In Insect Losses and Insecticide Use
In Arizona Vegetables

J. Palumbo, A. Fournier, P. Ellsworth, P. Clay, and K. Nolte
Crop Insect Losses Working Group

• **Goal:** To provide information on insecticide-use patterns, insect-related losses and management costs in Arizona vegetable crops.

• Information traditionally provided using “expert” opinion.

• Improve the process with *real world* data.

• Primarily incorporates data from PCAs, Growers, and Agrichemical Industry.

Why is this Information Important?

**Regulatory**

• Section 18 Emergency Exemptions / 24C SLN

• Defense and Support of older A.I.s (*ie. Lannate*)

• FQPA: next go-around – endosulfan / pyrethroids

**Academic**

• Documents the role of new insecticides

• Quantitative measure of impact of IPM

• Historic record of insect losses / outbreaks

• Identifies and prioritizes pest problems
Why is this Information Important?

Industry

- Translates the PCAs job into *economic* terms
- Validates the *necessity* of PCA to the vegetable industry
- Emphasizes the *significance* of insect pests and their management in desert vegetable production
- Demonstrates *value* of new pest control technologies

Crop Insect Losses Workshops
Data collection (CIL workshops)

Crops and Locations:
- Spring Cantaloupes (Central AZ and Yuma)
- Spring Watermelons (Central AZ and Yuma)
- Fall and Spring Head Lettuce (Yuma)

Three Part Survey:

Part 1 General Estimates
- Overall yield reductions
- Management costs

Part 2 Crop losses
- Economic losses
- Yield losses

Part 3 Insecticide Use
- Treated acreage
- Spray frequency

Overall Crop Losses (%)

Spring Melons
Overall Crop Losses (%)

Cantaloupes (2005-2006)

- Central Arizona: 26.2%
- Yuma: 23.2%

Overall Crop Losses (%)

Watermelons (2005-2006)

- Central Arizona: 25.4%
- Yuma: 20.5%
Total Crop Losses (%)

**Head Lettuce**
(2005-2006)

- Fall Lettuce: 22.5%
- Spring Lettuce: 29.3%

Insect Management Costs

Cost ($) of IPM
## Insect Management Costs

### Cost ($) of IPM

<table>
<thead>
<tr>
<th>IPM</th>
<th>Melons</th>
<th></th>
<th>Head Lettuce</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Central AZ</td>
<td>Yuma</td>
<td></td>
</tr>
<tr>
<td>Acreage scouted (%)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>No. field visits / week</td>
<td>2.2</td>
<td>3.4</td>
<td>3.8</td>
</tr>
<tr>
<td>Cost ($) / acre</td>
<td>$12.70</td>
<td>$17.50</td>
<td>$22.75</td>
</tr>
<tr>
<td></td>
<td>$5.75</td>
<td>$5.15</td>
<td>$6.00</td>
</tr>
</tbody>
</table>

## Economic Losses ($)

- Control costs ($)
- Application frequency (No.)
- Acres treated (%)
Seedling Pests

Darkling Beetles

Beet Armyworm
Economic Losses ($)  

Cantaloupes

<table>
<thead>
<tr>
<th>Pest</th>
<th>Central Arizona</th>
<th>Yuma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whitefly</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Darkling beetle</td>
<td>$51</td>
<td></td>
</tr>
<tr>
<td>Seedcorn maggot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cabbage looper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leafminers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seedling pests</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dollar ($) Loss / Treated Acre  
(Treated acres*No. sprays*Control cost)

* Does not include Application Costs ($)

Economic Losses ($)  

Watermelons

<table>
<thead>
<tr>
<th>Pest</th>
<th>Central Arizona</th>
<th>Yuma</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whitefly</td>
<td></td>
<td></td>
</tr>
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<td>Cabbage looper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seedcorn maggot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seedling pests</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beet armyworm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aphids</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dollar ($) Loss / Treated Acre  
(Treated acres*No. sprays*Control cost)

* Does not include Application Costs ($)
**Economic Losses ($)**

*Head Lettuce*

- **Fall**
  - Beet armyworm: $327
  - Cabbage looper: $238
  - Whitefly: $238
  - Thrips: $238
  - Seedling pests: $238
  - Flea beetles: $238

- **Spring**
  - Aphids: $238
  - Thrips: $238
  - Cabbage looper: $238
  - Beet armyworm: $238
  - Flea beetles: $238
  - Trash bugs: $238

**Dollar ($) Loss / Treated Acre**

*(Treated acres* No. sprays* Control cost)*
Yield Losses (%)

- Stand loss
- Reduced fruit size
- Uniformity
- Fruit quality
- Contamination

Yield Losses (%)

**Cantaloupes**

- Central Arizona
  - Seedcorn maggot
  - Darkling beetle
  - Seedling pests
  - Whitefly
  - Cabbage looper
  - Yield Loss (%): 2.9%

- Yuma
  - Cabbage looper
  - Whitefly
  - Seedcorn maggot
  - Seedling pests
  - Beet armyworm
  - Leafminers
  - Yield Loss (%): 2.3%
Yield Losses (%) Watermelons

Yield Loss (%)

Central Arizona
- Beet armyworm
- Whitefly
- Spider mites
- Cabbage looper
- Seedling pests
- Darkling beetle

1.6%

Yuma
- Whitefly
- Cabbage looper
- Beet armyworm

1.8%

Yield Losses (%)
- Stand loss
- Reduced head size
- Uniformity
- Cosmetic quality
- Insect contamination
Yield Losses (%)
Head Lettuce

<table>
<thead>
<tr>
<th></th>
<th>Fall</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Seedling pests</td>
<td></td>
<td></td>
<td>% 7.4</td>
</tr>
<tr>
<td>Beet armyworm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cabbage looper</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flea beetles</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whitefly</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thrips</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Spring</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Aphids</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thrips</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Seedling pests</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beet armyworm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flea beetles</td>
<td></td>
<td></td>
<td>% 6.8</td>
</tr>
</tbody>
</table>

Insecticide Use

[Image of insecticide bottles]
Insecticide Use  Head Lettuce

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Fall Treated Acres</th>
<th>Spring Treated Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrethruids</td>
<td>120</td>
<td>140</td>
</tr>
<tr>
<td>Success</td>
<td>100</td>
<td>40</td>
</tr>
<tr>
<td>Lannate</td>
<td>80</td>
<td>60</td>
</tr>
<tr>
<td>Imidacloprid</td>
<td>60</td>
<td>20</td>
</tr>
<tr>
<td>Intrepid</td>
<td>40</td>
<td>20</td>
</tr>
<tr>
<td>Diazinon</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Endosulfan</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Dimethoate</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Avaunt</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Proclaim</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

Treated Acres (*1000)

http://cals.arizona.edu/pubs/crops/
Relevant Outcomes

**Regulatory**
- ✓ FQPA (Lannate)
- ✓ Section 18 (Birds)

**Academic**

**Industry**

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**Lannate / Larvin Use in Head Lettuce**

*Feb 2007*

Questions posed by USDA OPMP for the Carbamate Cumulative Risk assessment conducted by the EPA:

1. Typical use rates
2. Typical no. of applications
3. Timing of applications
4. Would both be applied to same crop in same growing season?
5. If so, how often?

The concerns involve drinking water. Apparently thiodicarb breaks down into 2 molecules of methomyl and this is complicating the risk analysis as both products can be used on the same crops; head lettuce and sweet corn being of the most concern.
Pesticide Information Request Response
Arid Southwest IPM Network
March 7, 2007

Active Ingredients:
Methomyl (Lannate) and Thiodicarb

Crops/Target sites:
Sweet corn and head lettuce. EPA is also interested in other sections of the country where these crops are grown and these active ingredients are used.

Data Sources:
Arizona: The Pesticide Use Reporting (PUR) database provided data for product use from 2001 to 2005. In addition, data from an annual head lettuce crop insect losses survey conducted by John Palumbo were consulted. Dr. Palumbo provided responses for product use in head lettuce in Arizona. Eric Natwick collected information and provided responses for Imperial County, CA.

General Comments:
Lannate (methomyl) is extremely important to the AZ/CA Lettuce industries.
## Relevant Outcomes

### Regulatory
- ✓ FQPA (Lannate)
- ✓ Section 18 (Birds)

### Academic
- ✓ Educating the educators
- ✓ Cost-effectiveness of IPM
- ✓ Relevancy of Insecticides
- ✓ Research Priorities

### Industry
Relevant Outcomes

**Regulatory**
- FQPA (Lannate)
- Section 18 (Birds)

**Academic**
- Baseline Data for Education
- Relevancy of Insecticides
- Research Priorities

**Industry**
- Trends in Chemical Use – *Red Flags*
- Future Trends in Insect Management
Insecticide Use

Fall Head Lettuce

<table>
<thead>
<tr>
<th>Insecticide Type</th>
<th>% Treated Acres (No. times applied)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrethroids (Foliar)</td>
<td></td>
</tr>
<tr>
<td>Success</td>
<td>3.4</td>
</tr>
<tr>
<td>Admire</td>
<td>2.7</td>
</tr>
<tr>
<td>Intrepid</td>
<td>1.3</td>
</tr>
<tr>
<td>Pyrethroids (Chem.)</td>
<td>1.0</td>
</tr>
<tr>
<td>Lannate</td>
<td>2.0</td>
</tr>
<tr>
<td>Diazinon (Chem.)</td>
<td>1.0</td>
</tr>
<tr>
<td>Proclaim</td>
<td>1.1</td>
</tr>
<tr>
<td>Avaunt</td>
<td>1.2</td>
</tr>
<tr>
<td>Endosulfan</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Insecticide Use By Chemical Class  **Cantaloupes**

- **Reduced Risk**
  - Central AZ
  - Yuma

- **Pyrethroid**
  - Central AZ
  - Yuma

- **Neonicotinoid**
  - Central AZ
  - Yuma

- **OP/Carb**
  - Central AZ
  - Yuma

- **Endosulfan**
  - Central AZ
  - Yuma

Insecticide Use By Chemical Class  **Watermelons**

- **Reduced Risk**
  - Central AZ
  - Yuma

- **Pyrethroid**
  - Central AZ
  - Yuma

- **Neonicotinoid**
  - Central AZ
  - Yuma

- **OP/Carb**
  - Central AZ
  - Yuma

- **Endosulfan**
  - Central AZ
  - Yuma
Trends in New Product and Chemistry Development in Desert Vegetable Crops

- **Neonicotinoids**
  - Provado
  - Admire

- **Pyridine-IGR**
  - Knack
  - Courier
  - Confirm
  - Success

- **Proclaim**
  - Platinum
  - Fulfill
  - Avant
  - Assail
  - Intrepid

- **Radiant**
  - Alverde
  - Tesoro
  - Movento
  - Coragen
  - Synapse

- **Venom**
- **Oberon**
- **Beleaf**

- **Ketoenols**
  - Pyridyl caboxomide

- **Semicarbozone**
  - Pyridalyl

- **Diamides**
  - Synapase

* Reduced Risk