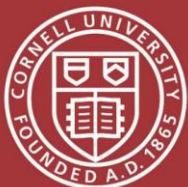


# Squash those bugs!

Empire State Producers EXPO  
January 13, 2021



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# Outline

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- **Common insect pests**
  - **General IPM tactics**
  - **Deployment of IPM tactics (preventative vs. curative)**
  - **IPM tactics and their deployment for each pest**
-

# Insect Pests of Vine Crops in NY

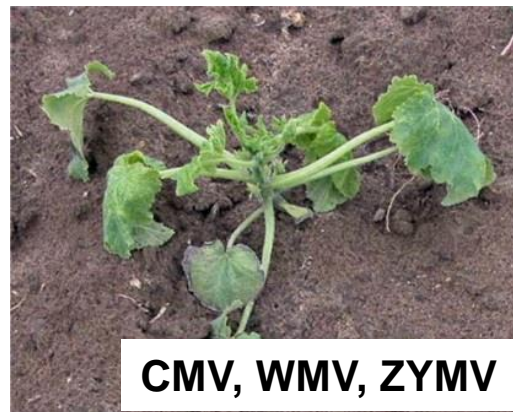
## Seedcorn maggot



## Cucumber beetles



## Aphids





# Insect Pests of Vine Crops in NY

## Mites



## Squash vine borer



## Squash bug

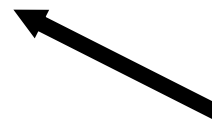
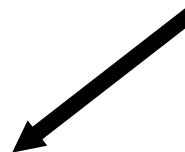


# General IPM tactics

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**Plant Resistance**

**Chemical Control**



**Cultural Control**

**Biological Control**

# Approaches to deploy IPM tactics

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**Preventative** – deploy management tactic before pest(s) arrive (i.e., reflective mulch, row cover, planting date, insecticide at planting)

**Curative** – deploy management tactic only when pest(s) infest crop (i.e., insecticide sprays)

# Concerns about neonicotinoid insecticide use in vine crops harming bees

- Risk of harming bees and other non-target organisms with neonicotinoids



**Integrated Crop Management NEWS**


## Insecticidal Seed Treatments can Harm Honey Bees

Erin Hodgson, Department of Entomology (ISU) and Christian Krupke, Department of Entomology (Purdue)

Neonicotinoids are a relatively new class of chemistry to control insects. They are now widely adopted because they are persistent and systemic in plant tissues. Most field crops in Iowa have a neonicotinoid seed treatment. Common examples of neonicotinoids include: clothianidin (Poncho®), thiamethoxam (Cruiser®), and imidacloprid (Gaucho®). Active ingredient rates range from 0.25-1.25 milligrams per kernel (sold as 250-1,250 rates).


Neonicotinoids are extremely toxic to bees. Lethal LD50 rates (the rate at which half of the exposed population dies) for clothianidin are 22-44 nanograms per bee for direct contact and 2.8-3.7 nanograms per bee for oral ingestion. In other words, a single corn kernel with a 1,250 rate of neonicotinoid seed treatment contains enough active ingredient to kill over 80,000 honey bees.

There has been an increased public awareness of pollinator health and the decline of bees in North America. Researchers have identified multiple contributing factors for honey bee decline, including: Varroa mites, disease-causing pathogens, habitat loss, malnutrition, the intensity of migratory pollination services and pesticides (Fig. 1).



## ARE NEONICOTINOIDS KILLING BEES?

A Review of Research into the Effects of Neonicotinoid Insecticides on Bees, with Recommendations for Action



Erin Hodgson, Mack Vaughan, Matthew Shepherd, David Biddinger, Eric Mader, Scott Hoffman Slack, and Corinne Mazzacano

The World Soil Information Consortium



# Seedcorn maggot

- Seedcorn maggot (*Delia platura*)
- Overwinters as a puparium in soil in NY (resident pest)
- Adults emerge in April and early May
- Eggs laid on decaying organic material as well as recently planted crops
- 3 - 5 generations; early generations are typically the most problematic

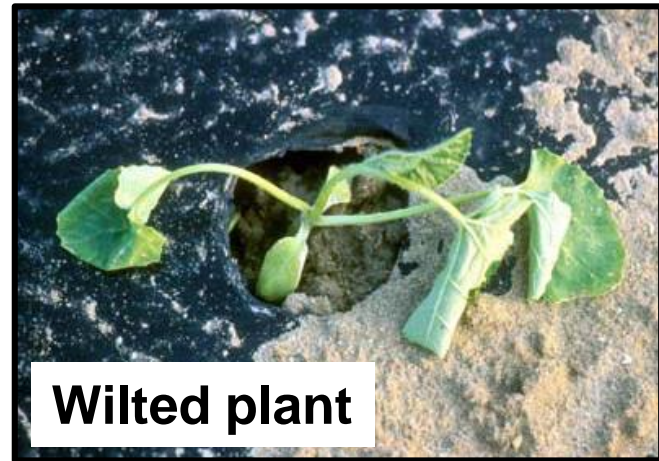




# Seedcorn maggot damage



**Feeding in seed**



**Wilted plant**



**Feeding in stem**



**Dead plant**

*(Photos: G. Brust)*

# IPM tactics for maggots

~~Plant Resistance~~

Chemical Control



Seed treatments



Tray drench



Avoid manure



Row covers



Cultural Control

~~Biological Control~~

# Seedcorn maggot management:

## Chemical approaches



### ➤ Preventative

#### a) Neonicotinoid seed treatment

- Cruiser 5FS (thiamethoxam)  FarMore® FI400  
Cucurbits

*Coming soon (Q1 2022?)*

#### b) Spinosyn seed treatment

- Regard SC (spinosad)   Regard™ SC

# Seedcorn maggot management:

## Chemical approaches



### ➤ Preventative

c) Diamide insecticide at planting (in-furrow, drip, tray drench)

- Verimark (cyantraniliprole)





# Seedcorn maggot management: Cultural Approaches



## ➤ Preventative

### d) Avoid recent heavily manured fields

At minimum plant at least 10 days after the manure application or incorporation of a cover crop



# Seedcorn maggot management: Cultural Approaches



## ➤ Preventative e) Row cover

Degree-day model is available for timing (whether to use) [https://agweather.cals.wisc.edu/thermal\\_models/scm](https://agweather.cals.wisc.edu/thermal_models/scm)



# Seedcorn maggot management:

All approaches



➤ Curative

# Nothing!

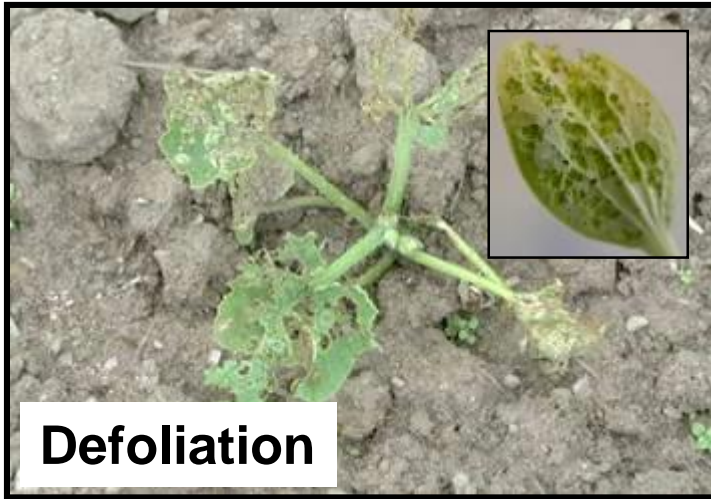
# Cucumber beetles

- **Striped cucumber beetle**  
(*Acalymma vittatum*)
- **Spotted cucumber beetle**  
(*Diabrotica undecimpunctata*)
- **Both overwinter as an adult in in NY (resident pest)**
- **Adults emerge in May/ June**
- **Eggs laid at base of plants**
- **Larvae develop on roots**
- **2 generations per year**





# Cucumber beetle damage

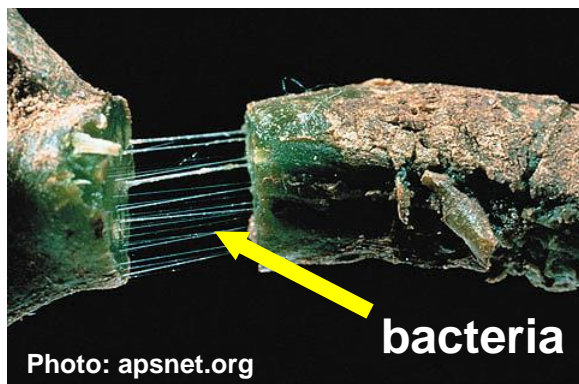


# Cucumber beetle-related damage

**Disease: Bacterial wilt**

**Pathogen: *Erwinia tracheiphila***

**Vector: Cucumber beetle adults**





# IPM tactics for beetles

## ~~Plant Resistance~~

squash > watermelon

Repellent



Trap cropping



Row covers



## Cultural Control

## Chemical Control

Seed treatments



Tray drench



Foliar sprays



## ~~Biological Control~~



# Cucumber beetle management:

## Chemical approaches



### ➤ Preventative

#### a) Neonicotinoid seed treatment

- Cruiser 5FS (thiamethoxam)





# Cucumber beetle management:

## Chemical approaches



### ➤ Preventative

b) Neonicotinoid insecticide at planting (in-furrow, drip, tray drench)

- Admire Pro (imidacloprid)
- Platinum (thiamethoxam)



c) Diamide insecticide at planting (in-furrow, drip, tray drench)

- Verimark (cyantraniliprole)



**FIFRA 2(ee) for New York**

# Cucumber beetle management:



## Cultural approaches



### ➤ Preventative

#### d) Repellent

- Surround WP (kaolin clay)

- ✓ Multiple foliar applications needed
- ✓ Avoid clogging nozzles
- ✓ Reduces heat stress/  
improves  
photosynthesis

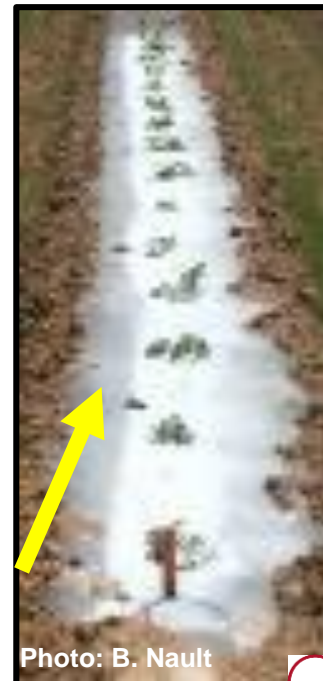


Photo: B. Nault

**Surround® WP**

Crop Protectant



# Cucumber beetle management:

## Cultural approaches



- Preventative
  - e) Trap cropping



**Melons  
(cash crop)**

**Squash  
(trap crop)  
= preferred host**

# Cucumber beetle management:

## Cultural approaches



### ➤ Preventative

#### f) Row cover

- ✓ Remove covers before flowering to provide bees access to flowers for pollination





# Cucumber beetle management:

## Chemical approaches



### ➤ Curative

### *Action Thresholds:*

- **5 beetles/ plant (cotyledon to 4-leaf stage)**
- **>5 beetles/ plant (5-leaf stage to harvest)**

# Cucumber beetle management:

## Chemical approaches



### ➤ Curative

#### a) Synthetic insecticides (foliar applied)

- Neonicotinoids (e.g., Assail)
- Pyrethroids (e.g., Warrior II w/zeon)
- Lannate LV (methomyl)
- Sevin XLR Plus (carbaryl)
- Exirel (cyantraniliprole)



#### b) Organic insecticides (foliar applied)

- ? no success with Entrust or Azera



# Aphids

- Melon aphid (*Aphis gossypii*)
- Green peach aphid (*Myzus persicae*)
- Overwinters as eggs on spring hosts in NY (resident pest)
- Adults emerge in April and early May
- multiple generations per year



# Aphid damage



Photos: J. Obermeyer

**Wilted plant**



# Aphid-related damage

**Diseases:** multiple diseases caused by aphid-transmitted viruses

**Pathogens:** *Cucumber mosaic virus*; *Watermelon mosaic virus*; *Zucchini yellow mosaic virus*

**Vectors:** Adult aphids (multiple species)



# IPM tactics for aphids/ viruses

## Plant Resistance

Virus-resistant cultivars



## Chemical Control

Seed treatments



Tray drench



Foliar sprays



Repellent



Row covers



Predators



## Cultural Control

## Biological Control

# Aphid management: Chemical approaches



## ➤ Preventative

### a) Neonicotinoid seed treatment

- Cruiser 5FS (thiamethoxam)  FarMore<sup>®</sup> FI400  
Cucurbits

# Aphid management: Chemical approaches



## ➤ Preventative

b) Neonicotinoid insecticide at planting (in-furrow, drip, tray drench)

- Admire Pro (imidacloprid)
- Platinum (thiamethoxam)



c) Other insecticide at planting (in-furrow, drip, tray drench)

- Verimark (cyantraniliprole)
- Sivanto Prime (flupyradifurone)

**not for muskmelons; drip & in-furrow**





# Aphid-transmitted virus management:

## Plant resistance



### ➤ Preventative

#### d) Virus-resistant cultivars

- ***Squash (zucchini)*** e.g., Declaration II, Independence II, Judgement III, Justice II
- ***Squash (yellow)*** e.g., Destiny III, Prelude II, Multipik, Superpik, Fortune, Sunbar, Precious II
- ***Melons and Pumpkins*** – NONE?
- ***Watermelons*** – rarely a problem

# Aphid & virus management: Cultural control



## ➤ Preventative e) Row cover



## f) Reflective mulch



# Aphid management: Chemical approaches



## ➤ Curative

***Action Threshold:*** >20% vines have > 5  
aphids on leaves

# Aphid management: Chemical approaches



## ➤ Curative

### a) Neonicotinoid insecticides

- Assail 30SG (acetamiprid)

- Endigo ZC ( $\lambda$ -cyhalothrin  
+ thiamethoxam)



### b) Other synthetic insecticides

- Beleaf 50SG (flonicamid)

- Fulfill (pymetrozine)

- Sivanto Prime (flupyradifurone)





# Aphid management: Chemical approaches



## ➤ Curative

### c) Organic insecticides



- Azadirachtin products



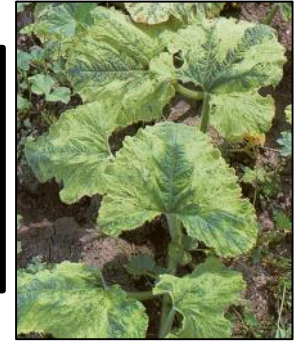
- M-pede (insecticidal soap)



# Virus management: Chemical approaches



- Curative
  - d) Mineral oils
    - JMS Stylet



# Aphid management: Biocontrol approaches



## ➤ Biological control

- naturally occurring predators and parasitoids



# Mites

- **Two-spotted spider mite**  
(*Tetranychus urticae*)
- **Overwinters as an adult in NY**  
(resident pest)
- **Adults emerge in spring**
- **Multiple generations per year;**  
**more in hot and dry seasons**



Photo: J. Obermeyer



# Mite damage



# IPM tactics for mites

~~Plant Resistance~~

Chemical Control

Foliar sprays



Predators



~~Cultural Control~~

Biological Control

# Mite management: All approaches



➤ Preventative



# NOTHING!

# Mite management: Chemical approaches



## ➤ Curative

***Action Threshold:* > 50% of vines show early leaf injury on crown leaves and live mites present**



# Mite management: Chemical approaches



## ➤ Curative

### a) Synthetic insecticides/ miticides

- Agri-Mek SC (abamectin)



- Acramite 50WS (bifenazate)



- Oberon 2SC (spiromesifen)



- Portal (fenpyroximate)



- Zeal (etoxazole)



# Mite management: Chemical approaches



## ➤ Curative

b) Mineral oils

- JMS Stylet?



# Mite management: Biocontrol approaches



## ➤ Biological control

- naturally occurring predators



*Phytoseiulus persimilis*



*Neoseiulus cucumeris*

# Squash vine borer

- Squash vine borer (*Melittia cucurbitae*)
- Larvae overwinter in cocoons in NY (resident pest)
- Active from mid-June to August
- Eggs laid at base of squash and pumpkin plants
- 1 generation per year





# Squash vine borer damage



# IPM tactics for vine borer

~~Plant Resistance~~

Chemical Control

Foliar sprays



Row covers



Cultural Control

~~Biological Control~~

# Squash vine borer management:

## Cultural approach



### ➤ Preventative

#### a) Row covers



- ✓ Degree day model: Row covers at 900-1000 degree days (base 50° F)  
<https://hort.extension.wisc.edu/articles/squash-vine-borer/>
- ✓ Remove covers before flowering to provide bees access to flowers for pollination

# Squash vine borer management:

## Chemical approach



### ➤ Curative

#### a) Synthetic insecticides (foliar applied)

- Neonicotinoid (e.g., Assail)
- Pyrethroids (e.g., Warrior II w/zeon)



#### b) Organic insecticides (foliar applied)

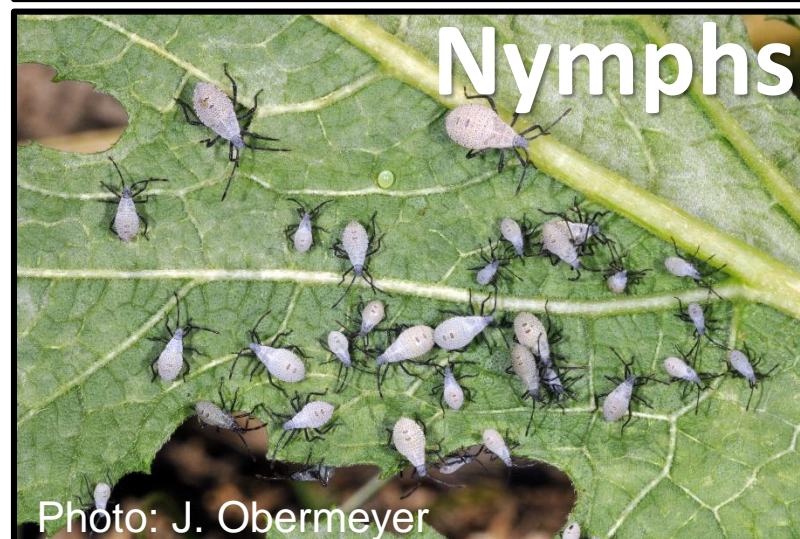
- Entrust SC (spinosad)





# Squash bug

- Squash bug (*Anasa tristis*)
- Adults overwinter in protected shelters in NY (resident pest)
- Active from June to Sept
- Eggs laid in groups on undersides of leaves
- 1 generation per year
- Particularly like squash and pumpkin



# Squash bug damage





# Squash bug-related damage

**Disease: Cucurbit yellow vine disease (CYVD)**

**Bacterial pathogen: *Serratia marcescens***

**Vector: Squash bugs**



# IPM tactics for squash bug

~~Plant Resistance~~

blue hubbard > butternut

Chemical Control

Foliar sprays



Row covers



Cultural Control

~~Biological Control~~



# Squash bug management:

## Cultural approach



### ➤ Preventative

**a) Row covers (but adults often colonize later)**



- ✓ **Remove covers before flowering to provide bees access to flowers for pollination**

# Squash bug management:

## Chemical approaches



### ➤ Curative

### *Action Thresholds:*

Seedling stage (< 5 leaves): 2 overwintering adults

Early flowering stage:  $\geq 2$  egg mass per plant;  
direct sprays at base of plant

# Squash bug management:

## Chemical approach



### ➤ Curative

#### a) Synthetic insecticides (foliar applied)

- Neonicotinoid (e.g., Assail)
- Pyrethroids (e.g., Warrior II w/zeon)
- Sevin XLR (carbaryl)
- Sivanto Prime (flupyradifurone)

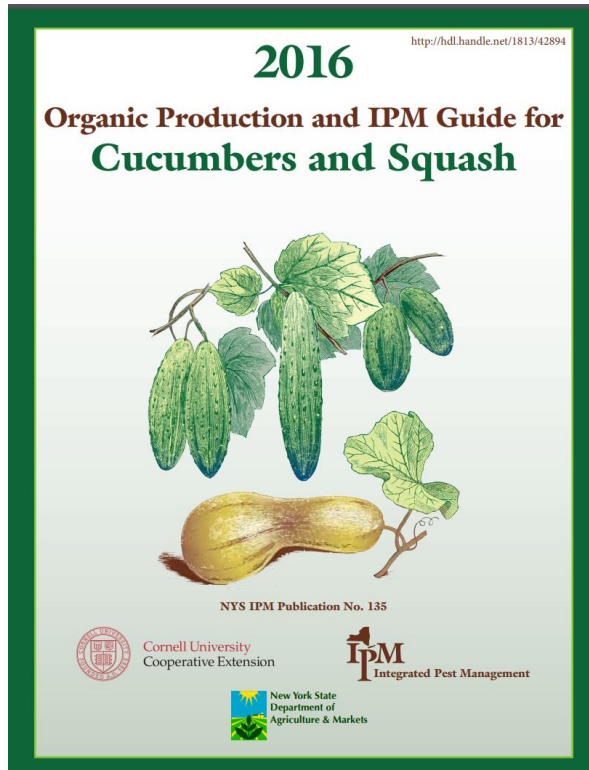


#### b) Organic insecticides (foliar applied)

- Azera (azadiractin + pyrethrin)?
- Pyganic (pyrethrin)?



# Resources



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2020  
Cornell Integrated Crop and  
Pest Management Guidelines for  
Commercial Vegetable Production

Cornell Cooperative Extension

These guidelines are not a substitute for pesticide labeling. Always read and understand the product label before using any pesticide.