

Yarra Ranges Council - Natural Pest Control Using Integrated Pest Management Principles

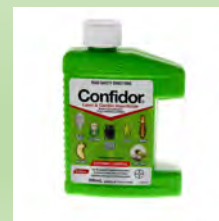
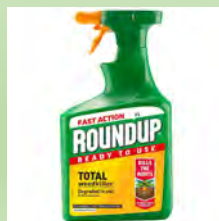
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Conventional Pest Control Methods

- Often use chemical controls as first option.
- Usually ignore causes of pest problems.
- Rely on routine, scheduled pesticide applications.



Seven Problems with Chemical Pest Controls

1. Provides **temporary** fix only, ineffective over the long term.
2. Chemical use disrupts ecological balance – beneficial insects are more vulnerable to synthetic chemical insecticides, and take longer to recover, leading to explosions of pests populations!
3. Pests become resistant to pesticides – need to rotate chemicals, it just takes one survivor – but they don't tell you that (**except on agricultural chemicals**)!



3

Agricultural vs Domestic Garden Chemicals

- Same products sold under different names, but agricultural products have long warnings and disclaimers! Here's an example *Confidor/Imidacloprid* :

INSECTICIDE RESISTANCE WARNING

GROUP 4A INSECTICIDE

For insecticide resistance management, Imtrade Imidacloprid 350 SC Insecticide is a Group 4A Insecticide. Some naturally occurring insect biotypes resistant to Imtrade Imidacloprid 350 SC Insecticide and other Group 4A Insecticides may exist through normal genetic variability in any insect population. **The resistant individuals can eventually dominate the insect population** if Imtrade Imidacloprid 350 SC Insecticide and other Group 4A Insecticides are used repeatedly. The effectiveness of Imtrade Imidacloprid 350 SC Insecticide on resistant individuals could be significantly reduced.

Since the occurrence of resistant individuals is difficult to detect prior to use, Imtrade Australia Pty Ltd accepts no liability for any losses that may result from the failure of Imtrade Imidacloprid 350 SC Insecticide to control resistant insects. Imtrade Imidacloprid 350 SC Insecticide may be subject to specific resistance management strategies. For further information contact your local supplier, Imtrade representative or local agricultural department agronomist.

4

Problems with Chemical Pest Controls

4. Environmental toxicity – persistence in soil, bioaccumulation, mobility and contamination of waterways/groundwater.
5. Toxicity to non-target species, including people and pets.
6. Social acceptance - increased awareness and public concern about chemicals.



5

Problems with Chemical Pest Controls

7. And the big one... Cost \$\$\$ - which is ongoing!



6

What Is Integrated Pest Management (IPM)?

- *Definition:* IPM is a systematic, scientific pest management strategy based on **prevention, monitoring, and control**, that uses a **combination of techniques to limit pest populations** and the damage they cause to economically acceptable levels, while eliminating or drastically **reducing the use of pesticides to minimise risks** to people and the environment.



7

How Does IPM Work? Prevention

- The goal of IPM is long-term prevention of pests or their damage by managing the ecosystem
- **Proactive** – by understanding the environmental factors that affect the pest and its ability to thrive, we can create conditions that are unfavourable for the pest.
- *As opposed to **reactive** conventional chemical pest control, eliminating visible pests right now.*

8

How Does IPM Work? Monitoring

- **Monitoring** - checking to identify pest types, pest numbers or pest damage.
- **Correct pest identification** – is the pest a problem, what is the best management strategy if it is?
- After pest biology and environmental factors considered, we decide – can pest be **tolerated**, or a problem needing **control**, and if so which management methods are the most effective?

9

How Does IPM Work? Controls

- **Integrated** – IPM combines various pest management methods together for greater effectiveness.
 - Various types of controls, or methods from within those controls, can be deployed together, and they can be escalated in terms of risk if required.
1. Biological controls
 2. Cultural controls
 3. Mechanical and physical controls
 4. Chemical controls

10

How Does IPM Work? Breaking It Down

- **systematic, scientific strategy** - calculated escalation
- **prevention, monitoring, and control** – solutions based on pest biology and behaviour
- **combination of techniques** – cumulative effectiveness of controls
- **limiting pest populations and damage to acceptable levels** – realistic goals which preserve natural controls
- **eliminating or significantly reducing the use of pesticides** - minimises cost as well as risks to people and the environment

11

Mechanical and Physical Controls

- These controls block pests out, make the environment unsuitable for them, or kill them directly.
- **Physical controls** include:
 - Manual methods - hand removal of small pest infestations, disease infected or pest infested leaves, or hosing pests off.
 - Barriers – netting, fencing, electric fencing, tree banding, fence spikes, root barriers, mulches for weed control, pest barrier sprays.



12

Mechanical and Physical Controls

- **Physical controls** include:

- Traps – tree glue banding, tree cardboard banding, pheromone traps, sticky traps, earwig newspaper traps, snail traps.
- Heat based – boiling water or flaming weeds, soil steam sterilization for diseases.



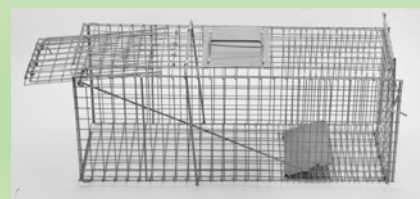
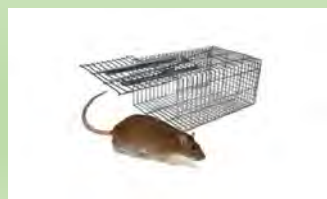
13

Mechanical and Physical Controls

- These controls block pests out, make the environment unsuitable for them, or kill them directly.

- **Mechanical controls** include:

- Rodent traps (lethal and humane/non-lethal)
- Possum cage traps.



14

Physical Controls – Calcined Kaolin

- Calcined Kaolin, sold as Surround WP, a form of clay, organically rated.
- Forms a white film over stems and leaves, reflects sun's rays to prevent fruit sunburn
- Acts as a barrier to pests – causes irritation, confusion and an obstacle to feeding and egg-laying. May prevent fungal spores establishing on leaves.



15

Physical Controls – Calcined Kaolin

- Calcined Kaolin is sprayed on leaves and fruit – avoid flowers!
- Effective in control of:
 - Gall Wasp
 - Codling Moth and oriental Fruit Moth
 - Leafhoppers
 - Powdery Mildew
 - Stink Bugs
 - Thrips



16

Cultural Controls

- These controls are practices which disrupt the environment of the pest, reducing pest establishment, reproduction, dispersal, and survival.
- Many of these methods work by improving soil and plant health - *remember that plants and soil ecology can naturally control pests and diseases!*

17

Cultural Controls

- **Cultural controls** include:
 - Changing irrigation and fertilisation practices
 - Crop rotation
 - Selecting pest-resistant plant varieties
 - Sanitation and hygiene - removing infected plant material and fallen fruit
 - Eliminating debris where pests can hide, or locating wood piles and other materials away from crops
 - Removing weeds which are hosts to pests
 - Companion planting – pest repellent and beneficial insect attracting plants

18

Cultural Controls – Citrus Leaf Miner

- Citrus leafminer moths only attack new growth flushes in summer and autumn. Once leaves harden off, pest can't mine into them.
- Fertilise citrus in late winter to promote strong growth in spring, when citrus leafminer is absent or in extremely low numbers.



19

Cultural Controls – Citrus Leaf Miner

- Peak pest periods in late summer and autumn, reduce new growth by not overfertilizing, using high nitrogen fertilizers or overwatering in summer and autumn. **Use just enough fertilizer and water to support normal growth, but no more than that.**
- Spraying horticultural oil on new growth flush leaves deters citrus leafminer from laying their eggs. They avoid surfaces sprayed with oil. **Begin spraying new summer growth as soon as it emerges, before the leaves reach 10 mm in length.**



20

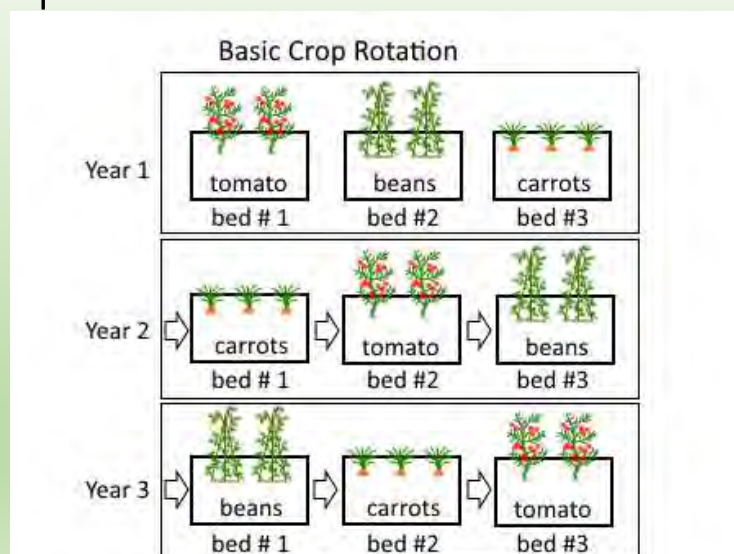
Cultural Controls – Crop Rotation

- **Crop rotation** is the practise of planting a particular crop in a different spot in the garden each year, moving the planting location from year to year so the any garden location will never grows the same type of plant for longer than a year.



21

How Crop Rotation Works



22

Benefits of Crop Rotation

- 1. Preventing depletion of soil nutrients** – certain vegetables use more of some nutrients and less of others, depleting the most used ones very quickly.
- 2. Reducing pests and diseases** – if the same vegetables are grown in a location continuously, pests that prefer those vegetables will gather there.
- 3. Keeping soil healthy** – certain plants used in crop rotation add nutrients back into the soil, maintaining nutrient levels to support plant growth.

23

Crop Rotation by Plant Family

Group A (Cucurbits)	Group B (Brassicas)	Group C (Solanums)	Group D (Root Crops)	Group E (Corn)	Group F (Legumes)
Cantaloupe	Brussels	Eggplant	Beetroot	Sweet corn	All beans
Cucumbers	sprouts	Potato	Carrot		Peas
Pumpkin	Cabbage	Okra	Garlic		
Squash	Cauliflower	Pepper	Onion		
Watermelon	Collard	Tomato	Shallot		
	Kale		Sweet potato		
	Lettuce*				
	Mustard				
	Radish				
	Rutabaga				
	Spinach*				
	Swiss chard*				
	Turnip				

Crop Grouping for Rotation to Control Soil-borne Diseases

*Note – Lettuce, Spinach and Swiss chard are not brassicas, but are rotated with that group for the sake of convenience.

24

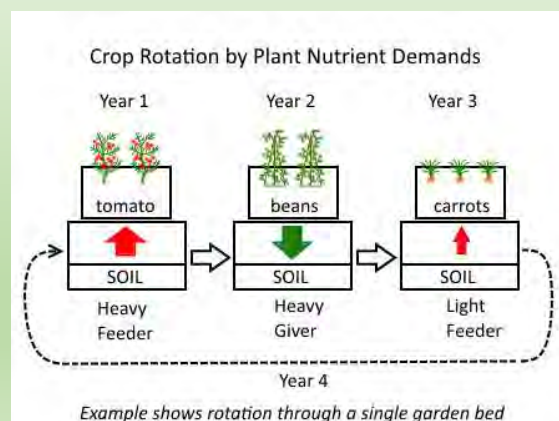
Crop Rotation by Plant Nutrient Demands

- In book *“How to Grow More Vegetables”* by John Jeavons, we learn of crop rotation system that categorizes plants as follows:
- **Heavy feeders** – most vegetables in this category, very hungry plants that take lots of nutrients from soil. Require lots of nitrogen especially, for green leafy growth.
- **Heavy Givers** – nitrogen-fixing plants that take nitrogen from air and convert it to a form usable by plants. They return nitrogen to the soil, maintaining soil fertility.
- **Light Feeders** – includes all root crops, only use a small amount of nutrients, giving the soil a rest and a chance to recover before the heavy feeders are planted once again.

25

Rotating Crops by Nutrient Demands

- To use this system, rotate in the order of
Heavy feeders -> Heavy givers -> Light feeders



26

Plants by Nutrient Categories

- **Heavy Feeders** – Asparagus, Beet, Broccoli, Brussels sprouts, Cabbage, Cantaloupe, Cauliflower, Celery, Collard, Corn (Sweet), Eggplant, Endive, Kale, Kohlrabi, Lettuce, Okra, Parsley, Pepper, Potato, Pumpkin, Radish, Rhubarb, Spinach, Squash (Summer), Strawberry, Sunflower, Tomato, Watermelon
- **Light Feeders** – (Root Crops) Carrot, Garlic, Leek, Mustard Greens, Onion, Parsnip, Rutabaga, Shallot, Sweet Potato, Swiss Chard
- **Heavy Givers** – (Legumes) Alfalfa, Beans, Clover, Peas, Peanut, Soybeans

27

Improve Soils With Green Manure Crops

- Sold as seed mixes, just sow into garden bed.
- **Warm Season green manures** include buckwheat, cowpea, French white millet, Japanese millet, lablab, mung bean, soybean.
- **Cool Season green manures** include broad bean, fenugreek, lupins, mustard, oats, subclover, vetch.



28

Cultural Controls – Keys to Soil Health

1. Build soil by adding organic matter
2. Rejuvenate the soil each season (Spring & Autumn) with the addition of compost and manure (fertiliser)
3. Compost restores SOIL STRUCTURE
4. Fertiliser replaces NUTRIENTS
5. Use mulch to protect soil – soil is alive and needs to be kept moist and dark!

Remember, unhealthy soils do not produce healthy plants!

29

Cultural Controls – Plant Selection

- “The Right Plant in the Right Place”
- When plants are in inappropriate location, they become weakened.
- **Pests and diseases attack weak plants**, their job is to remove them so other plants better suited to the location can grow there instead!
- Plants in the right location are healthy and vigorous, and can protect themselves well enough, **like they do in nature!**

30

Cultural Controls – Companion Planting

- Companion planting - Technique of planting two or more types of plants together for some kind of benefit.
- Good companions provide many benefits:
 - Control of pests
 - Increased health and vigour
 - Resistance to disease
 - Habitat for beneficial insects
 - Higher yields



31

Pest Repellent/Disease Suppressing

- Exude substances from roots, leaves or flowers that repel pests or suppress diseases and protect neighbouring plants.



Horseradish



Tansy



Clove Pinks

32

Pest Repellent/Disease Suppressing

- Some more examples...



Marigold



Santolina



Lemon/Citronella
Scented Pelargonium

33

Trap Cropping (Pest Decoys)

- A plant that is more attractive to pests can be planted nearby as a decoy or 'sacrificial plant'.



Horseradish



Nasturtium



Nettle

34

Trap Cropping (Pest Decoys)

- Dead end trap crops divert and kill pests insects.



Land Cress/Upland Cress

35

Shape Masking (Visual Camouflage)

- Some pests identify their food sources through physical outline (shape).
- Confuse pests by using mixed plantings!



36

Scent Masking

- Some pests identify their food through scent.
- Confuse pests with aromatic plants which mask the scent of neighbouring plants, plant upwind to protect whole garden.



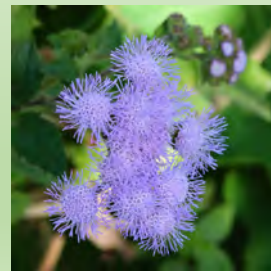
Wormwood



Lavender



Rosemary



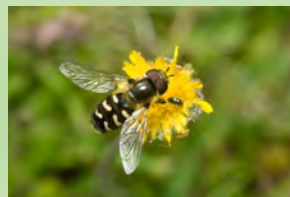
Perennial Ageratum

37

Biological Controls

Using biological control agents, the natural enemies of pests to keep their populations in check.

- Ladybirds
- Lacewings
- Hoverflies
- Predatory mites
- Parasitic wasps
- Nematodes
- Bacteria



38

Insectary Plants, Habitat for Beneficial Insects

- These are plants which attract insects .
- Provide beneficial insects with:
 - Nectar as an alternative food source
 - A habitat for them to live in (a home and place to overwinter).
- Grow perennial plants for permanent homes!



39

Plants to Attract Beneficial Insects

- *Asteraceae* (*Compositae*) and *Apiaceae* (*Umbelliferae*) families
- Beneficial predator insects have short mouthparts, need shallow flowers to feed!



Feverfew – *Asteraceae* (Daisy) family



Parsley – *Apiaceae* (Carrot) family

40

Plants to Attract Beneficial Insects

- Use plants from other families too, including long flowering natives.
- Nectar-rich plants also attract birds, which eat pests too!



Alyssum



Yarrow



Correa reflexa

41

Biological Control Lists – Ladybirds and Lacewings

- **Biological controls** include:
 - Spotted ladybirds (*Harmonia octomaculata* and *Harmonia conformis*) for control of aphids
 - Ladybird (*Cryptolaemus montrouzieri*) for control of mealybugs and soft scale insects.
 - Ladybird (*Chilocorus circumdatus*) for control of armoured scale insects.
 - Green lacewing (*Mallada signata*), generalist predators, for control of wide range of pests including aphids, scale insects, mealybugs, caterpillars, whitefly and mites.

42

Biological Control Lists – Predatory Mites

- **Biological controls** include:

- Persimilis predatory mite (*Phytoseiulus persimilis*) for control of spider mites.
- Montdorensis predatory mite (*Typhlodromips montdorensis*) for control of thrips, whitefly, other small insects and mites.
- Californicus predatory mite (*Neoseiulus californicus*) for the control of spider mites, broad mite and cyclamen mite.

43

Biological Control Lists – Parasitic Wasps

- **Biological controls** include:

- Aphytis parasitic wasp (*Aphytis lingnanensis*), parasite for control of red scale and other armoured scale insects
- Encarsia Parasitic wasp (*Encarsia Formosa*), parasite for control of greenhouse whitefly and tobacco whitefly.
- Eretmocerus parasitic wasp (*Eretmocerus hayati*), parasite for control of silverleaf whitefly.

44

Biological Control Lists – Parasitic Wasps

- **Biological controls** include:

- Parasitic wasp (*Trichogramma carverae*), moth egg parasite for control of codling moth, oriental fruit moth, light brown apple moth and other pest caterpillars.
- Parasitic wasp (*Trichogramma pretiosum*), moth egg parasite for control of heliothis and other pest caterpillars.



45

Biological Control Lists – Nematodes

- **Biological controls** include:

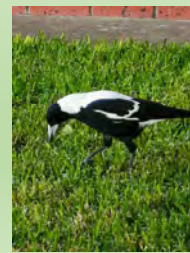
- Entomopathogenic nematode (*Heterorhabditis zealandica*) for control of scarab beetle, including lawn beetle grubs, and weevil control.
- Entomopathogenic nematode (*Steinernema feltiae*) for control of fungus gnats in indoor plants, nurseries, mushroom growing and hydroponic systems.

46

Biological Control Lists – Bacteria

- **Biological controls** include:

- Milky Spore (*Paenibacillus popilliae*) is a bacterial biological control primarily for **Japanese lawn beetle grubs** (which are also controlled by magpies!).
- BT (*Bacillus thuringiensis subsp. Kurstaki*) sold as **DiPel** or **Nature's Way Caterpillar Killer** and (*Bacillus thuringiensis subsp. Aizawai*) sold as **XenTari** are bacterial biological controls for caterpillars .



47

Biological Controls – Suppliers

- **Ecogrow** - <http://ecogrow.com.au>
- **Nemassist** - <http://www.nemassist.com.au/>
- **Biological Services** - <http://www.biologicalservices.com.au>
- **Bugs for Bugs** - <https://bugsforbugs.com.au/>

48

Chemical Controls

- Chemical control is the use of pesticides to control pests.
- Only used in IPM when needed, usually as a **last resort**, combined with other methods for more effective, long-term control.
- The most selective and least toxic pesticides that will do the job is preferred, leaving possibility of escalating to stronger pesticides.
- Used in ways that are safest for environment and people, spot spraying, minimising wind drift and runoff, avoiding spraying before rain, spraying in evening to protect bees.

49

Chemical Control – Modes of Action

Horticultural chemicals have different modes of action

- Selective – Used to eliminate specific pests
- Non-selective – Act on target and non-target pests
- Systemic – Applied directly to plants to kill pests feeding on them.
- Contact – Act by physical contact with the pest.
- Residual – (*Persistent*) Can persist in the soil for periods from a few hours to many years.
- Non-Residual – (*Non-Persistent*) Degraded by soil microorganisms to non-toxic substances.

50

Chemical Controls

Chemical Insecticide Controls include products such as:

- Natural horticultural oils – suffocating agents
- Neem oil based pesticides – anti-feedant and life-cycle disruptor
- Pyrethrum pesticides – non-specific, 24 hour persistence, synthetic synergists not organic certified!



51

Chemical Controls

Chemical Fungicide Controls include products such as:

- Copper fungicides
- Sulphur fungicides – wettable sulphur and lime sulphur
- Potassium bicarbonate fungicides – require wetting agent



52

Chemical Controls

Chemical Herbicide Controls include products such as:

- Plant oil based herbicides – geranium or pine oils, which burn leaves only
- Vinegar based herbicides – most contain salt (sodium chloride), make your own using cleaning vinegar and a touch of liquid soap.



53

Creating an IPM Program

- There are 6 major components common to all IPM programs:
 - 1. Monitoring** – use regular site inspections and trapping to determine pest types, numbers and damage.
 - 2. Action Levels** - set thresholds for when management action is needed, as pests are almost never eliminated completely.
 - 3. Prevention** – incorporate preventive measures (cultural controls) into existing structures and designs for new structures.

54

Creating an IPM Program

- There are 6 major components common to all IPM programs:
4. **Pest identification** – keep records to identify patterns and trends in pest outbreaks, and which pests are the problem.
 5. **Controls** - use combinations of physical-mechanical, cultural, biological and chemical controls (last resort, least toxic first) to reduce pest problem.
 6. **Evaluation** - assess and review effectiveness of pest management strategies.

55

The Ecological Approach to IPM Strategy

- To manage a pest, it must be understood in terms of biology and ecology (possum or fruit bat for example):
- Identify the pest as accurately as possible.
- Learn about the pest's habits, life cycle, needs and dislikes.
- Try to exclude the pest from the area, if possible by making it inhospitable to its survival or reproduction.
- Try to remove food, water and shelter which the pest uses.
- Locate the pest's home and determine the travel patterns.
- Identify all possible control options available before taking action.

56

Common Garden Pests & Their Control

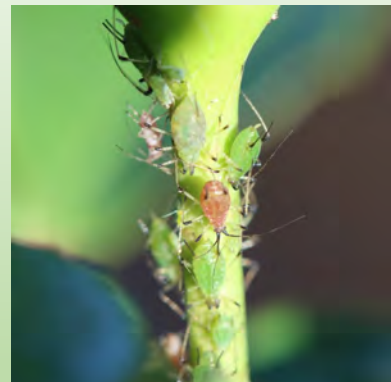
Who's who in the zoo! – list of garden pests

- Identification
- Prevention
- First line of control
- Last resort measures

57

Aphids

- New growth is seriously malformed, with lots of ants on plant stems
- Plant parts are sticky from honeydew, leading to sooty mould.
- Fond of yellow flowers, warm moist environments, succulent new growth (esp. roses, many vegies, and citrus trees).



58

Aphids

Prevention

- Encourage predatory insects, such as ladybirds, lacewings, hover flies.
- Repel ants by planting Tansy and Pennyroyal close by.
- Plant Garlic or Chives under citrus trees

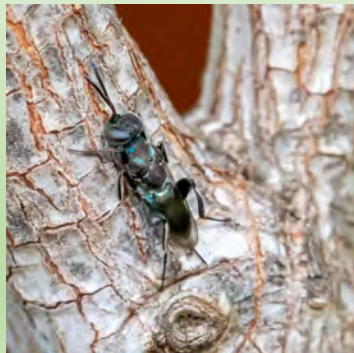
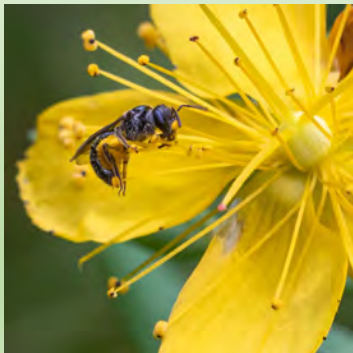


59

Aphids

Prevention

- Encourage **beneficial wasps**, these are nectar feeders which parasitise aphids.

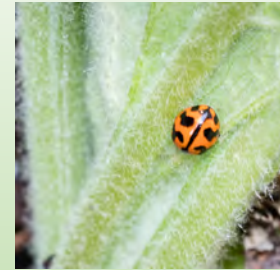


60

Aphids

First Option

- Squash by hand or hose off with strong jet of water
- Use sticky traps
- Place a yellow dish, half filled with water nearby.
- Place a flattened square of aluminium foil at base of plants



Last Resort

- Use a horticultural soap spray or Pyrethrum spray
- Spray fruit trees bark & trunk bases with Winter Oil or Pest Oil to smother eggs



61

Aphids

Prevention

- **Glue banding trees** to prevent ants carrying up scale onto trees or defending their aphid colonies which they farm for honeydew.
- Beneficial insects will quickly clean up undefended pests.



62

Aphids

Prevention

- **Glue banding trees** either ready to apply or uses cardboard wrap and adhesive.
- Ants can also be baited to reduce their numbers with DIY borax-sugar trap.



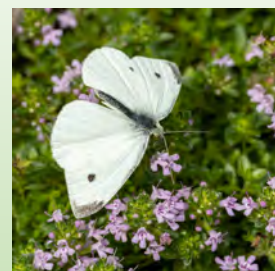
63

Cabbage White Butterfly

- Larvae (caterpillars) eat through the leaves of cabbage, tomato and other plants.
- Leave holes in the outer edges of leaves, and green poo on nearby leaves

Prevention

- Decoys: white eggshells or white plastic butterfly shapes
- Use companion plants which attract parasitic wasps
- Use aromatic companion plants to confuse scent



64

Cabbage White Butterfly

First option

- Hand removal - Collect in a bucket and feed to the chooks
- Squash caterpillars and leave remains on leaves

Last Resort

- Use 'Dipel' - *Bacillus thuringiensis* (BT) bacteria or
- Use 'Success' - spinosad, low toxicity insecticide synthetically derived from toxic metabolites of specific soil bacteria.

65

Citrus Leaf Miner

- Citrus leaf miner moths are attracted to new growth flushes of citrus trees.
- Once the leaves harden, the pest will not be able to mine the leaves.
- Do not prune off damaged because undamaged continue to produce food for the tree.

Prevention

- Do not apply nitrogen fertilizer at times of the year when leaf miner populations are high.
- Use companion plants to attract parasitic wasps.
- Avoid pruning live branches more than once a year, so that the cycles of new growth are uniform and short.



66

Citrus Leaf Miner

First option

- Crush up the rolled leaf margins with the pupa inside

Last Resort

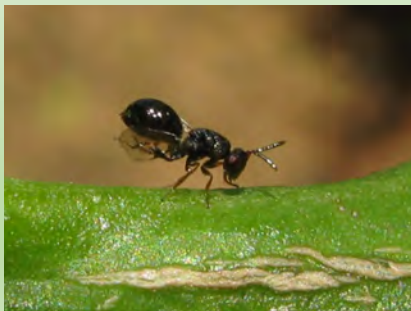
- Spray with White Oil to smother the larvae



67

Citrus Gall Wasp

- Citrus Gall Wasp attack citrus trees of all kinds (native and exotic).
- Small wasp, 3mm long, lays up to 100 eggs at a time in the young stems, which hatch in September (spring).

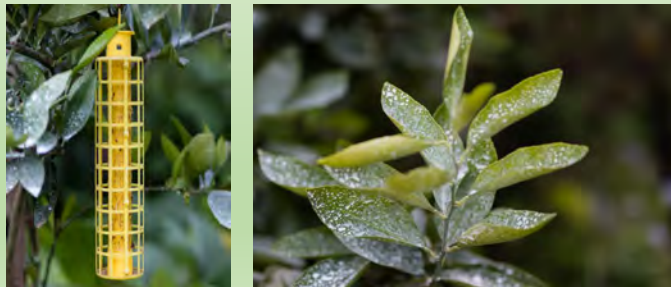


68

Citrus Gall Wasp

Prevention

- Hang yellow sticky traps in the infected tree to attract and trap adult wasps.
- Spray new growth with calcined kaolin to discourage egg laying.



69

Citrus Gall Wasp

First (and only) Option

- Check trees in July, remove all infected stems (cut back behind the galls) by the end of August at the latest.
- Destroy the removed stems by burning or wrap them in a plastic bag and put in the garbage. Never add them to the compost heap!
- Can also slice the side of gall during autumn and winter to dry out dormant pest.



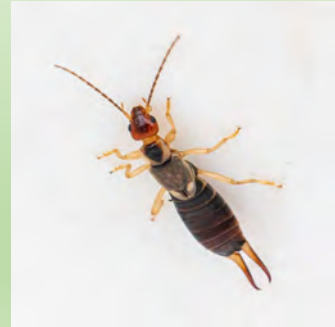
70

Earwigs

- Attack growing tips, stems, flowers and fruits.
- Eat seedling roots, and can destroy a bed in a single night
- Thrive in over-worked gardens and love organic mulches

Prevention

- Create a diverse garden to attract predators.
- Clean up garden debris that provides hiding places (only if earwigs are a problem!), otherwise you'll be removing homes of beneficial predatory insects such as carabid beetles and centipedes.

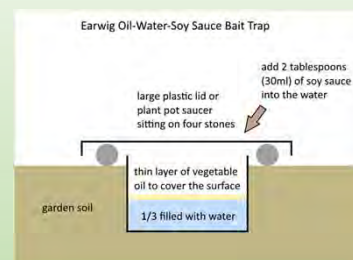


71

Earwigs

First Option

- Set a few traps baited with soy sauce and a thin film of vegetable oil on top and bury to rim in mulch.
- Half fill a jar with beer and lay it on its side where earwigs are active.
- Create a trap by crumpling newspaper and stuffing it inside a flower pot. Later destroy the paper with the earwigs inside it.



72

Pear and Cherry Slug

- These pests are the sawfly larvae, which eats the leaves of pears, cherries, plums, apples, quinces and hawthorns.

Prevention

- Encourage natural predators such as paper wasps, hoverflies, lacewings, spiders and birds.
- Fence bantams under the tree during winter to destroy overwintering pupae.



73

Pear and Cherry Slug

First option

- Dry out their slimy bodies with flour, talcum powder, dolomite or wood ash. Stand upwind of the tree and throw over it. Or put in a stocking and dust over leaves.
- Try a home-made 'Glue Spray'
- Hose them off the leaves with a strong jet of water and band the tree with a horticultural glue to prevent them climbing back up.

Last resort

- Spray leaves with Yates Success or a pyrethrum based insecticide



74

Scale

Prevention

- Attract natural predators of scale such as ladybirds, lacewings, spiders and tiny parasitoid wasps by growing flowers which provide an all-year round food source.

First Option

- Scrape them off using old toothbrush
- Control ants which protect scale from natural predators

Last resort

- Use an insecticidal soap sprays such as **Natrasoap**
- Smother them with an oil spray, such as White Oil, Pest Oil or Eco Oil.



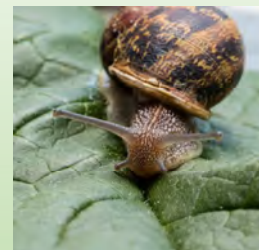
75

Snails and Slugs

- Eat seedlings to the ground overnight. Leave big holes in middle of leaves, and shiny silver trails.
- Appear at night, after rain, love cool, moist weather

Prevention

- Handpick to reduce their numbers - seek them out in their favourite hiding places e.g. strappy leafed plants and squash them on a wet night.
- Grow sacrificial plants such as horseradish.



76

Snails and Slugs

First option

- Use barriers to protect vulnerable plants - crushed eggshells, lime, wood ash, coffee grounds, wood shavings, sawdust or copper banding around plants or pots.
- Spray a strong coffee brew on plants and soil - 10 parts water, one part espresso coffee (*instant coffee is too weak*).



77

Snails and Slugs

First option

- Make traps - beer traps, citrus halves open end down or inverted pots (check in morning!)
- Mulch area with strong smelling herbs like wormwood, mint, tansy, lemon balm.



78

Snails and Slugs

Last Resort

- Snail baits based on chelated iron (*not metaldehyde as it is toxic to pets and humans*).
- Elemental iron pellets also available now, even safer.
- Hunt snails with ammonia spray – 1 part cloudy ammonia, 4 parts water, dash of liquid soap.
- Don't use salt to melt snails, salt is bad for the soil!



79

Spider Mites (Two Spotted Mites)

- These pests live on underside of leaves, upper surface of leaves is mottled.
- Rubbing finger across underside of leaf leaves a red smear along fingertip.
- Feed on a many plants, especially beans, berry fruits, capsicums, cucumbers, roses, strawberries, tomatoes as well as apple and peach trees.

Prevention

- Keep plants healthy by feeding, mulching, watering.
- Encourage predatory mites by making compost, mulch the soil and avoiding chemical insecticides.
- Mist underside of plant leaves regularly.
- Foliar feed with organic liquid fertiliser eg Charlie Carp.



80

Spider Mites (Two Spotted Mites)

First Option

- Prune off affected growth and raise humidity around new growth.
- Try a high pressure hosing in the early morning, 3 days in a row.

Last resort

- Spray with a horticultural soap such as **Natrasoap** or horticultural oil.
- Dust with **Wettable Sulphur**.



81

Whitefly

- Small white moths, 1mm long, which suck the sap from the underside of the leaf, and excrete 'honeydew' which can cause black sooty mould. Eggs hatch in 8 days and a complete lifecycle is completed in 20-30 days!

Prevention

- Avoid using an excessive nitrogen fertilizer, as the weak, sappy growth will increase whitefly populations.
- Encourage whitefly predators such as ladybirds, lacewings, hoverflies, ground beetles, spiders, mirid bugs, damsel bugs and small birds.
- Plant nasturtiums to repel the pest



82

Whitefly

First Option

- Try a high pressure hosing in the early morning, 3 days in a row.
- Reduce their numbers by using sticky yellow traps, or tolerate small outbreaks.

Last resort

- Horticultural soap spray such as **Natrasoap** every 2-3 days for 2 weeks.
- Horticultural oil such as **Eco-Oil** or **White Oil**.
- **Pyrethrum** or **Neem** spray.

83

Queensland Fruit Fly

- Hang Queensland fruit fly **pheromone traps** (such as the *Eco-lure trap* or *Ryset Fruit Fly Trap*) in foliage at beginning of spring season to trap male flies, check regularly.
- Eco-lure traps effective for 3 months, take replacement wick.
- Ryset traps topped up with Wild Mays attractant.



84

Queensland Fruit Fly

- When male QFF appear in pheromone traps, they're active and starting to mate
- Time to apply a **sugar-protein spinosad insecticide** (such as Eco-naturalure or Nature's Way Fruit Fly Control) to also control females.
- Apply insecticides 5 weeks before ripening – recommend time as early as petal drop, as QFF sting green fruit as small as marbles. Apply weekly and after rain.



85

Queensland Fruit Fly

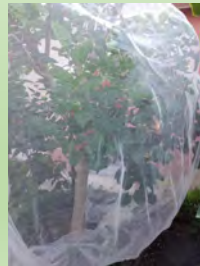
- Use **sugar-protein liquid bait traps** (such as Cera Trap) before fruit flies start attacking fruit, when fruit are small and still developing.
- Ideally, hang traps when fruit reaches approx 1/3 final size. To reduce pest numbers, install traps at least 45 days prior to fruit ripening.
- Refill traps after 3-4 months when liquid evaporates.



86

Queensland Fruit Fly

- Net trees and berries with **insect exclusion netting** or fruit bunches with **insect exclusion netting bags** when fruit first starts forming.
- Once pollination has occurred, all insects can be excluded. Summer prune new growth back by half to make netting easier.



87

Possums

- Possums can destroy everything from seedlings to trees
- Eaten leaves, missing buds, hollowed fruits, chewed vegies, broken branches.
- Are creatures of habit!



88

Possums

Preventative measures

- Net affected plants with bird netting or insect exclusion netting.
- Sprinkle blood & bone around base of target plants.
- Spray or interrupt possum highways.
- Camphor balls or blood & bone in stocking hung in trees.
- Spray plants with garlic and chilli spray, **Lapsang Souchong tea spray**, **Quassia chips**, Indonesian Fish Sauce or fish emulsion, sprayed weekly onto foliage.

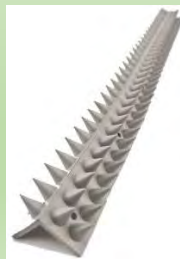


89

Possums

Preventative measures

- Electric fences along fencing (away from trees)
- Possum spikes, such as Thorny Devil barriers
- Deterrent animals (pets!)



90

Leaf Curl on Peaches & Nectarines

- Affects stone fruit - peach, nectarine, apricot and almond.
- Thickened pinkish or green blisters on the leaves, tree may lose all leaves. Spread by water



Preventative measures

- Spray at leaf fall and again at early bud swell with Lime Sulphur or Copper Oxychloride. Spray regularly, especially if there has been rain.
- If leaves are infected, clean away all infected leaves, twigs and fallen fruit from the ground. Provide potash to the tree in spring to increase resistance to fungal attack.
- *Note – if you can see the damage, it is too late to spray!*

91

Powdery Mildew

- Affects many plants, esp. cucumbers, pumpkins, peas, turnips, grapes, pawpaw, strawberries and some apples.
- Circular white powdery spots on older leaves and stems which spread and kill the leaf. Spread by wind, worse in dry weather with evening dew.



92

Powdery Mildew

Prevention

- Use mulch and avoid watering from overhead which leaves the leaves wet.
- Water in the morning so leaves can dry, not in evening when leaves stay wet.
- Select resistant plant varieties, keep plants healthy & vigorous with plenty of sun.
- Spray susceptible plants with seaweed extract.
- Fertilise with potash and an organic fertiliser after the first flush of flowers.
- Spray grapes when the shoots are first starting, with a potassium bicarbonate or milk spray.
- Reduce humidity around plant foliage and improve air circulation.
- Remove leaves as soon as they are affected.

93

Powdery Mildew

First option

- Use a potassium bicarbonate spray (30-40g/10L water + 20ml liquid soap)
- Use milk spray (one part of the organic milk to 10 parts water) - *organic milk has antibiotic qualities!*
- Use Casuarina spray (500g fresh Casuarina needles in 1 litre water, bring to the boil and simmer for 20 minutes. Add 25ml to one litre of water and spray)

Last resort

- Copper-based fungal sprays, or Lime Sulphur

94

One More Thing...

- If you have been using chemical controls in your garden, *it will take some time for beneficial insect numbers to increase, so be patient.*
- Remember, **without any food, beneficial insects won't survive** either, so you must be able to tolerate a low level of insect pest damage.

Thank You!



95

End of Session Questions?



96