Lacanobia Fruitworm Management in 2001

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Developing an IPM program

- Know your enemy
- What constitutes a treatable population
  - Most difficult IPM decision
- When to treat
  - Sampling and DD models
- What to spray
  - Bioassays and field trials screen potential candidates
Know your enemy

• Survey of noctuid pests Washington
  - Spotted Cutworm
  - Bertha Armyworm
  - Lacanobia subjuncta (Lacanobia fruitworm)

• Main pests differ in biology
  - Overwintering stage
  - Host plants
Lacanobia, bertha armyworm and spotted cutworm (5th instar larvae)

Lacanobia fruitworm

Herringbone pattern

Bertha armyworm

Note difference in pattern on last segments

Spotted cutworm
Spotted Cutworm

Overwintering larvae feed early on developing buds/fruitlets and late on mature pears and apples.
Bertha armyworm

Damage, appearance and phenology very similar to lacanobia. Will also attack pear. Associated with poor weed control.
Lacanobia Fruitworm
Lacanobia damage
Lacanobia fruitworm life cycle

- Eggs
- Larvae
- Pupae
- Adults

Mar Apr May Jun Jul Aug Sep Oct

Full bloom
What is a treatable population

• Adults highly attracted to a pheromone lure
  - Must be monitored with a bucket-style trap
  - Not well correlated with fruit injury
  - Catch of more than 150 moths/week is sign of trouble
What is a treatable population

- Larval densities are better measure of population
  - Tend to find larvae in areas of dense foliage
  - Beating tray and shoot inspections
    - Mid June/Early August
    - Approx. 30% infested shoots
    - Approx. 1 larva/10 trays
When to spray

- Before 1997 little was known about lacanobia phenology
  - Difficult to visually monitor oviposition and hatch
- Pheromone lure was developed
- Degree day model parameters established
- Preliminary model developed in 2000
- Field validation program in 2001
  - Optimal timing, majority of eggs hatched and larvae still small enough to control
Stage specific activity of Success

Ratio (LC$_{50}$:field rate)

- **Success 2 SC**
- **Thiodan 50 WP**

Field Rate Equivalent

Larval Instar

1 3 5
When to spray

- Rear all life stages at constant temperatures and fluctuating field conditions

```
y = mx + b
```

![Graph showing the relationship between average development rate (1/days) and constant rearing temperature (°C).](image)
Field Validation

Cumulative %

Degree days from biofix (44.88°F)

- Preovip=280
- Hatch=135
- First larvae=415

- oviposition
- hatch
1st generation larval sample

Best spray timing

% of Instars

2nd inst=550
1st pupa=1250

Hatch
=415

Hatch to 1150DD

DD after biofix

Hatch to 1150DD

## Field observations

| Event  | Location | Predicted | Observed | \(|variation|\) | Predicted | Observed | \(|variation|\) |
|--------|----------|-----------|----------|----------------|-----------|----------|----------------|
| Biofix | Quincy   | 378       | 340      | 38             | 27 Apr    | 24 Apr   | 3              |
|        | Brewster | 343       | 35       | 29 Apr         | 27 Apr    | 2        | 2              |
|        | Chelan   | 379       | 1        | 24 Apr         | 24 Apr    | 0        | 0              |
|        | Stayman  | 401       | 23       | 23 Apr         | 25 Apr    | 2        | 2              |
| **Avg \(|variation|\)** |           |           |           | **24.2** |           |           | **1.8**       |
Degree days from biofix

- Eggs
- Larvae
- Pupae

From 3/1

375 DD

Eggs
Larvae
Pupae
What to spray

• Determine cause of pest status increase
• Find potential chemical controls
  - Relative toxicity to lacanobia in lab
  - Optimize use and timing in field trials
  - Activity of field-aged residues
• Evaluate potential new chemicals
• Determine baseline resistance levels
Possible cause of outbreak

- Evidence of Guthion (OP) resistance

<table>
<thead>
<tr>
<th>Rate</th>
<th>percent mortality</th>
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<tbody>
<tr>
<td>0.2 lb/acre</td>
<td>0</td>
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<tr>
<td>0.7 lb/acre</td>
<td>4</td>
</tr>
<tr>
<td>2 lb/acre</td>
<td>4</td>
</tr>
<tr>
<td>7 lb/acre</td>
<td>40</td>
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Chemicals tested

- **IGR**
  - Confirm, Intrepid, Ecozin, Neemix
- **Neonicitinoids**
  - Provado, Actara, Assail, Calypso
- **Organophosphates**
  - Lorsban, Guthion, Penncap, Imidan, mal/methoxychlor
- **Organochlorines**
  - Thiodan
- **Pyrethrums/Pyrethroids**
  - Pyrellin, Diotech, Asana
- **Carbamates**
  - Avaunt, Lannate, Sevin, Larvin
- **Miscellaneous**
  - Success, Bt, Surround. Cryolite, Proclaim
Toxicity rankings

• High
  - Success
  - Avaunt+
  - Proclaim+
  - Lorsban+
  - Malathion
  - Thiodan
  - Asana
  - Larvin+
  - Lannate
  + not registered

• Moderate
  - Confirm
  - Intrepid
  - Surround
  - Cryolite
  - Ecozin
  - Pyrellin
  - Diotech

• Low
  - Guthion*
  - Imidan*
  - Sevin*
  - Bt
  - Actara+
  - Assail+
  - Calypso+
  - Provado
  - Penncap+

* resistance reversion
Biological control

- 3 species of tachinid flies
- Several wasp species
- Generalist predators???
- Varies in effect from yr to yr (0-25%)