Integrated Pest Management in Mungbeans and Soybeans

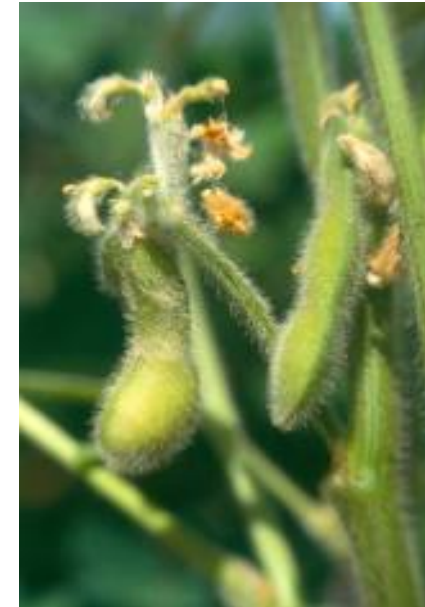# Overall pulse pest management aims

1. **Protect yield/quality in an economically rational manner – use thresholds**

2. **Avoid pesticide resistance - observe pesticide resistance guidelines**

3. **Foster farming systems that suppress pests, not generate pests – beneficials, cultural, host resistance, thresholds**

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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

- **Recent problem pests** – bean pod borer, etiella

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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 driven by SLW/mites**

- **Recent problem pests – etiella, podsuckers**

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Mungs in particular a fast crop so beat sheet regularly!

Monitor pests, beneficials & crop stage

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Key mungbean/soybean pests

Helicoverpa armigera

Attack leaves, buds, flowers & pods

Podsucking bugs

Suck pods reducing seed quality

bean podborer

Attack buds, flowers, pods
Major tropical mungbean pest

SLW

Threaten soybeans but not mungbeans. Flared by hard pesticides

mirids

Attack buds, flowers
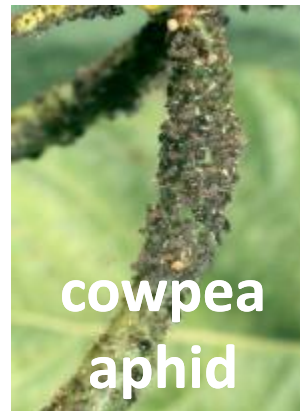Major mungbean pest but not in soybeans

Bean podborer

Mainly a problem on coast but reports as far as west Surat in the wet years of 2012/13

Lesser pests

loopers

Mainly leaf feeders but can attack flowers

cowpea aphid

Mungbeans only. Infest stems & pods

Soybean aphid

Soybeans only. Above threshold ppns. delay harvest maturity

thrips

Seedlings & flowers

mites

Under leaves – flared by hard pesticides

Soybean moth

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

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

loopers

Bt (Dipel)

- **Tolerance of early damage opens door for biopesticides**

- **Up to 33% looper defoliation no yield loss**

- **Bt (Dipel) effective against loopers**

Grass blue butterfly slug like larva

10 mm

Lop terminals & buds

Bt a soft option

Why might NPV (Vivus, Gemstar) be the preferred heli option in vegetative crops?

1. Resistance management

2. Conserve beneficials

3. Conserve 'big guns' for flowering/podding stages

4. Don't need to kill every heli in vegetative stage

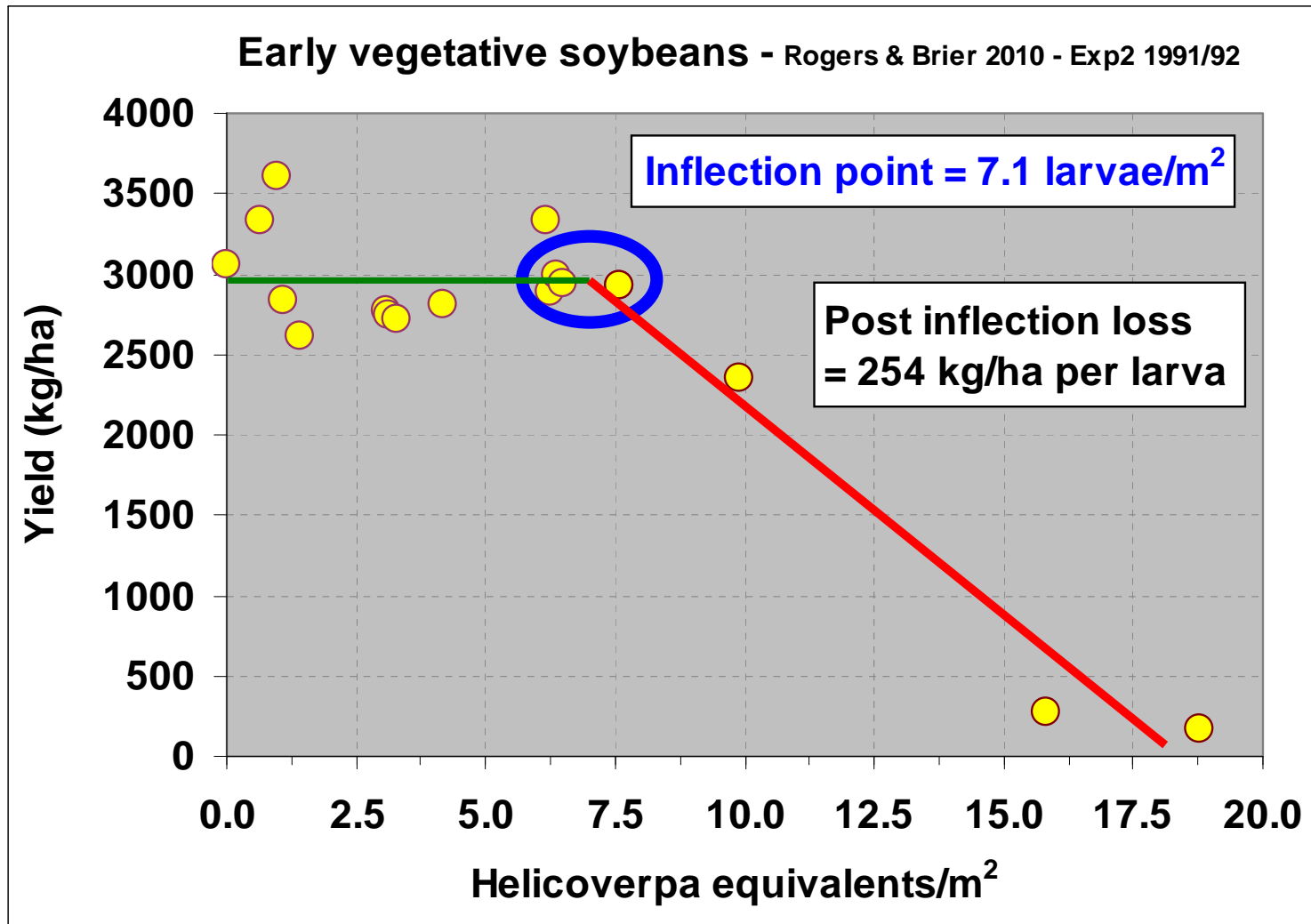5. No yield loss if up to 7/m² soys & 4-5/m² mungbeans

Natalie Moore

GRDC Grains R... Develop... Your GRDC wo...

Heli NPV in vegetative soybeans and mungbeans

- **Timely detection**

- **'Optimal' adjuvant, timing & good coverage**

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

Early vegetative soybeans - Rogers & Brier 2010 - Exp2 1991/92

Inflection point = 7.1 larvae/m^2

Post inflection loss = 254 kg/ha per larva

Yield (kg/ha)

Helicoverpa equivalents/m^2
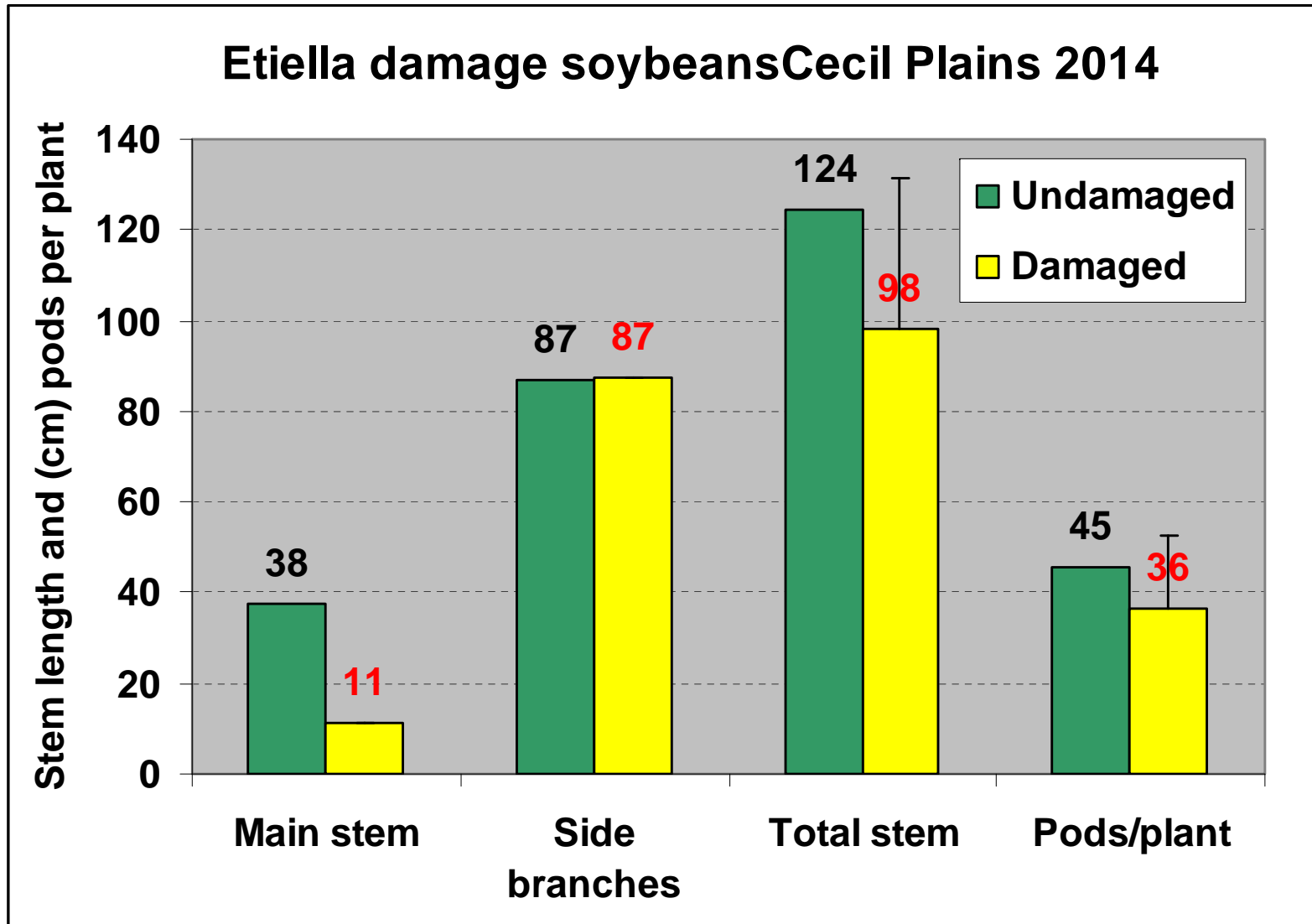
'NEW' pest on Downs & NW NSW in vegetative soybeans

Etiella damage in vegetative soybeans?

Watch for unusual symptoms

Reduced stem length = fewer pods

Etiella damage soybeansCecil Plains 2014

Etiella damage in podding soybeans

Etiella in late soybeans?

Etiella moth 12 mm

- **Early damage hard to pick**
- **Most larvae only eat 1 seed (0.2g)**
- **Theoretical threshold high – 40/m^2 for \$45/ha pesticide***
- **Threshold academic as larvae very difficult to control once inside pods**
- **Moth repellents??**

  ***Includes application**

Very small entry hole 0.2 mm

Etiella in soybean pod 13 mm

Etiella in budding mungbeans Downs Jan 2014

Please report any suspicious webbing of buds/flowers

Entry hole – very small
Exit hole – the bird has flown
Etiella in pods are unreachable

Etiella pod damage in mungs

One etiella larva can partially damage up to 6 mungbean seeds

The etiella IPM conundrum

- Once in stems/pods, larvae difficult if not impossible to control
- Larvae/damage often not detected until infestation well entrenched
- Monitor for moths? Pre-emptive action?
- Early SP use **will flare** mites, SLW, helis
- Early use of softer alternatives being investigated
- Resistance threat - watch this space

IPM best bets/opportunities
Mirids in mungbeans
at budding/flowering/podset

- **Optimize spray timing & consider lower dimethoate rates with salt adjuvant**

Decision Making
for Integrated Pest Management
In Grain Crops

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Scenario 1:
Mirids are **at threshold** & *helis* are **below threshold** in early flowering mungbeans

- No net gain if spray as mirids are at 'break even'
- Full dimethoate rate can flare helicoverpa
- Re-assess in 4 days time
- If mirids increase markedly, consider low rate dimethoate + salt adjuvant (0.5%)

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Further information to consider for Scenario 1

Scenario 1 background information

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

Dimethoate rate trial JBPRS C2 mungbeans 2001 3DAT

mL/ha
☐ 250
■ 500

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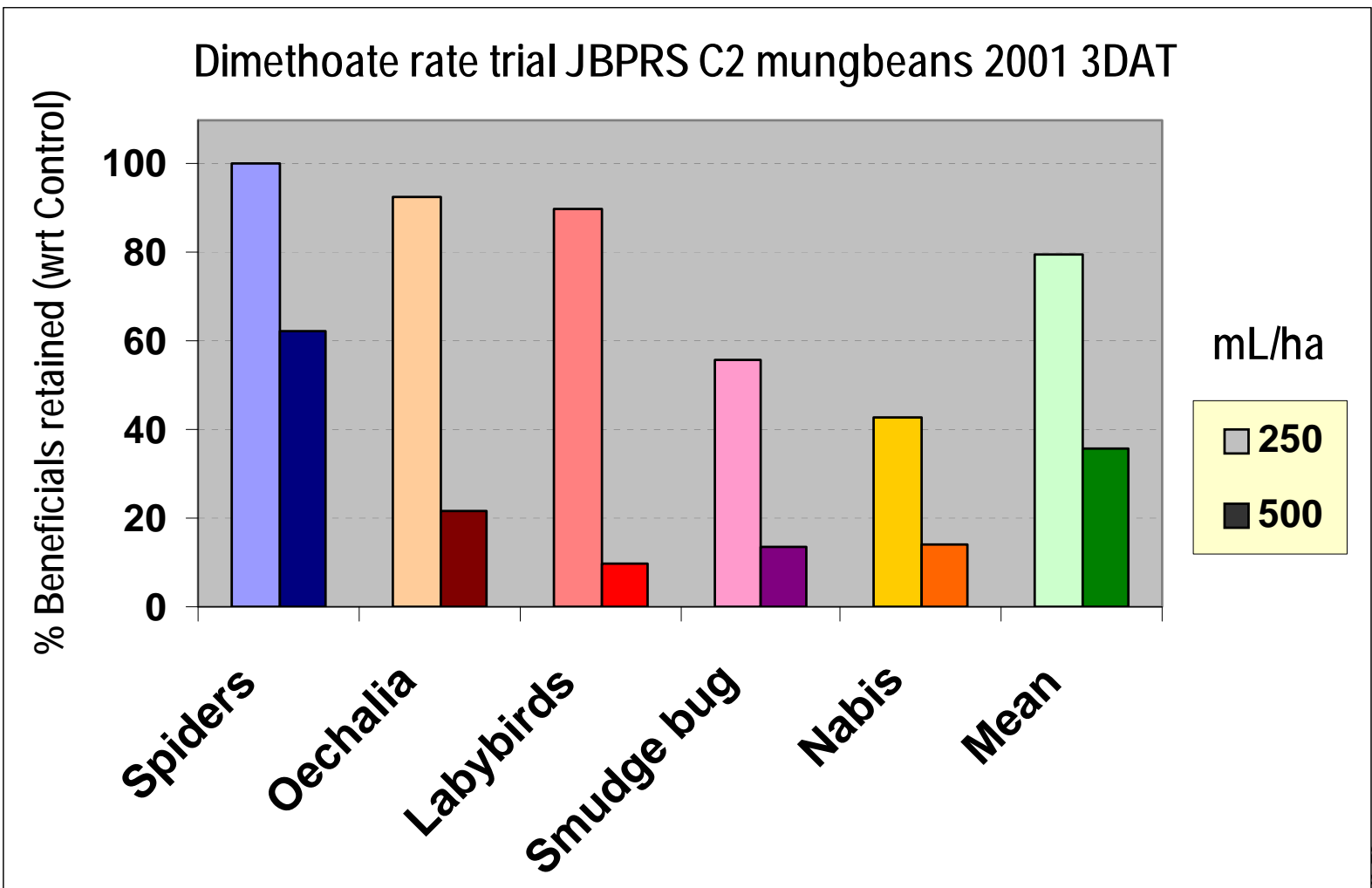
Economic Threshold Table for Mirids in Flowering **Mungbeans**

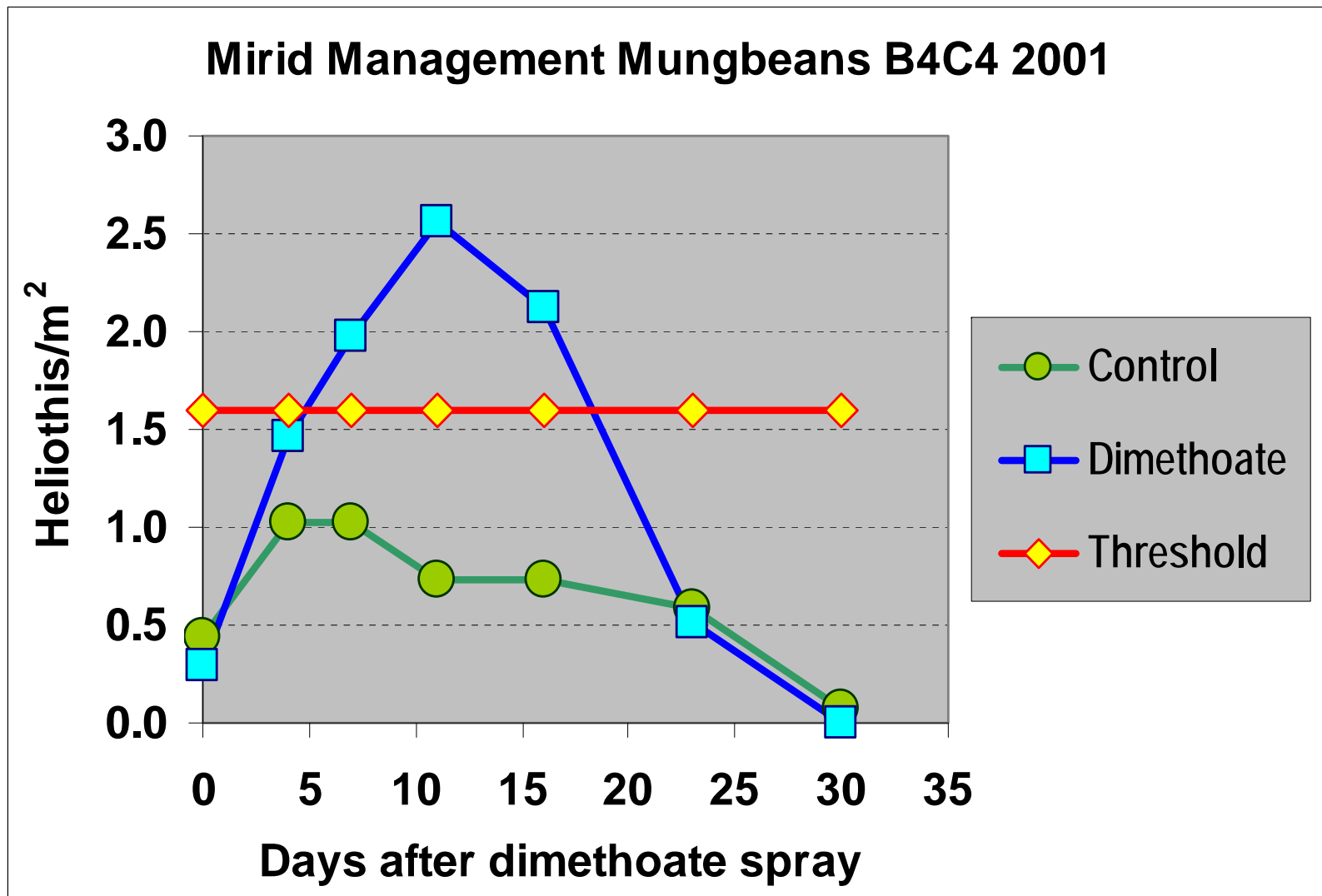| Control Cost $/ha	Threshold (adults + nymphs/m^2) at crop values below					
	$ 400	**$ 500**	**$ 600**	**$ 700**	**$ 800**	**$ 900**
$ 10	0.4	0.3	0.3	0.2	0.2	0.2
$ 15	0.6	0.5	0.4	**0.4**	0.3	0.3
$ 20	0.8	0.7	0.6	0.5	0.4	0.4
$ 25	1.0	0.8	0.7	0.6	0.5	0.5
$ 30	1.3	1.0	0.8	0.7	0.6	0.6
$ 35	1.5	1.2	1.0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

Just remember

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

- **Mirid thresholds are based on sustained attack over 28 days –** i.e. in this scenario: 0.4 mirids over 28 days

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

Mirid Management Mungbeans B4C4 2001

Heliothis/m^2 vs Days after dimethoate spray

Legend:
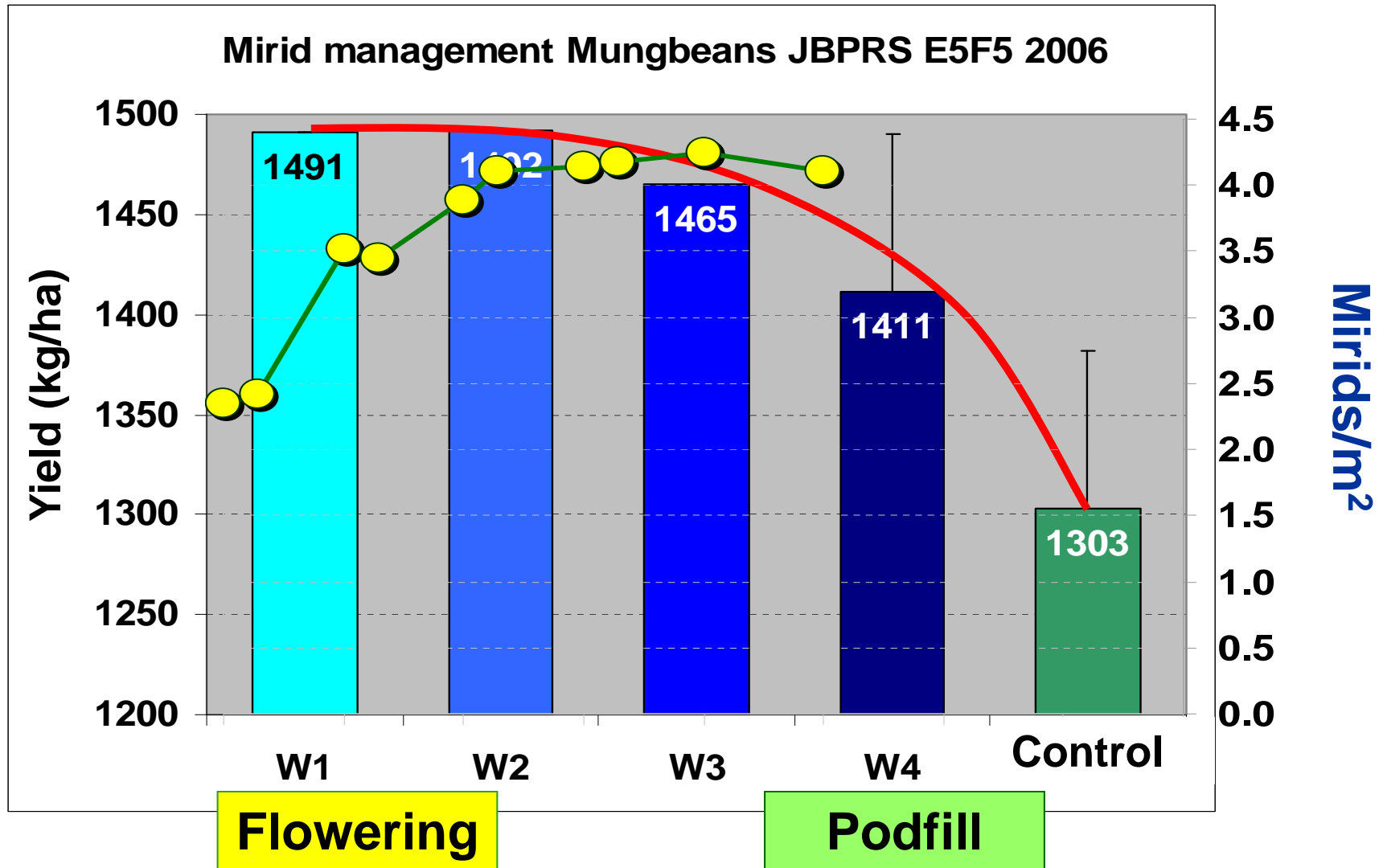- Control
- Dimethoate
- Threshold

Mirids in mungbeans
- Budding/flowering/podset

- Delaying a mirid spray !!***##

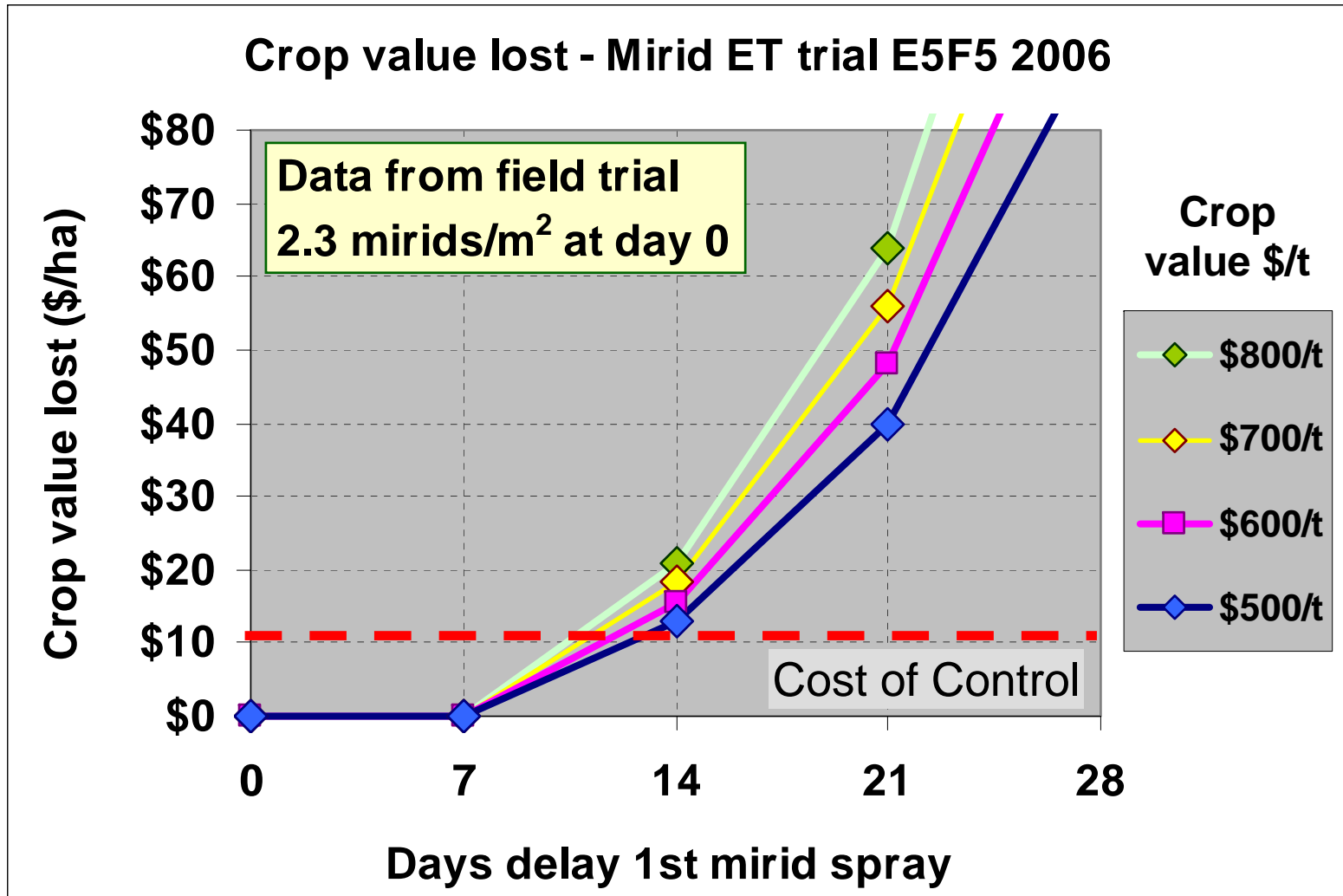- This is heresy!

- Show us the data!

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

Mirid management Mungbeans JBPRS E5F5 2006

Yield (kg/ha) — left axis: 1200, 1250, 1300, 1350, 1400, 1450, 1500

Mirids/m² — right axis: 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5

W1	W2	W3	W4	Control
1491	1492	1465	1411	1303

Flowering   **Podfill**

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

Crop value lost - Mirid ET trial E5F5 2006

Data from field trial
2.3 mirids/m^2 at day 0

Crop value lost ($/ha)

Cost of Control

Crop value $/t

- ◆ $800/t
- ◇ $700/t
- ■ $600/t
- ◆ $500/t

Days delay 1st mirid spray

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**

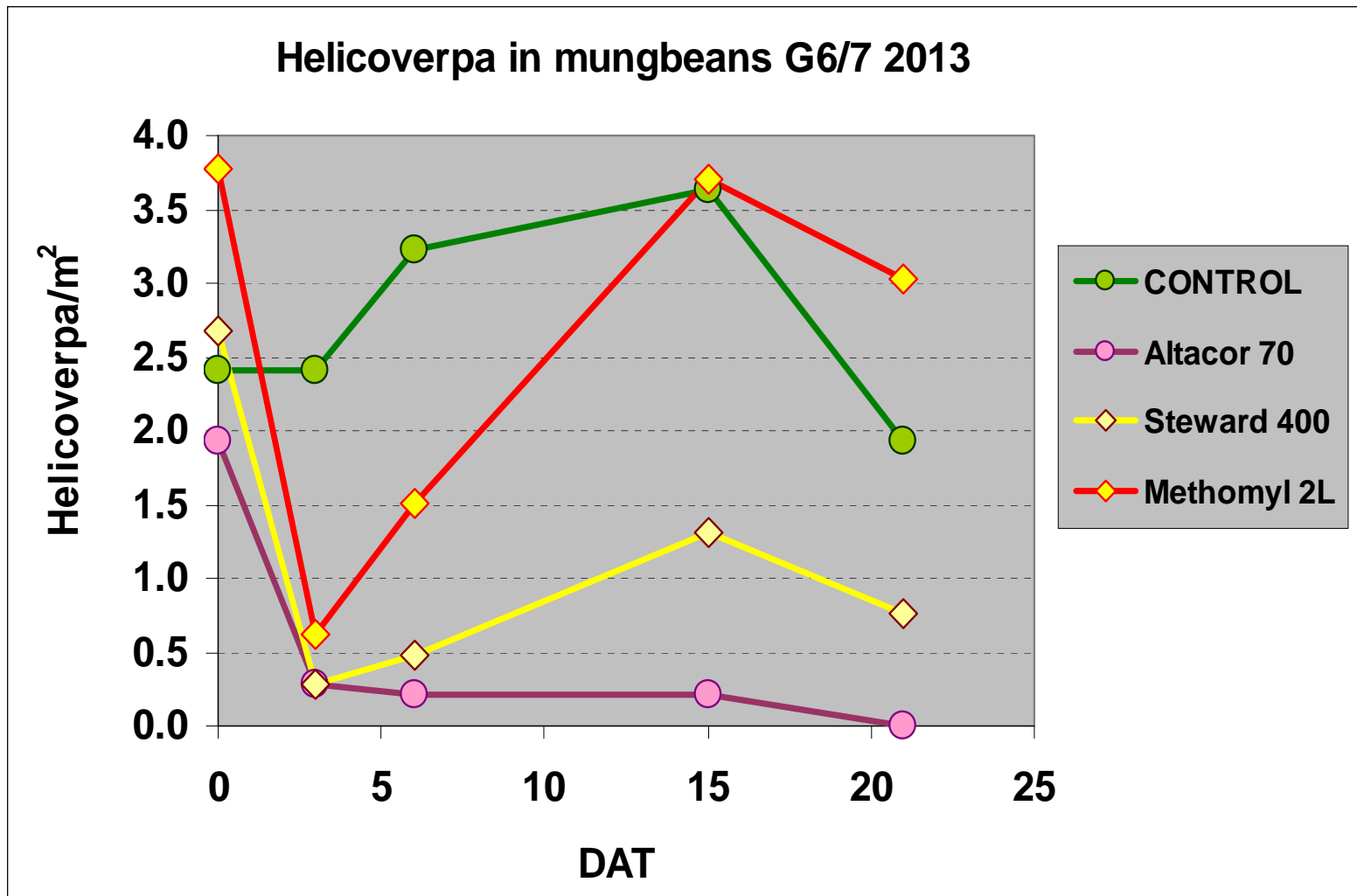# Economic Threshold Table for Helicoverpa in Podding Mungbeans

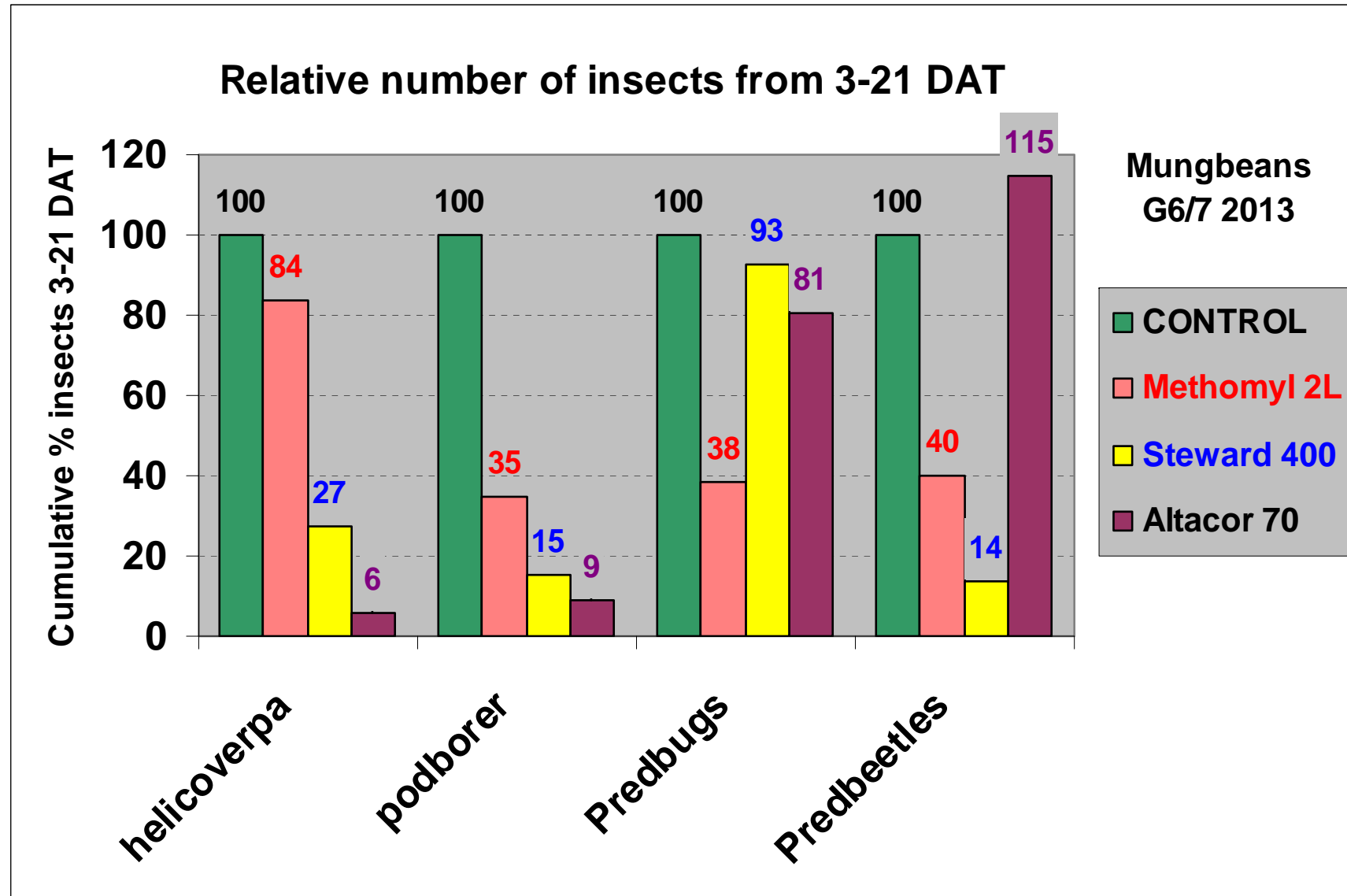| Control Cost $/ha	Threshold (larvae/m²) at crop values listed below ($/t)						
	$ 400	$ 500	$ 600	$ 700	$ 800	$ 900	$ 1,000
$ 15	1.1	0.9	0.7	0.6	0.5	0.5	0.4
$ 20	1.4	1.1	1.0	0.8	0.7	0.6	0.6
$ 25	1.8	1.4	1.2	1.0	0.9	0.8	0.7
$ 30	2.1	1.7	1.4	1.2	1.1	1.0	0.9
$ 35	2.5	2.0	1.7	1.4	1.3	1.1	1.0
$ 40	2.9	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

New registration for caterpillars in pulses

- Altacor ® is now the best of registered products
- Within 2 weeks, **methomyl** back at pre-spray levels

Helicoverpa in mungbeans G6/7 2013

Altacor harder on caterpillars, softer on beneficials

Relative number of insects from 3-21 DAT

Mungbeans G6/7 2013

CONTROL
Methomyl 2L
Steward 400
Altacor 70

Podfill/Pod ripening
Podsucking bugs

Green vegetable bug

Redbanded shield bug

Trichopoda

- **No effective soft options**

- **Deltamethrin ® (SP) - GVB**

- **Shield permit 12699 - GVB & redbanded (LAPSED)**

- **Delay 1st spray till early podfill**

- **By then – lower risk of SLW or mites**

- **Need salt adjuvant for redbanded (Piezodorus)**

Economic thresholds for podsucking bugs in mungbeans (and soybeans) are higher in high yielding crops.

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

Because thresholds are based on % seed damage & there are more seeds in higher yielding crops.

Mungbean thresholds based on GVBAEQ to give 2% seed damage

Economic thresholds for podsucking bugs in mungbeans and soybeans –
Now in on-line threshold calculator

Simply google "Beat Sheet Blog"

| Skip to content | About the Beatsheet | Links | Terms of use | DAFF Entomology contacts | Resources | Economic Threshold Calculators |

And select 'Economic Threshold Calculators'

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**

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