



australian almonds

Almond IPM Workshop

Module 1 Introduction

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Introduction

- APVMA undertaking a review of chemicals
- Compounds need to meet contemporary standards:
 - OH&S
 - Environment
 - Consumer exposure

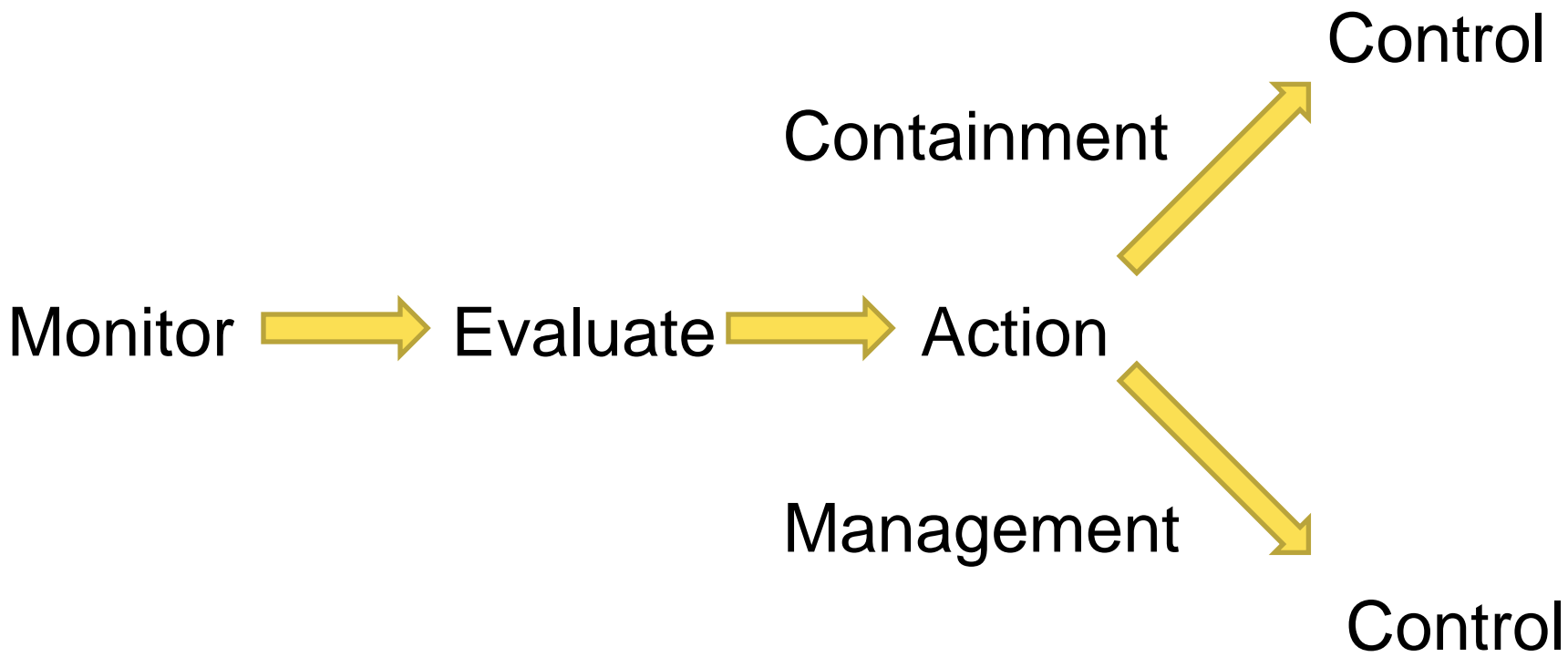
Introduction

- 29 chemicals currently under review including paraquat & diquat
- 40 chemicals nominated for review including propiconazole (e.g. Tilt), chlorothalonil (e.g. Bravo), dithiocarbamates (e.g. Mancozeb) and simazine



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Integrated Pest Management (IPM)



Six Steps to Controlling Pests & Diseases

1. Setup & maintain orchard to minimise pests & diseases
2. Start the season with a plan
- 3. Monitoring**
4. Take appropriate action only
5. Post-harvest assessment
6. Revise plan for the next season

Six Steps to Controlling Pests & Diseases

1. Setup & maintain the orchard to minimise pests & diseases (hygiene / cultural practices / start with clean trees)
2. Start the season with a plan to provide a deliberate course of action specific to your situation.

Consider resources (staff or time, equipment, outside support), profitability, risks, efficiency and the environment. Ask yourself questions!

3. Monitor

- Which blocks will I monitor?
 - Target patches with a history of infection & damage
 - Consider tree age and orchard topography (e.g. soil type, low lying areas, dust or high traffic locations)
 - Start small & work up if problems detected
 - Same trees/path v's different trees/path
 - Quality is better than quantity

3. Monitor

- Sample units

Orchard Size Hectares	Sites Assessed	No. of trees sampled	Time taken to check block (minutes)
<10	2	30	30
11-40	3-4	60	45-60
41-100	5-6	90	60-90
101-400	7-8	120	90-120

3. Monitor

- Who will monitor?
 - Owner, TO, consultant
- How much time should I spend monitoring?
 - 15 minutes per site every 7-14 days through peak season (7 days if emerging problem / high risk period)

3. Monitor

- Equipment
 - Weather data, onsite or neighbouring weather stations
 - 10x hand lens
 - Good record keeping including date, growth stage, numerical descriptions (enables effective review to take place at the end of the year and provides a useful reference point in future years)

3. Monitor

- What pests & diseases are likely to cause problems?
 - Major endemic pests
 - What if any pests / diseases have been present in your block over the last 4 years
- Become familiar with the identification & life cycles of your pests, diseases & beneficial organisms

3. Monitor

- Parasites - An organism which develops in or on its host and causes death of the host e.g. Trichogramma, Aphidius
- Predators – An animal that feeds on other animals, killing two or more prey during its lifetime e.g. Lacewings, Stethorus, 6 Spotted thrips, Mites etc
- Pathogens – Organisms that causes disease, e.g. Viruses, bacteria, fungi etc

3. Monitor

- What are my action thresholds for each pest & disease?
 - At what point is there going to be unacceptable financial loss?
 - Will vary according to pest organism, stage of crop cycle, presence of natural control agents

4. Take appropriate action only

- IPM friendly/soft v's cheaper chemicals
 - Avoid broad-spectrum chemicals such as organophosphates, carbamates and synthetic pyrethroids.
 - Some fungicides & selective insecticides (e.g. miticides) still **do** harm beneficial organisms

4. Take action only if you need to

- IPM friendly

Pesticide	Active Ingredient	Trade Names	Comments
Insecticides	pymetrozine	Chess	Systemic
Miticides	bifenazate	Acramite	Contact & residual against motiles, generally ladybird friendly
	clofentazine	Apollo	Mite growth inhibitor
Fungicides	chlorothalonil	Bravo	Protectant fungicide
	propiconazole	Tilt	Systemic, curative only
	pyraclostrobin	Cabrio	Protectant fungicide
	Captan (NR)	Captan	Protectant fungicide

4. Take action only if you need to

- To be used with caution in IPM programs

Pesticide	Active Ingredient	Trade Names	Comments
Insecticides	pirimicarb	Pirimor	Selective, systemic aphicide
Fungicides	mancozeb	Dithane	Protectant fungicide
	sulphur		Protectant fungicide, some miticide activity

Source: IPDM for Australian Summerfruit

4. Take action only if you need to

- To be used only in an emergency in IPM programs

Pesticide	Active Ingredient	Trade Names	Comments
Miticides	abamectin	Vertimec	Contact & ingestion
	dicofol	Kelthane	Non-systemic with contact

Source: IPDM for Australian Summerfruit

4. Take action only if you need to

- Coverage, water rates

Tree size	Approx age (yrs)	Water rate (L / Ha)	
		Dormant oil	Other sprays
Small	1 – 2	500 – 1,000	300 - 600
Small – Medium	3 – 4	1,500 – 2,000	600 – 1,000
Medium – Large	4 – 6	2,500 – 3,000	1,200 – 2,000
Large +	6+	3,000 – 3,500	1,500 – 2,500

4. Take action only if you need to

- Spraying speed
 - Fungicides/insecticides/nutrient = approx 5 km/hr
 - Dormant oil = approx 2.5 – 3.5 km/hr
- Spraying conditions
 - Temperature $<28^{\circ}\text{C}$
 - RH $>45\%$
 - Delta T between 2 and 8, <10
 - Wind speed 3-15 km/hr

4. Take action only if you need to

- Compatibility
 - Check labels
 - Wetters not always required
- Resistance management
 - Refer to label
 - Avoid multiple, consecutive sprays of single-site chemicals (over use increases selection pressure)
 - Multiple site fungicides have an inherently low risk of resistance

Fungicides

Activity Group	Trade Name	Active Constituent	Resistance Potential	Systemic Action	Mode of Action
2	Rovral	iprodione	High	Yes	Single-site
3	Tilt	propiconazole	High	Yes?	Single-site
11	Amistar	azoxystrobin	High	Yes?	Single-site
11	Cabrio	pyraclostrobin	High	Yes?	Single-site
33	Foli-r-Fos	phosphorus acid	Low	Yes	Multi-site
M1	Kocide Blue Extra	copper	Low	No	Multi-site
M2	Sulphur	sulphur	Low	No	Multi-site
M3	Dithane	mancozeb	Low	No	Multi-site
M5	Bravo	chlorothalonil	Low	No	Multi-site

? Observed but not experimentally proven

Fungicide Efficacy

Fungicide	Brown Rot	Anthraco nose	Shot Hole	Rust	Leaf Blight
Rovral	+++	---- (NR)	+++ (NR)	---- (NR)	ND (NR)
Tilt	++++	++++	+ (NR)	+++ (NR)	ND (NR)
Amistar	+++ (NR)	++++	+++ (NR)	++++ (NR)	+++ (NR)
Cabrio	++ (NR)	++++ (NR)	(NR)	++++	(NR)
Foli-r-Fos	----	----	----	----	----
Kocide Blue Xtra	+/- (NR)	---- (NR)	+	---- (NR)	---- (NR)
Sulphur	+/-	---- (NR)	---- (NR)	++	---- (NR)
Dithane	++	++ (NR)	++ (NR)	+++ (NR)	++ (NR)
Bravo	++ (NR)	+++ (NR)	+++	++++	ND (NR)

++++ = excellent & consistent, +++ = good & reliable, ++ = moderate & variable, + = limited and/or erratic, +/- = minimal & often ineffective, ---- = ineffective, ND = no data, NR = not registered



Source: Adapted from UC Davis IPM



Fungicide Treatment Timing

Disease	Dormant	Bloom			Spring		Summer	
		Pink Bud	Full Bloom	Petal Fall	2 weeks	5 weeks	Dec	Jan
Anthracnose	----	++	+++	+++	+++	+++	+++	++
Brown Rot	----	++	+++	+	----	----	----	----
Leaf Blight	----	----	+++	++	+	----	----	----
Shot Hole	+	+	++	+++	+++	++	----	----
Rust	----	----	----	----	----	+++	+++	+

+++ = good & reliable, ++ = moderate & variable, + = limited and/or erratic, ---- = ineffective,

Source: UC Davis IPM

Insecticides

Activity Group	Trade Name	Active Constituent	Systemic Action	Beneficial Toxicity
1A	Pirimor	pirimicarb	Systemic & Ingestion	Low/Mod/High
2D	Acramite	bifenazate	Contact & Residual	Low
6A	Vertimec	abamectin	Contact & Ingestion	Mod/High
9A	Chess	pymetrozine	Systemic	Low/Mod
10A	Apollo	clofentezine	Contact	Low

Insecticide Efficacy


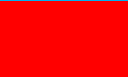
Insecticide	Carob Moth	San Jose Scale	Aphids	Bryobia Mite		Two-Spotted Mite	
				Eggs	Motiles	Eggs	Motiles
Pirimor	NR	NR	+++	NR	NR	NR	NR
Acramite	NR	NR	NR	+/-	+++	+/-	+++
Vertimec	NR	NR	NR	+++	+++	+++	+++
Chess	NR	NR	+++	NR	NR	NR	NR
Apollo	NR	NR	NR	+++	+/-	+++	+/-
Petroleum Oil	NR	+++	NR	+++	+/-	+++	+/-

+++ = good & reliable, +/- = minimal & often ineffective, NR = not registered

Pest & Disease Calendar

- Root & Crown Rots

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Phytophthora	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor			Monitor	Monitor		
			Damage period	Damage period	Damage period	Damage period	Damage period		Damage period	Damage period		
Crown Gall	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
	Damage period	Damage period	Damage period	Damage period	Damage period	Damage period	Damage period	Damage period	Damage period	Damage period	Damage period	Damage period
Armillaria	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor	Monitor
			Damage period	Damage period	Damage period	Damage period	Damage period					

 Monitor
 Damage period



Pest & Disease Calendar

- Trunk & Branch Cankers

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Bacterial Canker	Monitor	Monitor	Monitor	Monitor	Monitor							
	Damage period	Damage period	Damage period	Damage period							Damage period	Damage period

Monitor

Damage period

Pest & Disease Calendar

- Vascular System Diseases



	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Verticillium Wilt												

	Monitor
	Damage period

Pest & Disease Calendar

- Branch, Foliage & Fruit Diseases

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Blossom /Twig Blight	Monitor	Monitor	Monitor									
	Damage period	Damage period	Damage period									
Shot Hole		Monitor	Monitor	Monitor								
		Damage period	Damage period	Damage period	Damage period							
Anthracnose			Monitor	Monitor	Monitor	Monitor	Monitor					
			Damage period	Damage period	Damage period	Damage period						



 Monitor
 Damage period



Pest & Disease Calendar

- Branch, Foliage & Fruit Diseases

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Rust					Monitor	Monitor	Monitor	Monitor	Monitor			
						Damage period	Damage period	Damage period	Damage period			
Leaf Blight		Monitor	Monitor	Monitor	Monitor	Monitor	Monitor					
		Damage period	Damage period	Damage period	Damage period	Damage period	Damage period					
Hull Rot						Monitor	Monitor	Monitor	Monitor			
						Damage period	Damage period	Damage period	Damage period			

 Monitor
 Damage period



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Pest & Disease Calendar

- Branch, Foliage & Fruit Diseases

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
NIBF			■	■	■	■						
			■	■	■	■	■	■	■	■		

■ Monitor
■ Damage period







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Pest & Disease Calendar

- Insects

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Bryobia	Blue	Blue	Blue	Blue	Blue	Blue						
Mites			Red	Red	Red	Red	Red	Red	Red			
Aphids		Blue	Blue	Blue	Blue							
		Red	Red	Red	Red							
San Jose Scale	Blue	Blue	Blue	Blue	Blue	Blue						Blue
			Red	Red	Red	Red	Red	Red	Red	Red		



 Monitor
 Damage period



Pest & Disease Calendar

- Insects

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Two-Spotted Mite					Monitor	Monitor	Monitor	Monitor				
						Damage period	Damage period	Damage period				
Carob Moth				Monitor	Monitor	Monitor	Monitor	Monitor				
							Damage period	Damage period	Damage period	Damage period		

 Monitor
 Damage period

References

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www.croplifeaustralia.org.au

Acknowledgments

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