



# Integrated Pest Management pilot workshop for advisors

## Winter Pulses - South



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- Viruses, aphids & pulses
- Native budworm
- Etiella in lentils
- Winter pulse best bet
- Pea weevil



# Key pests of winter pulses

Chickpeas, faba beans, lupins, field peas, lentils

Pest	Emergence	Vegetative	Flowering	Podding - Grainfill
Mites				
Lucerne flea				
Weevils				
Snails				
Aphids				
Helicoverpa				
Etiella (field pea, lentils)				
Pea Weevil (peas)				





# Viruses, aphids and pulses



# Viruses & Pulses

**Management requires an integrated approach**

Viruses are

- aphid-vectored
- Some are seed-borne

Increased risk if:

- High rainfall (> 500 mm/year)
- Irrigation region
- Clover/medic pastures and other hosts nearby
- Green bridge (weeds and volunteers)

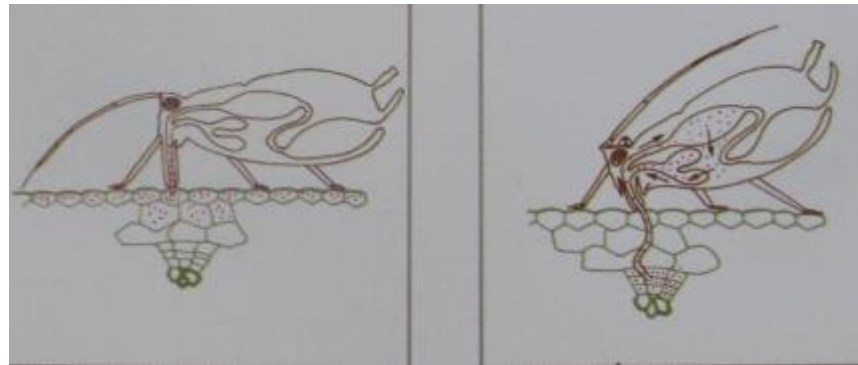


Cowpea aphid on volunteer vetch

# Aphid virus transmission

## Non-Persistent (N-P) vs. Persistent (P)

CMV  
AMV  
BYMV



BLV  
BWYV

(image: D Persley, DAFF Qld)

Need only very short  
feeding times

Need feed for several  
hours to acquire virus

Insecticides not usually  
fast enough to reduce  
transmission

Insecticides may reduce  
virus transmission

- Monitoring and aphid thresholds do not apply to aphids carrying virus







# Assessing risk: aphids and virus transmission



GREEN PEACH APHID  
(*Myzus persicae*)

PEA APHID  
(*Acyrtosiphon pisum*)

COWPEA APHID  
(*Aphis craccivora*)

BLUEGREEN APHID  
(*Acyrtosiphon kondoi*)

Ex GRDC factsheet "Aphids and viruses in pulse crops"

## Transmission of viruses by different aphid species

Aphid species	Cucumber mosaic virus (non-persistent)	Pea seed-borne mosaic virus (non-persistent)	Beet western yellows virus (persistent)
Green peach aphid	✓	✓	✓
Pea aphid	✓	✓	
Cowpea aphid	✓	✓	✓
Bluegreen aphid	✓		





# Managing aphids and virus impact



Minimise sources of virus (green bridge, weeds)

## Sow

- virus-free seed
- resistant cultivars
- Into standing stubble
- Higher seeding rate



Virus-infected plants scattered through a chickpea crop

## Control

- Seed dressing where risk of persistent virus







# Flowering to grain fill

## Native budworm

## Etiella moth

Aphids





# Native budworm



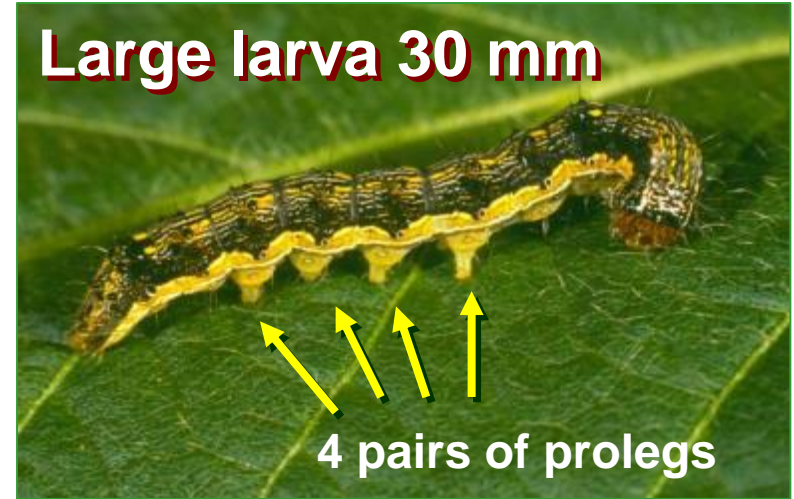
# Native budworm life stages



*Helicoverpa punctigera*



Eggs: fresh, **brown ring**, about to hatch **Only 0.6 mm diameter**

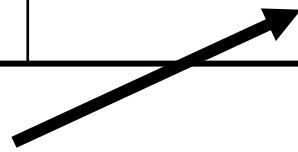


**Large larva 30 mm**

**4 pairs of prolegs**

Helicoverpa size categories			
Very small	Small	Medium	Large
1-3 mm	4-7 mm	8-23 mm	24-30+ mm

90 % of damage caused by these larvae





# Monitoring budworm

**Decision Making**  
for Insect Management  
in Grain Crops



## Early warning – moth activity

- Pheromone traps



## In-crop monitoring

- Sweep net





# Dynamic thresholds for native budworm



	<b>K – grain loss kg/larva/ha</b>	<b>P – grain price \$/tonne</b>	<b>C – cost of control \$/ha</b>	<b>ET – larvae per 10 sweeps</b>
<b>Field peas</b>	<b>50</b>	350	10	<b>0.6</b>
<b>Lentils</b>	<b>60</b>	435	10	<b>0.4</b>
<b>Faba bean</b>	<b>90</b>	335	10	<b>0.3</b>
<b>Chickpeas - desi</b>	<b>30</b>	275	10	<b>1.2</b>
<b>Canola</b>	<b>6</b>	580	10	<b>2.9</b>
<b>Lupins</b>	<b>7</b>	300	10	<b>4.8</b>
<b>Field peas</b>	<b>50</b>	350	10	<b>0.6</b>

$$ET = (C \times 1000) / (K \times P)$$

*\*Developed in Western Australia: Source: DAFWA*





# Example ready reckoner: chickpea

Control is warranted if the cost of control is less than the value of the yield loss predicted.

Chickpea price (\$/t)	Value of yield loss (\$/ha)				
	1 larva/10 sweeps	2 larva/10 sweeps	3 larva/10 sweeps	4 larva/10 sweeps	5 larva/10 sweeps
200	6	12	18	24	30
300	9	18	27	36	45
400	12	24	36	48	60
500	15	30	45	60	75
600	18	36	54	72	90

Value of yield loss = (cost of control x 1000)/ (30 x chickpea price)

based on DAFWA estimate of potential yield loss 30 kg/ha per larva/10 sweeps





# Do receival standards for defective grain make yield thresholds irrelevant?

## Faba bean as an example

Cost of control (\$/ha)	Grain price (\$/t)		
	300	400	500
15	0.6	0.4	0.3
20	0.7	0.6	0.4
25	0.9	0.7	0.6
30	1.1	0.8	0.7
35	1.3	1.0	0.8
40	1.5	1.1	0.9

Faba beans Canning grade	<b>2% Max by weight</b> , includes 1% Max by weight Poor Colour
Faba beans #1 grade	6% Max by weight includes 3% Max by weight Poor Colour <b>3% Max by weight total of all other Defects</b>
Faba beans #2 grade	<b>10% Max by weight</b> , includes 7% Max by weight Poor Colour
Faba beans #3 grade	<b>20% Max by weight</b> of which 7% Max by weight bin burnt, caked, heat damaged, sprouted

Based on DAFWA yield loss estimate of 90 kg/ha per larva per 10 sweeps.





# Other considerations

Egg and early instar mortality high

Hot weather – small larvae burrow

Soft options – NPV, Bt?

Target small – medium larvae



# *Etiella in lentils*



# *Etiella* in lentils

- Larvae remain enclosed within pods until close to maturity
  - Damage levels not known until harvest
  - Not exposed to chemical sprays
- Sprays must target adult moths before egg lay
- Therefore require early warning system
- Very low tolerance for damaged lentil grain





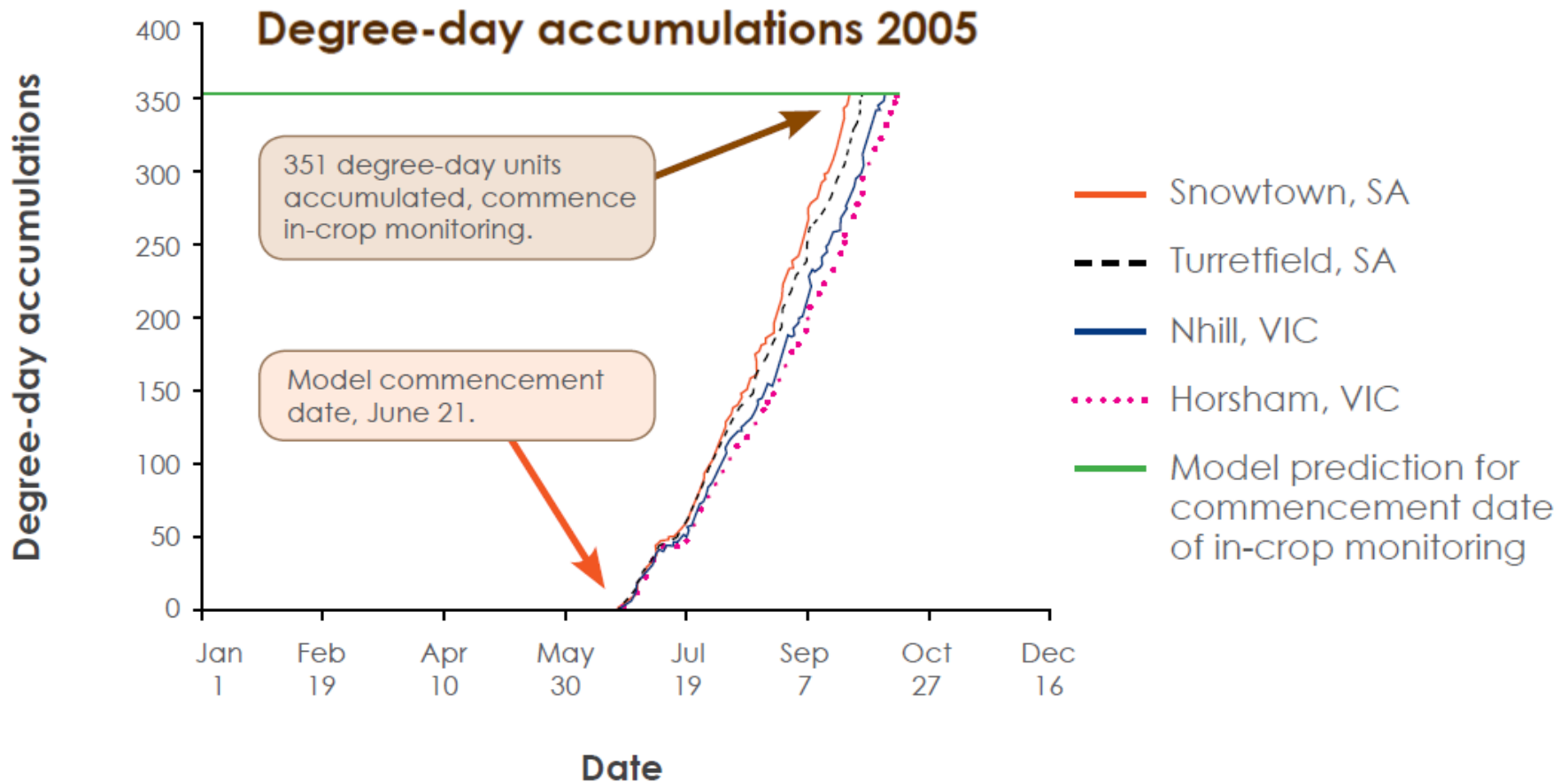
# Early warning system – *Etiella*

## *Etiella* degree-day model

- Forecasts timing of initial moth flight
- Uses daily max/min temperatures
- Date when the model reaches 351 D-days is the date to start monitoring for moth flights
- Download the model from the SARDI website [www.sardi.sa.gov.au](http://www.sardi.sa.gov.au)
- Input max/min temperatures from [www.bom.gov.au/climate/data](http://www.bom.gov.au/climate/data)
- **PestFacts newsletter provides model D-day outputs during spring**

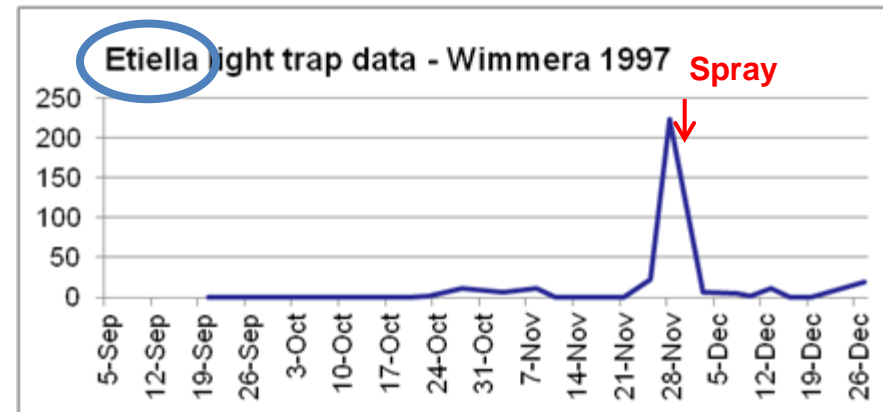
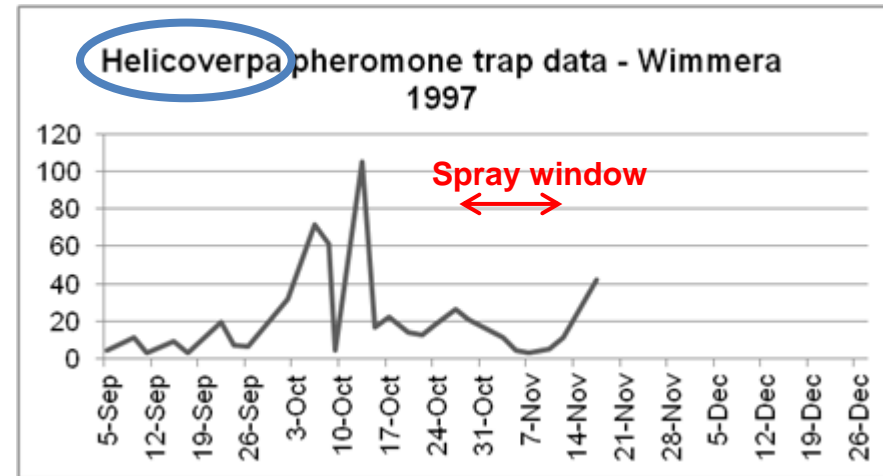


# Etiella flight model output



# Can we control *Helicoverpa* and *Etiella* with one spray?

- Not in all years.  
eg. Wimmera 1997.
- However in some years YES.
- Requires close monitoring and use of the *Etiella* model.



Adapted from M. Miles, H. Brier, *Lentil Focus Proceedings* 2002





# Aphids – direct damage

	Threshold
Chickpea	None
Lupins	Treat at appearance of clusters on flowering plants (NSW)
Faba beans	10% plants heavily infested (Vic)
Field pea	None. Assess % plants infested.
Lentil	None





# Winter pulse best bet

Pest	Post harvest, Pre-sowing	Establishment - vegetative	Flowering - grainfill
<p>Aphids – direct damage (not virus) Cowpea Green peach Blue-green Pea aphid</p>	<p>Remove green bridge (aphid hosts) to minimise build up during autumn and spring.  Sowing into standing stubble may reduce aphid landing and delay aphid build up in crops.</p>	<p>Control in-crop weeds to minimise sources of aphids.  Conserve beneficial insects that will suppress small aphid populations and reduce the likelihood of outbreaks.  High nitrogen may make the crop more attractive to aphids</p>	<p>Conserve and monitor beneficials that suppress aphids.  Be aware that use of SPs, OPs and carbamates may flare aphids. Monitor post application for flaring.  Limited knowledge of damaging levels.  If control is required, use soft options (e.g. pirimicarb).</p>





# Virus in chickpea



**Edgeroi chickpea crop (11km NW of Edgeroi) with  
~50% symptomatic plants throughout block 2012.  
(M. Sharman, DAFF)**



**Virus symptoms in chickpeas showing  
reddening 2011 (M. Sharman, DAFF)**

- Losses are often difficult to estimate but can be 100% if infections are early in the cropping cycle and at high incidence
- if infection is very late in the season then those plants may still have produced some pods but it is likely the seed quality would be poor as the plants would have shut down (died) prematurely.



# Pea weevil

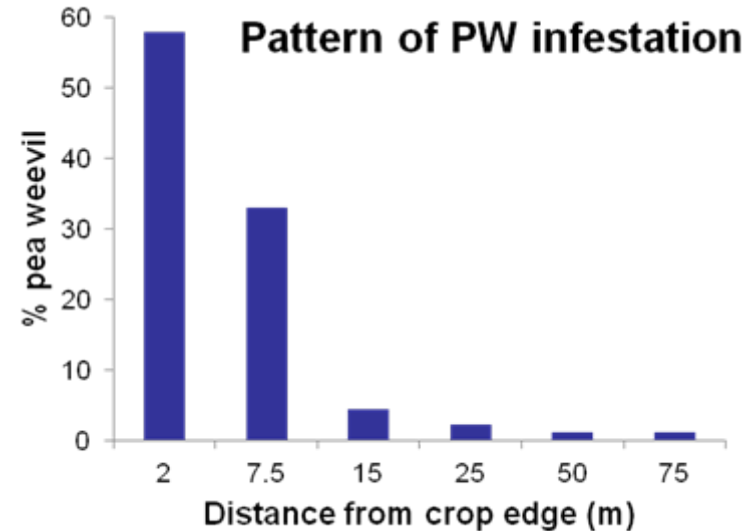
# Pea Weevil (PW): a southern Pulse IPM case study

- 1980's - emerged as major pest
  - no effective natural enemies
  - no cultural controls
  - insecticidal control difficult
    - Timing must prevent egg laying
- 1986-1992: coordinated research on PW biology/ecology across 3 States
  - objective to generate new knowledge to improve management



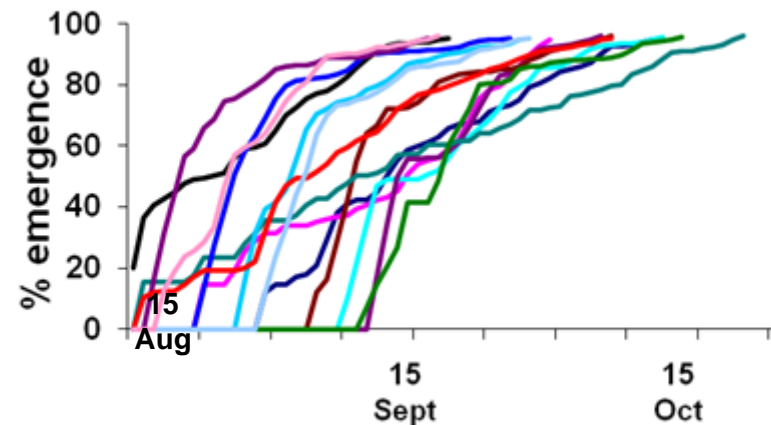
# Pea Weevil: the key R&D findings

- PW invasion of pea crops
  - Occurs from crop edge, PW infestation remains highly skewed
  - Timing of invasion (start date & duration) is temperature dependent
    - Predictive models were developed



- Rate of Pea Weevil Development
  - Rate of ovarian development
  - Egg to adult: Pea crop consistently harvestable 3-4 weeks before first PW adults develop

**Estimated timing of PW invasion, SA, 1986-2002**



# Pea Weevil - The IPM Strategy

- Optimised Insecticidal Control
  - Border spraying (outer 40m, < 1/3<sup>rd</sup> of average crop area)
  - Accurate timing guidelines:
    - date for 1<sup>st</sup> spray
    - need for 2<sup>nd</sup> spray (and date if required)
  - Marked reduction in grain infestation levels and spray costs
- Early Harvest followed by grazing
  - Yield losses minimized, and
  - Prevents PW dispersal and carryover within the district

