Management strategies for stem fly, whitefly and other insects of interest

Management strategies for stem fly, whitefly and other insects the group wants to focus on (podborer?).

- - Insect ecology and biology
- - Damage thresholds and impacts
- - Key decision points and options
- - Setting the crop up for success and tips for ..successful management

What pests to look out for in 2014!

Soybean stem fly - Casino

Etiella in vegetative soys

Early heli damage

Soybean stem fly larva & damage – Casino NSW

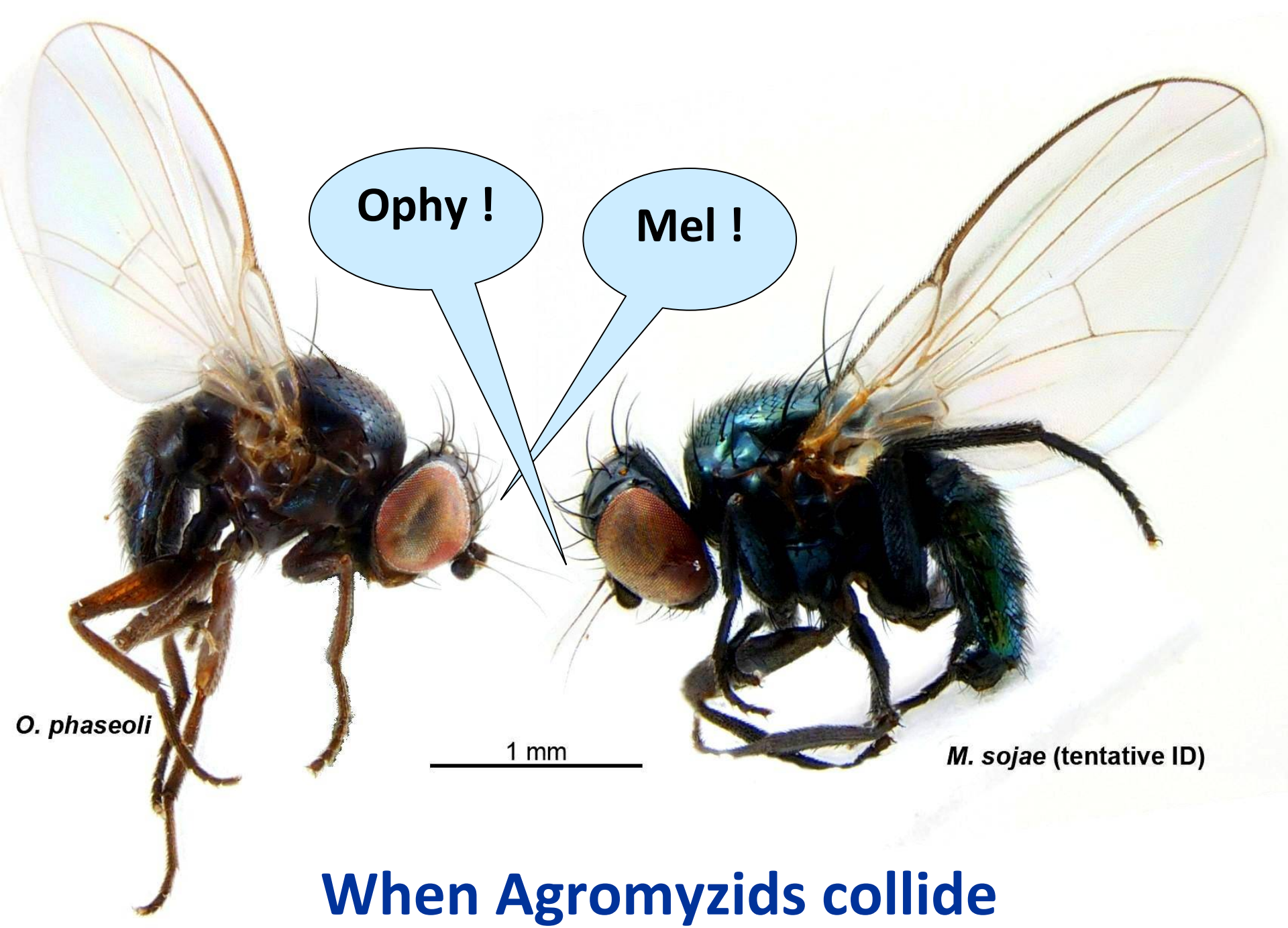
Lucerne crown borer

whitefly

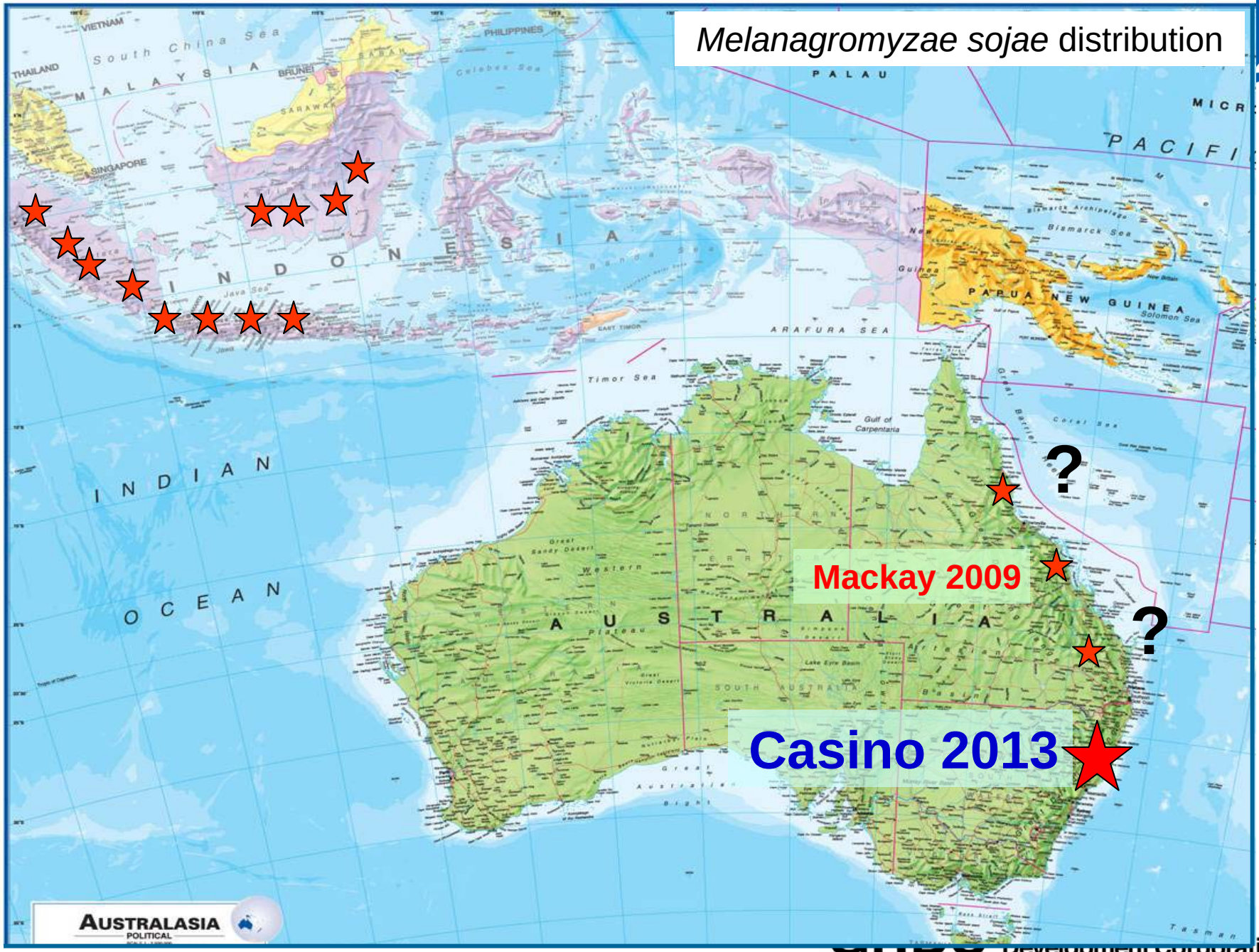
GRDC Grains Research & Development Corporation
Your GRDC working with you

IPM drivers in soybeans and mungbeans/adzukis? Choose 2

1. Threat of pesticide resistance in *H. armigera*
2. Flaring of 1^0 & 2^0 pests
3. Current pesticides ineffective
4. No registered products
5. Current products too toxic (eg methomyl)
6. Desire to preserve beneficials
7. Market demand for reduced pesticide use



When Agromyzids collide


Melanagromyzae sojae distribution
Mackay 2009
Casino 2013
?
?
INDONESIA
INDIAN OCEAN
AUSTRALIA
PAPUA NEW GUINEA
PALAU
PACIFIC
MALAYSIA
SINGAPORE
THAILAND
VIETNAM
PHILIPPINES
BRUNEI
ARAFURA SEA
Timor Sea
Gulf of Carpentaria
Coral Sea
Tasman
AUSTRALASIA
POLITICAL

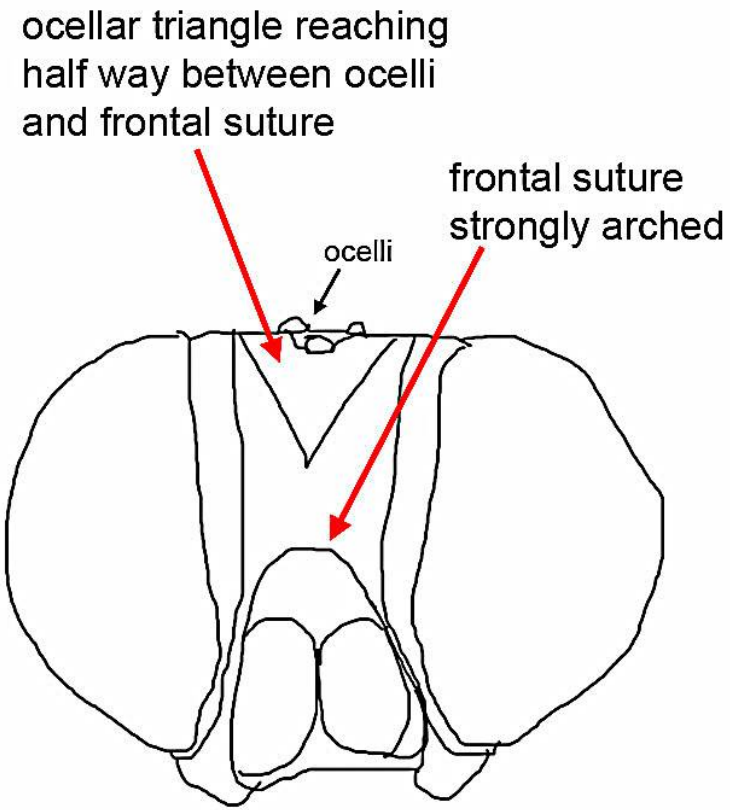
Soybean stem fly

- ‘New’ pest
- Major outbreak Casino 2013
- Early activity reported in mid Jan 2014 at Grafton
- No effective IPM-friendly registered products
- BUT – potential for new generation products in future
- Significant parasitism in 2013 Casino outbreak

Soybean stem fly larva & damage – Casino NSW

Soybean stem fly

Note: Image clarity and differentiation (e.g. the shiny ocellar triangle) requires **strategically directed** light source



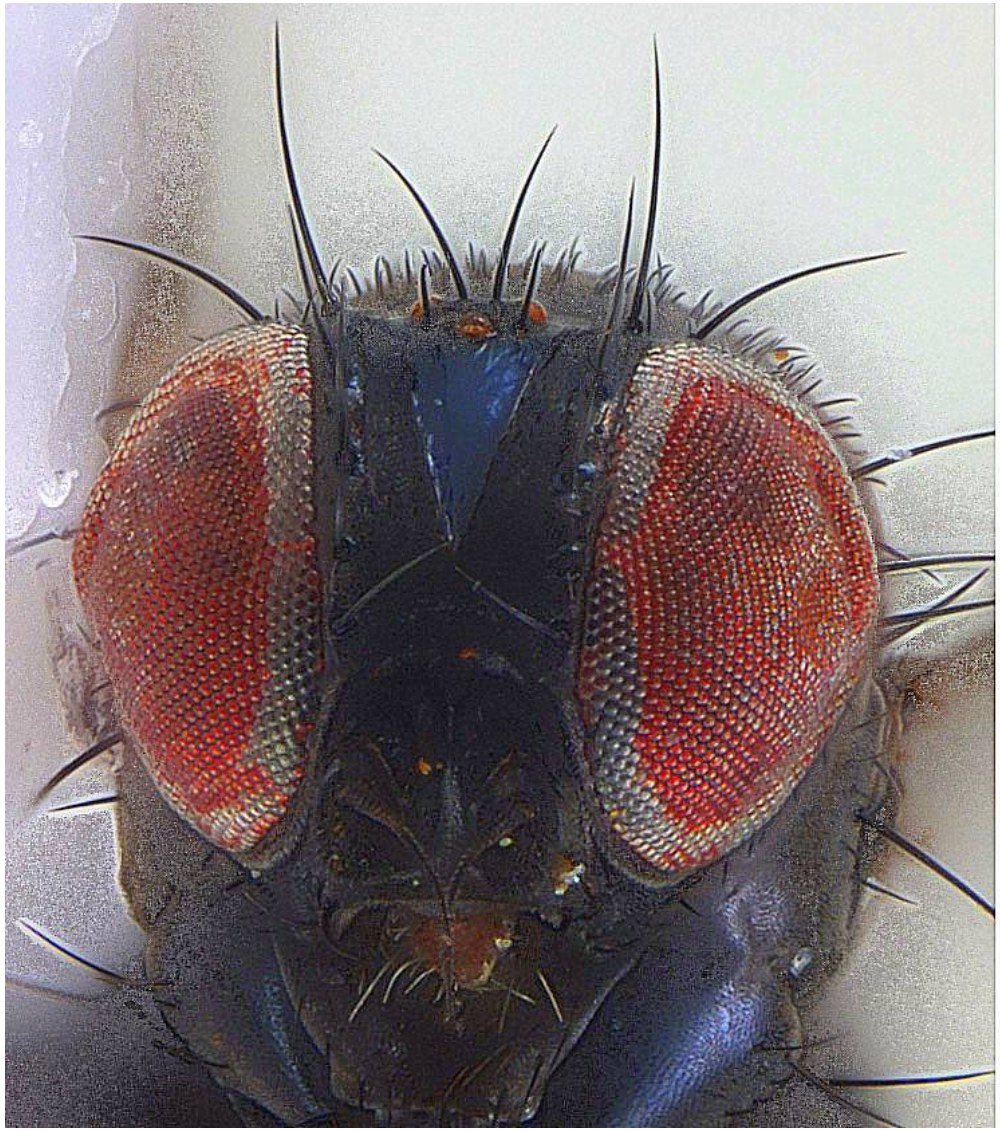
Soybean stem fly (*Melanagromyza sojae*)

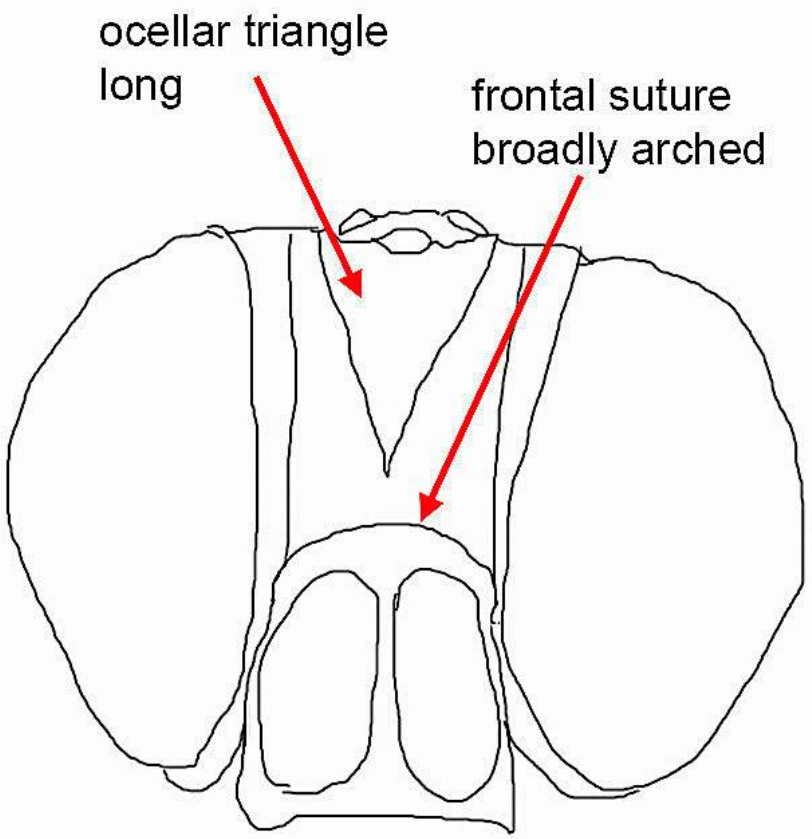
ID Justin Bartlett

Adults very hard to separate from other bean flies

GRDC
Grains
Research &
Development
Corporation
Your GRDC working with you

Bean fly

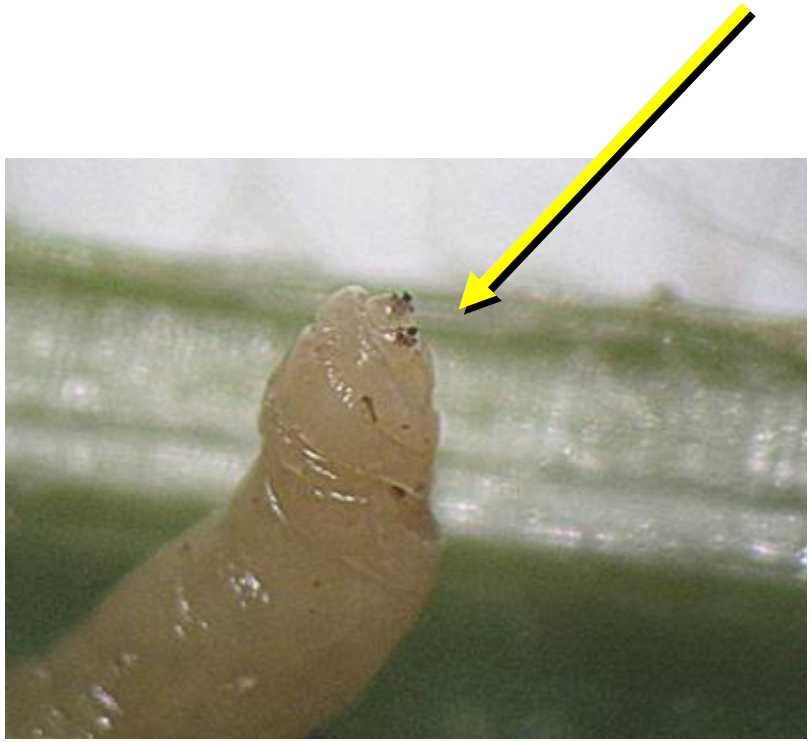




Bean fly (*Ophiomyia phaseoli*)

Images Justin Bartlett

Soybean stem fly larva easy to ID - have shrunken posterior spiracles – called atrophied horns



Soybean stem fly

Ordinary bean fly - posterior spiracles not shrunken

Stem fly oviposition stings

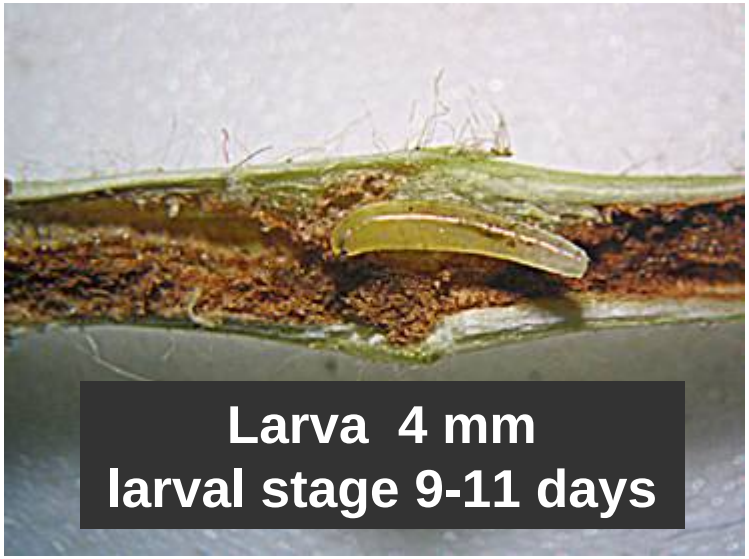
Eggs hatch in 2 days

Hatching larvae vulnerable to systemic insecticides

Soybean stem fly Casino 2013
only previous outbreak Mackay 2009

Decision Making for Insect Management in Grain Crops

Parasite 2 mm



GRDC Grains Research & Development Corporation
Your GRDC working with you

Other pests tunnel in stems

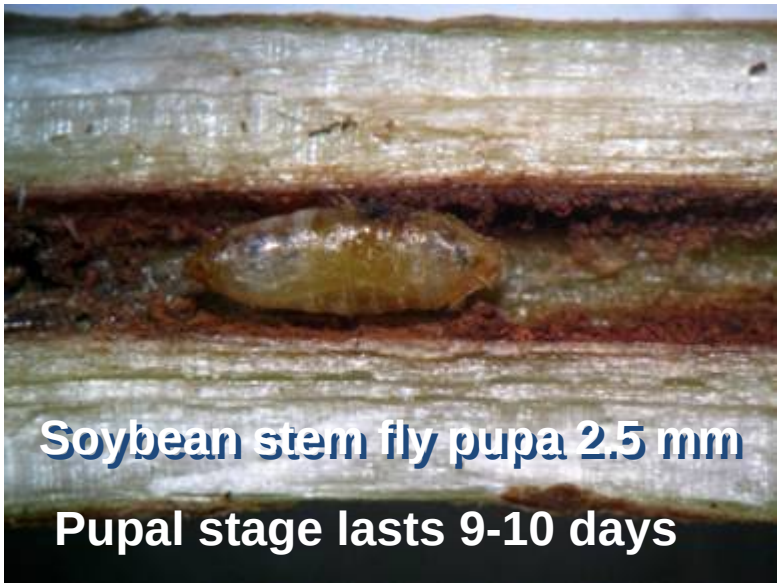
Soybean stem fly - Casino

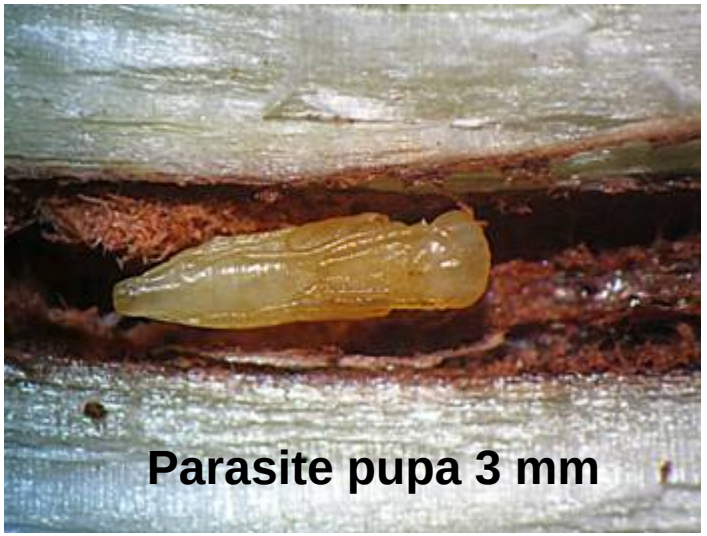
Etiella in vegetative soys

Soybean stem fly larva & damage – Casino NSW

Lucerne crown borer

Soybean stem fly and parasites Casino 2013





GRDC Grains Research & Development Corporation
Your GRDC working with you

Isolated plant with stem fly symptoms

Severely affected plants Casino 2013

Charcoal-rot-infected soybeans from Casino with severely impacted roots

Oh Lord above we pray to thee, for natural control of *M. sojae*

Soybean stem fly (SSF) control

- Emergency use PER14121
- Dimethoate @ 800 mL/ha
- **LAPSED 31 May 2013**
- Could be renewed but how effective in late outbreaks?
- Hard on beneficials – so consider lower rates?
- Go soft early for other pests to preserve SSF & SLW & Heli parasites
- And to preserve aphid and caterpillar predators

Soybean stem fly larva & damage – Casino NSW

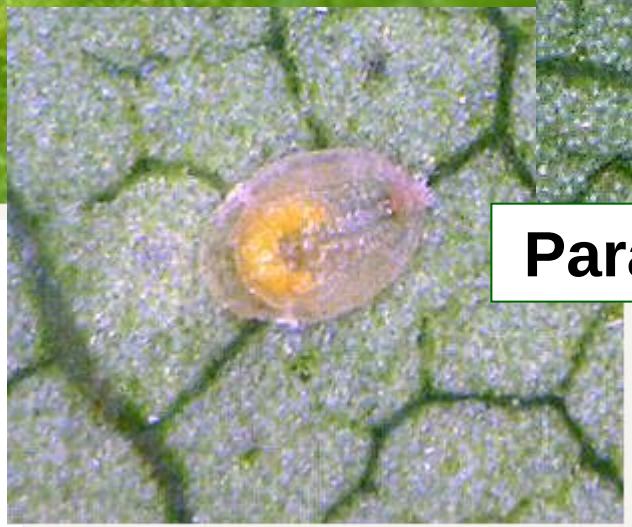
SLW squadron in Casino soybeans 2013

Decision Making
for Insect Management
in Grain Crops

Hard pesticides flare whitefly

GRDC
Grains
Research &
Development
Corporation
Your GRDC working with you

SLW nymphs and parasites



Parasitized nymphs

GRDC
Grains
Research &
Development
Corporation
Your GRDC working with you

Key mungbean/soybean pests

Attack leaves, buds, flowers & pods

Suck pods reducing seed quality

Attack buds, flowers, pods
Major tropical mungbean pest

Threaten soybeans but not mungbeans. Flared by hard pesticides

Attack buds, flowers
Major mungbean pest
but not in soybeans

Lesser pests

Decision Making for Integrated Pest Management in Grain Crops

Mainly leaf feeders but can attack flowers

Mungbeans only. Infest stems & pods

Soybeans only. Above threshold ppns. delay harvest maturity

Seedlings & flowers

Under leaves – flared by hard pesticides

Soybeans only. Common at low densities but spasmodically occurs in huge numbers.
Abamectin permit

GRDC Grains Research & Development Corporation
Your GRDC working with you

Discussion re IPM of these pests

- Key problem issues identified by audience
- Multi-pest issues
- Cheap oldies vs exy newies
- New kids on the block

Etiella in vegetative soys/mungs *Jan 2013 & 2014 - Downs & Moree*

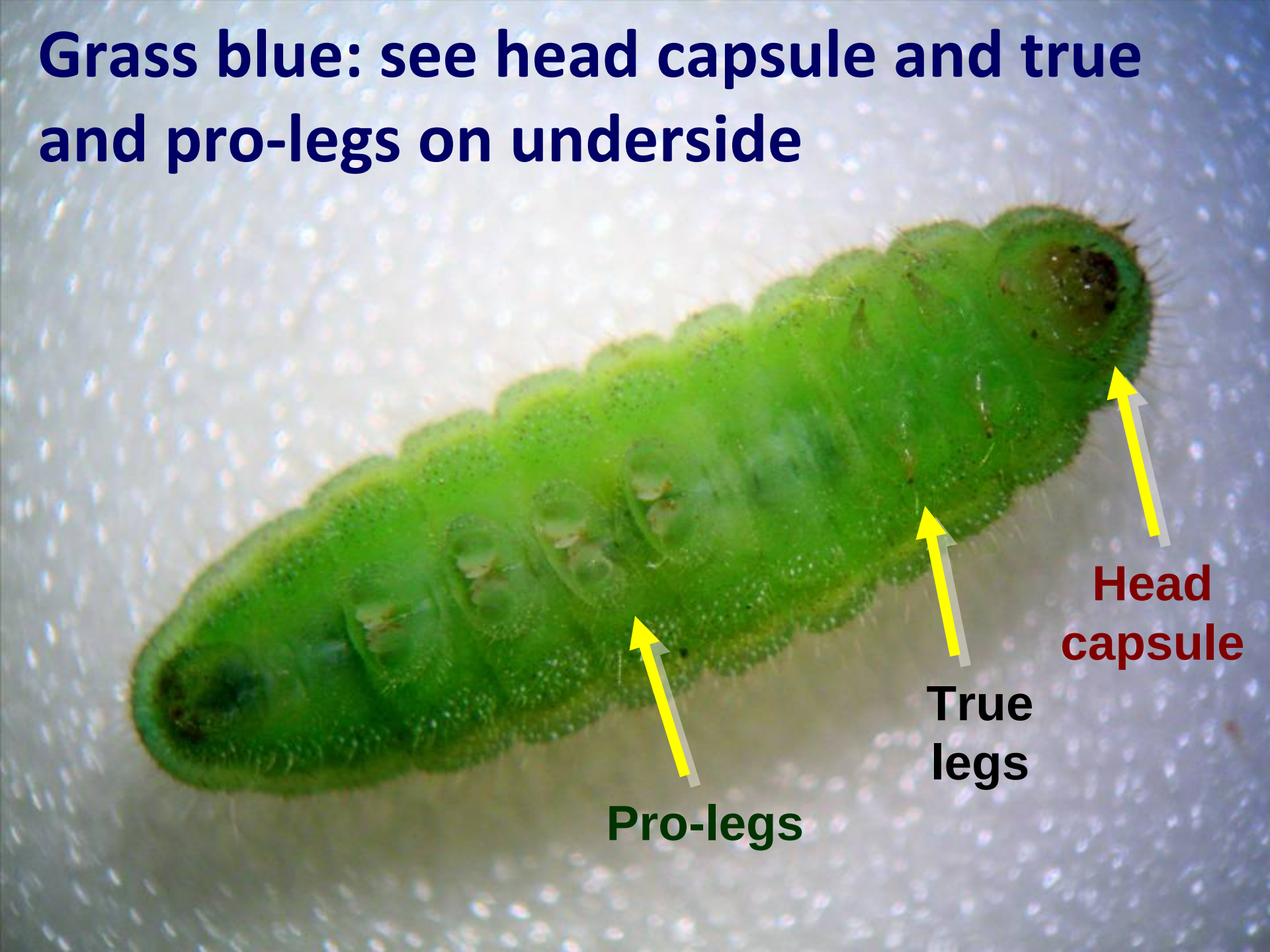
Watch for unusual symptoms

New coastal pest – *Rhyparida humeralis* – leaf swarming beetle

Parasitized beetle (4 mm) and damage

Damage to terminals, stems and petioles caused by 3 different pests

Grass blue: see head capsule and true and pro-legs on underside




windowing
Grass blue

Pests develop quickly in hot summers so sample regularly!

Monitor pests, beneficials & crop stage

Decision Making
for Integrated Pest Management
in Grain Crops

Integrated Pest Management?

What cards do we have?

- Paddock selection to avoid/minimize pests
- Best practice agronomy – increases pest tolerance
- Conserve natural enemies – free control - by using 'more-selective' 'softer' pesticides
- Only spray above-threshold pest populations saves $$ and conserves natural enemies

GRDC Grains Research & Development Corporation
Your GRDC working with you

Key IPM messages
"Go Soft Early"

"Beneficials save you money!"

IPM best bets/opportunities

Vegetative mungbeans & soybeans - loopers

- Tolerance of early caterpillar damage opens door for biopesticides
- Up to **33% looper defoliation** no yield loss
- Bt (Dipel) effective against loopers

Which leaf has 30% defoliation?

Decision Making
for Insect Management
in Grain Crops

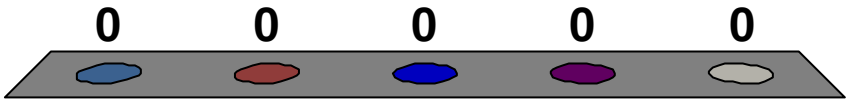
1.  5%

2.  10%

3.  20%

4.  30%

5.  40%



GRDC Grains Research & Development Corporation
Your GRDC working with you

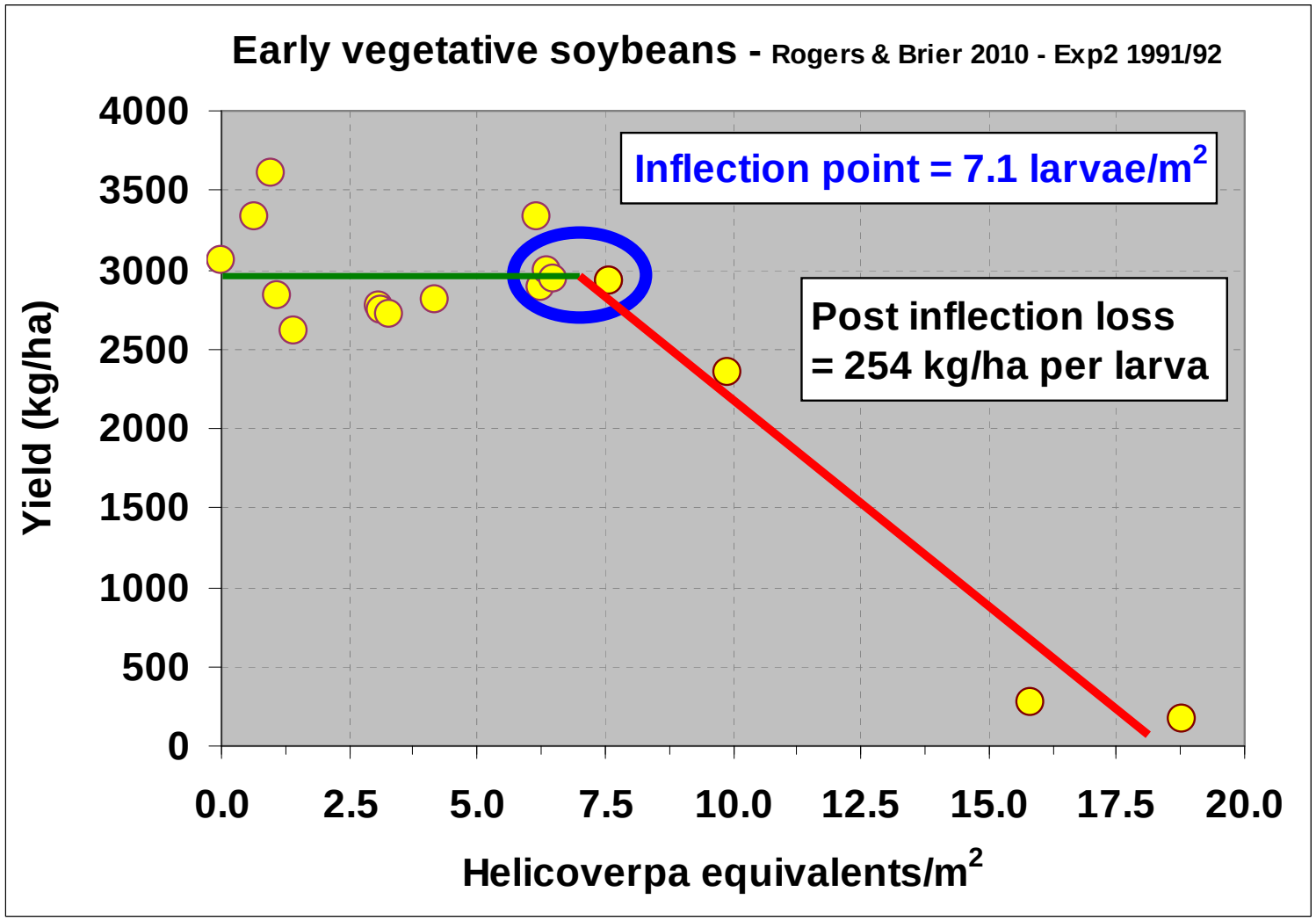
Vegetative soybeans helicoverpa

- Soybeans can tolerate 7 helis/m^2 with no yield loss
- Threshold is 6 helis/m^2 as severe damage if >7/m^2
- NO need to kill ALL larvae – biopesticides ✓
- NPV (VivusMax®, Gemstar®) for helis
- Coverage, adjuvants important

Decision Making
for Integrated Pest Management
In Grain Crops

GRDC Grains Research & Development Corporation
Your GRDC working with you

Vegetative soybeans – Heli IPM target
Keep larvae <7/m²



IPM best bets/opportunities

Budding/flowering/podset

Mirids in soybeans?

- Far more tolerant than mungbeans
- Usually no need to spray as ET is 5/m^2

IPM best bets/opportunities
Podfill/Pod ripening
Helicoverpa

- Indoxacarb preferred option
- Lower impact (softer) on parasitoids & bug predators than carbamates
- SP's ineffective against *H armigera*
- Observe thresholds – see following tables

Economic Threshold Table for Helicoverpa in Podding Mungbeans

Control Cost $/ha	Threshold (larvae/m^2) at crop values listed below ($/t)						
	$ 400	$ 500	$ 600	$ 700	$ 800	$ 900	$ 1,000
$ 15	1.1	0.9	0.7	0.6	0.5	0.5	0.4
$ 20	1.4	1.1	1.0	0.8	0.7	0.6	0.6
$ 25	1.8	1.4	1.2	1.0	0.9	0.8	0.7
$ 30	2.1	1.7	1.4	1.2	1.1	1.0	0.9
$ 35	2.5	2.0	1.7	1.4	1.3	1.1	1.0
$ 40	2.9	2.3	1.9	**1.6**	1.4	1.3	1.1
$ 45	3.2	2.6	2.1	1.8	1.6	1.4	1.3
$ 50	3.6	2.9	2.4	2.0	1.8	1.6	1.4

- Cross-reference cost of control vs crop value
- For Cost of Control = $40/ha & Crop Value = $700/t, ET = 1.6

Economic Threshold Table for Helicoverpa in Podding Soybeans

Control Cost $/ha	Threshold (larvae/m^2) at crop values listed below ($/t)						
	$ 400	$ 500	$ 600	$ 700	$ 800	$ 900	$ 1,000
$ 15	0.9	0.8	0.6	0.5	0.5	0.4	0.4
$ 20	1.3	1.0	0.8	0.7	0.6	0.6	0.5
$ 25	1.6	1.3	1.0	0.9	0.8	0.7	0.6
$ 30	1.9	1.5	1.3	1.1	0.9	0.8	0.8
$ 35	2.2	1.8	1.5	1.3	1.1	1.0	0.9
$ 40	2.5	2.0	**1.7**	1.4	1.3	1.1	1.0
$ 45	2.8	2.3	1.9	1.6	1.4	1.3	1.1
$ 50	3.1	2.5	2.1	1.8	1.6	1.4	1.3

- Cross-reference Control Cost vs Crop Value
- For Cost of Control = $40/ha & Crop Value = $600/t, ET = 1.7

Podsuckers

- Major pests
- 5 main species
- Invade at flowering but damage at podding
- Feed on seeds
- Nymphs different to adults
- Some confused with predatory bugs

Bean bug adults look like assassin bugs but are more slender, not as convex, have a larger head & are less dangerous!

Bean bug nymphs look like ANTS

Decision Making
for Insect Management
in Grain Crops

Know your bugs!!

= 0.2 GVB

GRDC Grains Research & Development Corporation
Your GRDC working with you

Podfill/Pod ripening
Podsucking bugs

- No effective soft options
- Deltamethrin ® (SP)

- Shield permit 12699 - GVB & redbanded (Sept 2014)
- Delay 1st spray till early podfill

- By then – lower risk of SLW or mites
- Need salt adjuvant for redbanded (Piezodorus)

Podsucking bug thresholds

- Based on seed quality
- Based on % seed damage
- 3% damage MAX allowed for edibles
- Thresholds set for 2% damage to allow for non-bug damage
- Thresholds influenced by yield, seed size, bug stage, bug species and days to harvest
- Non edible (crushing) thresholds were stated as roughly TWICE edible threshold – but new model are coming to calculate more accurate crushing thresholds for podsuckers

New podsucker threshold calculator – Step 1:
enter agronomic parameters that influence the threshold

Variety	Bunya				
Row spacing*	0.91	metres			
Days to harvest maturity*	28	days			
Predicted yield*	4	t/ha		*Calculated values:*	
Mean seed weight (MSW)	25	grams/100 seeds		= 4000	seeds/kg
OR*			(*use this button to autofill the MSW based on your selected variety*)		
number seeds	4000	seeds/kg		= 25	grams/100 seeds

Counts (average per metre row)

New podsucker threshold calculator – Step 2

Enter your bug counts (per metre of row)

Bug growth stage:	Instar I	Instar II	Instar III	Instar IV	Instar V	Adults	Total AEQ / m	GBVAEQ / m^2 re. days to harvest
Green vegetable bug (GVB)			1				0.68	0.75
Brown bean bugs (BSB)								
Redbanded shield bug (RBSB)				1			0.89	0.74
Brown shield bug (BSB)								

Total GVBAEQ for all species	1.48	per m^2
Threshold	0.71	GVBAEQ / m^2
Are you above threshold	YES	

Please ensure required values (*) are completed

GRDC Grains Research & Development Corporation
Your GRDC working with you

Podsucking bug control

- **Don't spray until early podfill**
- **Young nymphs cause very little damage**
- **Deltamethrin most effective ® GVB option**
- **Need 0.5% salt adjuvant to control (66%) redbanded & brown shield bugs**
- **Permit 12699 for clothianidin (Shield) against GVB & redbanded in soys**
- **Avoid sequential plantings**

Redbanded shield bug

Lucerne crown borer *Zygrita diva*

Decision Making for Insect Management in Grain Crops

- Early infestation can give premmy plant death
- Hot summers & lucerne high risk factors
- **Pesticide control problematic**

GRDC Grains Research & Development Corporation
Your GRDC working with you

spotless

2 small spots - standard

Zygrita colour forms

2 large spots

All Black (wing covers)

3 barred

2 barred

Monolepta
redshouldered leaf beetle

Larvae feed on cane roots

Adults shred leaves and eat flowers

Soybean aphid *Aphis glycines* A bright pale-green aphid

Worse in cooler summers

Unsure as to how good IPM is for your pest/crop??

- **Leave unsprayed strip/s** and monitor pests prior to and post spray till harvest
- **Assess** yield, time to harvest, and evenness of maturity

IPM Summary soys & other pulses

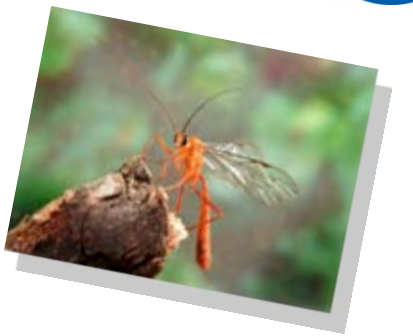
- Sample regularly to detect the early stages of pest infestations and critical crop stages
- 'Go soft early' wherever possible
- Conserve beneficials by:-
- Only spraying above threshold pest ppns.
- And using selective pesticides where possible
- Delay hard pesticides as long as possible

Case study 1:

Helis @ 8/m² in a crop of mid vegetative soys. SLW have been reported in neighbouring crops. You have only very low stem fly (<1% plants infested)

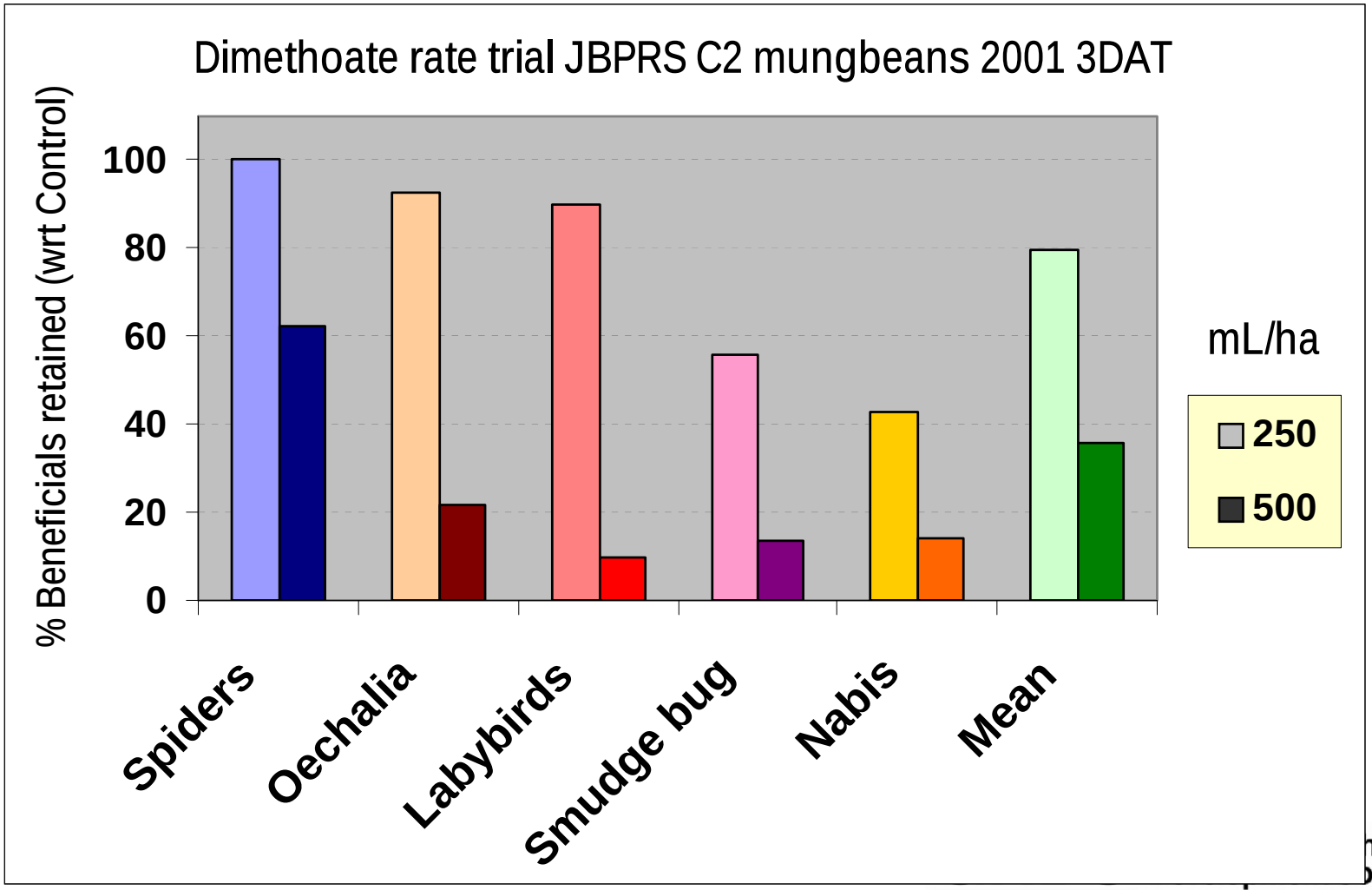
- What is your recommendation?
- What factors would you consider?

Decision Making
for Insect Management
in Grain Crops

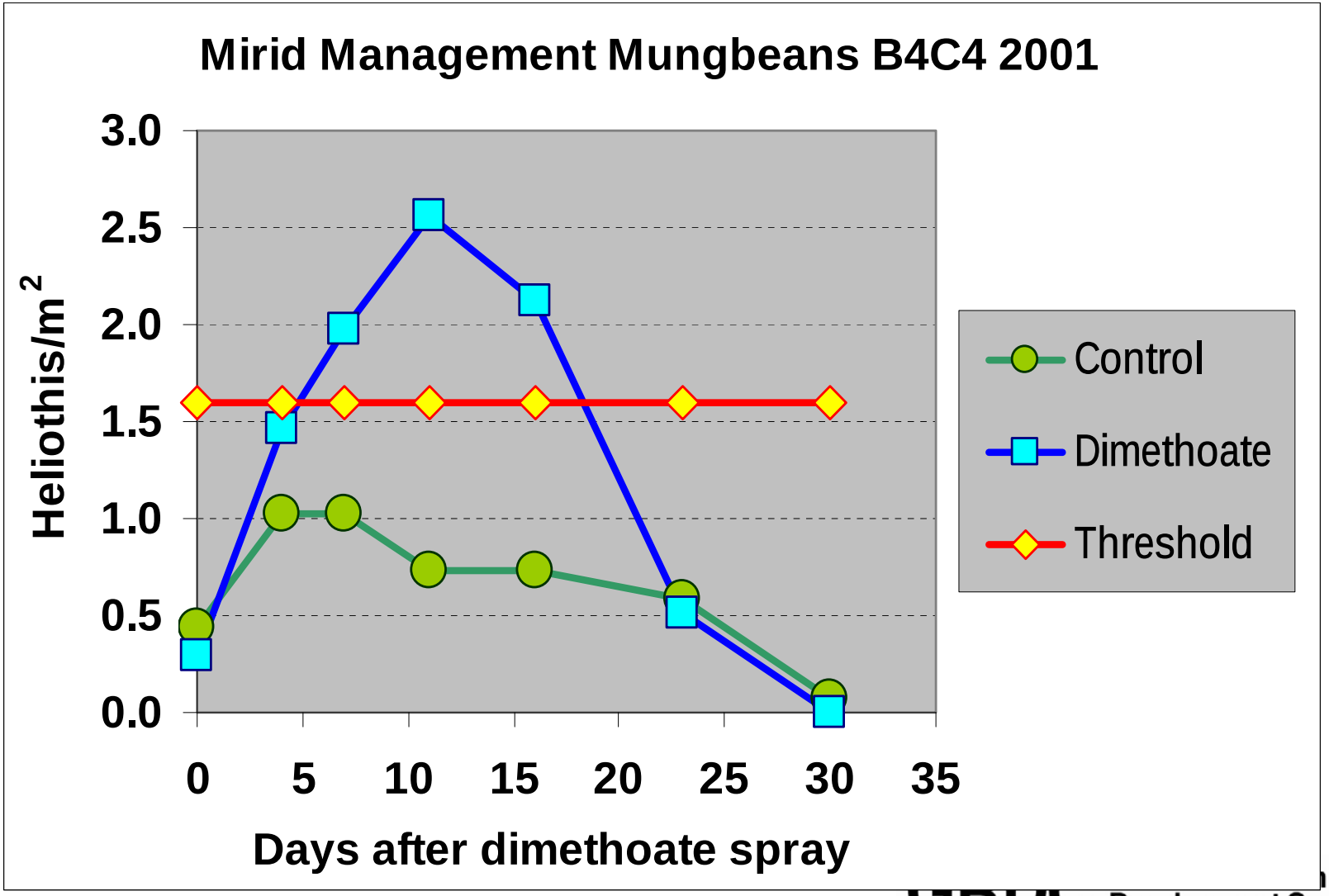


Further information to consider for case study

Low rate dimethoate (250mL/ha) has far less impact on most beneficials

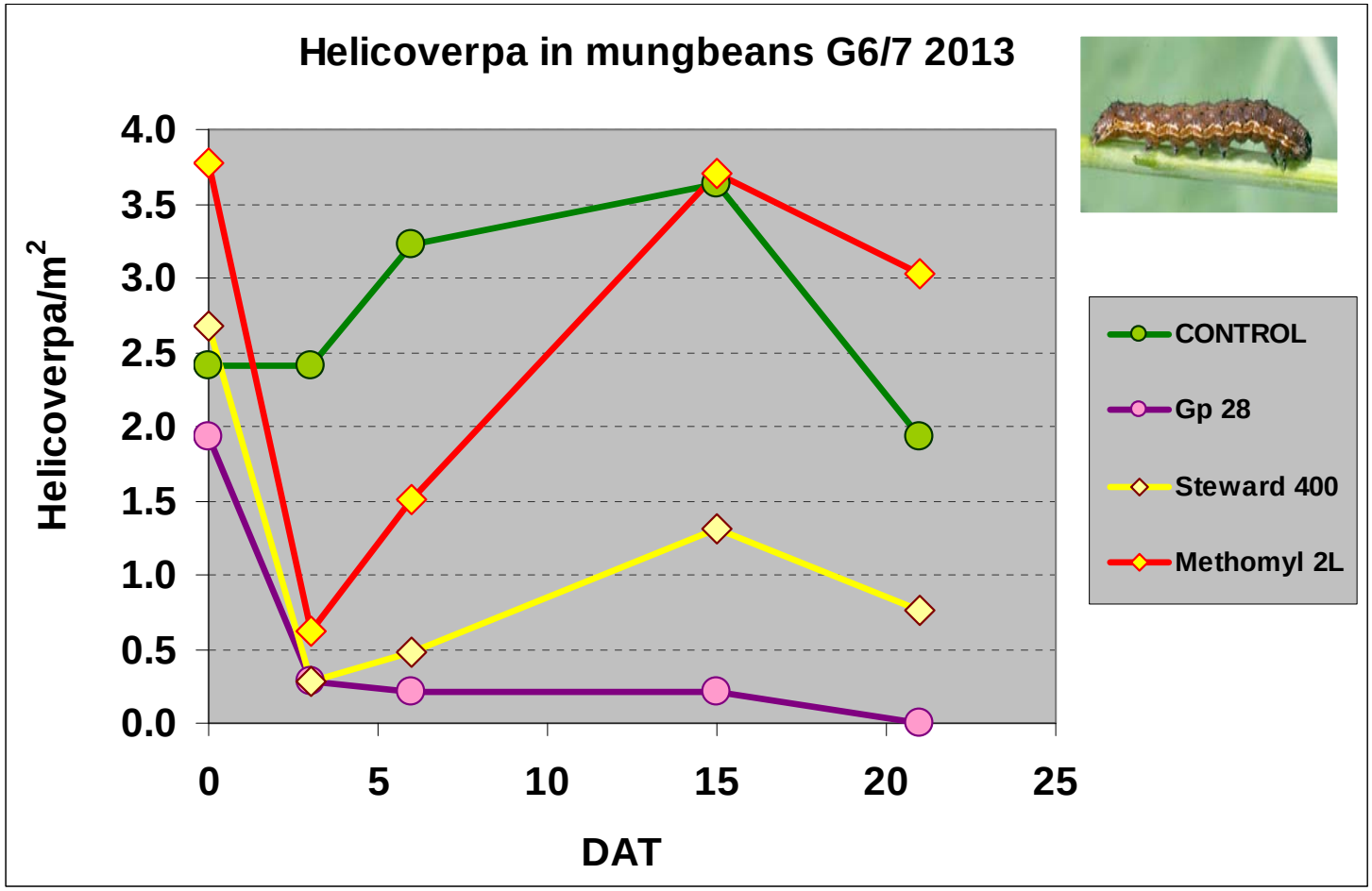


Dimethoate @ 500mL/ha can increase the risk of subsequent helicoverpa attack



Cheapest is not always best

- **Within 2 weeks, methomyl** back at pre-spray levels
- **Steward®** best of registered products
- **New generation pesticides will do even better** when registered



Pests develop quickly in hot summers so sample regularly!

To avoid nasty surprises

GRDC Grains Research & Development Corporation
Your GRDC working with you

Key IPM messages
"Go Soft Early"

"Beneficials save you money!"

Observe Thresholds

GRDC Grains Research & Development Corporation
Your GRDC working with you

IPM Summary soys & other pulses

- Sample regularly to detect the early stages of pest infestations and critical crop stages
- 'Go soft early' wherever possible
- Conserve beneficials by:-
- Only spraying above threshold pest ppns.
- And using selective pesticides where possible
- Delay hard pesticides as long as possible

Know the Story – and pest ID

- **What pests to expect**
- **Damage symptoms**
- **What pests look alike and cause similar damage**
- **When is crop at greatest risk**
- **Thresholds**

Supporting research organisations

Queensland Government
Department of Agriculture, Fisheries and Forestry

NSW GOVERNMENT Department of Primary Industries

cesar

SARDI
SOUTH AUSTRALIAN RESEARCH AND DEVELOPMENT INSTITUTE

Financial workshop support

Dow AgroSciences

syngenta

Workshop facilitation

ICAN
Independent Consultants Australia Network

The End – do NOT proceed!

And easy decision really – a no brainer!