraying oil (petroleum)	insecticide, spreader	Various trade names	1	Rigorous agitation is required to maintain oil in suspension. Reduction in the use of organophosphate insecticides during the growing season has allowed a resurgence of this pest.
	<b>San Jose Scale</b>	winter spraying oil (petroleum)	insecticide, spreader	Various trade names	1	Rigorous agitation is required to maintain oil in suspension. Oil can be combined with one of the insecticides to improve control.

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments
Late dormancy to green tip	<b>San Jose Scale</b>	chlorpyrifos	1B	Various trade names	14	<b>Do not apply oil or insecticide</b> if any part of the tree is <b>more advanced than tight cluster</b> because the insecticide is toxic to bees and in combination with oil is phyto-toxic to flowers. Do not use on Delicious or Cox's Orange Pippin.
		diazinon		Barmac Diazinon Country Diazinon 800		
		lime sulphur	Y	Stoller's Lime Sulphur Kendon Lime Sulphur	N/A	
		methidathion	1B	Supracide 400 Suprathion 400 EC	14	
		parathion-methyl		Folidol 450CS Penncap-M Folidol M500		
Green tip	<b>Powdery Mildew</b>	benomyl	A	Benlate Marvel	N/A	Do not apply more than 3 applications per season.
		lime sulphur	Y	Stoller's Lime Sulphur Kendon Lime Sulphur		Do not use on Delicious or Cox's Orange Pippin.
		sulfur		Thiovit Jet		
	<b>Bitter Rot</b>	copper oxychloride	Y	Various trade names	1	Oil can be combined with copper to improve control.
		zineb		Barmac Zineb	14	

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments
Green tip	<b>Woolly Aphid</b>	imidacloprid	4A	Confidor 200 SC	N/A	Apply around the base of trees. Use on trees up to 7 years old. Do not treat more than once in any three year period. Use low rate if aphid wasp parasite is present.
	<b>Target Spot, Sooty Blotch &amp; Flyspeck</b>	mancozeb and copper hydroxide	Y	ManKocide DF	14	Do not spray after green-tip, the copper may be phyto-toxic.
Tight cluster to early pink bud	<b>Apple Dimpling Bug</b>	chlorpyrifos	1B	Lorsban 500 W Pyrinex 500 WP Cyren 500 WP Lorsban 750 WG	14	<b>Chlorpyrifos is extremely toxic to bees, apply before flowering.</b> Mow cover crop if flowering before application.
Pink bud to end of blossom	<b>Apple Dimpling Bug &amp; Thrips</b>	bifenthrin	3A	Talstar 80 SC	14	Apply when bees are not actively foraging. Use the higher rate for both knockdown and residual control only. Through monitoring, the lower rate may be used for knockdown control only. When the lower rate is used, a second application at the low rate may be required to control reinfestation.
		endosulfan	2A	Various trade names		<b>Permit No. 5974 Expires 31/12/03</b> Special requirements apply for use of endosulfan.
		methomyl	1A	Marlin Marlin 225 Lannate- L Nudrin 225	1	
		tau - fluvalinate	3A	Mavrik Aquaflow	N/A	Apply early blossom, from pink bud to 20% bloom. Do not apply outside bloom period. Apply a minimum of 2 non-consecutive sprays per season. May affect beneficials of pest mites.

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments
Pink bud to end of blossom	Powdery Mildew	benomyl	A	Benlate Marvel	N/A	Apply on a 14 day schedule over flowering and early fruit development.
		carbendazim		Various trade names	7	
		fenarimol	C	Rubigan 120 SC	14	
		flusilazole		Nustar DF		
		hexaconazole		Anvil Hexacon 500 SC Hex 50 SC	7	Do not use on McIntosh apples or related varieties. May reduce fruit length under certain conditions.
		kresoxim-methyl	K	Stroby WG	42	Apply at 7 –10 days intervals during rapid growth. Later applications can be at 10-14 days.
		myclobutanil	C	Systhane 400 WP	21	
		penconazole		Topas 100 EC	14	
		pyrimethanil + fluquinconazole	C I	Vision 250 SC	N/A	Do not spray 4 weeks after petal fall. Do not apply more than 3 sprays per season.
		sulphur	Y	Various trade names		Apply at 2 - 3 weekly intervals from pink bud to petal fall. Do not apply to sulphur-sensitive varieties in hot weather.
		trifloxystrobin	K	Flint 500 WG	35 (70 for Export)	Apply as a block of three treatments with 10 day intervals. Do not apply more than 3 sprays per season.
		triforine	C	Saprol	1	Do not apply to Golden Delicious or Cox's Orange Pippin. Apply at 10 – 14 day intervals.

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments
Petal fall to fruitlet development	<b>Heliothis Caterpillar ( native budworm)</b>	carbaryl	1A	Bugmaster Flowable Flowable Carbaryl 500	3	Do not apply to apples within 30 days AFTER full bloom if reduction in fruit set is not desired.  <b>Permit No. 5974 Expires 31/12/03</b> Special requirements apply for use of endosulfan.
		endosulfan	2A	Various trade names	14	
		indoxacarb	22A	Avatar		
		methomyl	1A	Lannate-L Marlin Marlin 225 Nudrin 225	1	
	pyrethrins	3A	Py-Bo Pyrethrum Insecticide			
	<b>Spring Beetle</b>	azinphos-methyl	1B	Gusathion 200 SC Benthion 200	14	
Fruitlet development	<b>Garden Weevil &amp; Apple Weevil (curculio beetle)</b>	alpha cypermethrin	3A	Various trade names	14	<b>Trunk &amp; butt spray only.</b> Monitor weevil emergence using a single-sided cardboard trunk band . Continue monitoring after spraying. Summer oil can be added at 1-2% to help prolong residual activity.

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments
Fruitlet development	<b>Wingless Grasshopper</b>	chlorpyrifos	1B	Various trade names	14	See Farmnote 62/90: "Wingless grasshoppers and their control." Baiting can also be used.
		carbaryl	1A	Bugmaster Flowable Flowable Carbaryl 500	3	Do not apply to apples within 30 days AFTER full bloom if reduction in fruit set is not desired
		dimethoate		Various trade names	7	
		maldison	1B	Maldison ULV		
	<b>San Jose Scale (crawlers)</b>	azinphos-methyl	1B	Gusathion 200SC Benthion 200	14	With azinphos-methyl or diazinon add 1.2 L/100 L of summer oil.
		chlorpyrifos		Various trade names		This pest is most susceptible to chemical control methods when crawlers are active, in mid to late November.
		diazinon		Barmac Diazinon Country Diazinon 800		With azinphos-methyl or diazinon add 1.2 L/100 L of summer oil.
		fenoxycarb	7B	Insegar 250W		Suppresses scale when used in a full season schedule against lightbrown apple moth.
		methidathion	1B	Supracide 400 Suprathion 400EC		
		parathion-methyl		Pennacp-M Folidol 450 CS Folidol M 500		

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments	
Fruit development to harvest	<b>Bitter Pit (storage disorder)</b>	calcium nitrate		Various trade names	N/A	Use calcium nitrate on green apples	
		calcium chloride		Various trade names	N/A	Use calcium chloride on red apples Apply 3 to 4 applications 3 to 4 weeks apart. Can be mixed with fungicides or insecticides.	
	<b>Two-spotted Mite</b>	abamectin (A) + summer oil	6A	Various trade names	14	Apply 2 to 6 weeks after petal fall or soon after mite numbers have reached the threshold level for your area.	
		chlorfenapyr (A)	13A	Secure 360 SC		Apply only once per season	
		clofentezine (O)	10A	Apollo SC	21	<b>Ovicides(O)</b> kill mite eggs and newly hatched mites. <b>Adulticides(A)</b> kill active stages of mites. Refer to information sheet: “ Using Miticides in WA Deciduous Fruit Tree Crops 2003/2004.” by Stewart Learmonth	
		dicofol (A)	2B	Kelthane EC Miti-Fol EC Kelthane MF	7		
		dicofol + tetradifon (O,A)	2B	Masta-mite	7		
		fenbutatin oxide (A)	12A	Torque	2		
		hexythiozox (O)	10A	Calibre 100EC	3		
		maldison (A)	1B	Various trade names			
		methidathion (A)		Supracide 400 Suprathion 400 EC	14		
		omethoate (A)		Folimat	7		
		oxythioquinox (A)	X	Morestan	N/A		Post harvest only
		parathion-methyl (A)	1B	Folidol 450 SC	14		
		petroleum oils (O,A)	insecticide, spreader	Various trade names	1	Some petroleum oils are registered to be used during the growing season. Check label for rates and conditions.	
		potassium salts (A)		Neemtech	N/A		
		propargite (A)	14A	Omite 300W	7		
		pyridaben (O,A)	10A	Sanmite	1		
		tebufenpyrad (O,A)		Pyranica	14		
sulfur (A)	Y	Country Wettasul 800 WP	Nil				

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments
Fruit development to harvest	<b>Bryobia Mite</b>	azinphos-methyl	1B	Benthion 200 Gusathion 200	14	
		dicofol	2B	Kelthane EC Miti-Fol EC	7	
		dicofol + tetradifon		Masta-mite		
		fenbutatin oxide	12A	Torque	2	
		sulfur	Y	Country Wettasul 800 WP	Nil	
	<b>Lightbrown Apple Moth</b>	azinphos-methyl	1B	Gusathion 200 SC Benthion 200	14	
		<i>Bacillus thuringiensis</i>	11C	Full-Bac WDG Dipel DF Delfin WG	Nil	Adjust water volume and/or rate of product to ensure the minimum application rate per ha. Check label for minimum rate.
		carbaryl	1A	Bugmaster Flowable Carbaryl 500 Flowable Flowable Carbaryl 500	3	
		chlorpyrifos	1B	Lorsban 750WG Pyrinex 500WP Cyren 500WP	14	
		fenoxycarb	7B	Insegar 250W		
		fenthion	1B	Lebaycid	7	
		indoxacarb	22A	Avatar	14	
		methidathion	1B	Supracide 400 Suprathion 400 EC		
		methomyl	1A	Various trade names	1	
		parathion-methyl	1B	Penncap-M Folidol 450CS Parathion Methyl 500 Folidol M500	14	
		pyrethrins	3A	Pyrethrum Insecticide	1	
		spinosad	5A	Success Naturalyte Entrust Naturalyte	3	Monitor crop for eggs and larvae. Target sprays against mature eggs and newly hatched larvae.
		tebufenozide	16A	Mimic 700WP	21	

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments
Fruit development to harvest	<b>Fuller's Rose Weevil &amp; Apple Weevil (curculio beetle)</b>	azinphos-methyl	1B	Gusathion 200SC Benthion 200	14	Apply lower rate as a high volume spray to foliage. Use higher rate as a butt & soil spray only.
	<b>Mealybug</b>	chlorpyrifos	1B	Various trade names	14	Apply 2 to 3 weeks before harvest if pest numbers are high. Mealybugs excrete honeydew which encourages sooty mould to grow on the fruit.
		methidathion		Supracide 400 Suprathion 400 EC		
		parathion-methyl		Penncap-M		
	<b>Woolly Aphid</b>	azinphos-methyl	1B	Gusathion 200SC Benthion 200	14	
		chlorpyrifos		Various trade names		
		dimethoate		Various trade names		
		endosulfan	2A	Various trade names	14	<b>Permit No. 5974 Expires 31/12/03</b> Special requirements apply for use of endosulfan.
		maldison	1B	Farmoz Maldison 500 Nufarm Maldison 500 Hymal	3	
		methidathion		Supracide 400 Suprathion 400EC	14	
		omethoate		Folimat 800	7	
		parathion-methyl		Penncap-M Folidol 450 Folidol M500	14	
		pirimicarb	1A	Biffo 500 WG Pirimicarb 500 Aphidex 500 Pirimor WG	2	
	thiacloprid	4A	Calypso 480 SC	21		
	<b>Collar Rot (Phytophthora)</b>	fosetyl	Y	Aliette WG	14	Can be applied as a foliar spray or as a soil drench.

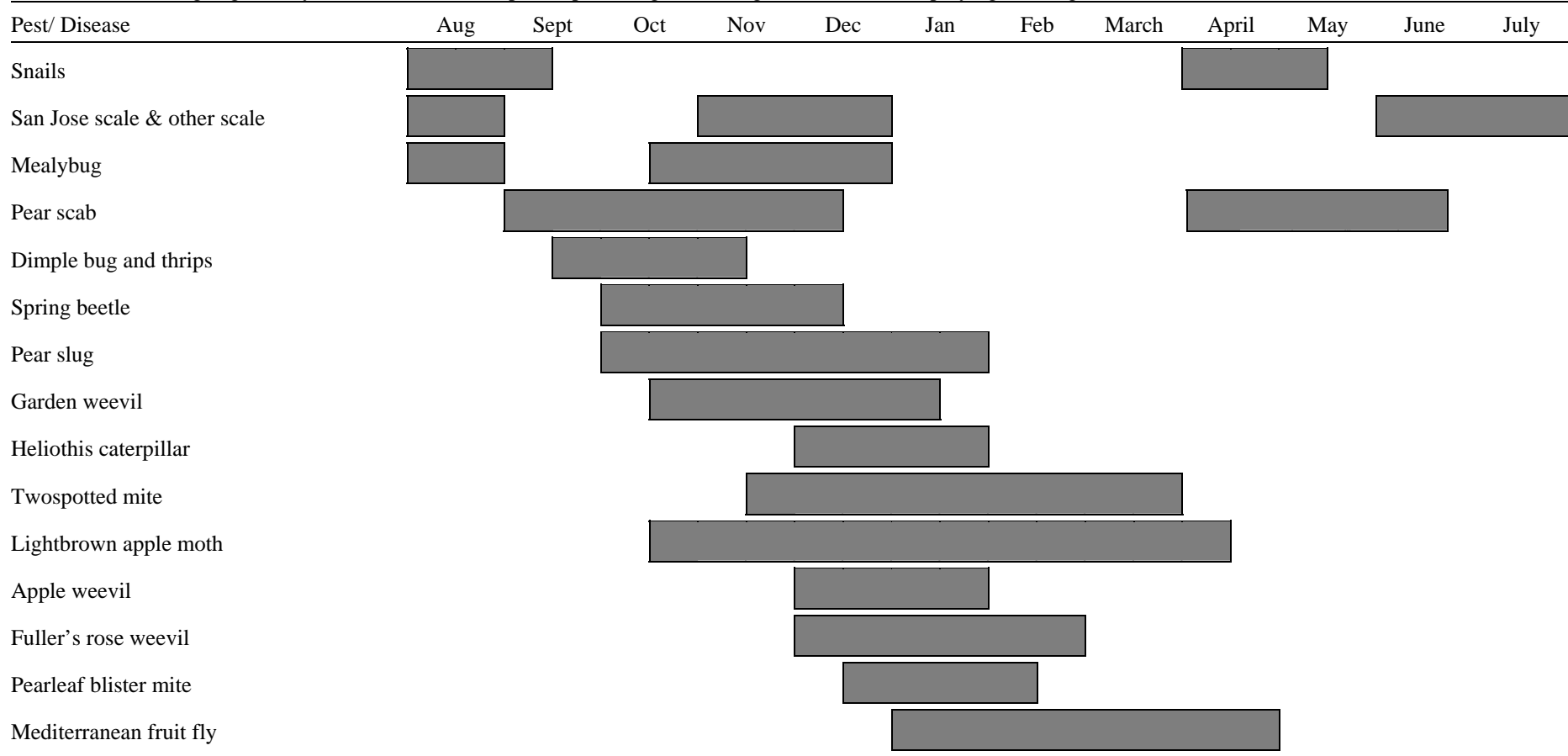
Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments		
Fruit development to harvest	<b>Mediterranean Fruit Fly</b>	<b>Baiting :</b>					For more detail information refer to Bulletin No 4385 : “ Control of Mediterranean Fruit Fly (Medfly) in Commercial Orchards.”	
		trichlorfon	1B	Dipterex 500 SL Lepidex 500	2			
		or maldison		Farmoz Maldison 500 Nufarm Maldison 500	3			
		protein hydrolysate		Flavex				
		or protein autolysate		Pinnacle yeast Q- fly lure				
		<b>Cover sprays :</b>						
		fenthion	1B	Lebaycid	7			
	dimethoate	Various trade names						
	trichlorfon	Dipterex 500SL Lepidex 500		2				
	<b>Bitter Rot</b>	mancozeb	Y	Various trade names	14			
		zineb		Zineb				
		ziram		Fulasin DF Barmac Ziram DG	7			
	<b>Target Spot &amp; Ripe Spot</b>	mancozeb	Y	Various trade names	14			
thiram		Thiram Thiram DG Thirangranz		7				

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments
Fruit development to harvest	<b>Sooty Blotch</b>	mancozeb	Y	Various trade names	14	
		zineb		Zineb		
	<b>Fly Speck</b>	mancozeb	Y	Various trade names	14	
Post-harvest	<b>Snails</b>	copper sulphate	unspecified	Bluestone + wetting agent	NA	Soil and butt spray only
		methiocarb	1A	Mesurool Snail & Slug Bait	7	Apply to ground only, place bait close to tree trunk.
		metaldehyde	molluscicide	Various trade names		
	<b>San Jose Scale</b>	diazinon	1B	Barmac Diazinon Country Diazinon 800	14	Apply in autumn if scale is evident in harvested crop.
	<b>Woolly Aphid</b>	diazinon	1B	Country Diazinon 800	14	Apply in autumn if aphid is evident in harvested crop.

## 11.1 PEAR AND NASHI PEST AND DISEASE MONITORING AND TREATMENT CALENDAR

Not all these pests will occur in your orchard

**NOTE :** This is a guide only. The pest status of each pest varies across fruit growing districts; monitor to avoid unnecessary or poorly timed spraying.  
Monitoring is generally most effective in the period preceding and during the best time for spraying / baiting.



█ Best time for spraying or baiting

## 11.2 Pear & Nashi Spray Options

Reference source : Infopest, March 2003

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments
Dormant	Snails	copper sulphate	unspecified	Bluestone	NA	Soil and butt spray only.
		copper	molluscicide	Escar-Go	1	
		metaldehyde		Blitzem Snail & Slug Pellets Slugout All Weather Slug & Snail Bait	7	Apply to ground only, place bait close to tree trunk.
		methiocarb	1A	Mesurool Snail & Slug Bait		
		silicate salts	unspecified	Socusil Snail Repellent	-	
Late dormancy to green tip	San Jose Scale	Winter spray oils -paraffin oil	insecticide, spray adjuvant	Biopest Paraffin oil	1	Registered for scales in general.
		-paraffinic petroleum oil		Ulvapron		Rigorous agitation is required to maintain oil in suspension. Oil can be combined with a listed insecticide to improve control.
		-petroleum oil	insecticide, spreader	Various trade names		
		chlorpyrifos	1B	Various trade names	14	<b>Do not apply oil or insecticide if</b> any part of the tree is <b>more advanced than tight cluster</b> because insecticide is toxic to bees and in combination with oil is phytotoxic to flowers.

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments
Late dormancy to green tip	<b>San Jose Scale</b>	methidathion	1B	Supracide 400 Suprathion 400EC	14	
		diazinon		Country Diazinon 800 Barmac Diazinon		
		parathion- methyl		Penncap-M Folidol 450CS Folidol M500		
	<b>Pear Scab (pears only)</b>	polysulphide sulphur	Y	Kendon Lime sulphur	-	
Green tip	<b>Longtailed Mealybug</b>	bifenthrin	3A	Rage Talstar 100EC	14	Do not spray after flowering has commenced.
	<b>Mealybug</b>	prothiofos	1B	Tokuthion	56	Combine with summer oil.
	<b>Pear Scab (pears only)</b>	carbendazim	A	Various trade names	7	Apply at 7 to 10 day intervals until petal fall.
		copper oxychloride	Y	Various trade names	1	Oil can be combined with copper to improve control.
		copper hydroxide		Various trade names		
		cuprous oxide		Norshield Flocop Nordox 500 Norshield 750 WP		
		tri-basic copper sulphate		Tri-Base Blue Cuprofix Disperss		
		kresoxim-methyl	K	Stroby	42	
pyrimethanil + fluquinconazole	C+I	Vision 250SC	N/A	<b>Do not use after petal fall.</b>		

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments
Green tip	<b>Pear Scab</b> (pears only)	copper hydroxide + mancozeb	Y	ManKocide DF	14	
Pink bud to end of blossom	<b>Dimpling Bug &amp; Thrips</b>	endosulfan	2A	Various trade names.	28	<b>Permit 5974: Expires 31/12/03</b> Special requirements apply for use of endosulfan.
		<b>Pear Scab</b> (pears only)	cyprodinil	I	Chorus	NA
	dodine		X	Syllit 400SC	5	<b>Read label carefully</b>
	thiram		Y	Thiram DG Thiragranz Thiram	7	
Petal fall to fruitlet development	<b>Pear Scab</b> (pears only)	captan	Y	Captan WG Orthocide WG	7	Good pear scab control is reliant on a close spraying schedule from budburst to mid December. <b>Check labels for timing.</b>
		dithianon		Delan 700WG Patrol 700 WG	21	
		difenoconazole		Bogard 100WG	28	
		fenarimol	C	Rubigan 120 SC	14	
		flusilazole		Nustar DF		
		penconazole		Topas 100 EC		
		hexaconazole		Anvil Hex 50SC Hexacon 50SC		
		mancozeb		Y		

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments
Petal fall to fruitlet development	<b>Pear Scab</b> (pears only)	metiram	Y	Polyram DF	14	
		myclobutanil	C	Systhane WP	21	
		zineb	Y	Zineb	14	
		ziram		Fulasin DF Ziragranz Ziram Granuflow Ziram DG	7	
		trifloxystrobin	K	Flint	35	
Fruit development to harvest	<b>Spring Beetle</b>	azinphos-methyl	1B	Gusathion 200 SC Benthion 200	14	
	<b>Heliothis Caterpillar</b> ( native budworm)	carbaryl	1A	Bugmaster Flowable Flowable Carbaryl 500	3	
		endosulfan	2A	Various trade names	28	<b>Permit 5974: Expires 31/12/2003</b> Do not use to control native budworm ( <i>H.punctigera</i> ) larger than 10mm long.
		indoxacarb	22A	Avatar	14	
		<i>Bacillus thuringiensis</i>	11C	Full-Bac WDG Dipel DF	Nil	Read "Critical Comments," on label.
	<b>Garden weevil &amp; Apple weevil</b> ( <i>curculio</i> beetle)	alpha - cypermethrin	3A	Various trade names	14	<b>Trunk &amp; butt spray only.</b> Monitor weevil emergence using a single-sided cardboard trunk band. Continue monitoring after spraying. Summer oil can be added at 1-2% to help prolong residual activity.

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments
Fruit development to harvest	<b>Wingless Grasshopper</b>	carbaryl	1A	Bugmaster Flowable Flowable Carbaryl 500	3	See Farmnote 62/90 : “ Wingless grasshoppers and their control .” Baiting can also be used.
		chlorpyrifos	1B	Various trade names	14	
		dimethoate		Various trade names	7	
	<b>Pear Slug</b>	azinphos-methyl	1B	Gusathion 200 SC Benthion 200	14	
		carbaryl	1A	Bugmaster Flowable Flowable Carbaryl 500	3	
		spinosad	5A	Success Naturalyte Entrust Naturalyte		
	<b>Longtailed Mealybug</b>	parathion-methyl	1B	Penncap-M	14	
	<b>Mealybug</b>	methidathion	1B	Supracide 400 Suprathion 400 EC	14	
		chlorpyrifos		Various trade names		
		prothiofos		Tokuthion	56	
	<b>San Jose Scale ( crawlers)</b>	chlorpyrifos	1B	Various trade names	14	Monitor scale for crawlers in early summer, for effective timing of sprays.
		azinphos-methyl		Benthion 200 Gusathion 200SC		With azinphos-methyl or diazinon add 1.2 L/100 L of summer oil.
		diazinon		Country Diazinon 800 Barmac Diazinon		
		parathion-methyl		Penncap-M		
		methidathion		Supracide 400 Suprathion 400EC		
fenoxy carb		7B	Insegar 250W	Suppresses scale when used in a full season schedule against lightbrown apple moth.		

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments
Fruit development to harvest	<b>Two-Spotted Mite</b>	hexythiozox (O)	10A	Calibre 100EC	3	<b>Ovicides(O)</b> kill mite eggs and newly hatched mites. <b>Adulticides(A)</b> kill active stages of mites. Refer to Farmnote: “ Using Miticides in WA Deciduous Fruit Tree Crops 2003/2004.” by Stewart Learmonth.
		fenbutatin oxide (A)	12A	Torque	2	
		dicofol (A)	2B	Miti-fol EC Kelthane MF	7	
		dicofol + tetradifon (O,A)		Masta-mite		
		pyridaben (O,A)	10A	Sanmite	1	
		tebufenpyrad (O,A)		Pyranica	14	
		fenpyroximate (O,A)		Acaban		
		abamectin (A)	6A	Various trade names		
		chlorfenapyr (A)	13A	Secure 360 SC		
		methidathion (A)	1B	Supracide 400 Suprathion 400 EC		
		omethoate (A)		Folimat 800	7	
		clofentezine(O,A)	10A	Apollo SC	21	
		paraffin oil	Insecticide, spray adjuvant	Biopest Paraffin Oil	1	
	petroleum oil	SunSpray Ultra-fine				
	<b>Pear Leaf Blister Mite</b>	carbaryl	1A	Bugmaster Flowable Carbaryl 500 Flowable Carbaryl WP Carbaryl 500	3	
		paraffin oil	Insecticide, spray adjuvant	Biopest Paraffin Oil	1	
		petroleum oil		SunSpray Ultra-fine		
		polysulphide sulphur	Y	Kendon Lime sulphur	-	

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments	
Fruit development to harvest	Lightbrown Apple Moth	aziphos-methyl	1B	Gusathion 200SC Benthion 200	14		
		carbaryl	1A	Bugmaster Flowable Carbaryl 500 Flowable Carbaryl 500 Carbaryl WP	3		
		parathion-methyl	1B	Penncap-M Folidol 450 Folidol M500 Parathion Methyl 500	14		
		chlorpyrifos		Pyrinex 500WP Cyren 500WP Lorsban 750WG			
		methidathion		Supracide 400 Suprathion 400 EC			
		methomyl	1A	Marlin Marlin 225 Nudrin 225	2		
				Lannate-L	Nil		
		tebufenozide	16A	Mimic 700WP	21		
		fenthion	1B	Lebaycid	7		
		fenoxycarb	7B	Insegar 250W	14		
		<i>Bacillus thuringiensis</i>	11C	Full-Bac WDG Dipel DF Forte Dipel DF Delfin WG	Nil		Adjust water volume and/ or rate of product to ensure the minimum application rate per ha. <b>Check label for minimum rate.</b>
		indoxacarb	22A	Avatar	14		
		spinosad	5A	Success Naturalyte Entrust Naturalyte	3		
			Fuller's Rose Weevil & Apple Weevil (curculio beetle)	aziphos-methyl	1B		Benthion 200 Gusathion 200SC

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	WHP (days)	Comments	
Fruit development to harvest	<b>Mediterranean Fruit Fly</b>	<b>Baiting :</b>					For more detail information refer to Bulletin No 4385 : “ Control of Mediterranean Fruit Fly (Medfly) in Commercial Orchards.”
		trichlorfon	1B	Dipterex 500 SL Lepidex 500	2		
		<b>or</b> maldison		Nufarm Maldison 500 Farmoz Maldison 500	3		
		<b>plus either</b> protein hydrolysate		Flavex			
		<b>or</b> protein autolysate		Pinnacle yeast Q- fly lure			
		<b>Cover sprays :</b>					
		dimethoate	1B	Various trade names	7		
		fenthion		Lebaycid			
		trichlorfon		Dipterex 500SL Lepidex 500	2		
		Post-harvest	<b>Snails</b>	copper sulphate	unspecified	Bluestone + wetting agent	
methiocarb	1A			Mesurool Snail & Slug Bait	7	Apply to ground only, place bait close to tree trunk.	
metaldehyde	molluscicide			Blitzem Snail & Slug Pellets Slugout All Weather Slug & Snail Bait			

<b>Spray Timing</b>	<b>Pest or Disease</b>	<b>Active Ingredient</b>	<b>Chem Class</b>	<b>Common Trade Names</b>	<b>WHP (days)</b>	<b>Comments</b>
Post-harvest	<b>Two-Spotted Mite</b>	propargite (A)	14A	Omite 300W	N/A	Other miticides can be used at this stage. Omite is used only post-harvest as it may cause fruit spotting, leaf burn and possible defoliation; this is more likely under hot conditions.
Leaf fall	<b>Pear Scab</b>	urea		Urea + wetting agent	N/A	Encourages early dormancy, assists with the break-down of leaf litter and reduces the carry over of scab spores.

## 12. POST HARVEST TREATMENTS FOR APPLES & PEARS

### 12.1 Fungicides for Storage Rots

These fungicides are registered for post harvest dipping of apples and pears. Submerge fruit for approximately 30 seconds. Dipping should occur within 24 hours of harvest.

Reference source : Infopest, March 2003.

Active ingredient	Trade names	Fungicide Group	Disease controlled
carbendazim	Various trade names	A	Blue Mould ( <i>Penicillium</i> spp.)
imazalil	Fungaflor 500 EC Fungazil 500 EC	C	Blue Mould ( <i>Penicillium</i> spp.)
imazalil as a sulphate	Magnate 750 WG Imazagard 750 WG Fungaflor 750 WSP	C	Blue Mould ( <i>Penicillium</i> spp.)
iprodione	Rovral Aquaflo Civet Aquaflo Ippon 500 Aquaflo	B	Blue Mould ( <i>Penicillium</i> spp.) Grey Mould ( <i>Botrytis cinerea</i> ) Ripe Fruit Rot ( <i>Gleosporium album</i> )
thiabendazole	Tecto Flowable SC	A	Blue Mould ( <i>Penicillium</i> spp.) Grey Mould ( <i>Botrytis cinerea</i> ) Ripe Fruit Rot ( <i>Gleosporium album</i> )

### 12.2 DPA (diphenylamine) for Superficial Scald

DPA is recommended for immersion or drench application to some apple and pear varieties to control superficial scald.

**Warning:** There are many **different rates and recommendations** on the label. **ENSURE THAT THE LABEL IS READ CAREFULLY AND FULLY UNDERSTOOD.**

Reference source : Infopest, March 2003.

Active ingredient	Common Trade Names	Crop
diphenylamine	Campbell DPA 310 Scald Inhibitor	<b>Apples:</b> Bonza, Granny Smith, Golden Delicious, Jonathons, Red Delicious, Lady Williams. <b>Pears:</b> Nijisseiki(20 <sup>th</sup> Century), WBC(Bartletts), Packhams Triumph.
	Chemley No Scald DPA	<b>Apples:</b> Granny Smith, Golden Delicious, Jonathons, Red Delicious. <b>Pears:</b> Packham Pears.

### 12.3 Calcium Treatments for Bitter Pit

Calcium chloride will reduce Bitter Pit on apples which occurs during storage. It may also delay the softening of all varieties during storage.

There are several products available which contain calcium chloride that are suitable for post-harvest dipping of apples.

With careful mixing calcium chloride can be combined with DPA and fungicides.

The most effective control is achieved by treating fruit within 24 hours of harvest.

#### **Reducing the risk of calcium burn**

Calcium chloride treatment of apples can lead to some skin damage. Damage can be minimised if precautions are taken during harvest and post-harvest prior to treatment:

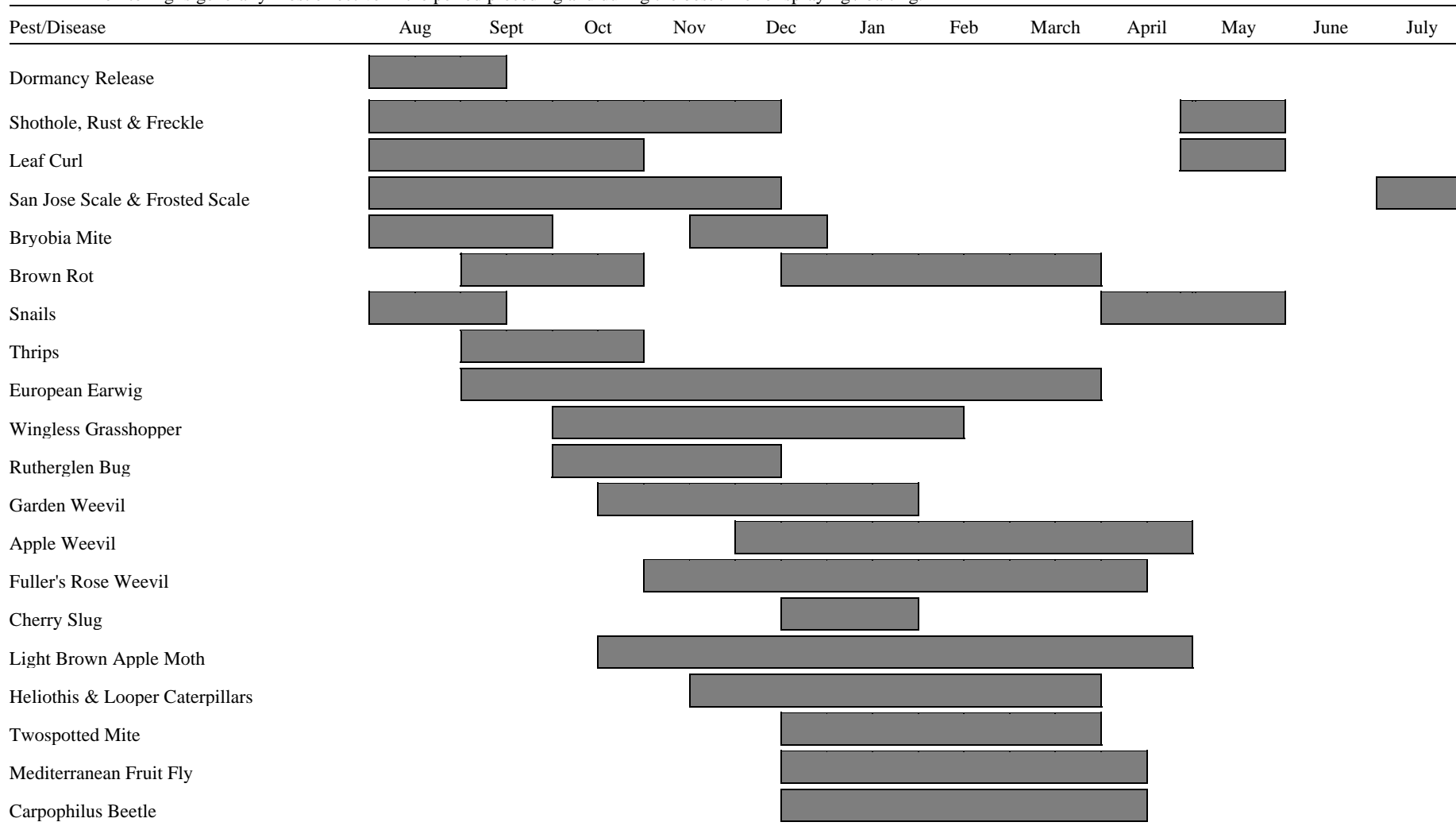
- a) Take all reasonable care to **avoid bruising or puncturing** the skin during fruit harvesting. Any skin injury is a site for excessive calcium absorption and subsequent damage.
- b) **Avoid treating hot fruit.** Never treat fruit with a pulp temperature exceeding 30°C. If necessary, cool fruit with water or delay treatment (never exceed 24 hours). Pre-washing fruit and bins prior to treatment for bitter pit or scald is a highly recommended practice. As well as cooling the fruit it will wash dust and soil contamination from the fruit and bins. This will reduce the contamination of the dip solution.
- c) **Calcium uptake by the fruit is completed in about 12 hours.** Drenching with fresh water soon after this time will remove any risk of further tissue damage from residual calcium chloride on the skin of the apple. This procedure is not possible if a fungicide has been applied as it will also be removed.

### 13.1 STONE FRUIT PEST AND DISEASE MONITORING CALENDAR

Not all these pests will occur in your orchard

**NOTE :** This is a guide only. The pest status of each pest varies across fruit growing districts and monitoring is critical to avoid unnecessary or poorly timed spraying.

Monitoring is generally most effective in the period preceding and during the best time for spraying / baiting.



█ Best time for spraying / baiting.

### 13.2 Stonefruit Spray Options

Reference source: Infopest, March 2003

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	Crop	WHP (days)	Comments	
Dormant	<b>Bacterial Canker or Bacterial Gumosis</b>	copper sulphate + hydrated lime or lime putty	Y	Bordeaux mixture	Stonefruit	1	See Farmnote 98/91 "Bacterial diseases of stonefruit". See Farmnote 78/91 "Bordeaux mixture and similar copper fungicides."	
		cupric hydroxide + mancozeb		ManKocide DF	Stonefruit	14		
		copper ammonium acetate cuprous oxide		Liquicop Copper Fungicide	Apricots	1		
				Flocop Copper Fungicide Norshield Copper Fungicide Nordox 500	Apricots			
		cupric hydroxide		Norshield 750 WP Norshield WG	Apricots Cherries			
				Various trade names	Apricots Cherries			
		copper oxychloride		Blue Barrier	Apricots			
				Barmac Copper Oxychloride Swift Brycop Country Copper Oxychloride 500 WP Melpat Coppox	Apricots Cherries			
	tri-basic copper sulphate	Tri-Base Blue Cuprofix Disperss	Apricots Cherries					
	<b>San Jose Scale</b>	chlorpyrifos	1B	Various trade names	Stonefruit	14		It is recommended to combine a dormant oil with any one of these insecticides.
		diazinon		Barmac Diazinon Country Diazinon 800 Cropro Diazinon 800	Stonefruit			
		methidathion		Suprathion 400 EC Supracide 400	Stonefruit			
		parathion-methyl		Folidol 450 CS Folidol M500	Stonefruit			
		paraffin oil	insecticide, spreader	Biopest Paraffin Oil	Stonefruit	1		
paraffinic petroleum oil		Ulvapron		Stonefruit				
petroleum oil	Various trade names	Stonefruit						
<b>Frosted Scale</b>	sulphur	Y	Kendon Lime Sulphur Stollers Lime Sulphur	Stonefruit	1			

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	Crop	WHP (days)	Comments	
Dormant	<b>Dormancy Release</b>	fatty acid esters	unspecified	Waiken	Cherries	NA	To advance bud break apply 35-50 days before normal bud break. To retard bud break apply 0 – 20 days before normal bud break.	
Late Dormancy to Budswell	<b>Bacterial Canker or Bacterial Gumosis</b>	copper sulphate + hydrated lime or lime putty	Y	Bordeaux mixture	Stonefruit	1	See Farmnote 98/91 “Bacterial diseases of stonefruit”. See Farmnote 78/91 “Bordeaux mixture and similar copper fungicides.”	
		cupric hydroxide + mancozeb		ManKocide DF	Stonefruit	14		
		copper ammonium acetate cuprous oxide		Liquicop Copper Fungicide	Apricots	1		
				Flocop Copper Fungicide Norshield Copper Fungicide Nordox 500	Apricots			
		cupric hydroxide		Norshield 750 WP Norshield WG	Apricots Cherries			
				Various trade names	Apricots Cherries			
		copper oxychloride		Blue Barrier	Apricots			
				Barmac Copper Oxychloride Swift Brycop Copper Oxychloride 500 WP Melpat Coppox	Apricots Cherries			
		Copperoxy 500 WP		Stonefruit				
	tri-basic copper sulphate	Tri-Base Blue Cuprofix Disperss	Apricots Cherries					
	<b>Bacterial Spot</b>	copper oxychloride	Y	Copperoxy 500 WP	Stonefruit	1		
	<b>San Jose Scale</b>	azinthos-methyl	1B	Benthion 200 Gusathion 200 SC	Peaches Nectarines Apricots	14		It is recommended to combine a dormant oil with any one of these insecticides.
				Various trade names	Stonefruit			
		chlorpyrifos		Barmac Diazinon Country Diazinon 800 Cropro Diazinon 800	Stonefruit			
		diazinon		Suprathion 400 EC Supracide 400	Stonefruit			
	methidathion							

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	Crop	WHP (days)	Comments
Late Dormancy to Budswell	<b>San Jose Scale</b>	parathion-methyl	1B	Folidol 450 CS Folidol M500	Stonefruit	14	
		paraffin oil	insecticide, spreader	Biopest Paraffin Oil	Stonefruit	1	
		paraffinic petroleum oil		Ulvapron	Stonefruit		
		petroleum oil		Various trade names	Stonefruit		
	<b>Frosted Scale</b>	sulphur	unspecified	Kendon Lime Sulphur Stollers Lime Sulphur	Stonefruit	1	
	<b>Snails</b>	copper sulphate	Y	Bluestone	Stonefruit	NA	Soil and butt spray. See the following farmnotes. Farmnote 112/94 "Pest snails and slugs of Western Australia", Farmnote 100/99 "Control of pest snails and slugs".
		copper	molluscicide	Escar – Go	Stonefruit	1	
		metaldehyde		Blitzem Snail + Slug Pellets Slugout	Stonefruit	7	
		methiocarb	1A	Mesuril Bait	Stonefruit		
		silicate salts + copper	unspecified	Socusil Snail Repellent	Stonefruit	NA	
	<b>Bryobia Mite</b>	petroleum oil	insecticide, spreader	Various trade names	Stonefruit	1	Reduction in the use of organophosphate insecticides has allowed a resurgence of this pest. At this growth stage petroleum oils are very effective against the eggs.
		sulphur	Y	Kendon Lime Sulphur	Stonefruit		
				Stollers Lime Sulphur	Stonefruit (except Cherries)		
	<b>Two-Spotted Mite</b>	paraffinic petroleum oil (O, A)	insecticide, spreader	Ulvapron	Stonefruit	1	Refer to information sheet "Using miticides in WA Deciduous Fruit Tree Crops 2003/2004" by Stewart Learmonth. Ovicides (O) kill mite eggs and newly hatched mites. Adulticides (A) kill active stages of mites
		petroleum oil (O, A)		Various trade names	Stonefruit		
sulphur (O, A)		Y	David Grays Lime Sulphur	Stonefruit	NA		

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	Crop	WHP (days)	Comments	
Late Dormancy to Budswell	Leaf Curl	copper oxychloride	Y	Various trade names	Peaches Nectarines	1		
				Various trade names	Stonefruit			
		cuprous oxide		Various trade names	Peaches Nectarines			
		cupric hydroxide		Various trade names	Peaches Nectarines			
		copper octanoate		Blue Mantel	Peaches			
				Tricop	Peaches Nectarines			
		chlorothalonil		Various trade names	Peaches	7		See "Additional Restraints for stonefruits" on label.
		cupric hydroxide + mancozeb		ManKocide DF	Stonefruit	14		
		dithianon		Delan 700 WG Patrol 700 WG	Peaches Nectarines	21		
		tri-basic copper sulphate		Tri-Base Blue Cuprofix Disperss	Peaches Nectarines	1		
		sulphur		Kendon Lime Sulphur Stollers Lime Sulphur	Stonefruit (except Cherries)			
		ziram		Ziram DG	Cherries Nectarines Peaches	7		
		Fulasin DF Ziram Granuflo	Stonefruit (except Apricots)					
	Shothole	copper ammonium acetate	Y	Liquicop	Apricots	1		
		cuprous oxide		Flocop Norshield Norshield WG	Stonefruit			
				Norshield 750 WP Nordox 500	Stonefruit (except Nectarines)			
		cupric hydroxide		Various trade names	Stonefruit			

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	Crop	WHP (days)	Comments
Late Dormancy to Budswell	<b>Shothole</b>	cupric hydroxide + mancozeb	Y	ManKocide DF	Stonefruit	14	
		copper oxychloride		Various trade names	Stonefruit	1	
		tri-basic copper sulphate		Tri-Base Blue Cuprofix Disperss	Stonefruit		
		dithianon		Delan 700 WG Patrol 700 WG	Stonefruit	21	
		sulphur		David Grays Lime Sulphur Kendons Lime Sulphur Stollers Lime Sulphur	Stonefruit (except Cherries)	NA	
	<b>Rust</b>	copper oxychloride	Y	Brycop Copperoxy 500 WP Oxydul DF Oxydul	Stonefruit	1	
		sulphur		David Grays Lime Sulphur Kendons Lime Sulphur Stollers Lime Sulphur	Stonefruit (except Cherries)	NA	
	<b>Freckle</b>	copper ammonium acetate	Y	Liquicop	Apricots	1	
		cuprous oxide		Flocop Norshield Nordox 500 Norshield 750 WP Norshield WG	Apricots		
		cupric hydroxide		Various trade names	Apricots		
		copper oxychloride		Various trade names	Apricots		
		tri-basic copper sulphate		Tri-Base Blue Cuprofix Disperss	Apricots		
		sulphur		Kendon Lime Sulphur Stollers Lime Sulphur	Stonefruit (except Cherries)	NA	

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	Crop	WHP (days)	Comments
Budburst/ Pink Bud to Fruit Development	<b>Brown Rot</b>	captan	Y	Captan WG Orthocide WG	Stonefruit (except Apricots)	7	Refer to Factsheet "Chemicals for management of Brown Rot in Stonefruit in Western Australia."
		carbendazim	A	Bavistin FL Carbendazim 500 SC Carbendon SC Spin Flo	Stonefruit	1	
		chlorothalonil	Y	Various trade names	Stonefruit	7 (1 for plums)	See "Additional Restraints for stonefruits" on label.
		cyprodinil	I	Chorus	Stonefruit (except cherries)	NA	Do not apply Chorus after shuck fall
		iprodione	B	Rovral Liquid Ippon 500 Aquaflo Rovral Aquaflo	Stonefruit	Nil	
		mancozeb	Y	Various trade names	Stonefruit (except Wilson Plums)	14	
				Dithane Rainshield	Stonefruit (except Wilson or Wickson Plums)		
				Dithane M-45	Stonefruit (except Wilson Plums or Cherries)		
		propiconazole	C	Aurora 250 EC Bumper 250 EC Tilt 250 EC Tyrant	Stonefruit	1	

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	Crop	WHP (days)	Comments
Budburst / Pink Bud to Fruit Development	<b>Brown Rot</b>	sulphur	Y	Various trade names	See <b>Comments</b> column	NA	Some sulphur formulations are only registered for Peaches, Nectarines and Plums while others are registered for all stonefruit except apricots. Also some formulations can be used at petal fall while others cannot be used until 4 weeks after petal fall. Check label before use.
		thiram		Thiram Thiragranz	Stonefruit	7	
		triforine	C	Saprol	Stonefruit	1	
		ziram	Y	Ziram DG Ziragranz	Cherries Nectarines Peaches	7	
	Fulasin DF Ziram Granuflo			Stonefruit (except Apricots)			
	<b>Leaf Curl</b>	chlorothalonil	Y	Various trade names	Peaches	7	See "Additional Restraints for stonefruits" on label.
		ziram		Ziram DG	Peaches Cherries Nectarines		
				Fulasin DF Ziram Granuflo	Stonefruit (except Apricots)		
	<b>Shothole</b>	chlorothalonil	Y	Various trade names	Stonefruit	7 (plums only 1)	See "Additional Restraints for stonefruits" on label.
		mancozeb		Various trade names	Stonefruit (except Wilson Plums )	14	

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	Crop	WHP (days)	Comments
Budburst / Pink Bud to Fruit Development	<b>Shothole</b>	ziram	Y	Ziram DG Fulasin DF Ziram Granuflo	Stonefruit (except Apricots)	7	
	<b>Freckle</b>	chlorothalonil	Y	Various trade names	Apricots	7	See "Additional Restraints for stonefruits" on label.
		dithianon		Delan 700 WG Patrol 700 WG	Apricots Nectarines Peaches	21	
		mancozeb		Various trade names	Stonefruit (except Wilson or Wickson Plums)	14	
		thiram		Thiram DG Thiram Thiram WP Thiragranz	Apricots	7	
	<b>Rust</b>	chlorothalonil	Y	Various trade names	Stonefruit (except Nectarines)	7	See "Additional Restraints for stonefruits" on label.
		mancozeb		Various trade names	Stonefruit (except Wilson Plums)	14	

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	Crop	WHP (days)	Comments
Budburst/ Pink Bud to Fruit Development	<b>European Earwig</b>	chlorpyrifos	1B	Various trade names	Stonefruit	14	Chlorpyrifos can be applied as a foliar spray or combined with sunflower oil and cracked grain to be applied as a ground bait.
		carbaryl	1A	Bugmaster Flowable Carbaryl 500	Stonefruit (except Cherries)	3	See Farmnote 9/95 "European earwigs threaten high yield crops". Monitor for this pest using single-sided corrugated cardboard trunk bands. Continue monitoring throughout season.
	<b>Thrips</b>	dimethoate	1B	Various trade names	Stonefruit	7	Some trade names not registered for apricots or early peach varieties. Check label before use.
		fatty acids – potassium salts	unspecified	Natrasoap Neemtech	Stonefruit	NA	
		methomyl	1A	Lannate L Marlin 225	Stonefruit	1	
				Marlin Nudrin 225	Cherries Nectarines Peaches		
		pyrethrins + piperonyl butoxide	3A	Pyrethrum Insecticide Py-Bo	Stonefruit	NA	
		tau-fluvalinate		Mavrik Aquaflo	Nectarines Peaches Plums (Low Chill Only)		
	<b>Bacterial Canker or Bacterial Gumosis</b>	copper ammonium acetate	Y	Liquicop Copper Fungicide	Apricots	1	These copper formulations are registered to be used 7 days after petal fall and repeated 7-10 days later. This application is at a lower rate, check label before use.
				Flocop Copper Fungicide Norshield Copper Fungicide Nordox 500	Apricots		
				Norshield 750 WP Norshield WG	Apricots Cherries		

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	Crop	WHP (days)	Comments
Budburst / Pink Bud to Fruit Development	<b>Bacterial Canker or Bacterial Gumosis</b>	cupric hydroxide	Y	Various trade names	Apricots Cherries	1	
		copper oxychloride		Blue Barrier	Apricots		
				Barmac Copper Oxychloride Swift Brycop Copper Oxychloride 500 WP Melpat Coppox	Apricots Cherries		
				Tri-Base Blue Cuprofix Disperss	Apricots Cherries		
Fruit Development to Harvest	<b>Leaf Curl</b>	chlorothalonil	Y	Various trade names	Peaches	7	See "Additional Restraints for stonefruits" on label.
		ziram		Ziram DG	Cherries Nectarines Peaches		
				Fulasin DF Ziram Granuflo	Stonefruit (except Apricots)		
	<b>Shothole</b>	chlorothalonil	Y	Various trade names	Stonefruit	7 (Plums only 1)	See "Additional Restraints for stonefruits" on label.
		dithianon		Delan 700 WG	Stonefruit	21	
		mancozeb		Various trade names	Stonefruit (except Wilson Plums)	14	
		thiram		Thiram DG Thiram Thiragranz	Stonefruit	7	
		ziram		Ziram DG Fulasin DF Ziram Granuflo	Stonefruit (except Apricots)		

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	Crop	WHP (days)	Comments
Fruit Development to Harvest	<b>Rust</b>	chlorothalonil	Y	Various trade names	Stonefruit (except Nectarines)	7	See “Additional Restraints for stonefruits” on label.
		dithianon		Delan 700 WG Patrol 700 WG	Peaches Plums Nectarines	21	
		mancozeb		Various trade names	Stonefruit (except Wilson Plums)	14	
		propiconazole	C	Bumper 250 EC Tyrant	Plums	1	
		sulphur	Y	Various trade names	Stonefruit (except Apricots)	NA	Can be applied 4 weeks after petal fall.
				Thiovit Jet	Peaches Nectarines Plums		
				zineb	Zineb	Peaches Nectarines Plums	
	<b>Freckle</b>	chlorothalonil	Y	Various trade names	Apricots	7	See “Additional Restraints for stonefruits”, on label.
		dithianon		Delan 700 WG	Apricots Nectarines Peaches	21	
		mancozeb		Various trade names	Stonefruit (except Wilson or Wickson Plums)	14	
		thiram		Thiram DG Thiram Thiram WP Thiragranz	Apricots	7	
		ziram		Ziram DG	Stonefruit (except Apricots)		

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	Crop	WHP (days)	Comments
Fruit Development to Harvest	<b>Wingless Grasshoppers</b>	carbaryl	1A	Bugmaster Flowable Carbaryl 500	Stonefruit	3	See farmnote 62/90 "Wingless grasshoppers and their control".
		dimethoate	1B	Various trade names	Stonefruit	7	
	<b>Rutherglen Bug</b>	fenthion	1B	Lebaycid	Stonefruit	3	It is recommended to spray nearby weeds too.
		trichlorfon		Dipterex 500 SL Lepidex 500	Stonefruit	2	
	<b>Bryobia Mite</b>	azinphos-methyl	1B	Benthion 200 Gusathion 200 SC	Stonefruit	14	
		dicofol + tetradifon	2B	Masta-Mite	Stonefruit (except Cherries)	7	
		dicofol		Miti-Fol EC Kelthane MF	Stonefruit		
		fenbutatin oxide	12A	Torque	Peaches Nectarines	14	
		sulfur	Y	Country Wettasul 800 WP	Stonefruit (except Apricots)	NA	
	<b>San Jose Scale</b>	chlorpyrifos	1B	Various trade names	Stonefruit	14	
		diazinon		Barmac Diazinon Country Diazinon 800 Cropro Diazinon 800	Stonefruit		
		paraffin oil	insecticide, spreader	Biopest Paraffin Oil	Stonefruit	1	
	<b>Garden Weevil</b>	alpha-cypermethrin	3A	Various trade names	Stonefruit (except Cherries)	14	<b>Trunk &amp; butt spray only.</b> Monitor weevil emergence using a single-sided cardboard trunk band. Summer oil can be added at 1-2% to help prolong residual activity. Continue monitoring after spraying.

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	Crop	WHP (days)	Comments	
Fruit Development to Harvest	<b>Apple Weevil</b>	alpha-cypermethrin	3A	Various trade names	Stonefruit (except Cherries)	14	Comments as above.	
		azinphos-methyl	1B	Benthion 200 Gusathion 200 SC	Peaches Nectarines Apricots		Can be applied as a butt spray or as a foliage spray – check label for correct rates.	
	<b>Fuller's Rose Weevil</b>	azinphos-methyl	1B	Benthion 200 Gusathion 200 SC	Peaches Nectarines Apricots	14	Can be applied as a butt spray or as a foliage spray – check label for correct rates.	
	<b>Light Brown Apple Moth</b>	azinphos-methyl	1B	Benthion 200 Gusathion 200 SC	Stonefruit	14		
		<i>Bacillus thuringiensis</i>	11C	Delfin WG Dipel DF Full-Bac	Stonefruit	Nil	Read "Critical Comments" on label.	
		carbaryl	1A	Bugmaster Flowable Carbaryl 500 Flowable Flowable Carbaryl 500	Stonefruit (except Cherries)	3		
				Carbaryl WP	Peaches Nectarines Plums			
		chlorpyrifos	1B	Pyrinex WP Cyren 500 WP Lorsban 750 WDG	Stonefruit	14		
				fenthion	Lebaycid	Stonefruit		3
		indoxacarb	22A	Avatar	Stonefruit (except Cherries)	7		Best results achieved when Avatar treatments are applied consecutively.
		parathion-methyl	1B	Folidol 450 CS Folidol M500 Parathion-Methyl 500	Stonefruit	14		
	<b>Heliothis</b>	carbaryl	1A	Bugmaster Flowable Flowable Carbaryl 500	Stonefruit (except Cherries)	3		
		methomyl		Lannate L Marlin 225 Marlin Nudrin 225	Peaches Nectarines	1		

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	Crop	WHP (days)	Comments
Fruit Development to Harvest	<b>Looper Caterpillars</b>	<i>Bacillus thuringiensis</i>	11C	Dipel DF Full-Bac WDG	Stonefruit	NA	Read "Critical Comments", on label.
		pyrethrins + piperonyl butoxide	3A	Pyrethrum Py-Bo	Stonefruit	1	
	<b>Cherry Slug</b>	azinphos-methyl	1B	Benthion 200 Gusathion 200 SC	Stonefruit (except Plums)	14	
		carbaryl	1A	Bugmaster Flowable Carbaryl 500 Flowable Flowable Carbaryl 500	Stonefruit (except Cherries)	3	
	<b>Two-Spotted Mites</b>	chlorfenapyr (A)	13A	Secure 360 SC	Peaches	7	Refer to information sheet "Using miticides in WA Deciduous Fruit Tree Crops" by Stewart Learmonth.
		clofentazine (O)	10A	Apollo SC	Stonefruit	21	
		dicofol + tetradifon (O, A)	2B	Masta-Mite	Stonefruit (except Cherries)	7	
		dicofol (A)		Miti-Fol EC Kelthane MF	Stonefruit		
		fatty acids – potassium salts (A)	unspecified	Natrasoap Neemtech	Stonefruit	NA	Ovicides(O) kill mite eggs and newly hatched mites. Adulticides(A) kill active stages of mites.
		fenbutatin oxide (A)	12A	Torque	Peaches Nectarines	14	
		hexythiozox (O)	10A	Calibre 100 EC	Stonefruit	3	
		oxythioquinox (A)	X	Morestan	Peaches	NA	Can only be applied post-harvest.
		paraffin oil (O, A)	insecticide, spreader	Biopest Paraffin Oil	Stonefruit	1	Some petroleum oils are registered to be used during growing season. Check label for rates and conditions.
		petroleum oil (O, A)		Various trade names	Stonefruit		
		propargite (A)	14A	Omite 300W	Stonefruit	7	
		pyridaben (O, A)	10A	Sanmite	Stonefruit	1	
	sulphur (A)	Y	Country Wettasul 800 WP	Stonefruit (except Apricots)	NA	Do not apply until 21 days after petal fall.	
tebufenpyrad (OA)	10	Pyranica	Peaches	14			

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	Crop	WHP (days)	Comments		
Fruit Development to Harvest	<b>Mediterranean Fruit Fly</b>	<b>Cover spray:</b>							
		dimethoate	1B	Various trade names	Stonefruit (except Apricots or early Peaches)	7	See Bulletin 4385 "Control of Mediterranean Fruit Fly (Medfly) in Commercial Orchards"		
		fenthion				Lebaycid		Stonefruit	3
		<b>Baiting:</b>							
		maldison	1B	Hy Mal Farmoz Maldison 500 Nufarm Maldison 500	Stonefruit	3			
		<b>or</b>							
		trichlorfon <b>plus either</b>		Dipterex 500 SL Lepidex 500	Stonefruit	2			
	protein hydrolysate <b>or</b>		Flavex						
	protein autolysate		Pinnacle yeast Q-fly lure						
	<b>Brown Rot</b>	captan	Y	Captan WG Orthocide WG	Stonefruit (except Apricots)	7	See Summer Fruit Fact Sheet No. 1 "Chemicals for Management of Brown Rot in Stonefruit in Western Australia"		
		carbendazim	A	Bavistin FL Carbendazim 500 SC Carbendon SC Spin Flo	Stonefruit	1			
chlorothalonil		Y	Various trade names	Stonefruit	7	See "Additional Restraints for stonefruits" on label.			
iprodione		B	Rovral Liquid Ippon 500 Aquaflo Rovral Aquaflo	Stonefruit	Nil				
mancozeb		Y	Various trade names	Stonefruit (except Wilson Plums)	14				

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	Crop	WHP (days)	Comments	
Fruit Development to Harvest	<b>Brown Rot</b>	mancozeb	Y	Dithane Rainshield	Stonefruit (except Wilson or Wickson Plums)	14		
				Dithane M-45	Stonefruit (except Wilson Plums or Cherries)			
		propiconazole	C	Aurora 250 EC Bumper 250 EC Tilt 250 EC Tyrant	Stonefruit	1		
		thiram	Y	Thiram Thiragranz	Stonefruit	7		
		triforine	C	Saprol	Stonefruit	1		
		ziram	Y	Ziram DG Ziragranz	Cherries Nectarines Peaches	7		
				Fulasin DF Ziram Granuflo	Stonefruit (except Cherries)			
		sulphur		Various trade names	Stonefruit (except Apricots or Cherries)	NA		
	<b>Carpophilus Beetle (Dried Fruit Beetle)</b>	bifenthrin	3A	Talstar 100 EC Arrow 100 EC Disect 100 EC Venom 100 EC	Stonefruit (except Cherries)	1		Monitor stonefruit orchards for Carpophilus beetles as fruit approach maturity and become susceptible to attack. Carpophilus beetles are a vector of Brown Rot.
	Post Harvest to Leaf Fall	<b>Snails</b>	metaldehyde	molluscicide	Blitzem Snail & Slug Pellets Slugout	Stonefruit		7
methiocarb			1A	Mesurol Bait	Stonefruit			

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	Crop	WHP (days)	Comments
Post Harvest to Leaf Fall	<b>Bacterial Canker or Bacterial Gumosis</b>	mancozeb + cupric hydroxide	Y	ManKocide DF	Stonefruit	14	See Farmnote 98/91 "Bacterial diseases of stonefruit".
		copper ammonium acetate		Liquicop Copper Fungicide	Apricots	1	
		cuprous oxide		Flocop Copper Fungicide Norshield Copper Fungicide Nordox 500	Apricots		
		cupric hydroxide		Nordox 750 WP Norshield WG	Apricots Cherries		
		cupric hydroxide		Various trade names	Apricots Cherries		
		cupric hydroxide		Blue Barrier	Apricots		
		copper oxychloride		Barmac Copper Oxychloride Swift Brycop Copper Oxychloride 500 WP Melpat Coppox	Apricots Cherries		
	tri-basic copper sulphate	Tri-Base Blue Cuprofix Disperss	Apricots Cherries				
	<b>Leaf Curl</b>	cuprous oxide	Y	Norshield WG	Peaches Nectarines	1	
		cupric hydroxide		Various trade names	Peaches Nectarines		
		cupric hydroxide		Blue Mantel	Peaches		
		cupric hydroxide + mancozeb		ManKocide DF	Stonefruit	14	
		copper oxychloride		Various trade names	Stonefruit	1	
	tri-basic copper sulphate	Tri-Base Blue Cuprofix Disperss	Peaches Nectarines				

Spray Timing	Pest or Disease	Active Ingredient	Chem Class	Common Trade Names	Crop	WHP (days)	Comments
Post Harvest to Leaf Fall	<b>Shothole</b>	copper ammonium acetate	Y	Liquicop	Apricots	1	
		cupric hydroxide		Various trade names	Stonefruit		
		cuprous oxide		Flocop Norshield Norshield WG	Stonefruit		
				Norshield 750 WP Nordox 500	Stonefruit (except Nectarines)		
		cupric hydroxide + mancozeb		ManKocide DF	Stonefruit	14	
		tri-basic copper sulphate		Tri-Base Blue Cuprofix Disperss	Stonefruit	1	
	<b>Freckle</b>	copper ammonium acetate	Y	Liquicop	Apricots	1	
		cuprous oxide		Various trade names	Apricots		
		cupric hydroxide		Various trade names	Apricots		
		copper oxychloride		Various trade names	Apricots		
tri-basic copper sulphate		Tri-Base Blue Cuprofix Disperss		Apricots			

### 13.3 Post harvest treatments for stonefruit

When dipping stonefruit, fruit should be submerged to allow sufficient time to thoroughly wet the fruit, approximately 30 seconds. Fungicide treatments should be applied as soon as is practical after harvest, usually within 24 hours.

Reference source : Infopest, March 2003

Active Ingredient	Common Trade Names	Chem Class	Crop	Pest or Disease Controlled
bromochlorodimethylhydantoin	Nylate	sanitiser	Stonefruit	External rot causing organisms
carbendazim	Boomer 500 WP Bavistin FL Carbendazim 500 SC Carbendon SC Spin Flo	A	Stonefruit	Brown Rot ( <i>Monilinia</i> spp.)
dimethoate	Dimethoate Rogor Dimethoate 400	1B	Cherries	Mediterranean Fruit Fly
iprodione	Civet Aquaflo Ippon 500 Aquaflo Rovral Aquaflo	B	Stonefruit	Transit Rot ( <i>Rhizopus stolonifer</i> ) (Suppression of Transit Rot only)
	Ippon 500 Aquaflo Rovral Aquaflo	B	Stonefruit	Brown Rot ( <i>Monilinia</i> spp.)
procymidone	Cyon 500 SC Fortress 500 Rumble 500 Spiral Aquaflo Sumisclex 500	B	Stonefruit	Brown Rot ( <i>Monilinia</i> spp.) Transit Rot ( <i>Rhizopus stolonifer</i> )
triforine	Saprol	C	Stonefruit	Brown Rot ( <i>Monilinia</i> spp.)

## 14. Herbicide Guide for Deciduous Orchards in WA

### Definitions

**Knockdown herbicides** control established weeds only. They may be **contact**, only burn off those parts of the plant contacted or **systemic**, absorbed and translocated throughout the plant for a total kill.

**Pre-emergent** or **residual herbicides** control germinating weed seeds before they emerge, but some can be effective up to the two-leaf stage. Control relies on a barrier of chemical in the surface of the soil.

Key : **Knockdown herbicide** =

**Residual herbicide** =

Reference source : Infopest, March 2003

Active Ingredient	Common Trade Names	Chem Class	Crop	Weeds Controlled	Comments
2,2 DPA	<b>Cerelon</b> <b>Atlapon</b>	J	pomefruit & stonefruit	annual & perennial grasses	Knockdown, systemic herbicide. Trees must 4 years and older. Best results with half rate at 4-6 week interval.
amitrole + ammonium thiocyanate	<b>Chemag Amitrole T</b> <b>Nufarm Amitrole T</b>	F	pomefruit & stonefruit	broad-leaf & grasses couch	Knockdown, systemic herbicide, absorbed mainly through leaves. <b>Do not apply less than 56 days before harvest.</b>
asulam	<b>Asulox</b> <b>Rattler 400</b>	K	apples	dock	Narrow-spectrum knockdown herbicide.
carfentrazone-ethyl	<b>Hammer</b>	G	pomefruit, peaches, plums & apricots	Various broad-leaf weed species	Do not apply Hammer on its own. Add to a knockdown herbicide. Refer to label.
dichlobenil	<b>Casoron G</b>	K	apples, apricots, peaches & plums	annual grasses & broad-leaf weeds	Pre-emergent granular herbicide

Active Ingredient	Common Trade Names	Chem Class	Crop	Weeds Controlled	Comments
diuron	Various trade names	C	pomefruit	annual broad-leaf & some grasses	Trees should be at least 1 year old. Residual herbicide, best applied to bare ground.
diquat	Reglone	L	pomefruit & stonefruit	capeweed	Can be useful under heavy infestations. Refer to label.
fluazifop-p-butyl	Fusilade	A	pomefruit & stonefruit	grasses only	Knockdown, systemic herbicide. Always add a wetting agent.
glufosinate-ammonium	Basta	N	pome fruit & stonefruit	broad spectrum, good on broad-leaf weeds & clovers	Partially systemic knockdown herbicide. Do not use on trees less than 2 years old unless shielded from spray drift. With holding period of 21 days applies for pome and stone fruit orchards.
glyphosate + diuron	Nomix G-D	M + C	pome fruit	broad spectrum, both annual & perennial	Trees should be established at least a year
glyphosate	Various trade names	M	pome fruit & stonefruit	broad spectrum, both annual & perennial	Knockdown, systemic herbicide. Do not use on trees less than 3 years old unless shielded from spray drift. <b>Lower rates</b> are intended for annual weeds and the <b>higher rates</b> are for perennial weeds. For the best rate refer to label recommendations.
haloxyfop-r-methyl	Verdict 520	A	pomefruit & stonefruit	annual & perennial grasses	Knockdown herbicide. Check label for optimum rates. The addition of an adjuvant is important.
napropamide	Devrinol WG	K	stonefruit	annual grasses, good on crab-grass.	Residual herbicide. Apply to a weed free soil.

Active Ingredient	Common Trade Names	Chem Class	Crop	Weeds Controlled	Comments
norflurazon	<b>Zoliar DF</b>	F	pome fruit & stonefruit	annual grasses & broad-leaf weeds	Residual herbicide. Apply before weed emergence, can be tank mixed with a knockdown. Do not use more than 5 kg / ha per season.
oryzalin	<b>Surflan 500 Flowable Cameo 500</b>	D	pome fruit & stonefruit	grasses & broad-leaf weeds	Residual herbicide. Apply to soil free of weeds & trash. Requires rain/irrigation (12.5mm) within 21 days to activate it.
oxyfluorfen	<b>Various trade names</b>	G	pomefruit, apricots, peaches & plums	annual grasses & broad-leaf weeds	Residual herbicide. <b>Do not use after budswell</b> or on apples & pears if less than 3 years old. Apply to freshly cultivated weed free soil. The addition of oxyfluorfen to glyphosate paraquat or diquat improves knockdown control & increases the speed of activity. Can be used all year.
paraquat + diquat	<b>Sprayseed 250</b>	L	pomefruit & stonefruit	annual grasses & broad-leaf weeds	Knockdown, contact herbicide. If water volume exceeds 200 L / ha add <b>Agral @ label rates.</b>
paraquat	<b>Various trade names</b>	L	pomefruit & stonefruit	annual grasses & broad-leaf weeds	
pendimethalin	<b>Various trade names</b>	D	pomefruit & stonefruit	annual grasses & broad-leaf weeds	Residual herbicide. Apply to soil free of weeds & trash. Requires rain/irrigation(5 mm) within 10 days to activate it.

Active Ingredient	Common Trade Names	Chem Class	Crop	Weeds Controlled	Comments
simazine	Various trade names	C	pomefruit	annual broad-leaf weeds	Residual herbicide. Apply to a bare moist soil. Do not use if trees less than 2 years old.
trifluralin	Various trade names	D	pomefruit & stonefruit	annual grasses & broad-leaf weeds (good on rye-grasses & wire-weed).	Residual herbicide. <b>Do not use after budswell.</b> Must be incorporated within 4 hours, so is best suited as a pre-plant treatment.

