Integrated Pest Management in Mungbeans and Soybeans
What crops do you scout regularly for clients?

1. Cereals inc sorghum only
2. Cereals/winter pulses
3. Cereals/WP/summer pulses
4. Cereals/WP/SP/Cotton
5. Cereals/WP/cotton
6. Don’t know!!!
Mungbeans, a brief description

- Short-season, indeterminate tropical pulse
- Seed quality **critical** to achieve to top $$$
- IPM IS CHALLENGING BUT *******
- NOT IMPOSSIBLE
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
Mungs in particular a fast crop so beat sheet regularly!

Monitor pests, beneficials & crop stage
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
Lesser pests

loopers
Mainly leaf feeders but can attack flowers

Mungbeans only. Infest stems & pods

mites
Under leaves – flared by hard pesticides

thrips
Seedlings & flowers

Soybean aphid
Soybeans only. Above threshold ppns. delay harvest maturity

Soybean moth
Soybeans only. Common at low densities but spasmodically occurs in huge numbers
Etiella in vegetative soybeans Jan 2013

Watch for unusual symptoms
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 - e.g. methomyl
5. Want to preserve beneficials
6. Market demand for reduced pesticide use
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 damage opens door for biopesticides
- Up to 33% looper defoliation no yield loss
- Bt (Dipel) effective against loopers
Which leaf has 30% defoliation?

1.  
2.  
3.  
4. 😊  
5.  

Bar chart showing:
- 40% defoliation: 0.30%
- 30% defoliation: 54%
- 20% defoliation: 15%
- 10% defoliation: 8%
- 5% defoliation: 23%
- 0% defoliation: 0%
What might cause this type of damage in young soybeans/mungbeans?

1. Lucerne crown borer
2. Helicoverpa
3. Grass blue butterfly
4. Etiella – lucerne seed webmoth
Grass blue butterfly slug like larva

Lop terminals & buds
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 & 5/m² mungbeans
Heli NPV in vegetative soybeans and mungbeans

- Timely detection
- ‘Optimal’ adjuvant, timing & coverage
Vegetative soybeans – Helicoverpa
IPM target - Keep larvae <7/m²

Inflection point = 7.1 larvae/m²
Post inflection loss = 254 kg/ha per larva
IPM best bets/opportunities
Mirids in mungbeans at budding/flowering/podset

- Optimize spray timing & low rates
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%)
Further information to consider for Scenario 1
## Economic Threshold Table for Mirids in Flowering Mungbeans

<table>
<thead>
<tr>
<th>Control Cost $/ha</th>
<th>Threshold (adults + nymphs/m²) at crop values below</th>
<th>$ 400</th>
<th>$ 500</th>
<th>$ 600</th>
<th>$ 700</th>
<th>$ 800</th>
<th>$ 900</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ 10</td>
<td></td>
<td>0.4</td>
<td>0.3</td>
<td>0.3</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>$ 15</td>
<td></td>
<td>0.6</td>
<td>0.5</td>
<td>0.4</td>
<td><strong>0.4</strong></td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>$ 20</td>
<td></td>
<td>0.8</td>
<td>0.7</td>
<td>0.6</td>
<td>0.5</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>$ 25</td>
<td></td>
<td>1.0</td>
<td>0.8</td>
<td>0.7</td>
<td>0.6</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>$ 30</td>
<td></td>
<td>1.3</td>
<td>1.0</td>
<td>0.8</td>
<td>0.7</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>$ 35</td>
<td></td>
<td>1.5</td>
<td>1.2</td>
<td>1.0</td>
<td>0.8</td>
<td>0.7</td>
<td>0.6</td>
</tr>
<tr>
<td>$ 40</td>
<td></td>
<td>1.7</td>
<td>1.3</td>
<td>1.1</td>
<td>1.0</td>
<td>0.8</td>
<td>0.7</td>
</tr>
</tbody>
</table>

- **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
Low rate dimethoate (250mL/ha) has far less impact on most beneficials.
Dimethoate @ 500mL/ha can increase the risk of subsequent helicoverpa attack

Mirid Management Mungbeans B4C4 2001

- **Control**
- **Dimethoate**
- **Threshold**

![Graph showing the comparison of Heliothis/m^2 over days after dimethoate spray]

- days: 0, 5, 10, 15, 20, 25, 30, 35
- Heliothis/m^2: 0.0, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0
Dimethoate @ 500mL/ha can increase the risk of subsequent helicoverpa attack.
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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
Mungbean yields where 1\textsuperscript{st} mirid spray applied progressively later at weekly intervals from flowering (W1) onwards.

No yield loss despite starting population of 2.3 mirids/m\textsuperscript{2}
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
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 1\textsuperscript{st} 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\textsuperscript{2} at day 0

Cost of Control

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/m²
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

<table>
<thead>
<tr>
<th>Control Cost $/ha</th>
<th>Threshold (larvae/m²) at crop values listed below ($/t)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$ 400</td>
</tr>
<tr>
<td>$ 15</td>
<td>1.1</td>
</tr>
<tr>
<td>$ 20</td>
<td>1.4</td>
</tr>
<tr>
<td>$ 25</td>
<td>1.8</td>
</tr>
<tr>
<td>$ 30</td>
<td>2.1</td>
</tr>
<tr>
<td>$ 35</td>
<td>2.5</td>
</tr>
<tr>
<td>$ 40</td>
<td>2.9</td>
</tr>
<tr>
<td>$ 45</td>
<td>3.2</td>
</tr>
<tr>
<td>$ 50</td>
<td>3.6</td>
</tr>
</tbody>
</table>

• Cross-reference cost of control vs crop value
• For Cost of Control = $40/ha & Crop Value = $700/t, ET = 1.6
• Within 2 weeks, **methomyl** back at pre-spray levels
• **Steward**® best of registered products
Methomyl softer on caterpillars, harder on beneficials

Relative number of insects from 3-21 DAT

Cumulative % insects 3-21 DAT

helicoverpa  podborer  Predbugs  Predbeetles

Mungbeans G6/7 2013

CONTROL  Methomyl 2L  Steward 400  Gp 28

84  35  38  115
27  15  81  40
6   9   14  14
Podfill/Pod ripening
Podsucking bugs

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

<table>
<thead>
<tr>
<th>Potential yield (t/ha)</th>
<th>0.25</th>
<th>0.5</th>
<th>1.0</th>
<th>1.5</th>
<th>2.0</th>
<th>2.5</th>
<th>3.0</th>
<th>3.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>GVBAEQ /m²</td>
<td>0.1</td>
<td>0.2</td>
<td>0.3</td>
<td>0.5</td>
<td>0.7</td>
<td>0.9</td>
<td>1.1</td>
<td>1.4</td>
</tr>
</tbody>
</table>

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
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