Decision Making
for Insect Management
in Grain Crops

Pest Management in Canola

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Pest management in canola

- Seedlings very susceptible to chewing and sucking pests (earthmites in particular)
  - favoured host of many pests
  - do not recover from severe damage
- Economic damage most likely at establishment and in spring
- Planning ahead is vital in canola

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Key canola pests

Pest group	Emergence	Vegetative	Flowering	Podding – Grain fill
Earth mites				
Lucerne flea				
Caterpillars (cutworms, loopers)				
Beetles (weevils, false wireworms)				
Slugs				
Earwigs, millipedes, slaters				
Snails				
Aphids				
Diamondback moth				
Native budworm				
Rutherglen bug **????**				

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Canola establishment

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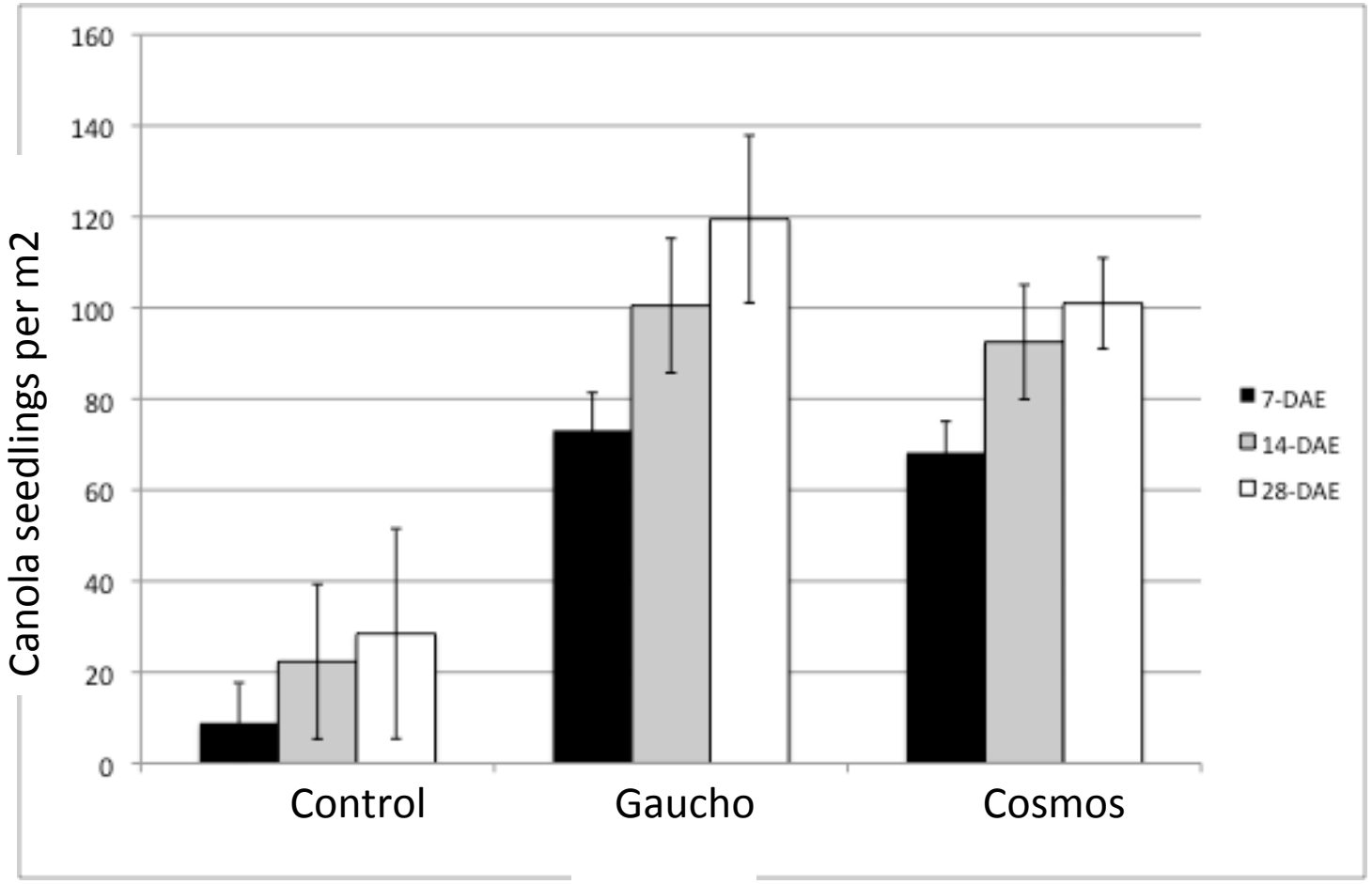
Sowing tactics

Can reduce pest impact:

- Early sowing
- High vigour varieties
- Slightly higher seeding rates

Seed treatments



Seed treatments can protect canola seedlings from mites

McColl & Umina. *Unpublished data*

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Canola spring pests

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Canola aphids

Cabbage aphid

- Powdery, greyish colonies
- Dense on growing tips

Turnip aphid

- Yellow/green colonies
- Dense on growing tips
- More common in drier years

Green peach aphid

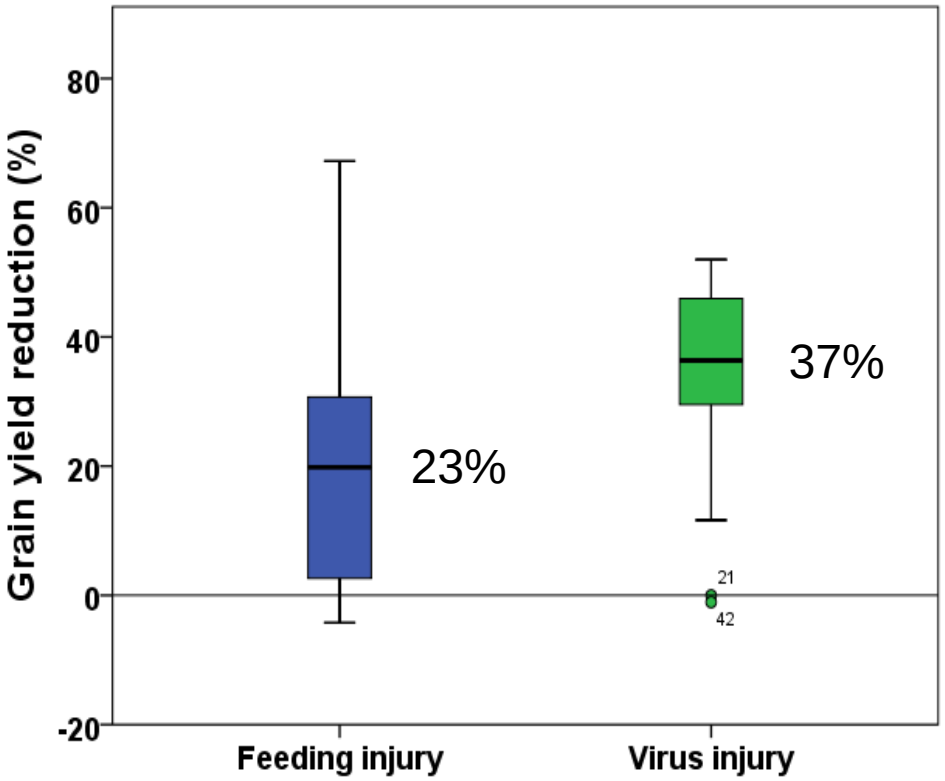
- Sparsely distributed on the underside of lower leaves

Aphid impact/damage

- Direct feeding injury (bud formation – late flowering)
  - wilting
  - flower abortion
  - reduced pod set
- BWY virus transmitted persistently by GPA

Cabbage aphid colony on the main raceme

Aphid impact/damage



Virus injury more significant than direct feeding injury

Source: Valenzuela and Hoffman, 2013

Risk factors

- *Brassica* green bridge (virus)
- Weather
- Low beneficial activity
- 'Hard' chemistry (any pest)

Yield impact / thresholds

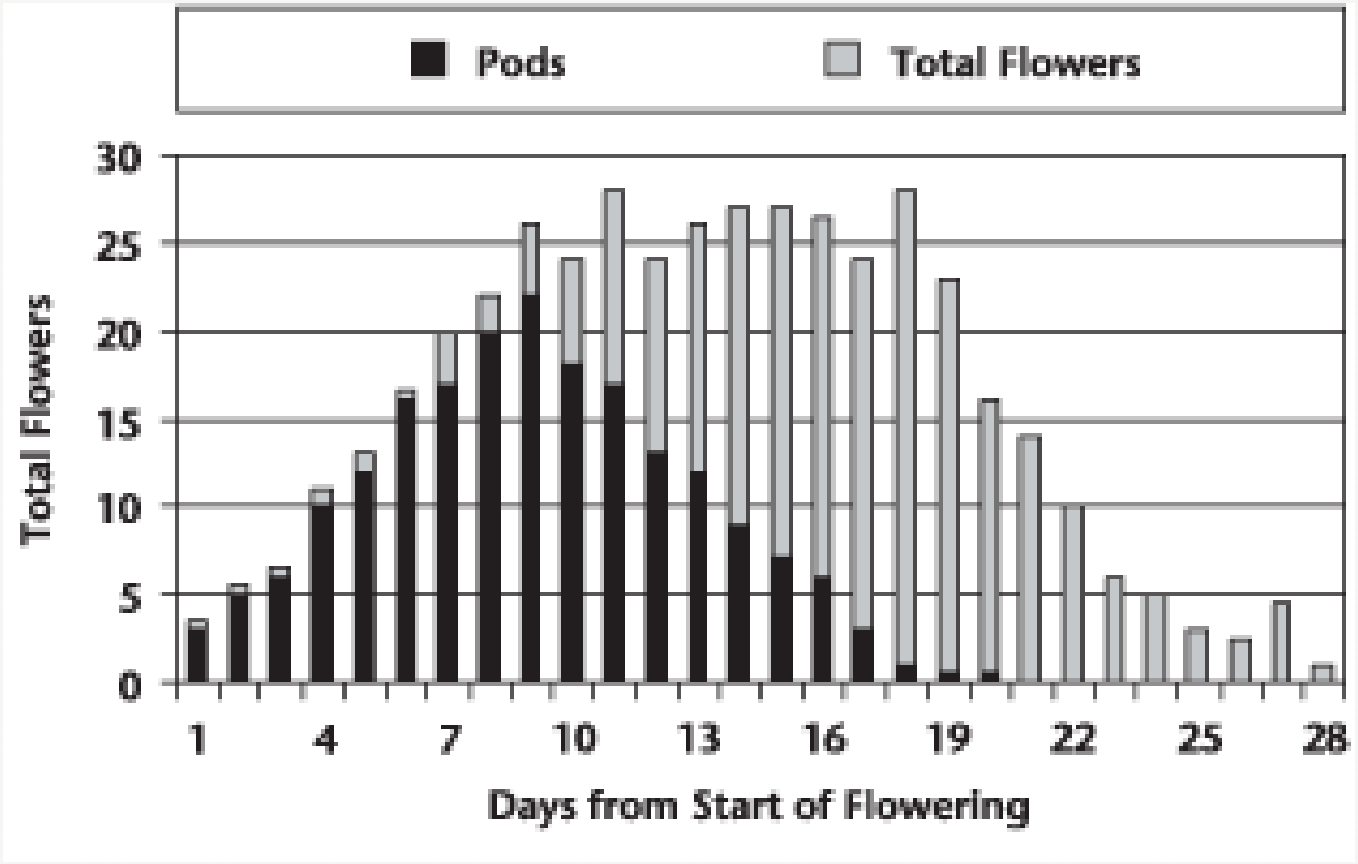
- How many plants are actually infested?
- Crop stage
- Plant compensation

Few demonstrated examples of yield loss in Australian literature

No significant differences in treatments simulating aphid infestation of canola at 10, 50 and 100% of racemes. Trial conducted in a dryland crop at Allora, SE Qld, 2013.

Treatment	Yield (t/ha)
Control	2.07 a
10% of terminals removed	1.93 a
50% of terminal removed	1.98 a
90% of terminal removed	2.01 a

Treatments followed by the same letter are not significantly different ($P<0.05$).



Source: Canola Council of Canada. Canola Grower's Manual. Chapter 3: Growth Stages.

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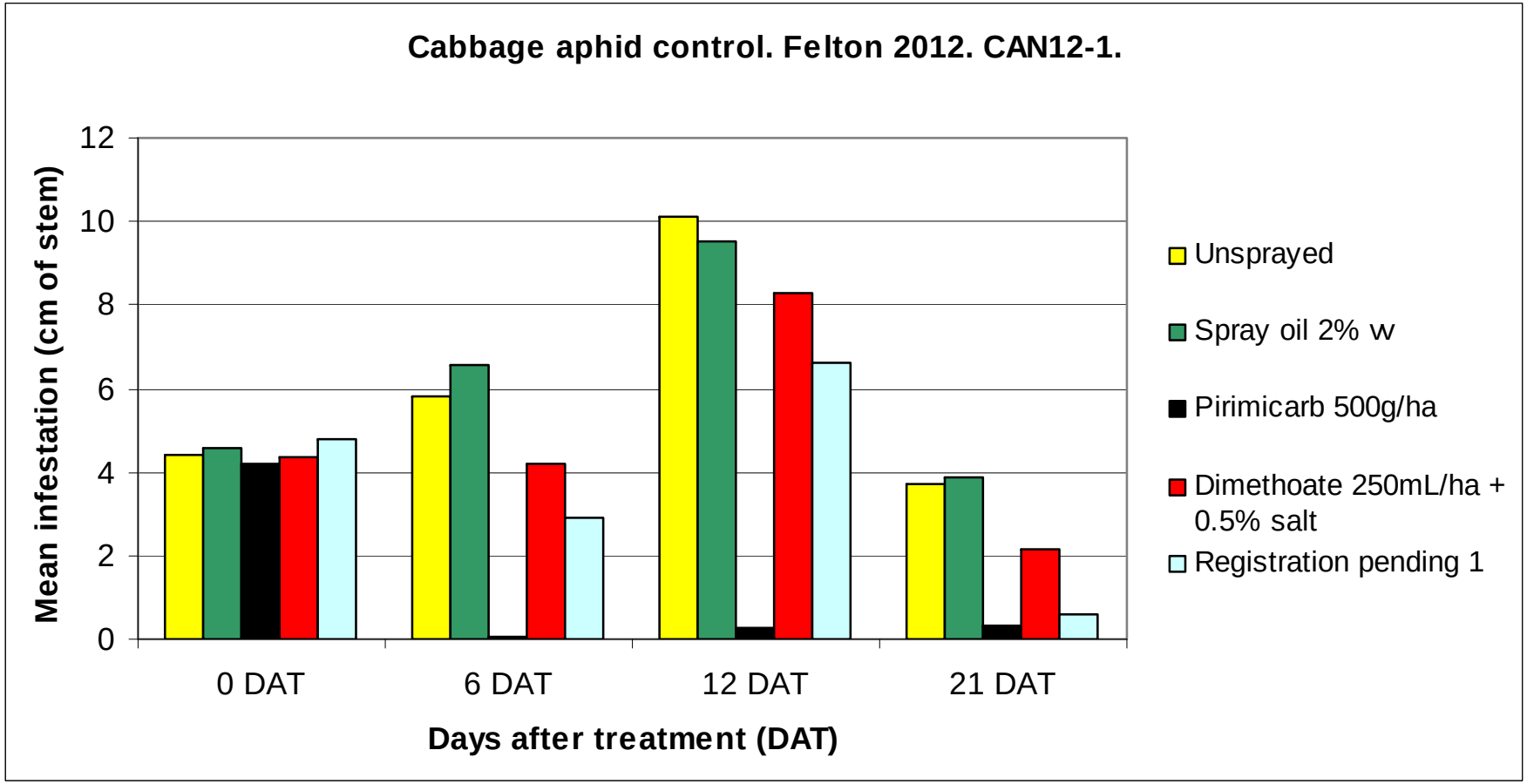
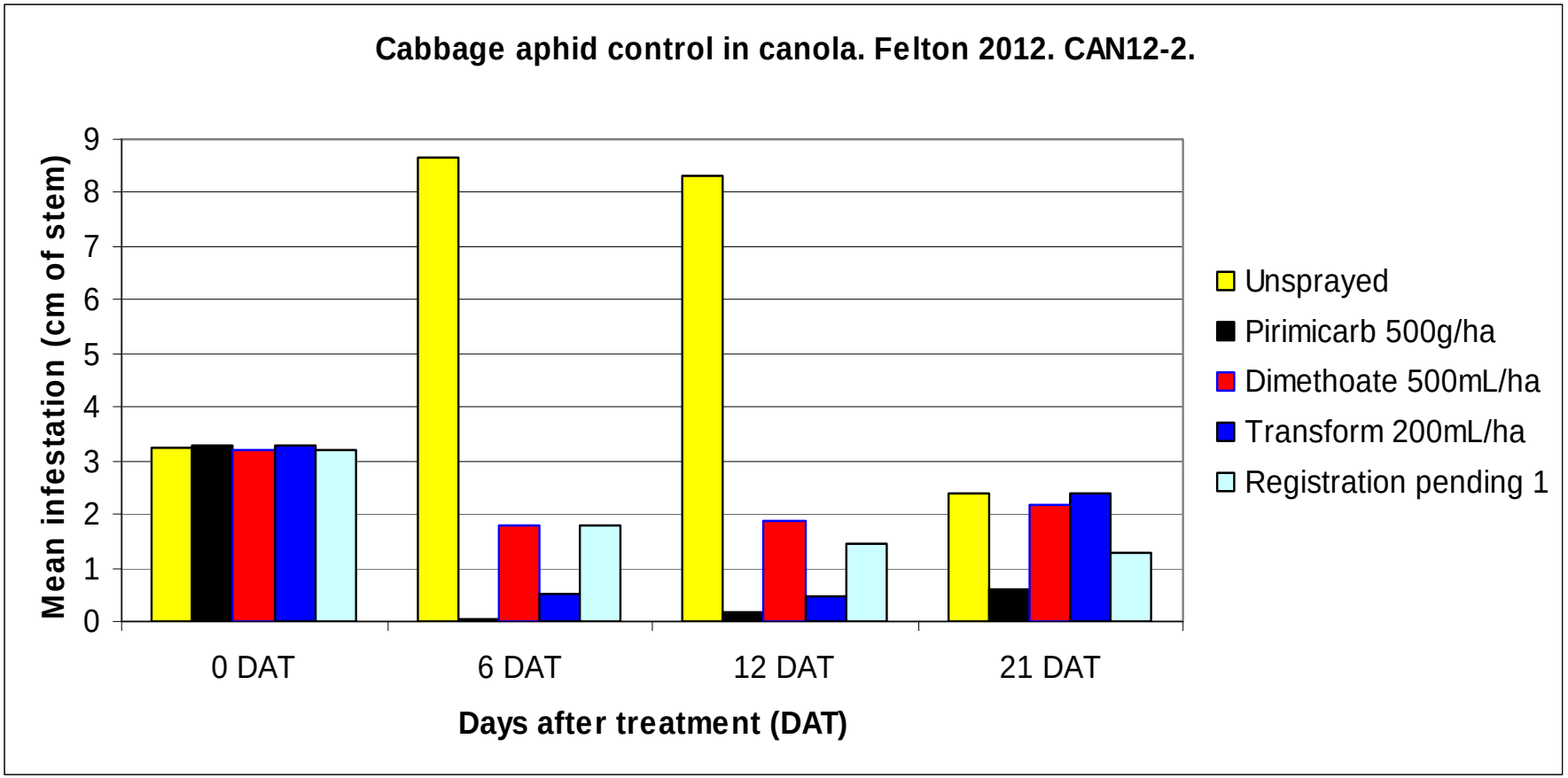
Insecticides for aphids



N.B. dimethoate is not registered for control of aphids in canola

Insecticides for aphids



N.B. dimethoate is not registered for control of aphids in canola

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Green peach aphid resistance

FIGURE 1 Carbamate resistance in green peach aphid populations.

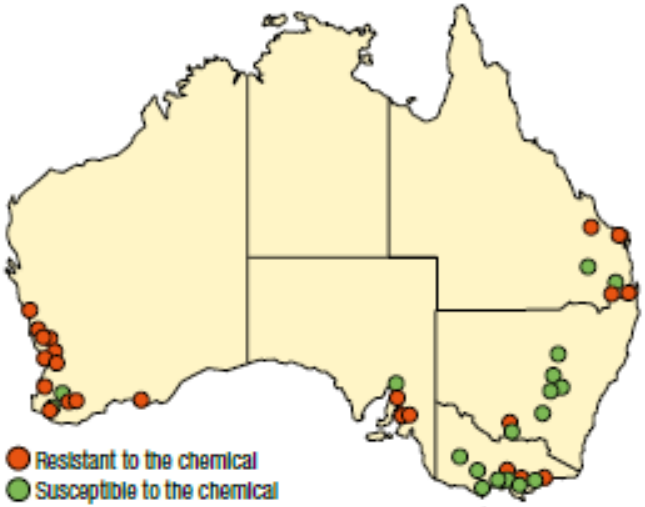


FIGURE 2 Organophosphate resistance in green peach aphid populations.

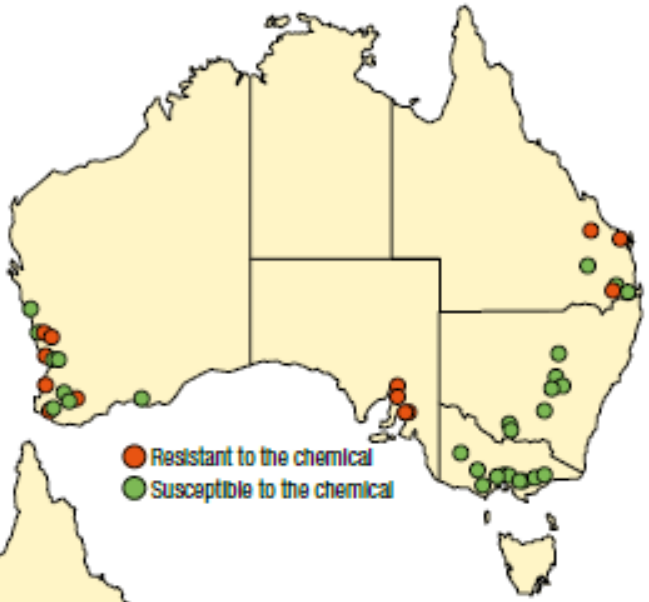
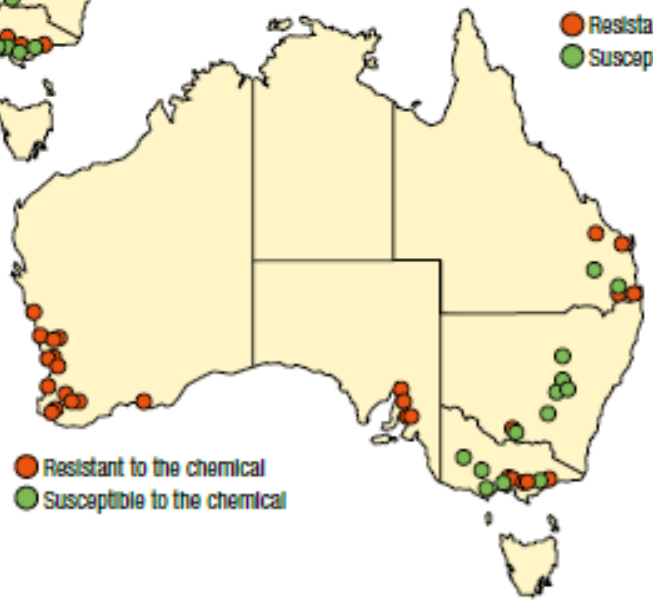


FIGURE 3 Synthetic pyrethroid resistance in green peach aphid populations.



GRDC factsheet March 2014

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Diamondback moth (DBM)

- Periodic outbreaks in canola
  - every 3-4 years in SA and NSW, Victoria
- Larvae feed on leaves, buds, flowers and pods
  - defoliation, reduced seed number & size

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Risk factors for DBM

High risk	Reduced risk	Low risk
• High summer rainfall creates *Brassica* green bridge • Warm and dry conditions July through spring • No significant rainfall events (>10mm)	• Significant heavy rainfall (<10mm) dislodges and drowns larvae • High beneficial activity and/or DBM parasitism	• Cool, moist conditions late winter through spring • Epizootics of fungal disease (e.g. *Zoophthera radicans*)

Lincoln weed
Perennial DBM host

Diadegma semiclausum
Key DBM parasitoid

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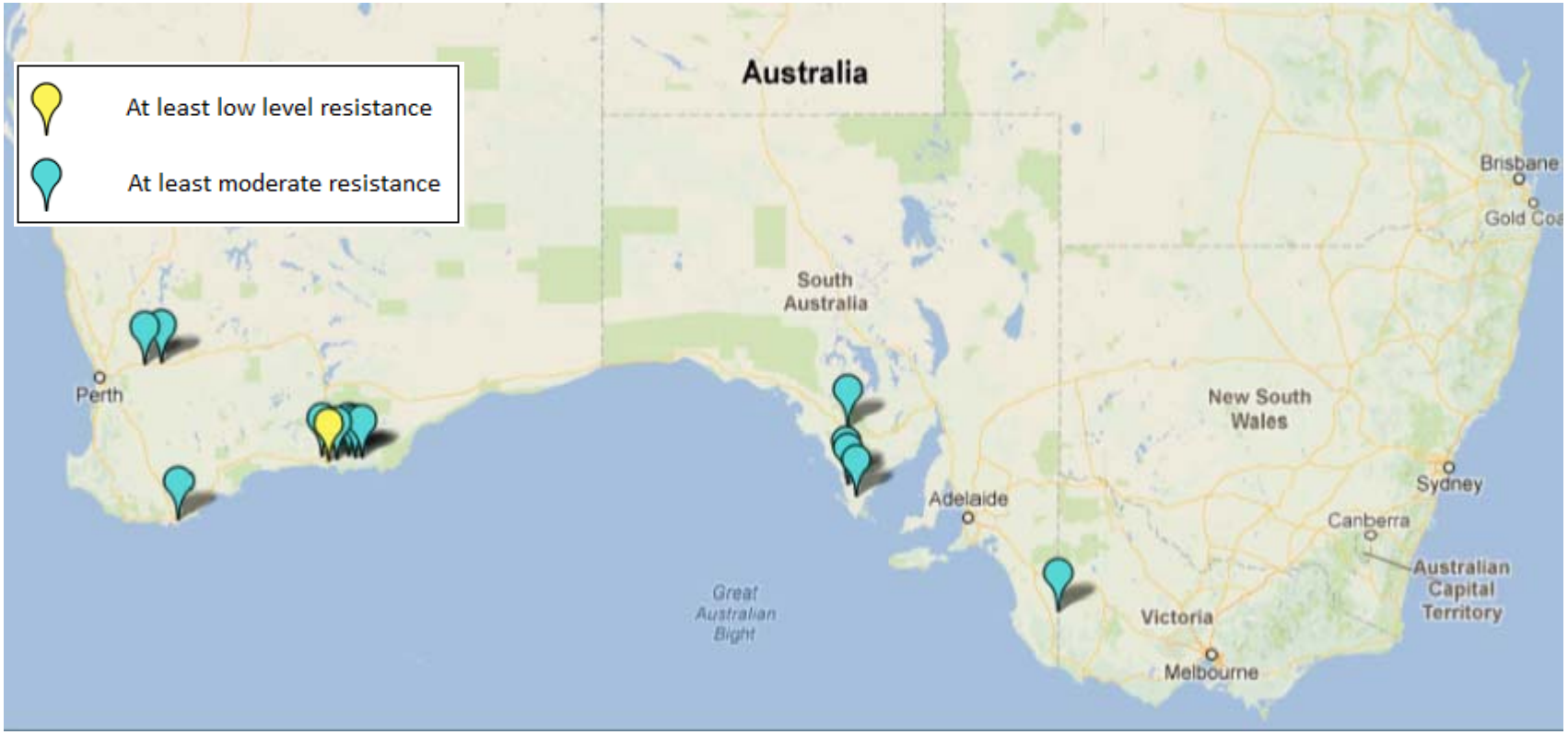
Difficulties with insecticidal control

- Overlapping generations
- Larvae distributed throughout canopy
- Spray penetration
- Rapidly evolves insecticide resistance
- Product selection, good coverage critical

Insecticide resistance in DBM



Alpha-cypermethrin resistance in DBM collected from canola crops (2006-11)

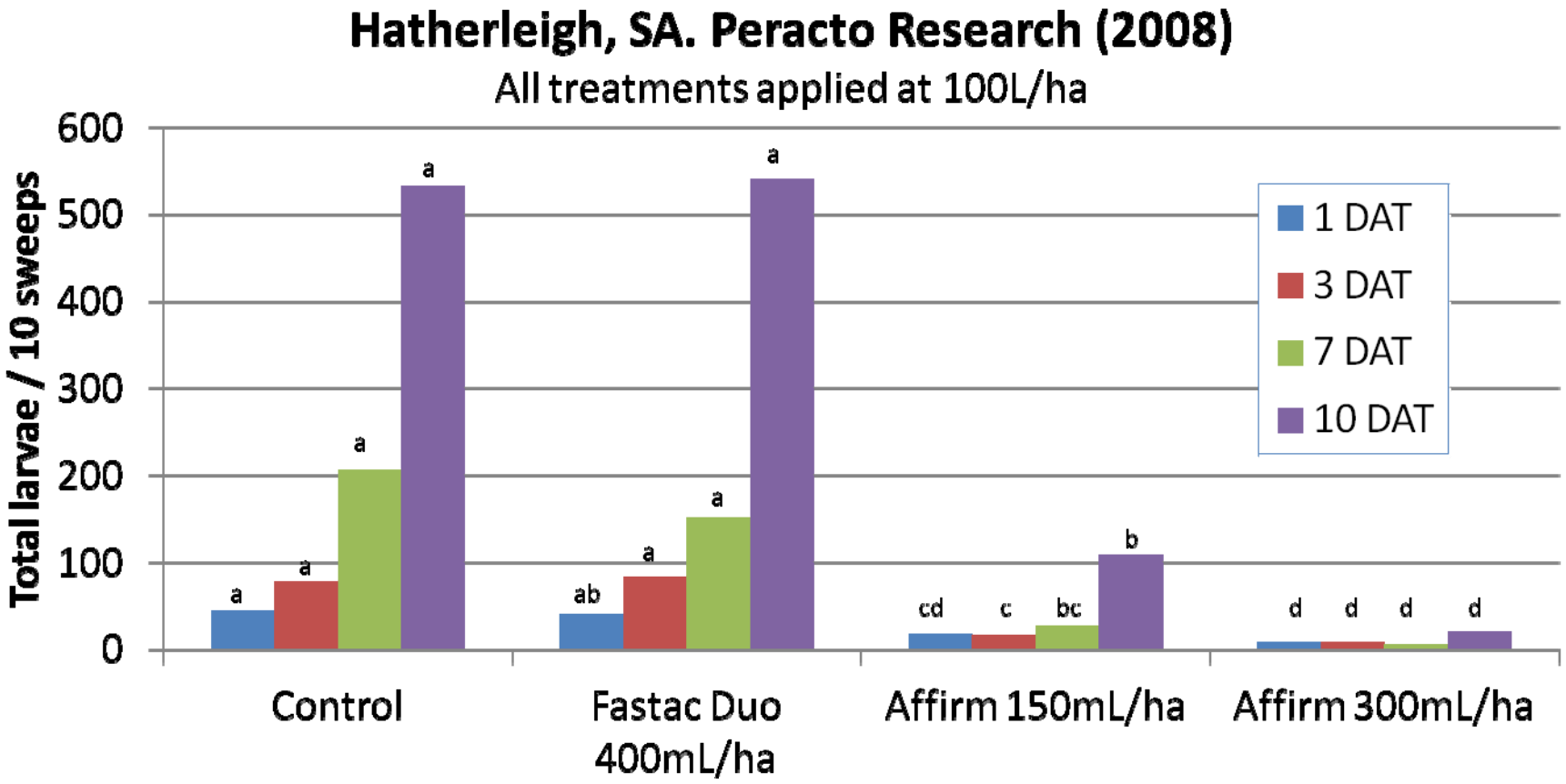
Powis & Baker, 2012. *Unpublished data*

Similar story with organophosphates

Treated under an emergency permit in 2007

Treated with a synthetic pyrethroid

Insecticide efficacy for DBM



Source: Syngenta, SARDI (G. Baker)

DBM management

- Manage *Brassica* green bridge
- Monitor to assess risk of exceeding thresholds
- If spraying:
  - Bt (<8mm larvae)
  - New chemistry
  - Rotate MOA across seasons
  - Avoid SPs

Parasitised DBM pupa – note capsule shape

DBM monitoring and thresholds

- Minimum of 5 sets of 10 sweeps
- Calculate larvae per 10 sweeps

Crop stage	Moisture stressed?	Spray threshold
Pre-flowering	Yes	> 30 larvae / 10 sweeps
	No	> 50 larvae / 10 sweeps
Majority in flower	Yes	< 100-200 larvae per 10 sweeps
	No	>100-200 larvae / 10 sweeps

DBM development rates

- Strongly temperature-dependent

Temperature	Lifecycle/Generation time
28°C	14 days
25°C	17 days
15°C	47 days
12°C	113 days

DBM Development calculator available at:
http://www.dpi.vic.gov.au/agriculture/pests-diseases-and-weeds/pest-insects/ag0512-diamondback-moth/sampling-plan/further-information

Bt application checklist

- Spray after 4pm to minimise UV breakdown
- Good coverage essential (must be ingested) – use a high water volume and/or wetting agent
- Target small caterpillars (2nd instar)
- Feeding attractants – commercial products or 1kg of skim milk powder per hectare in the mix
- Ensure tank is free of contamination with SPs
- Mixing Canopy oil with Dipel SC can enhance efficacy

Native budworm in canola

- Sweep net from flowering/podding
- Dynamic thresholds
- SPs may impact DBM/aphids
- *Bt* or NPV for small larvae (< 7-8mm)

Mature budworm larva burrowing into a canola pod

Thresholds in spring canola

Flowering to grain fill	
Cabbage aphid	25mm, or more, of stem infested in >20% plants
Turnip aphid	25mm, or more, of stem infested in >20% plants
Rutherglen bug	10 adults (or 20 nymphs) per plant
Native budworm	5-10 per m2 (larvae 10mm or longer)*
Diamond back moth	Unstressed Pre-flowering crops – 50 larvae per 10 sweeps
	Stressed Pre-flowering crops – 30 larvae per 10 sweeps
	Unstressed Flowering crops – 100-200 larvae per 10 sweeps

Source: VicDPI, Insectopedia, SARDI

** Dynamic threshold developed by DAFWA*

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Insecticide selection in canola

MOA		Canola aphids	DBM	Native budworm	Rutherglen Bug	Beneficial toxicity
11	*Bt*		<8mm	<8mm		Very Low
	NPV			<7mm		Very Low
	Petroleum spray oils	(s)	Mix *Bt*	(s)		Very Low
1A	Pirimicarb					Very Low
6	Emamectin					Mod
5	Spinetoram					Mod
1A	Methomyl		R?	WA		High
1B	OPs		R			High
3A	Pyrethroids		R			Very High

Registered R = resistance (s) = suppression

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NPV for Helicoverpa?

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Mean percentage NPV infection levels (± standard error) for (S + SM), ML and total larvae collected 2 DAT for the respective treatments.

Treatment	S + SM	ML	Combined Total
Unsprayed	24.6 ± 7.2 a	8.3 ± 8.3	23.2 ± 7.1 a
150 mL Vivus Max	88.3 ± 3.5 b	16.7 ± 16.7	85.2 ± 5.0 b
150 mL Vivus Max + 1.0 L Optimol	83.3 ± 6.6 b	66.7 ± 23.6	83.5 ± 6.7 b

Means in a column followed by the same letter are not significantly different (P>0.05).
No letters indicate no significant difference.

Percentage NPV infection levels for (S + SM), ML and total larvae collected 2 DAT for the commercial application blocks.

Treatment	S + SM	ML	Combined Total
Spray Coupe - 150 mL Vivus Max	66.0	37.5	62.1
Pivot - 150 mL Vivus Max	64.8	26.1	58.0

In the Vivus treatment larval density declined from 7.3/row metre at 0 DAT to 0.7/row m at 16 DAT