MANAGEMENT OF INSECT PESTS OF VEGETABLE CROPS IN SOUTH FLORIDA

D. R. Seal, R. Khan and C.M. Sabines
Tropical Research and Education Center
University of FL-IFAS
Homestead, FL 33031
Phone: 305-986-8926
Email:dseal@ifas.ufl.edu
Agriculture in Florida

--Florida has **47,500** commercial farms, using a total of **9.25** million acres.

--Florida **ranks second** in the value of vegetable production.

--Florida ranks **first nationally** in snap bean production.

--Snap bean is **a leading crop** in Florida which is next to tomatoes, peppers, strawberries and sweet corn.

--Florida snap bean growers contribute **$135 million** to national economy (29% of US value).
### Agriculture in Miami-Dade

<table>
<thead>
<tr>
<th>Vegetable production</th>
<th>Total acres</th>
<th>Total sale (million)</th>
<th>Total farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetables</td>
<td>33,451</td>
<td>$128</td>
<td>&gt;120</td>
</tr>
<tr>
<td>Nursery</td>
<td>13,000</td>
<td>$659</td>
<td>1500</td>
</tr>
<tr>
<td>Tropical fruit</td>
<td>10,300</td>
<td>$38</td>
<td>1443</td>
</tr>
<tr>
<td>Aquaculture Low</td>
<td>Low</td>
<td>4.5</td>
<td>27</td>
</tr>
<tr>
<td>Livestock</td>
<td>6000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Nation's “Salad Bowl” and “Winter Bread Basket. ...

<table>
<thead>
<tr>
<th>Vegetable crops</th>
<th>% of state’s production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweet potatoes</td>
<td>99</td>
</tr>
<tr>
<td>Squash</td>
<td>64</td>
</tr>
<tr>
<td>Beans</td>
<td>57</td>
</tr>
<tr>
<td>Okra</td>
<td>75</td>
</tr>
<tr>
<td>Taro</td>
<td>99</td>
</tr>
<tr>
<td>Tomato</td>
<td></td>
</tr>
<tr>
<td>Pepper</td>
<td></td>
</tr>
</tbody>
</table>
Soil type and land preparation

- **Rockdale soil:** very gravelly loam soil (Krome or Chekika series)
- **Perrine marl soil:** 2-72 inches deep, rich in humus
- **Mixed soil:** combination of Rockdale and Perrine marl soil

85% of agricultural area is underlain by Rockdale soil. Both soils must be irrigated and require frequent application of fertilizer.
Land preparation

Beans are generally planted on flat ground.

Sometimes planted on raised beds as a second crop after harvesting the primary crop.

Land preparation should be thorough with repeated turning of soil
   Soil bone pest-insects, fungus, weeds, nematodes,
## Fertilizer

<table>
<thead>
<tr>
<th>Time</th>
<th>N-P-K</th>
<th>Amount (lb.)</th>
<th>Method of application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preplant</td>
<td>6-12-12 or 6-3-12</td>
<td>1200</td>
<td>Broadcast/Band</td>
</tr>
<tr>
<td>Post plant</td>
<td>4-0-8</td>
<td>Sidedress after 3, 4 and 5 wks</td>
<td></td>
</tr>
</tbody>
</table>

More P is needed for the winter crop; more K is needed for the spring crop.

Foliar application of magnesium nitrate, magnesium sulfate or iron sulfate should be used if deficiency symptoms appear.

Use plant tissue analysis to determine the composition and rates of fertilizer to apply.
Irrigation

• Drip irrigation: If planted as a second crop on a raised bed

• Center pivot / Central pivot / waterwheel

• and circle irrigation:

• Big Gun irrigation

• Sprinkler irrigation
Insect pests of vegetable crops

Soil insect pests

• Wireworm
• Cutworms
• Rootworms

Foliar insect pests

• Corn silk fly
• Fall armyworm
• Corn earworm
• European corn borer
• Sap beetle
• Cucumber beetle
• Mites
• Corn leaf aphid
Soil insect pests

Wireworm

Southern corn rootworm

White grub

Delia platura (bean seed fly)

Cutworm

Flea beetle
Factors enhancing soil insects

a. Weedy fields and weed residue from previous crops
b. Fields with high organic soil
c. Fields with chronic history of soil insects
d. No tillage situation increases soil insects

Cultural control methods for reducing soil insects

Rotate fields
Rotate crops
Disc fields repeatedly to expose soil insects to sunlight, air, and predators.
Avoid fields with previous history of soil insect problems
Make sure that soil is well drained.
Foliage pests of vegetable crops

- Direct damage by foliage feeding
- Indirect damage
Insect pests of tomato

- Whitefly
- Thrips
- Leafminer
- Cucumber beetle
- Mites
- Beet armyworm
- Fruit worm
Thrips in tomato fields

- Melon thrips
- Common blossom thrips
- Western flower thrips
- Chilli thrips
- Florida flower thrips
- Onion thrips
## Insect pests of bean

<table>
<thead>
<tr>
<th>Pests (names)</th>
<th>Images</th>
<th>Damage</th>
<th>Hosts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leafminer</td>
<td><img src="leafminer.jpg" alt="Image" /></td>
<td><img src="leafminer_damage.jpg" alt="Image" /></td>
<td>Vegetable, ornamental and fruit crops</td>
</tr>
<tr>
<td>Silverleaf whitefly</td>
<td><img src="silverleaf_whitefly.jpg" alt="Image" /></td>
<td><img src="silverleaf_whitefly_damage.jpg" alt="Image" /></td>
<td>Vegetable, ornamental and fruit crops</td>
</tr>
<tr>
<td>Melon thrips</td>
<td><img src="melon_thrips.jpg" alt="Image" /></td>
<td><img src="melon_thrips_damage.jpg" alt="Image" /></td>
<td>Mostly vegetable crops</td>
</tr>
<tr>
<td>Common blossom thrips</td>
<td><img src="common_blossom_thrips.jpg" alt="Image" /></td>
<td><img src="common_blossom_thrips_damage.jpg" alt="Image" /></td>
<td>Tomato, pepper, cucurbits</td>
</tr>
</tbody>
</table>
Insect pests of Cucurbits

- Leafminer
- Melonworm
- Aphid
- Broad mite
- Cucumber beetle
Insect pests of pepper

- Pepper weevil
- Melon thrips
- Broad mite
- Beet armyworm
- Leafminer
- Green peach aphid
Insect pests of corn

- Corn silk fly
- Fall armyworm
- Corn earworm
- European corn borer
- Sap beetle
- Corn leaf aphid
- Spider mite
- Cucumber beetle
CORN SILK FLY (Picture wing fly)

- Chaetopsis massyla
  Credit: Gaurav Goyal

- Euxesta annonae
  Credit: Gaurav Goyal

- E. Eluta
  Credit: Gaurav Goyal

- Euxesta stigmatis
  Credit: Gaurav Goyal
MANAGEMENT OF CORN SILK FLY DAMAGE USING CORAGEN ONCE AT PLANTING AS A SOIL DRENCH

Date of planting: 2Feb 2013
Plot size: 30 feet long two rows
Block design: Randomized complete block with four replications
Application method: Applied once as a soil drench at planting
Sampling method: 10 plants/plot were checked for FAW infestation.

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Rate [oz]/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coragen SC</td>
<td>5.0</td>
</tr>
<tr>
<td>Coragen SC</td>
<td>7.0</td>
</tr>
<tr>
<td>Avaunt</td>
<td>5.0</td>
</tr>
<tr>
<td>Control</td>
<td>0</td>
</tr>
</tbody>
</table>
Insect pests of Okra

- Melon thrips
- Leafminer
- Beet armyworm
- Silverleaf Whitefly
- Aphid
- Broad mite
- Cucumber beetle
Insect pests of Sweet potato

- Sweetpotato weevil
- Leafminer
- Melon thrips
- Silverleaf Whitefly
- Aphid
- Broad mite
- Cucumber beetle
- Soil insect pests
CONVENTIONAL CONTROL

Heavy reliance on Insecticide

- Dev. of Resistance
- Elimination of Nat. Enem.

  - Resurgence of Target pest
  - Appearance of secondary pests

- Multiple pest problems
IPM
Avoid reliance on insecticide

- Chemical
- Biological
- Physical
- Mechanical
- Natural
- Cultural

No resurgence
No secondary pest
Safe to environment

(Know biology of the pest)
Integrated Pest Management

Avoid reliance on insecticide

Sampling soil insects

Soil insect infestation is unpredictable
Their presence is always overlooked as they cannot be seen.
Proper sampling methods are the only way to understand their presence

a. Collect soil from 10 cm deep and 10 cm diam.
b. Place them in a plastic bag.
c. Wash them using sieves of various mesh to collect wireworm at the bottom sieve with fine mesh (No. 1 – 20).

No resurgence
No secondary pest
Safe to environment

Chemical
Biological
Physical
Mechanical
Natural
Cultural

(Know the enemy)
(Prevention of the pest)
Factors enhancing soil insects

a. Weedy fields and weed residue from previous crops
b. Fields with high organic soil
c. Fields with chronic history of soil insects
d. No tillage situation increases soil insects

Cultural control methods for reducing soil insects

Rotate fields
Rotate crops
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Biological control of corn silk fly

- Milk weed bug
- Minute pirate bug
- Rove beetle larva
- Common green lacewing
Zelus longipes feeding on Euxesta stigmatias in sweet corn field

- Adult male feeding on corn silk fly adult
- Zelus longipes eggs
- First instars hatching out of eggs
- First instar feeding on corn silk fly larvae
Adult *O. insidiosus* feeding on a third instar larva of *Euxesta stigmatias*
Staphylinid larva feeding on *Euxesta stigmatias* eggs
Larva of *Chrysoperla carnea* feeding on an adult *Euxesta eluta* fly
Sweet corn was planed on 8 March 2013. Insecticides were applied on 5, 8, 11, 15 and 18 March. Sampling for evaluation was conducted 4-6 h after each application by thoroughly checking each of randomly selected five plants in each treatment plot.
Mean number of sweet corn plants infested with FAW

<table>
<thead>
<tr>
<th>Treatments</th>
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<tbody>
<tr>
<td>Coragen SC 5.0</td>
<td></td>
</tr>
<tr>
<td>Coragen SC 7.0</td>
<td></td>
</tr>
<tr>
<td>Avaunt 5.0</td>
<td></td>
</tr>
<tr>
<td>Control 0</td>
<td></td>
</tr>
</tbody>
</table>

Date of planting: 2Feb 2013  
Plot size: 30 feet long two rows  
Block design: Randomized complete block with four replications  
Application method: Applied once as a soil drench at planting  
Sampling method: 10 plants/plot were checked for FAW infestation.
Mean rating of sweet corn plants infested with cucumger beetle

Date of planting: 2Feb 2013
Plot size: 30 feet long two rows
Block design: Randomized complete block with four replications
Application method: Applied once as a soil drench at planting
Sampling method: All plants in a plot were usually rated on a scale 0 – 5, where 0=no damage

Treatments | Rate [oz]/A |
--- | --- |
Coragen SC 5.0 |
Coragen SC 7.0 |
Avaunt 5.0 |
Control 0 |
Some images and data information on various crops and insects on this presentation were collected from online sources.

The author respectfully acknowledge the contribution of those sources.
Thanks!