

# Green peach aphid resistance management



**Integrated  
Crop Protection**  
PROTECTING CROPS

**Hort  
Innovation**



**RMCG**



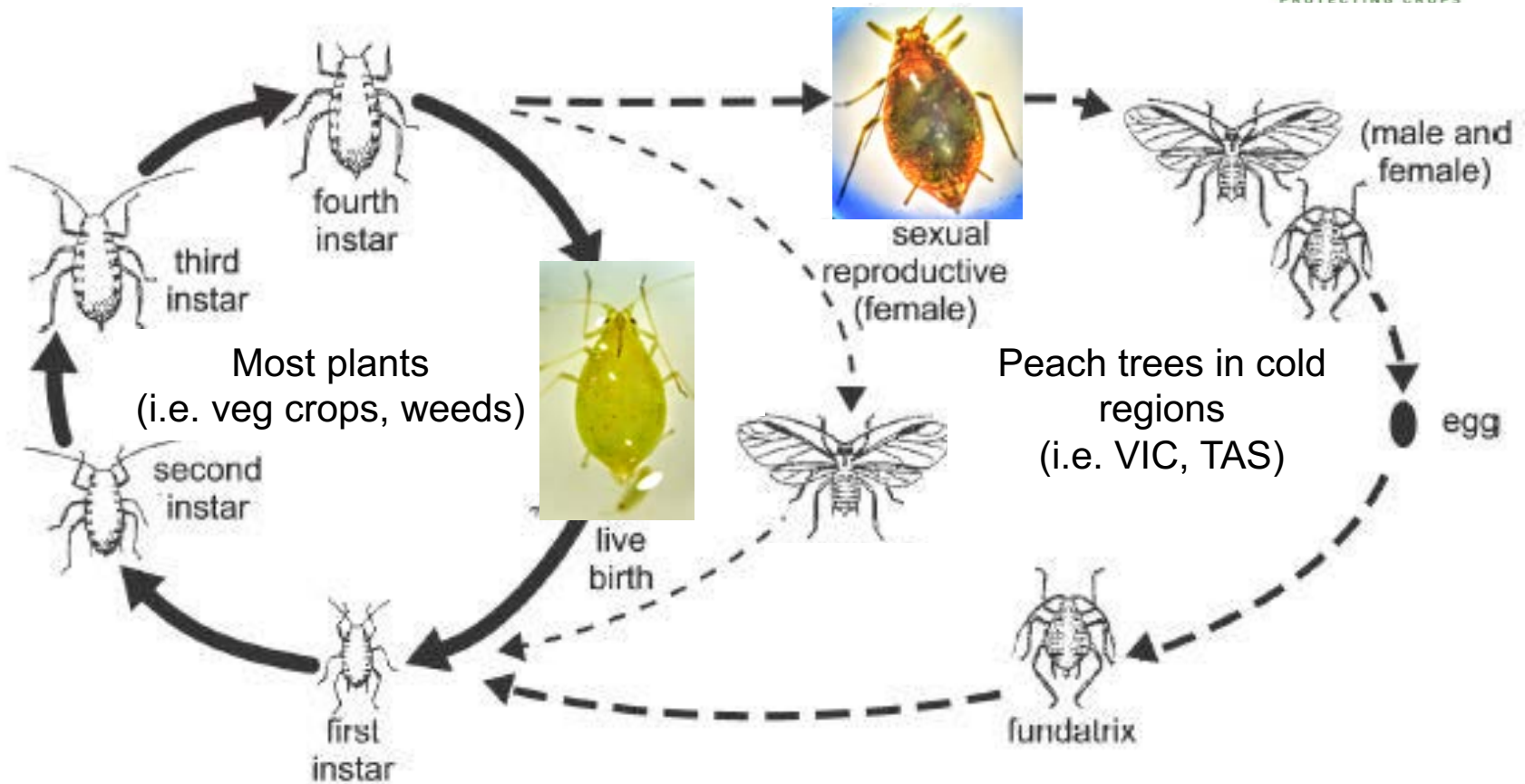
# Green peach aphid (*Myzus persicae*)



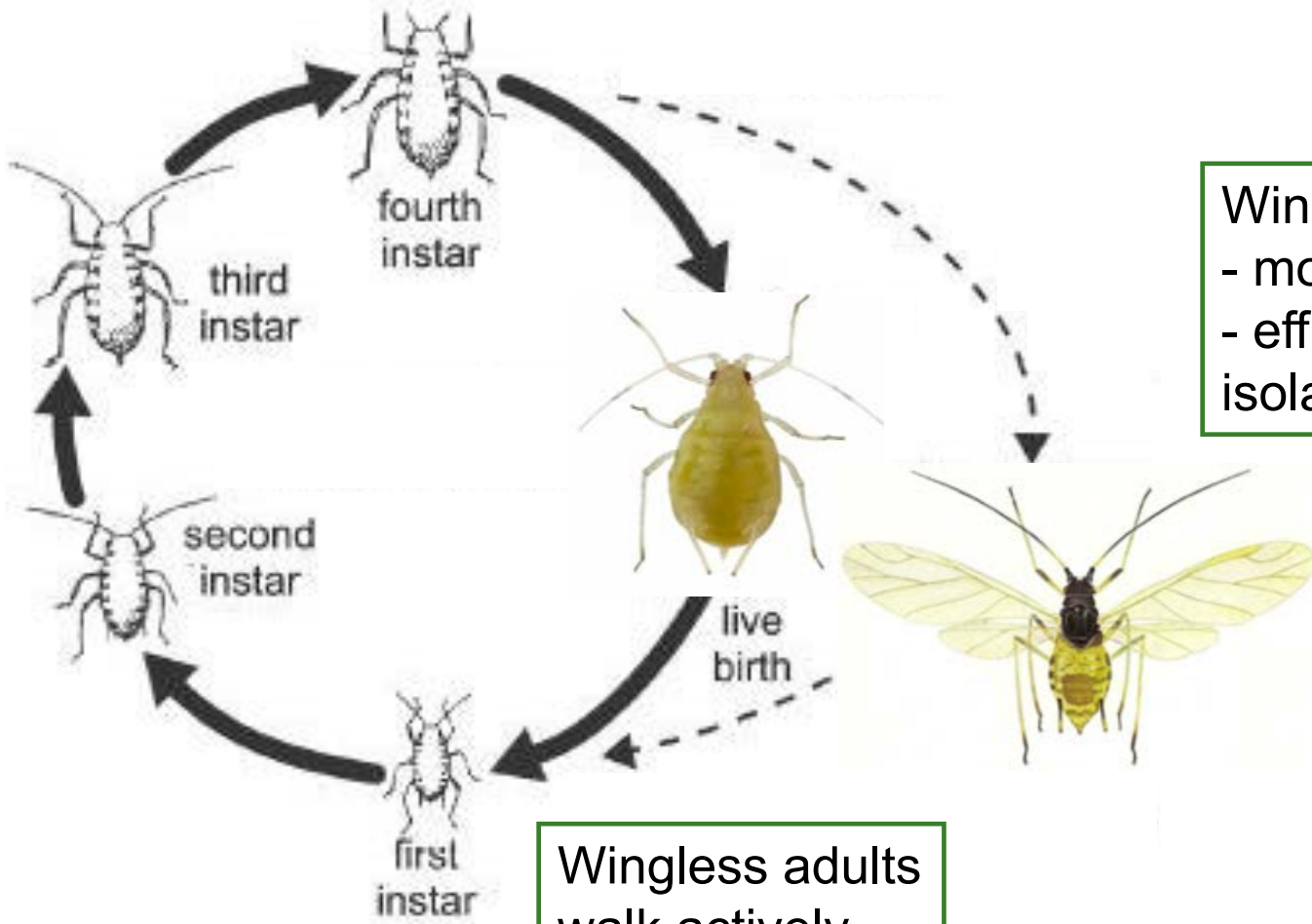
- Exotic species, widely distributed within Australia
- Attacks a wide variety of horticultural and broadacre crops.
- Vector of over 100 plant viruses. Plant damage from feeding and honeydew that can lead to sooty mold.
- Numbers highly influenced by temperature (and rainfall)
- Within Australia mostly reproduces asexually (live young), with some sexual reproduction in colder regions.
- Worldwide pest with a high propensity to develop resistance



# Green Peach Aphid Life Cycle



# Green Peach Aphid Life Cycle



**Winged GPA:**

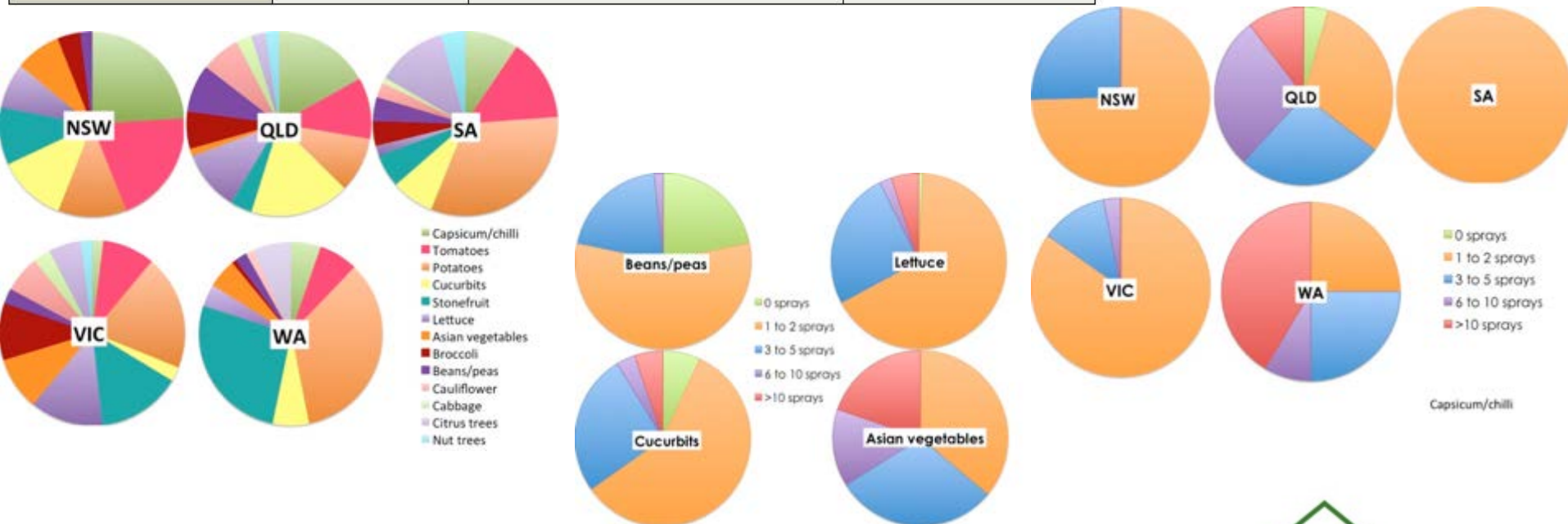
- move on wind currents.
- efficient at locating isolated host plants.

**Wingless adults walk actively between plants**

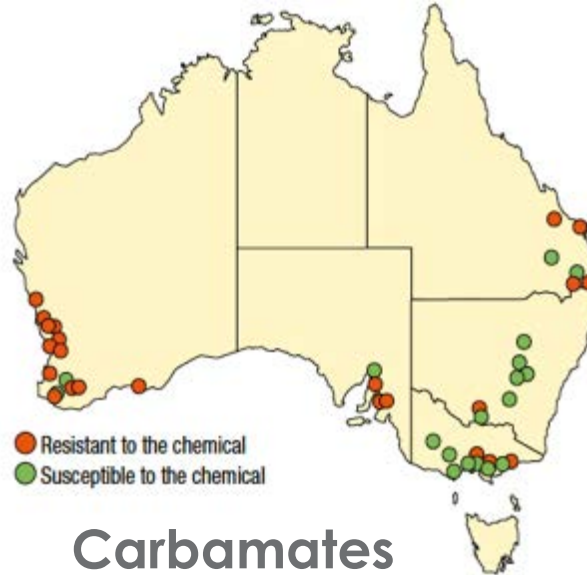
**Generation Time:**  
6 – 17 days  
<2 weeks under ideal conditions



IRAC MoA group	Insecticide category	Active ingredient(s)	Example trade names
GROUP 1A INSECTICIDE	Carbamates	pirimicarb	Pirimicarb, Pirimor
GROUP 1B INSECTICIDE	Organophosphates	chlorpyrifos, diazinon, dimethoate, maldison, omethoate, phorate	Strike Out, Danadim, Fyanon, Thimet, Fokus, Pyrinex Super <sup>1</sup>
GROUP 3A INSECTICIDE	Synthetic Pyrethroids	permethrin, piperonyl butoxide, pyrethrins, tau-fluvalinate	Ambush, Klartan, Pyrinex Super <sup>1</sup>
GROUP 4A INSECTICIDE	Neonicotinoids	acetamiprid, imidacloprid, thiamethoxam	Intruder, Confidor, Nuprid, Actara, Durivo <sup>2</sup>
GROUP 4C INSECTICIDE	Sulfoximines	sulfoxaflor (Isoclast™ active)	Transform
GROUP 9B INSECTICIDE	Pymetrozine	pymetrozine	Chess, Endgame
GROUP 23 INSECTICIDE	Tetronic and Tetramic acid derivatives	spirotetramat (iso)	Movento
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GROUP 29 INSECTICIDE	Fonicamid	fonicamid	Mainman

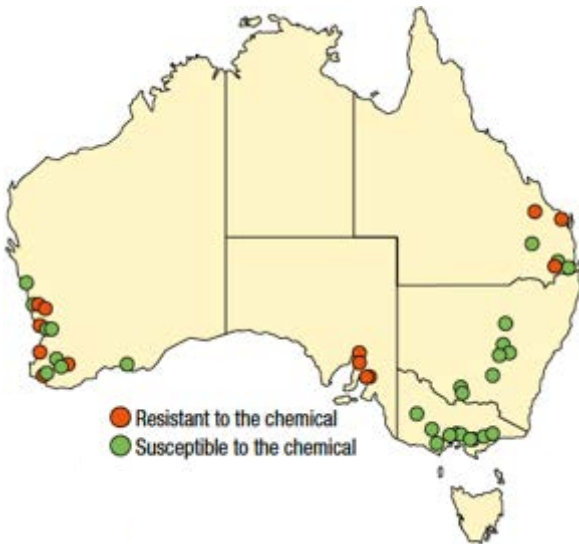


# Green Peach Aphid Resistance 2012



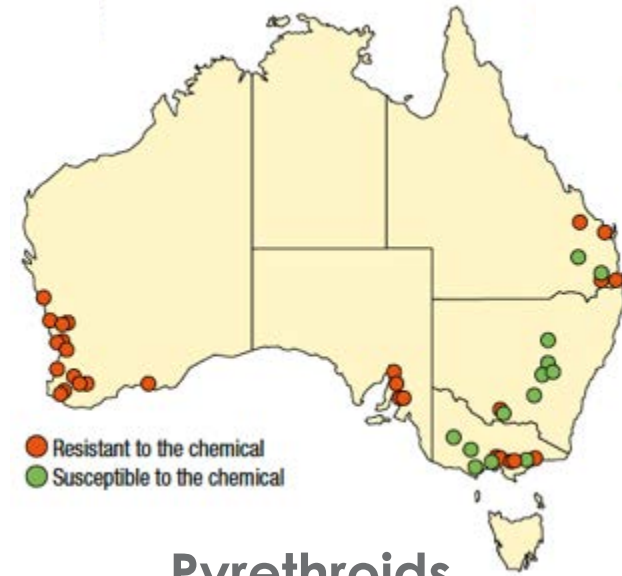
- Resistant to the chemical
- Susceptible to the chemical

## Carbamates



- Resistant to the chemical
- Susceptible to the chemical

## Organophosphates



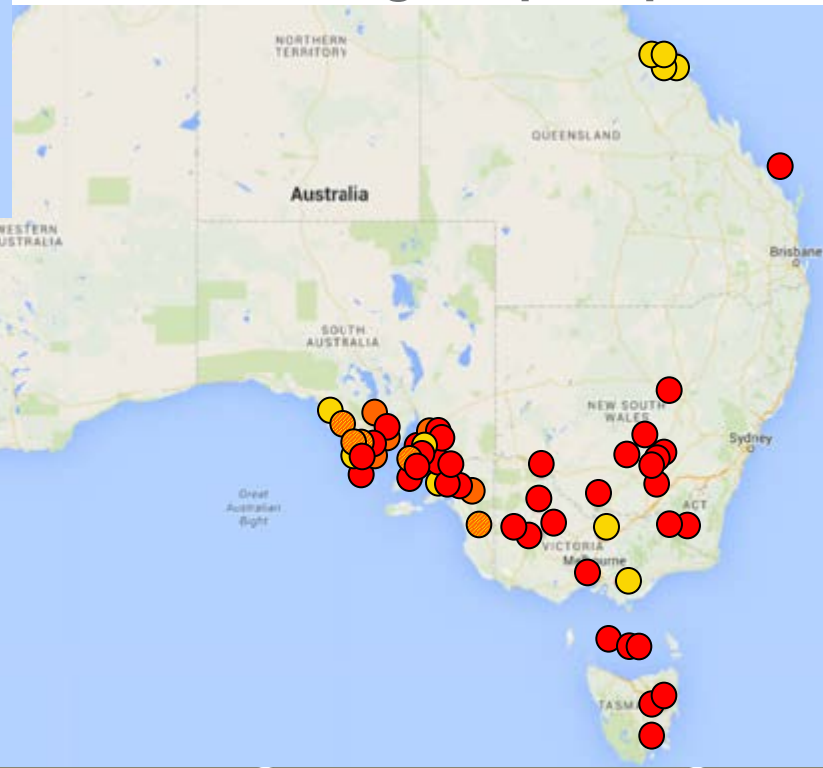
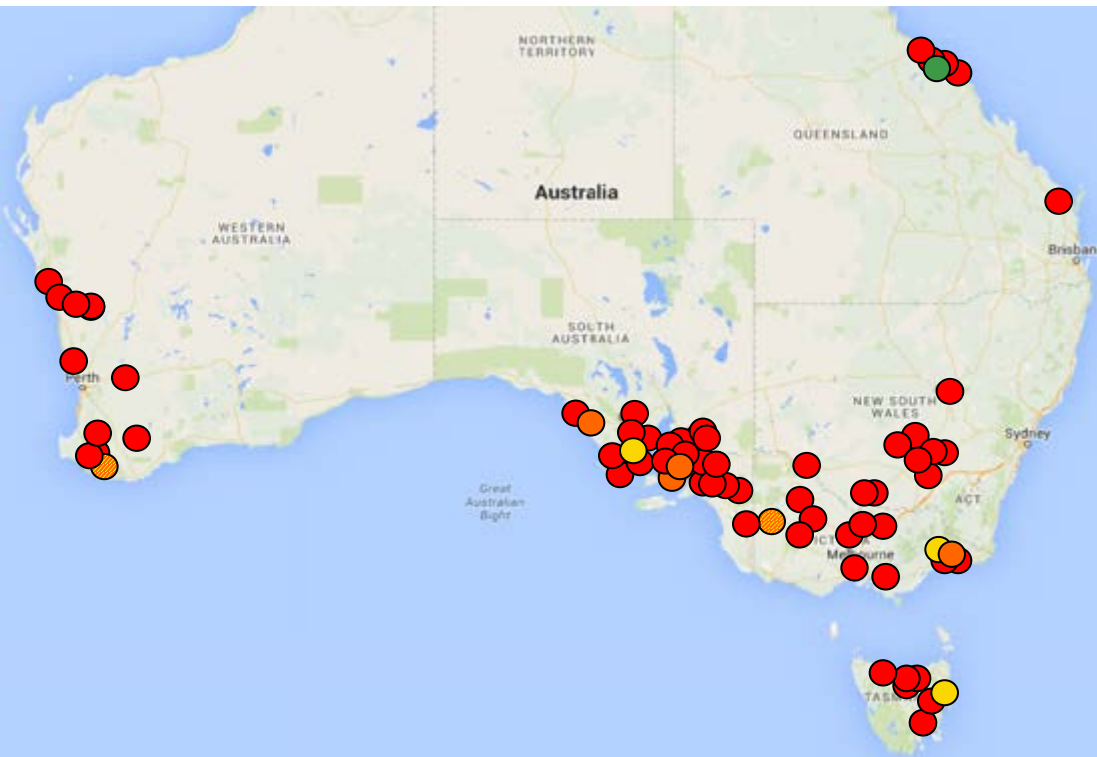
- Resistant to the chemical
- Susceptible to the chemical

## Pyrethroids

2014 - 2017



# Organophosphates



# Pyrethroids & Carbamates

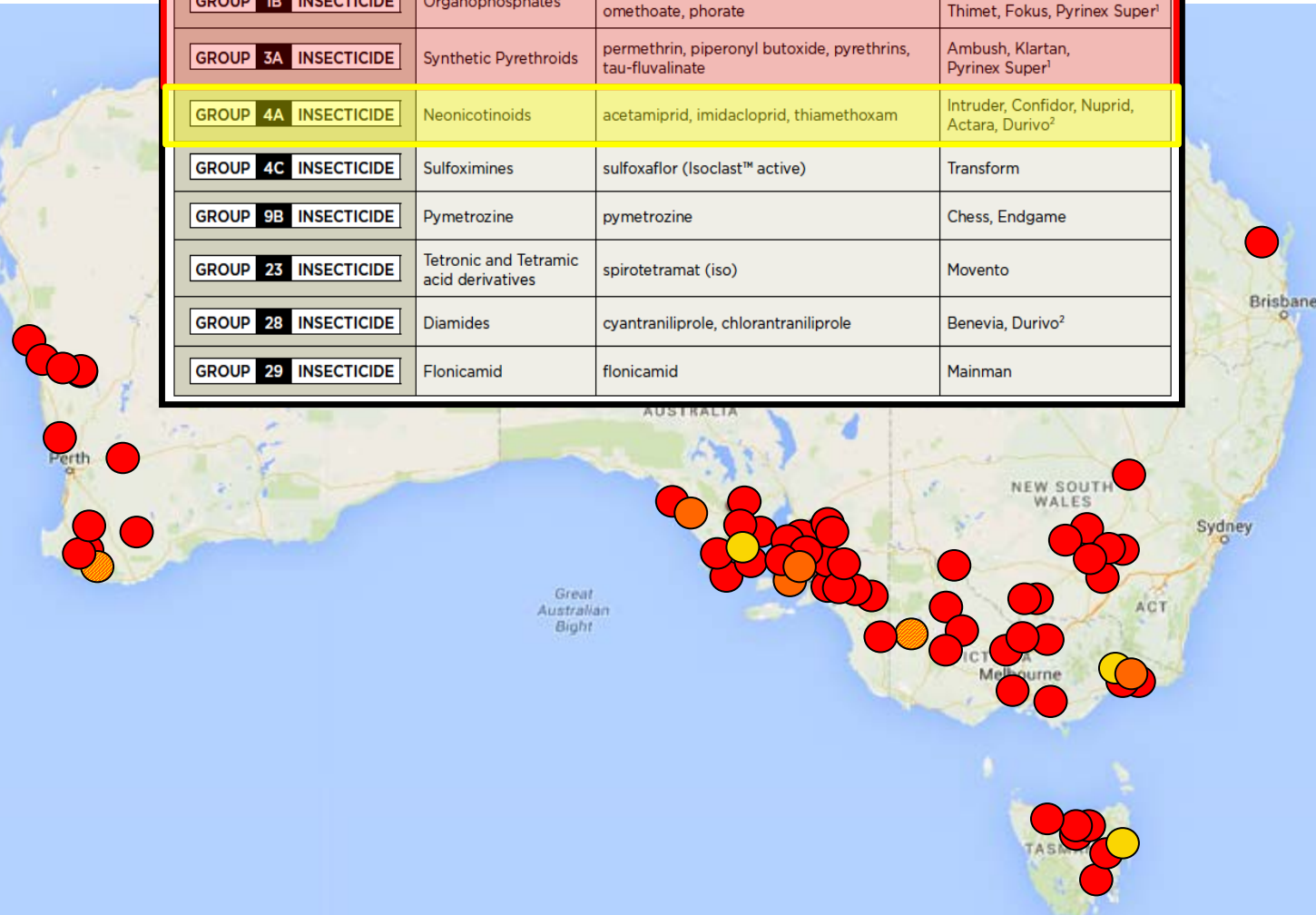
- 75 -100%
- 50 -75%
- 25 - 50%
- < 25 %
- 0%



# Remaining chemical groups for resistant aphids

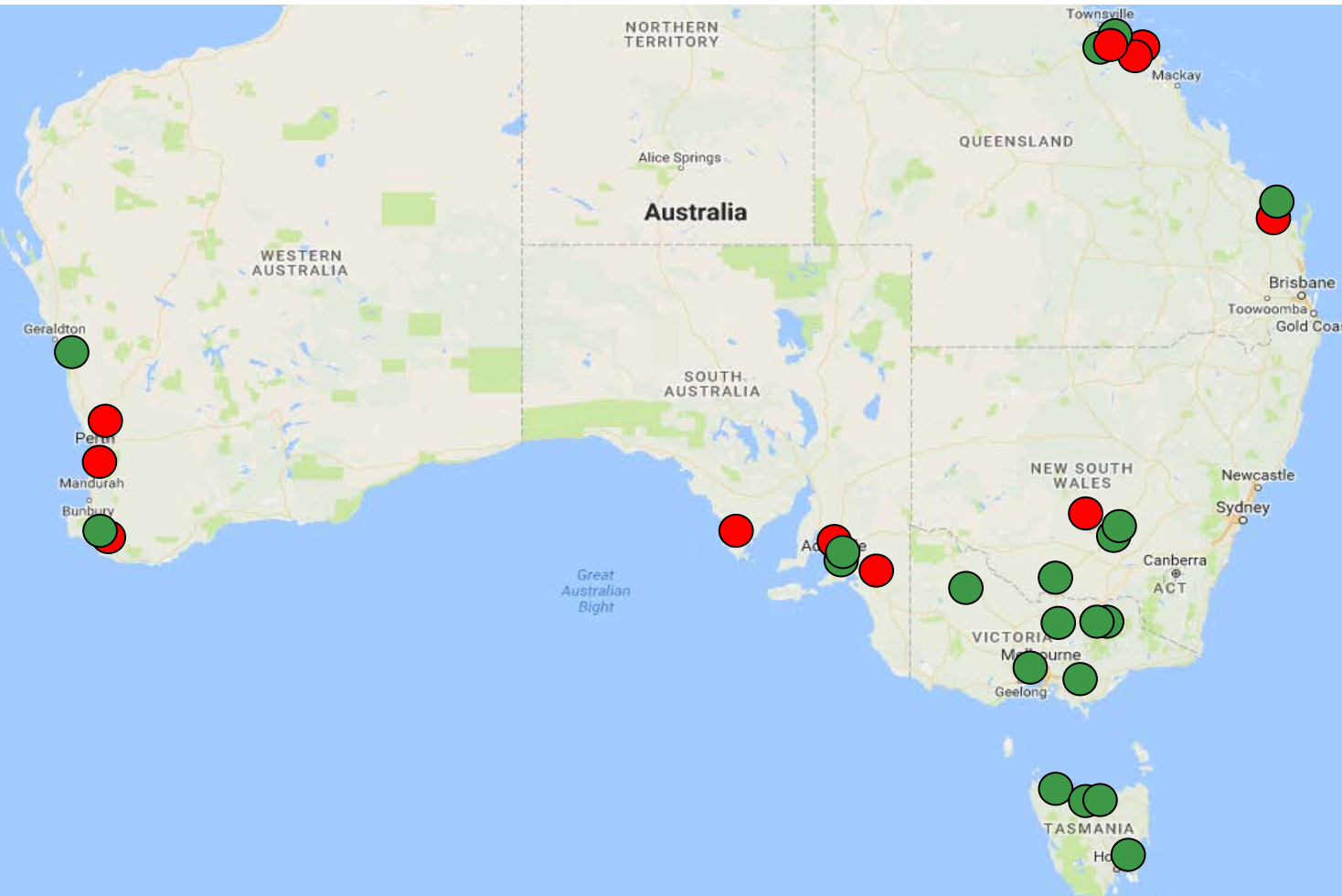


IRAC MoA group	Insecticide category	Active Ingredient(s)	Example trade names
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GROUP 29 INSECTICIDE	Flonicamid	flonicamid	Mainman





# Imidacloprid resistance 2013 - 2016



 Low-level resistance confirmed in bioassay

 Susceptible



# Different types of resistance

There are a number of ways insects can develop resistance



## **Metabolic resistance**

Resistant insects may detoxify or destroy the toxic chemical faster than susceptible insects, or quickly rid their bodies of toxic molecules. Metabolic resistance is the most common, as insects use their internal enzyme systems to break down insecticides. Resistant forms may possess higher levels or more efficient forms of these enzymes.

## **Target-site resistance**

The target site within the cell of the insect where the toxic chemical acts has genetically mutated or changed and prevents the toxic molecule from binding or interacting with the insect.

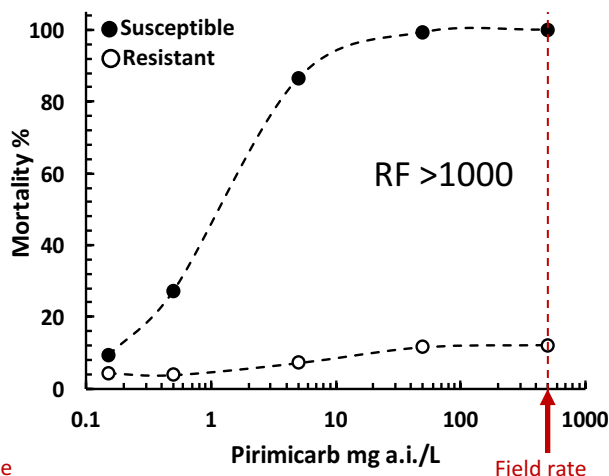
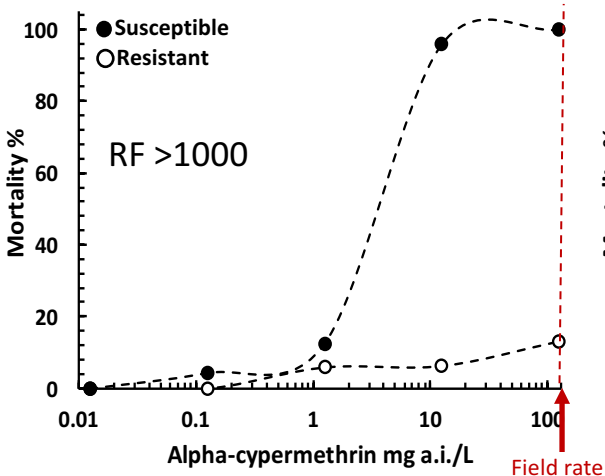
## **Penetration resistance**

Resistant insects may absorb the toxin more slowly than susceptible insects. The insect's outer cuticle develops barriers which can slow absorption of the toxic chemicals into their bodies

## **Behavioral resistance**

Resistant insects may detect or recognize and avoid the plants treated with the toxic chemical, stopping feeding or leaving the area where spraying occurred.

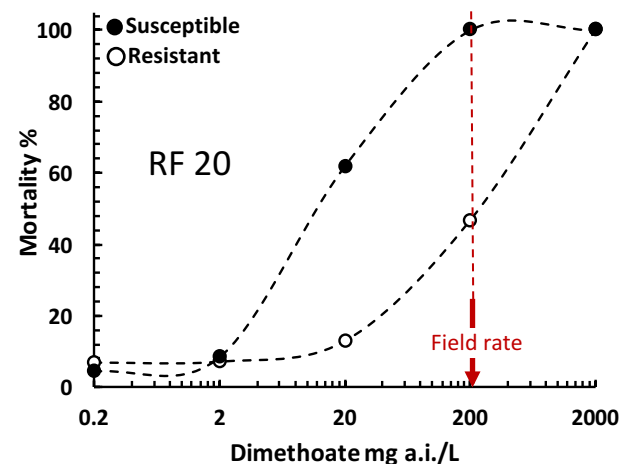
# Resistance in Green Peach Aphids



**Target-site**

Pyrethroids (alpha-cypermethrin): *kdr* and/or super-*kdr* mutations

Carbamates (pirimicarb): *MACE* mutation (carbamates)

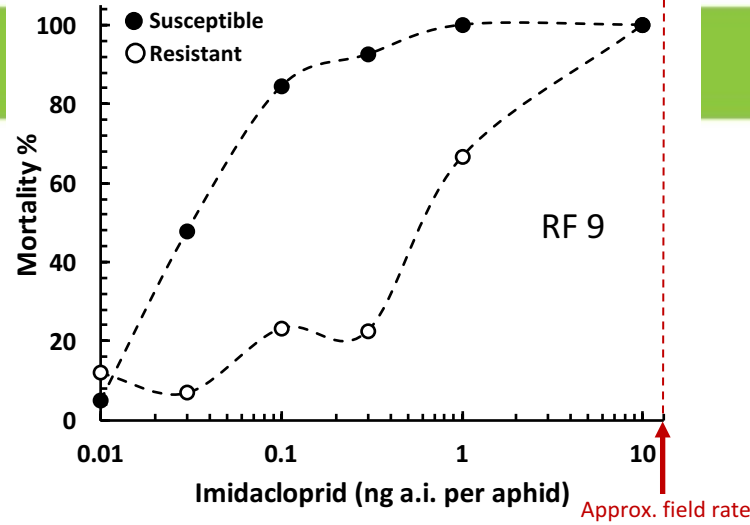
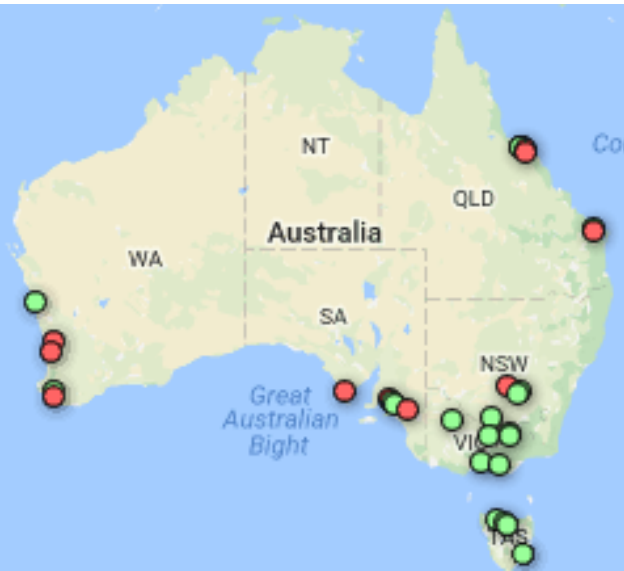


**Metabolic**

Overproduction of one of two closely related carboxylesterases (*E4* and *FE4*)



# Neonicotinoid resistance in Green Peach Aphids



Integrated  
Crop Protection  
PROTECTING CROPS

**Metabolic**

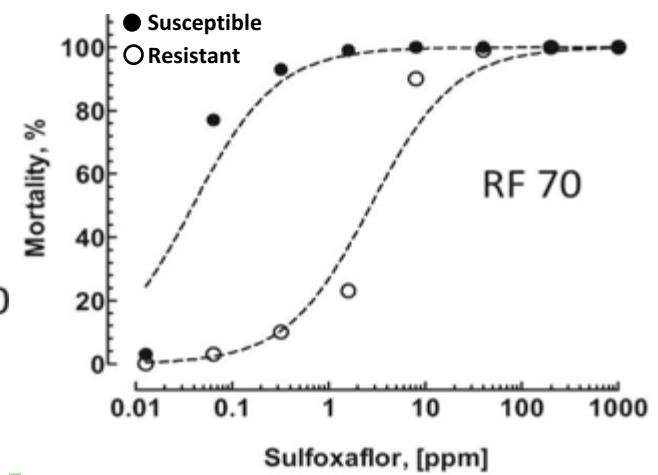
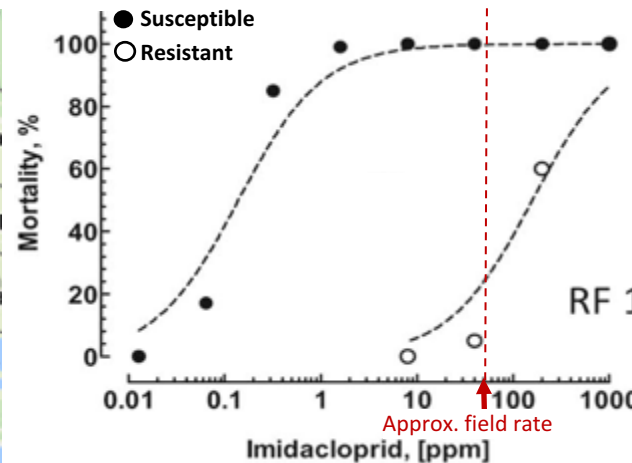
Enhanced expression of the P450 CYP6CY3 gene

## Meanwhile, in southern Europe

**Target-site**

Bass et al. 2015 *Pesticide Biochemistry and Physiology*, 121,78-87

R81T mutation of the nicotinic acetylcholine receptor



# Management of resistant aphid populations



## Monitoring

**What?** Do you have green peach aphid or another aphid species

**Where?** Crop edges and lower, oldest leaves on plants

**When?** Present all year, but high numbers in autumn and spring in SE Australia

**How?** Yellow sticky traps, hand lens



Green peach aphid



Turnip aphid



Cabbage aphid



Potato aphid

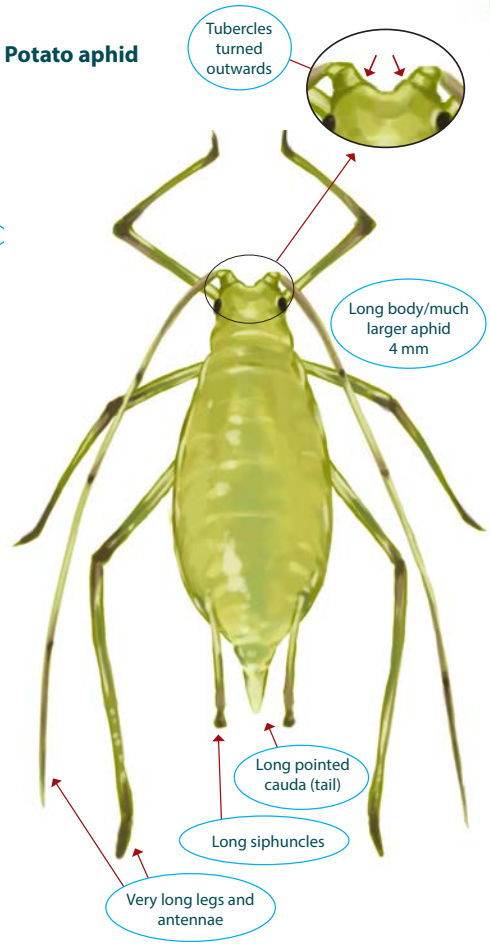
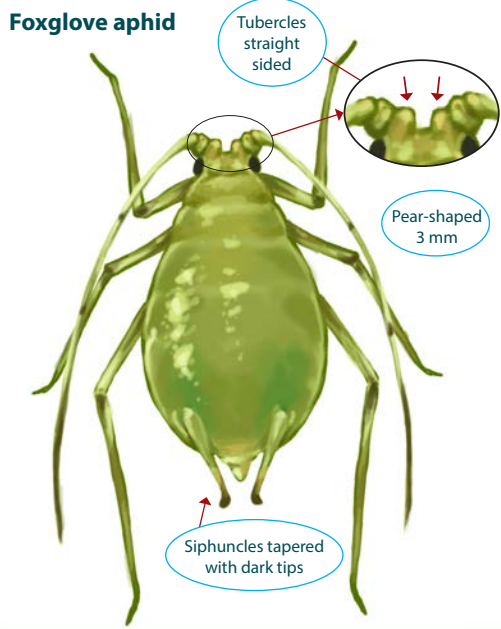
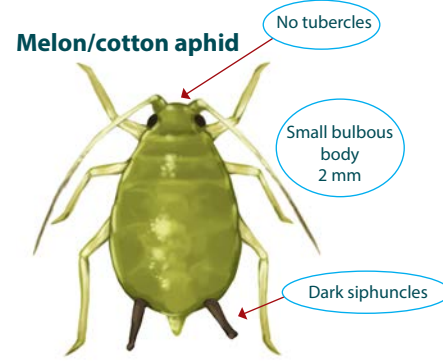
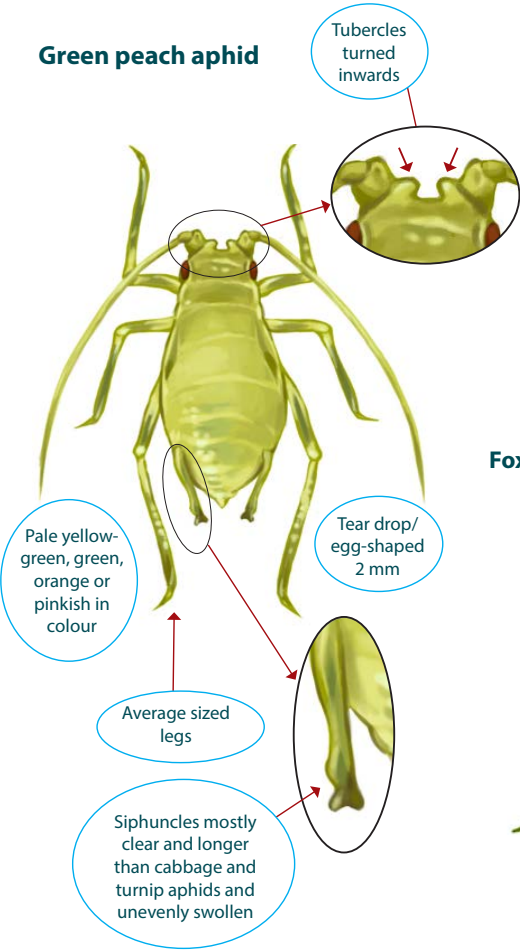


Foxglove aphid



Cotton/melon aphid

# Other aphids that look like Green Peach Aphid

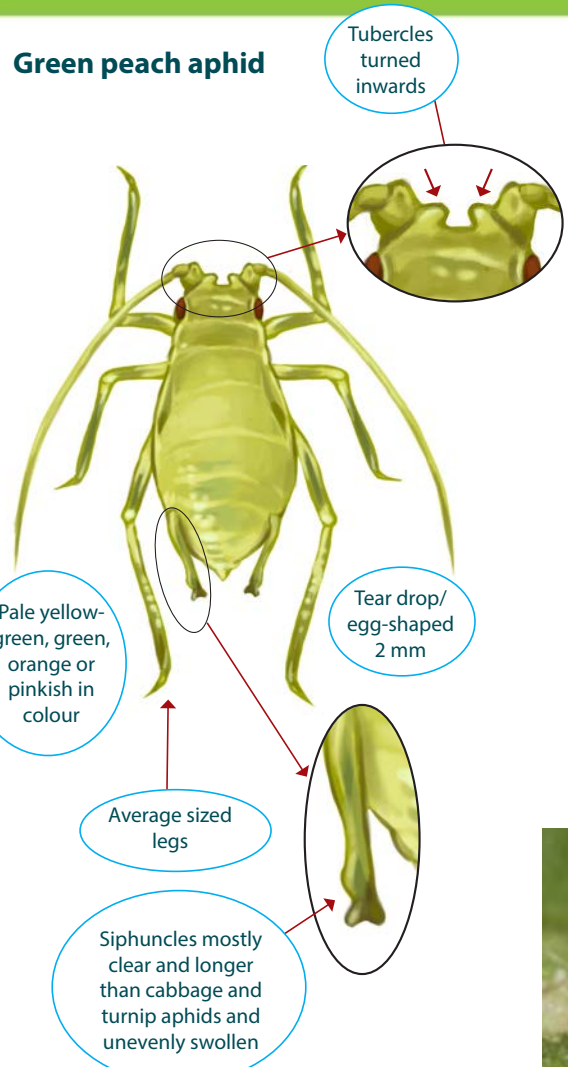


Diagrams by Dr Elia Pirtle © cesar pty ltd

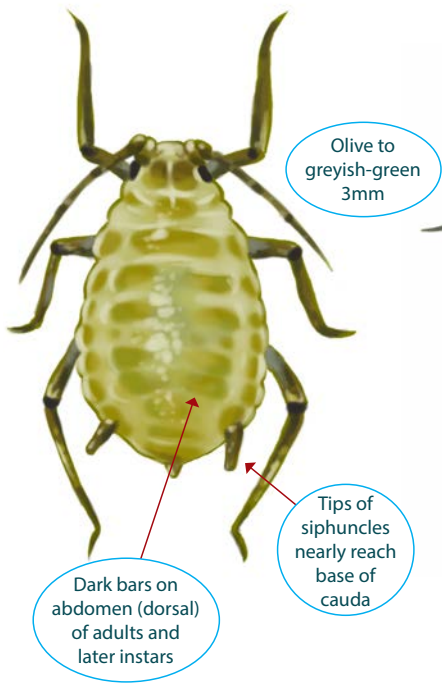


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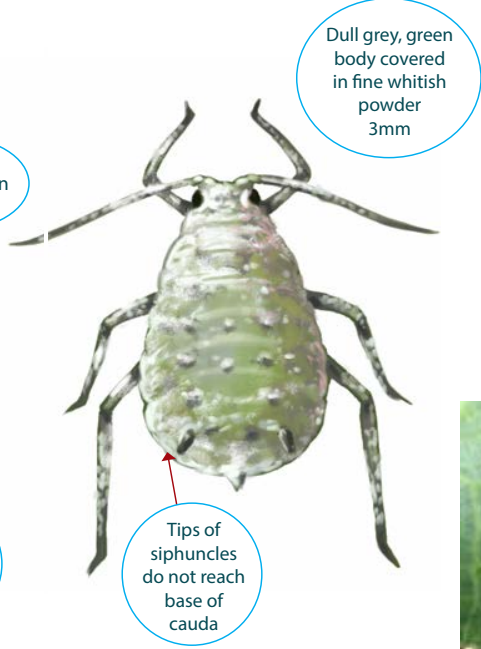
**Green peach aphid**



**Turnip aphid**



**Cabbage aphid**



Diagrams by Dr Elia Pirtle © cesar Pty Ltd



# 'Green peach aphids' are not always green



Photos: Andrew Weeks





# Management of resistant aphid populations



## Resistance management

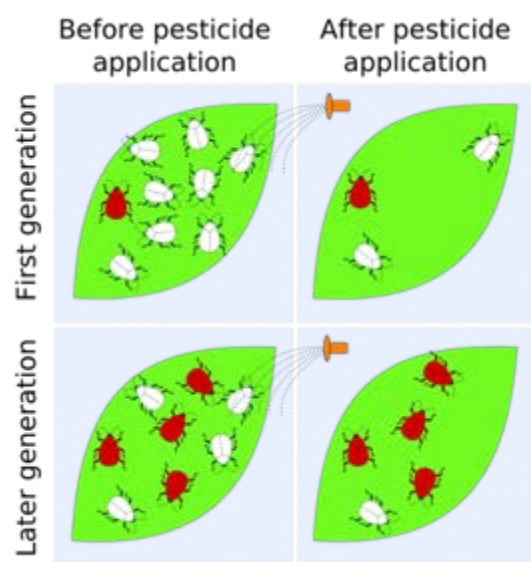
Identify aphid species: ensure that your aphid population is **GPA**

Don't use pyrethroids, carbamates or organophosphates

Do not follow a neonicotinoid seedling drench or irrigation with a neonicotinoid spray

**Rotate between chemical groups for consecutive sprays**

Ensure effective spray coverage, using correct droplet size and surfactants (always follow label)

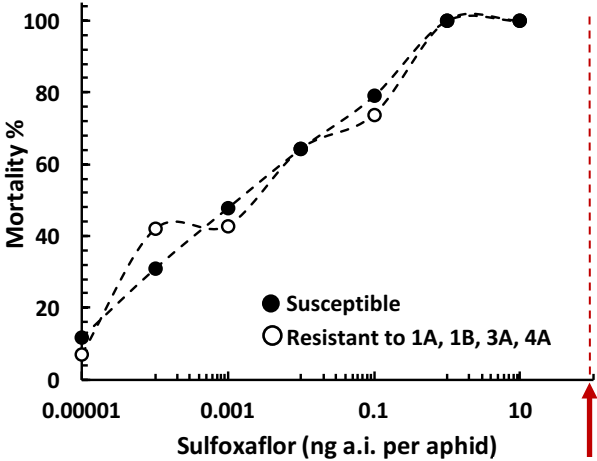


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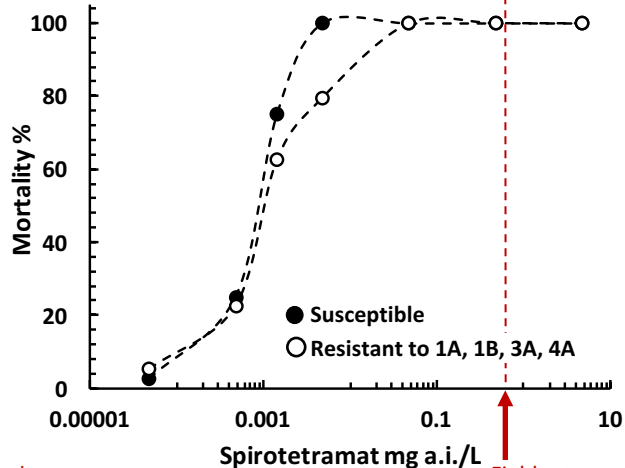


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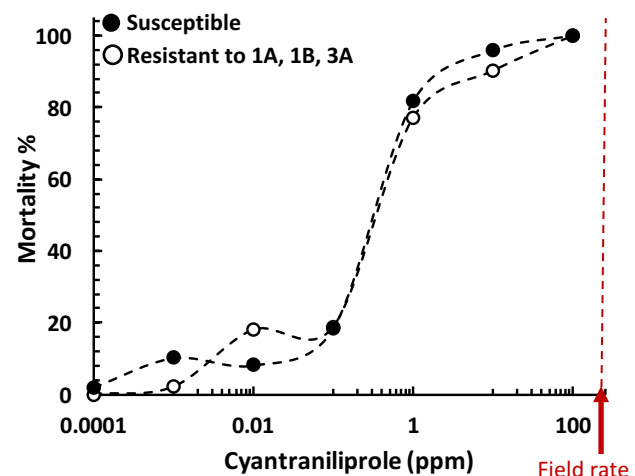
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Approx. field rate



Field rate



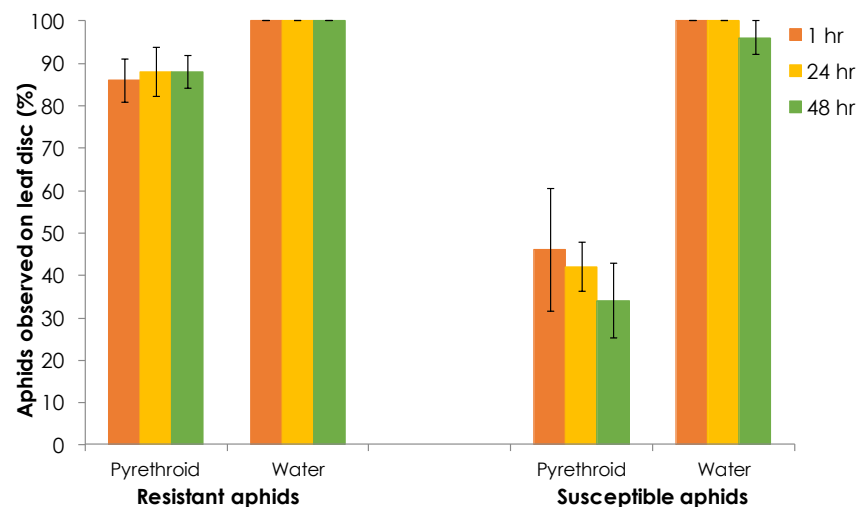
Field rate



# Non-chemical control methods



- Do not spray crops 'prophylactically' as insecticide sprays are ineffective in managing virus spread between crops
- Plant wind-barriers between crops to avoid wind-assisted aphid movement
- Use reflective mulches to reduce landing rates
- Eliminate weed virus hosts and control green bridge



# Beneficial Insects



Insecticide	Predatory beetles <sup>1</sup>				Predatory bugs				Predatory mites	Spiders	Hymenoptera (small wasps) <sup>6</sup>					Lacewing adults	Thrips <sup>8</sup>	Toxicity to bees <sup>9</sup>
	Total <sup>2</sup>	Red & Blue beetle	Minute 2-spotted lady beetle	Other lady beetles	Total <sup>3</sup>	Damselfly bugs	Big-eyed bugs	Other Predatory bugs			Apple Dimpling	Total (wasps)	<i>Eretmocerus</i> <sup>7</sup>	<i>Encarsia formosa</i>	<i>Trichogramma</i>			
Paraffinic Oil	VL	L	L	VL	VL	VL	VL	VL	VL	L	VL	-	-	VL	-	VL	VL	VL
Petroleum Oil	-	-	-	L	-	-	-	-	M	-	-	-	H	M	-	-	-	-
Cytrantraniliprole	M	M	VL	L	M	M	M	H	L	M	VL	L	-	VL	-	VH	H	-
Spirotetramat	M	L	H	H	VL	VL	VL	VL	M	-	M	L	-	M	-	VH	M	-
Pirimicarb	H	VL	VL	L	M	L	M	VL	VL	L	VL	VL	M	H	H	L	L	VL
Flonicamid	L	VL	VL	VL	H	H	VH	H	H	-	M	M	L	-	H	-	M	L
Diafenthiuron	M	H	VL	M	L	M	VL	L	H	-	L	L	H	-	L	-	VH	L
Pymetrozine	M	M	M	M	M	L	L	VL	H	L	L	L	M	L	M	M	VL	VL
Sulfoxaflor	H	L	M	H	L	VL	L	M	VH	-	L	M	-	-	H	-	H	H
Chlorantraniliprole / Thiamethoxam	-	-	-	-	-	-	-	-	-	-	-	M	-	-	-	-	-	-
Imidacloprid (Irrigating)	H <sup>4</sup>	-	-	-	VH	-	-	-	-	-	-	L	-	L	-	L	L	-
Acetamiprid	H	M	VH	H	H	M	H	M	VH	-	VL	L	H	-	H	L	VH	M <sup>10</sup>
Imidacloprid (Spraying)	H	L	VH	H	H	M	H	L	VH	M	L	L	VH	VH	H	H	VH	M
Thiamethoxam	H	H	H	H	H	M	M	H	H	-	VL	M	M	-	H	-	VH	M
Organophosphates <sup>5</sup>	H	M	H	H	H	M	H	H	VH	H	M	H	VH	VH	VH	H	VH	M
Tau-Fluvalinate	VH	-	-	-	VH	-	-	-	-	-	-	-	VH	-	VH	-	VH	M
Piperonyl Butoxide / Pyrethrins	VH	-	-	-	VH	-	-	-	VH	-	VH	VH	VH	-	VH	-	VH	H
Bifenthrin / Chlorpyrifos	VH	-	-	-	VH	-	-	-	VH	-	VH	VH	VH	-	VH	-	VH	VH
Permethrin	VH	-	-	H	VH	-	-	-	VH	H	VH	VH	VH	VH	H	VH	VH	VH



Photo: Andrew Weeks



Video: Julia Severi



Photo: Matt Witney

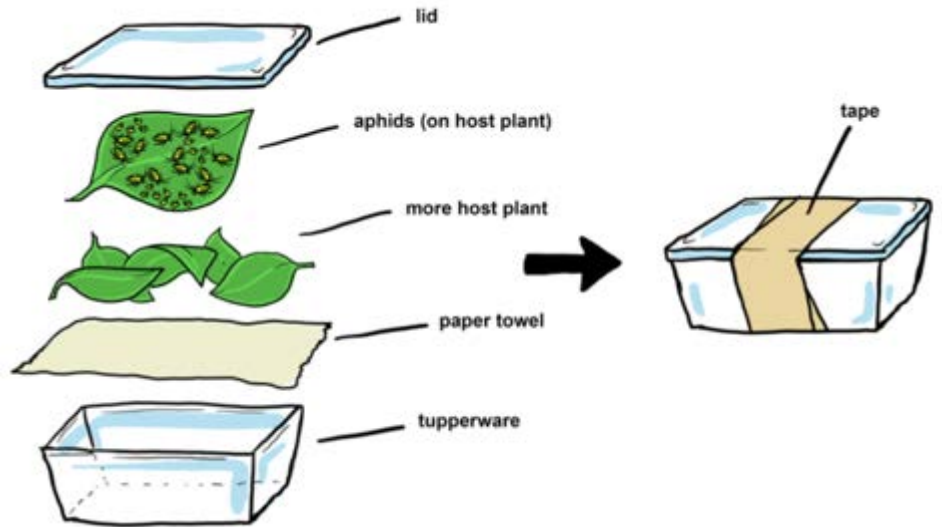


Video: Julia Severi

# Green peach aphid control failures



If you experience a **control failure**, particularly if you have applied a neonicotinoid, please send in surviving **green peach aphids** for resistance testing



aphid resistance testing service

**cesar pty ltd**  
293 Royal Parade  
Parkville, VIC, 3052





## Webinar

'Pesticides and insect pest control with Dr Paul Umina'

Wednesday 18<sup>th</sup> October 12:30pm

## Resources

<http://horticulture.com.au/resistance-management-strategy-for-the-green-peach-aphid-in-bundaberg-field-vegetable-crops/>

@PestFactscesar 

Veg Pest ID app 

[www.cesaraustralia.com](http://www.cesaraustralia.com)



# Thank You



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Crop Protection**  
PROTECTING CROPS

