Decision Making
for Insect Management
in Grain Crops

Integrated Pest Management in Mungbeans and Soybeans

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Mungbeans, a brief description

- Short-season, indeterminate tropical pulse
- Seed quality **critical** to achieve to top $$
- IPM IS CHALLENGING BUT ---------
- NOT IMPOSSIBLE

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Soybeans, a brief description

- A longer season summer pulse/oilseed
  - Determinate cultivars in northern Australia
  - Indeterminate cultivars in southern Australia
- More tolerant of pests than other pulses
- Seed quality critical for edible market
- IPM reduces SLW/mite risk

Key mungbean/soybean pests

Decision Making for Integrated Pest Management in Grain Crops

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

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

Etiella in vegetative soybeans *Jan 2013*

Watch for unusual symptoms

IPM drivers in mungbeans and soybeans? Choose 2

1. Threat of pesticide resistance in *H. armigera*
2. Flaring of 1^0 & 2^0 pests
3. Current pesticides ineffective
4. Current products too toxic (eg methomyl)
5. Desire to preserve beneficials
6. Market demand for reduced pesticide use

Mungs in particular a fast crop so beat sheet regularly!

Monitor pests, beneficials & crop stage

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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

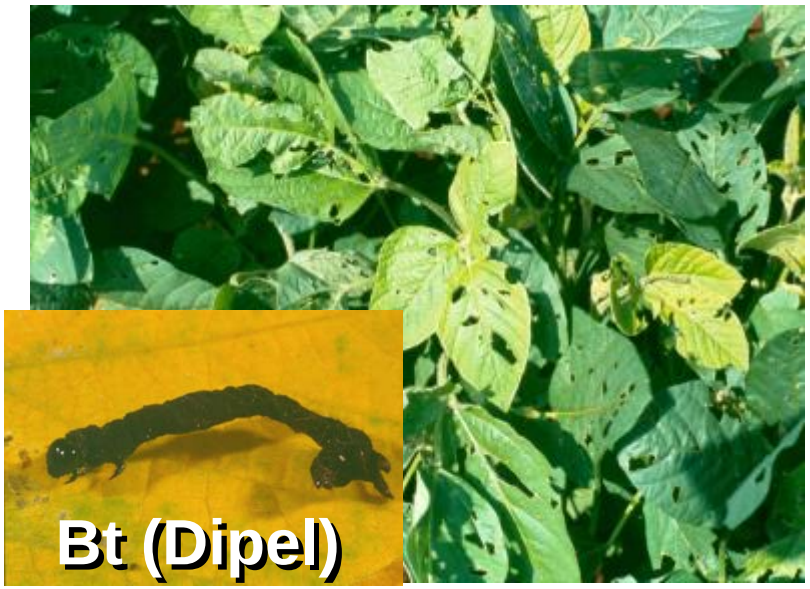
…saves $$ and conserves natural enemies

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?

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1. 
2. 
3. 
4. 
5. 

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Vegetative soybeans
-Helicoverpa

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- 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

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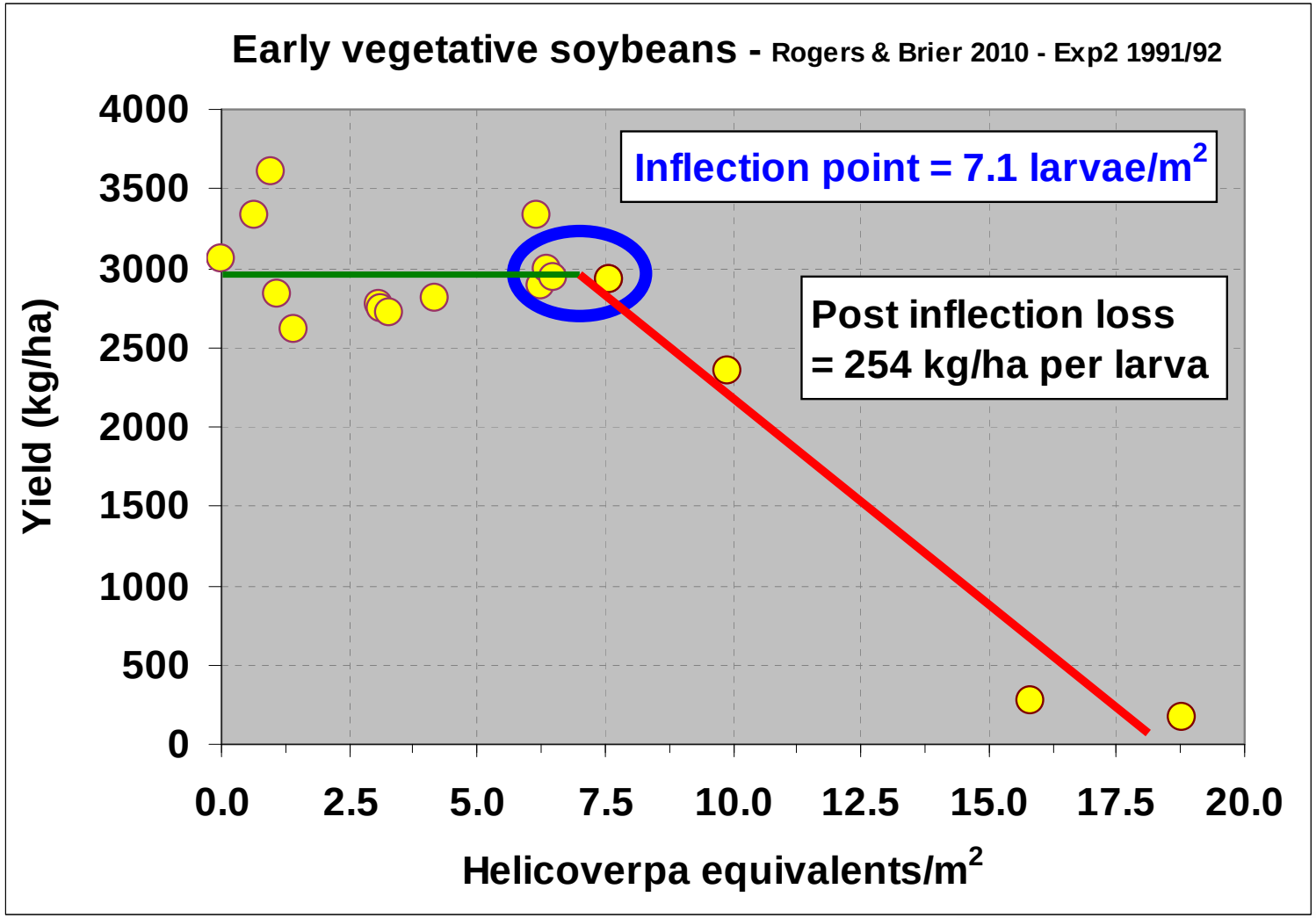
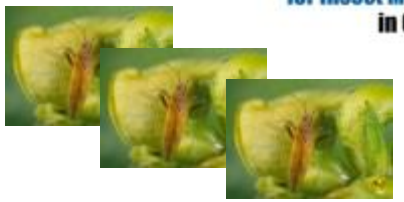
Vegetative soybeans – Helicoverpa IPM target - Keep larvae <7/m^2



Mirids in mungbeans
- Budding/flowering/podset

- **Optimize spray timing & low rates**
- Can delay 1st mirid spray by up to 7 days as no yield loss if mirid ppn. not too high
- Why? – to avoid a 2nd mirid spray
- To reduce risk of flaring *Helicoverpa*

Economic Threshold Table for Mirids in Flowering Mungbeans



Decision Making for Insect Management in Grain Crops

Control Cost $/ha	Threshold (adults + nymphs/m^2) at crop values below					
	$ 400	$ 500	$ 600	$ 700	$ 800	$ 900
$ 10	0.4	0.3	0.3	0.2	0.2	0.2
$ 15	0.6	0.5	0.4	**0.4**	0.3	0.3
$ 20	0.8	0.7	0.6	0.5	0.4	0.4
$ 25	1.0	0.8	0.7	0.6	0.5	0.5
$ 30	1.3	1.0	0.8	0.7	0.6	0.6
$ 35	1.5	1.2	1.0	0.8	0.7	0.6
$ 40	1.7	1.3	1.1	1.0	0.8	0.7

- Cross-reference Control Cost vs Crop Value
- For Cost of Control = $15/ha & Crop Value = $700/t, ET =0.4
- Threshold based on mirid damage in crop for up to 4 weeks

- **Mirid thresholds are low because dimethoate is cheap**

- **Mirid thresholds are based on sustained attack over 28 days**

Why not calendar mirid sprays?

If you don't sample:

- How do you know **when** to spray?
- How do you know **what** product to apply?

Insurance vs unintended consequences:

- Wasted money if pests are < threshold
- Flaring of pests – eg. helicoverpa - more costs
- Resistance, Residues
- **Poor industry IMAGE**

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Mirids in mungbeans
- Budding/flowering/podset

- Delaying a mirid spray !!***##
- This is heresy!
- Show us the data!

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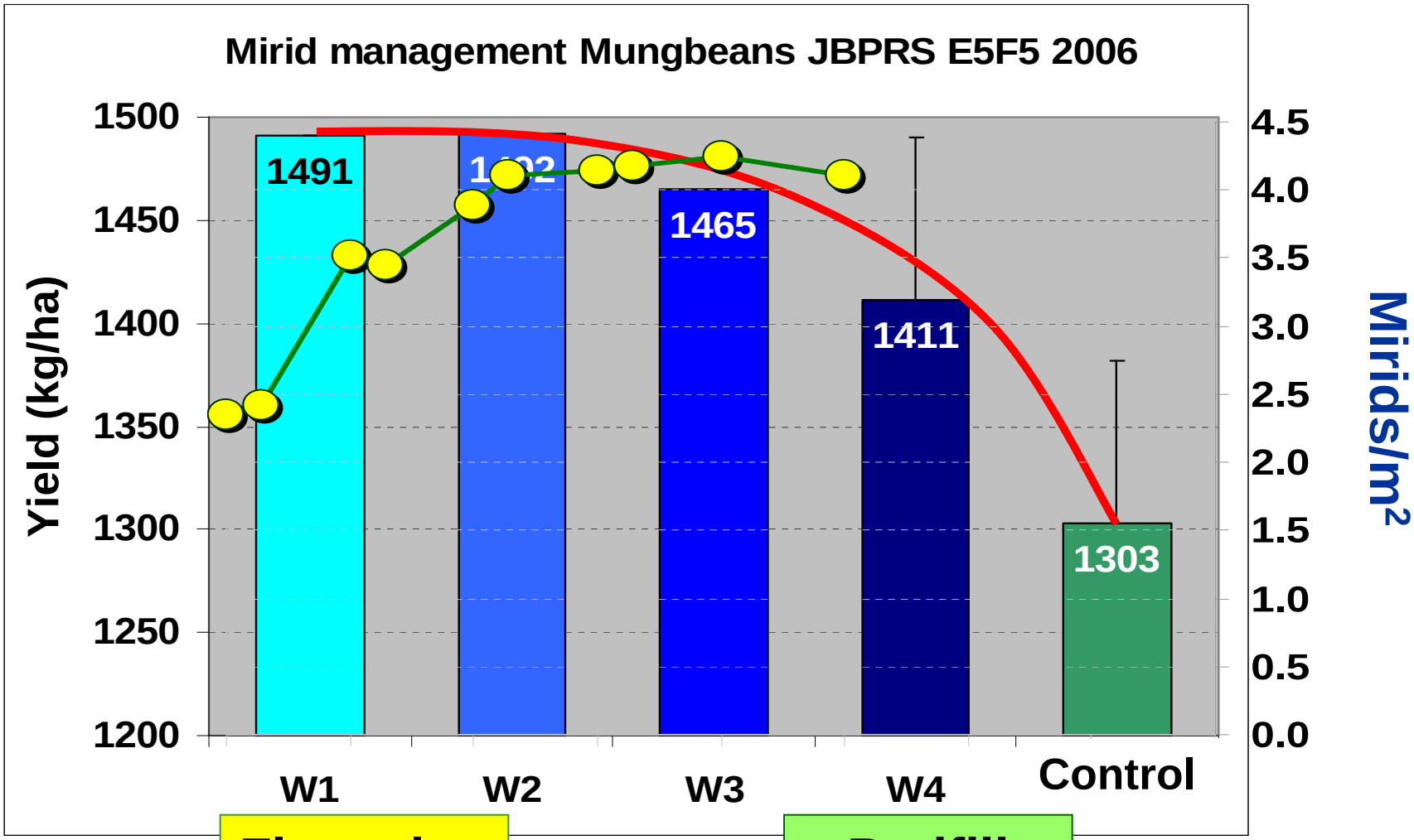
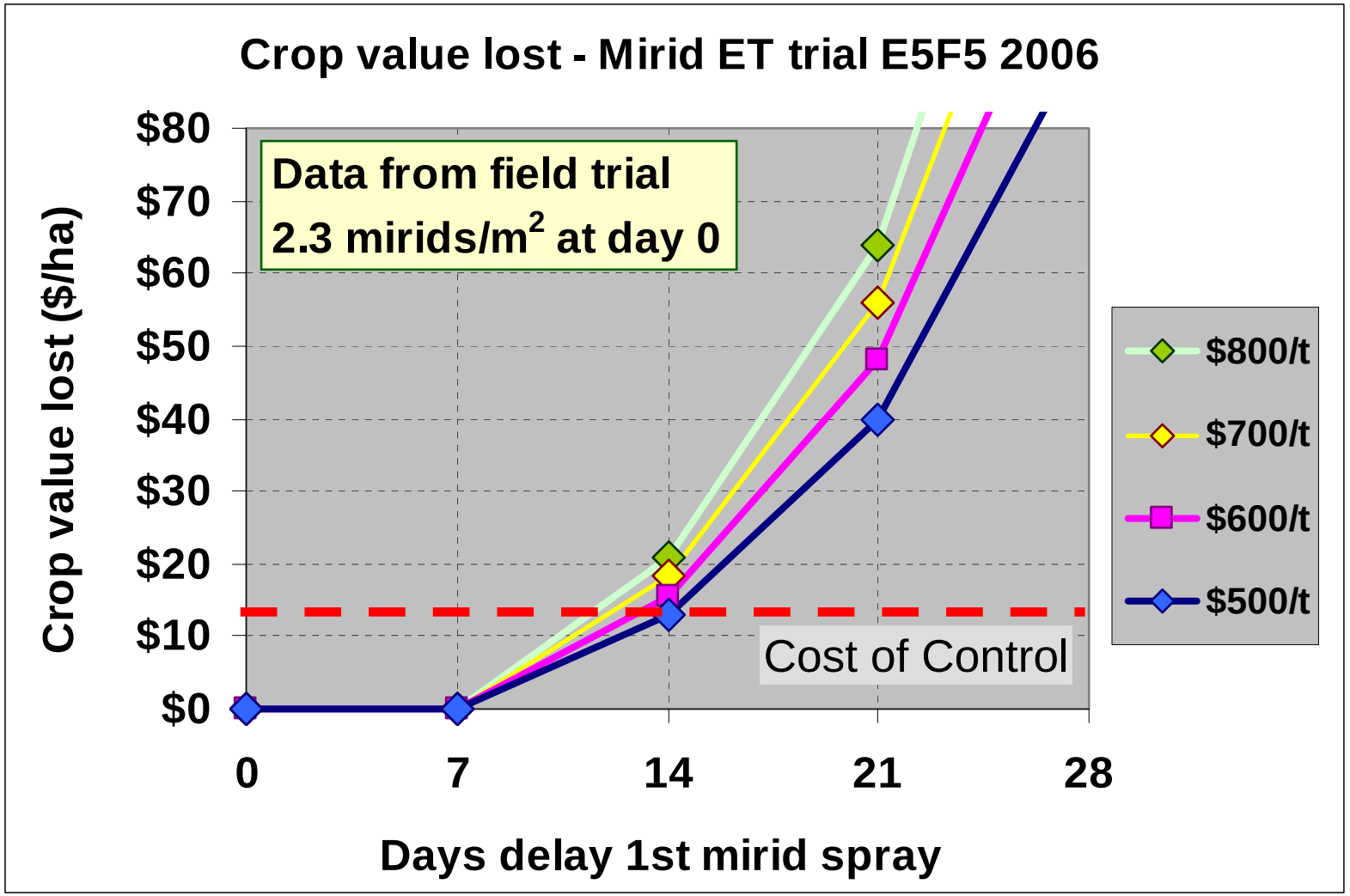
Mungbean yields where 1st mirid spray applied progressively later at weekly intervals from flowering (W1) onwards.

No yield loss despite starting population of 2.3 mirids/m²



Mungbeans

Can delay 1st mirid spray slightly by up to 7 days with no $$ loss – if mirid ppn. not too high



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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

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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

Podfill/Pod ripening
Podsucking bugs


Green vegetable bug


Redbanded shield bug

- No effective soft options
- Deltamethrin ® (SP) - GVB
- 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)


Trichopoda

Economic thresholds for podsucking bugs in podding mungbeans, in green vegetable bug adult equivalents (GVBAEQ) at early podfill (35 days prior to harvest)

Potential yield (t/ha)	0.25	0.5	1.0	1.5	2.0	2.5	3.0	3.5
GVBAEQ /m^2	0.1	0.2	0.3	0.5	0.7	0.9	1.1	1.4

Bug thresholds are higher in high yielding crops as thresholds are based on % seed damage and there are more seeds in higher yielding crops.

Thresholds based on GVBAEQ to give 2% seed damage

Economic thresholds for podsucking bugs in podding soybeans, in green vegetable bug adult equivalents (GVBAEQ) at early podfill (42 days prior to harvest)

Potential yield (t/ha)	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0
Nato soybeans (small seeded)	0.2	0.3	0.4	0.5	0.6	0.7	0.7	0.9	0.9
Normal soybeans (20g/100 seeds)	0.1	0.2	0.3	0.3	0.4	0.5	0.5	0.6	0.7

Bug thresholds are higher in high yielding crops as thresholds are based on % seed damage and there are more seeds in higher yielding crops

Bug thresholds are higher in small-seeded cultivars as these have more seeds pro-rata for a given yield.

Thresholds based on GVBAEQ to give 2% seed damage

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 Mungs & Soys

- 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:

Mirids just at threshold (0.5/m^2) + helis @ <0.5/m^2 in a vigorous crop of early flowering mungbeans

- What is your recommendation?
- What factors would you consider?
- The grower says he only wants to spray once
- As he will have to use a plane because the paddock is too wet for a ground rig

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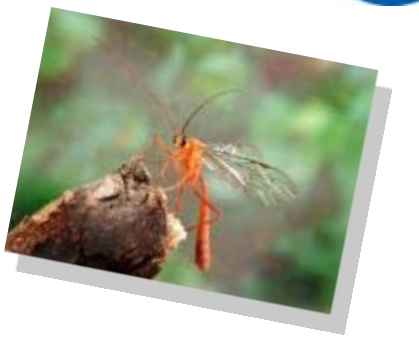

Further information to consider for case study

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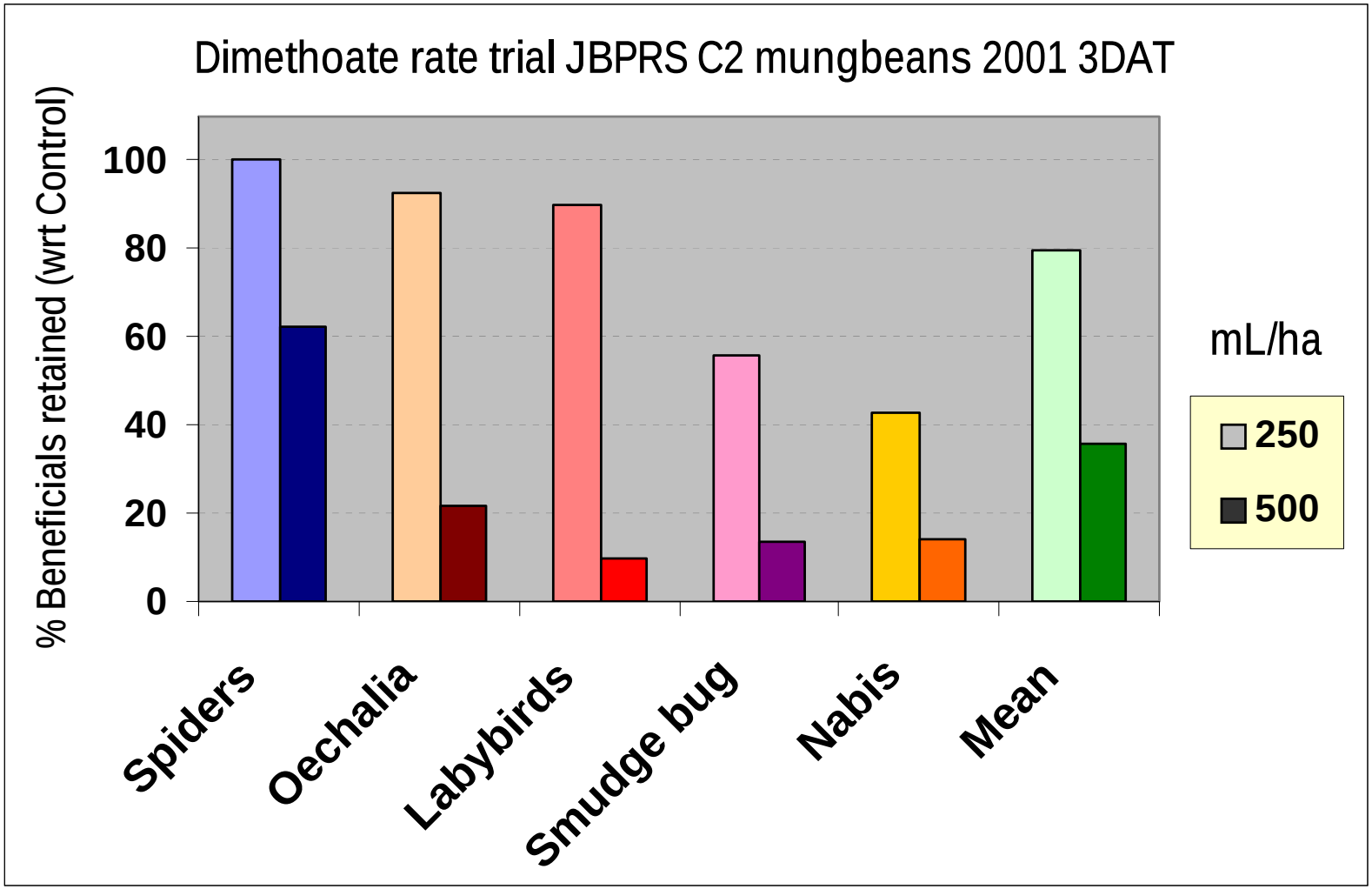
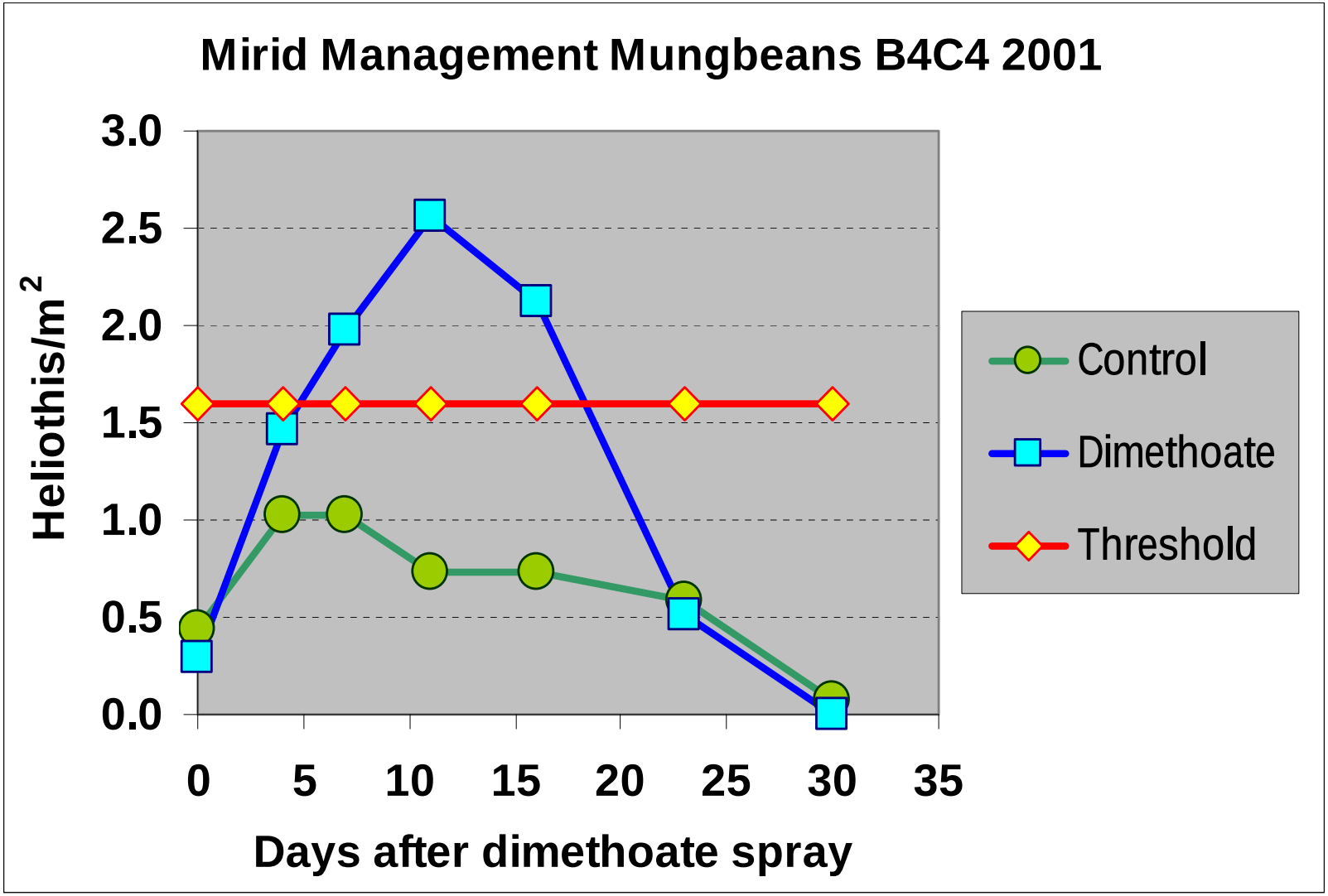
Low rate dimethoate (250mL/ha) has far less impact on most beneficials



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



Scout regularly!

To avoid nasty surprises

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Key IPM messages
"Go Soft Early"

"Beneficials save you money!"

Observe Thresholds

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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 Dow AgroSciences

syngenta

Workshop facilitation

ICAN
Independent Consultants Australia Network

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The End – do NOT proceed!

And easy decision really – a no brainer!