Brassica Pests:
Cabbage Webworm and Bagrada Bug

Kylie L.T. Tavares
Cabbage Webworm
(*Hellula undalis*)
Cabbage Webworm (*Hellula undalis*)

- Economically important pest on brassica crops
- Greyish yellow with five reddish brown bands down the length of the body
- In Hawaii pest development is most rapid during July and August
- 17-52 day life cycle

Source: CTAHR Crop Knowledge Master

Photo: J. Sugano
Cabbage Webworm (*Hellula undalis*)

- Infestations are not detected until plants appear stunted or deformed
- Look for silk webbing and frass
- Damage occurs throughout crop growth
  - Primary feeding damage on young, developing plants parts as webworms feed on growing terminals.
  - Bore into main stem and stalk, causing plants to wilt and die
  - Formation of multiple heads, deformation
  - Unmarketable crop

Source: CTAHR Crop Knowledge Master

Photo: J. Sugano
Cabbage Webworm Management

• Biological Control
  • Very little known about important parasitoids and predators

• Cultural Control
  • Screen seedlings before transplanting
  • Seedlings should be 5 or 6 inches high and good vigor

• Physical Control
  • Exclusion

• Chemical Control
  • Bt is only partially effective;
  Not recommended as standard treatments

Source: CTAHR Crop Knowledge Master
Comparing Physical Barriers and Organic Insecticides for Controlling Cabbage Webworm on Pak Choy

Objectives

• To rate efficacy of organic insecticides on webworm control, compared to a non-organic insecticide

• To evaluate the use of screen row covers for webworm control
<table>
<thead>
<tr>
<th>Product Name</th>
<th>Active Ingredient or Description</th>
<th>Rate Applied</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neemix</td>
<td>4.5% Azadirachtin</td>
<td>10 fl. oz./ac</td>
</tr>
<tr>
<td>DiPel</td>
<td><em>Bacillus thuringiensis</em> subsp. <em>kurstaki</em></td>
<td>2.0 pints/ac</td>
</tr>
<tr>
<td>Enstrust SC</td>
<td>Spinosad</td>
<td>3 fl. oz./ac</td>
</tr>
<tr>
<td>Pyganic</td>
<td>Pyrethrin</td>
<td>15 ml/gal</td>
</tr>
<tr>
<td>Pongamia Horticultural Oil</td>
<td></td>
<td>2.0% (v/v)</td>
</tr>
<tr>
<td>Coragen (non-organic)</td>
<td>Chlorantraniliprole</td>
<td>3.5 fl. oz./ac</td>
</tr>
<tr>
<td>Proteknet “Biothrips” row netting + wire hoops</td>
<td>0.35mm x 0.35mm ; 89% light transmission, 62% porosity</td>
<td>n/a</td>
</tr>
<tr>
<td>Control</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>
Results

Avg Head Weight at Harvest (lb)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Avg Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>A</td>
</tr>
<tr>
<td>Row Cover</td>
<td>A</td>
</tr>
<tr>
<td>Coragen</td>
<td>A</td>
</tr>
<tr>
<td>Entrust</td>
<td>A</td>
</tr>
<tr>
<td>DiPel</td>
<td>A</td>
</tr>
<tr>
<td>Pongamia Oil</td>
<td>A</td>
</tr>
<tr>
<td>Azatrol</td>
<td>A</td>
</tr>
<tr>
<td>Pyganic</td>
<td>A</td>
</tr>
</tbody>
</table>
Results

% Marketable Product

- Control: B
- Row Cover: A
- Coragen: AB
- Entrust: AB
- DiPel: B
- Pongamia Oil: B
- Azatrol: B
- Pyganic: B

Treatment
Considerations for Row Covers

• **Proteknet Biothrips Screen**
  • 0.35mm x 0.35mm
  • 89% light transmission
  • 62% porosity
  • $0.14/ft²

• **Wire Support Hoops**
  • 26” wide, 16-18” high at center
  • #10 gauge galvanized steel
  • $122.00 per 100 pc.+ shipping

• Secure row covers to ground

• Minimize opening to prevent pest entry during crop growth
Bagrada bug

(*Bagrada hilaris*)
Bagrada bug (*Bagrada hilaris*)

- Stink bug native to Africa; Found in HI on Maui in 2014
  - Found across the western US states
- Adults are black with orange and white markings
- Eggs laid in the soil beneath host plants—easy to mistakenly transport to uninfested areas
  - Also on leaves or hairy stems of host plants, mesh or row covers
- Nymphs are bright orange-red, may be confused with lady beetles
- 23 day life cycle

Source: HDOA, UC IPM

Photos: HDOA, S. Dara, E. Natwick
Bagrada bug (*Bagrada hilaris*)

- Wide range of hosts, including various vegetable crops
  - Main hosts are brassica plants—crops and weeds
  - 2° hosts include various weeds and bell pepper, melon, papaya, tomato, cucumber, okra, sugarcane, potato and some legumes.
- Favor warm temperatures, activity increases in warmer periods
- Hide in soil or leaf litter in cooler temperatures

Source: HDOA, UC IPM

Photos: Western Farm Press, Univ. of CA
<table>
<thead>
<tr>
<th>Preferred Host</th>
<th>Hosts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chinese Cabbage</td>
<td>Head Cabbage</td>
</tr>
<tr>
<td>Mizuna</td>
<td>Head cabbage</td>
</tr>
<tr>
<td>Arugula</td>
<td>Daikon</td>
</tr>
<tr>
<td>Baby Pak Choi</td>
<td>Broccoli</td>
</tr>
<tr>
<td></td>
<td>Cauliflower</td>
</tr>
<tr>
<td></td>
<td>Kale</td>
</tr>
<tr>
<td></td>
<td>Mustard greens</td>
</tr>
<tr>
<td></td>
<td>Mustard cabbage</td>
</tr>
<tr>
<td></td>
<td>Radish</td>
</tr>
</tbody>
</table>

2018 Host Preference Trial
Kula, Maui
- Sweet Alyssum
- Mustard Cover Crop

*Low population
Bagrada bug (*Bagrada hilaris*)

- Adults and nymphs feed on leaves, stems, flowers, and seeds
- Sucking mouth parts
- Starburst-shaped lesions on stems and leaves
- Stippled, wilted leaves, stunting, multiple heads or no head development
Bagrada bug (*Bagrada hilaris*) Management

- Early detection is key—populations build quickly
- Monitor nearby weeds to prevent pest movement
- Monitor seedlings prior to planting
  - Inspect after watering seedlings
- Monitoring should occur in warmer months, and at warmer times of the day
  - Bagrada may be hiding under leaves, at bases of plants or in soil on cooler, cloudy days

Source: UC IPM
Bagrada bug (Bagrada hilaris) Management

• Cultural Control
  • Remove weed hosts in and near planting areas
  • Inspect seedlings before transplanting; treat seedlings
  • Remove crop residue after harvest

• Physical Control
  • Removal by hand—low populations only
  • Removal by vacuum?
  • Traps baited with crushed sweet alyssum?

• Chemical Control

Source: UC IPM
# Insecticide Evaluations for Bagrada Bug on Cole Crops

December 2016 – January 2017

Robin Shimabuku, Dr. Ronald Mau, Kylie Wong, Dr. Ming Yi Chou

<table>
<thead>
<tr>
<th>Insecticide</th>
<th>Chemical AI</th>
<th>MOA</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Untreated Check</td>
<td>Water + surfactant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brigade – 2EC (Bifenthrin)</td>
<td>Pyrethroid</td>
<td>3</td>
<td>6.4 oz/A</td>
</tr>
<tr>
<td>Lannate SP (Methomyl)</td>
<td>Carbamate</td>
<td>1A</td>
<td>1.5 lbs/A</td>
</tr>
<tr>
<td>Warrior</td>
<td>Pyrethroid</td>
<td>3</td>
<td>3.84 fl.oz./A</td>
</tr>
<tr>
<td>Radiant</td>
<td>Spinetoram</td>
<td>5</td>
<td>10 fl.oz./A</td>
</tr>
<tr>
<td>Entrust SC</td>
<td>Spinosad</td>
<td>5</td>
<td>4 ozs/A</td>
</tr>
<tr>
<td>Venom</td>
<td>Neonicotinoid</td>
<td>4A</td>
<td>4 oz/A</td>
</tr>
<tr>
<td>Pyganic 5 EC</td>
<td>Pyrethrins</td>
<td>3</td>
<td>18 fl.oz/A</td>
</tr>
<tr>
<td>Beleaf</td>
<td>Flonicamid</td>
<td>9C</td>
<td>2.8 oz./A</td>
</tr>
<tr>
<td>Azadirect</td>
<td>Azadiractin</td>
<td>18B</td>
<td>3 pts/A</td>
</tr>
</tbody>
</table>
Bagrada knock down and control 1 day after treatment

![Bar chart showing the mean number of Bagrada bug per plant for different treatments.

- **Azatrol**
- **Beleaf**
- **Brigade 2EC**
- **Entrust**
- **Lannate**
- **Pyganic**
- **Radiant**
- **Venom**
- **Warrior**
- **Untreated Check**

The chart indicates that **Untreated Check** has the highest mean number of Bagrada bugs per plant, followed by **Pyganic**.
Bagrada knock down and control 7 days after treatment

Mean number of Bagrada bug per plant

7 DAT

Azatrol, Beleaf, Brigade 2EC, Entrust, Lannate, Pyganic, Radiant, Venom, Warrior, Untreated

A

A

B

B

A

B

B

B

A
• The insecticides that effectively control Bagrada bug all have good residual activity 7 days after treatment

• Entrust performed best out of organic treatments
Upcoming work with bagrada bug

Objective: Provide options and recommendations for organic management

• Traps and trap crops (alyssum, mizuna?)
• Mechanical removal by vacuum
• Organic insecticide efficacy trial, including biologicals

Photo: S. Dara, Univ. of CA
Questions?