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- The presentation will begin at the top of the hour
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Eastern Sustainable Organic Cucurbit Project
ESO-Cuc
Addressing Critical Pest Management Challenges in Organic Cucurbit Production

Management options for striped cucumber beetle in organic cucurbit production

This project was supported by Organic Research and Extension Initiative competitive grant no.: 2012-51300-20006 from the USDA National Institute of Food and Agriculture.

USDA United States Department of Agriculture National Institute of Food and Agriculture

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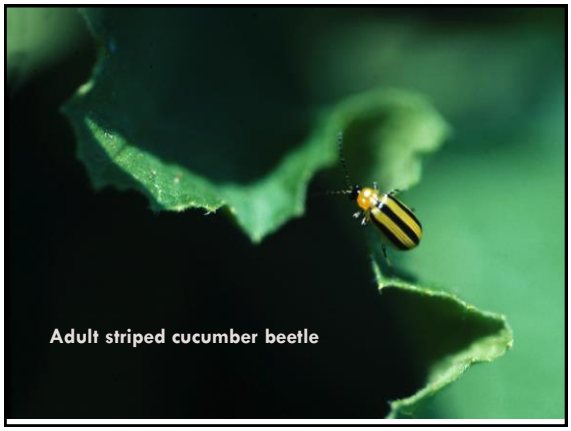


Striped cucumber beetle life cycle

Overwinters as adult in field borders

Adults migrate to fields, feed on foliage

Eggs laid at base of plants - larvae feed on roots

Summer adults emerge in late July - early August

Bacterial wilt transmitted by striped cucumber beetle

Squash mosaic virus

"Rindworm" could be SCB larvae

Photo credit: K. Rochacewich, Cargill.

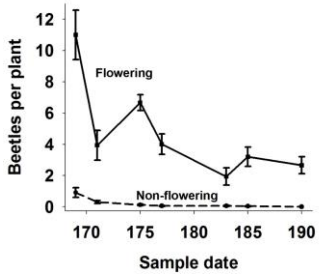
Biology that informs cultural controls

- Overwintering location is outside field
  - Pollen feeders – need cucurbits to complete life cycle
  - Invade fields quickly and sometimes in high numbers
  - Initially concentrated at edges
- Some cultivars are preferred
  - Selection made post-feeding
  - Aggregation pheromone
    - Both males and females attracted

Biology that informs cultural controls

- Plants are less susceptible to bacterial wilt after the 5-leaf stage
- Studies conducted in winter squash (Waltham butternut):
  - Seedlings can tolerate up to 20% damage without yield loss
  - Transplants (1-3 leaf stage) can tolerate up to 50% damage without yield loss

Beetles are attracted to flowers



Straw mulch may increase damage

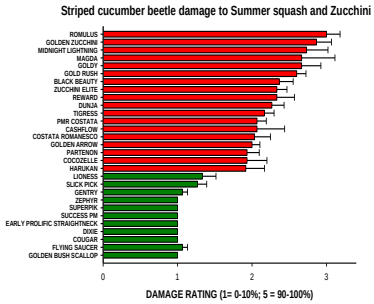
Photos courtesy of Ryan Maher, Cornell Small Farms Program

Cultural practices for SCB Management

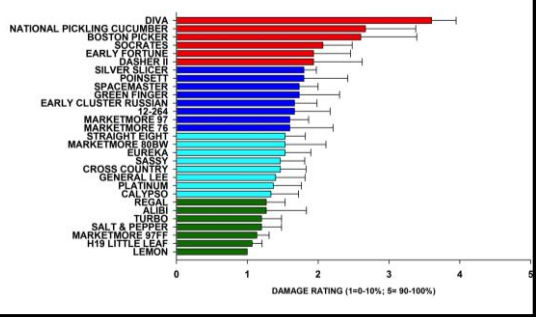
- Plant non-preferred varieties
- Row cover
- Perimeter trap cropping

Success PM vs. Golden Zucchini

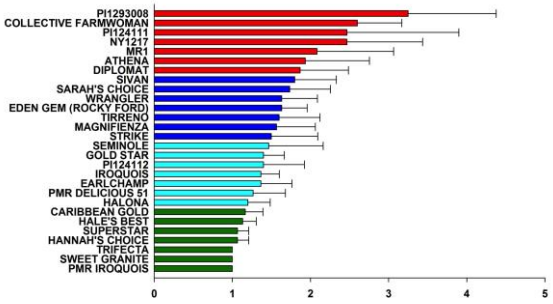
SCB Damage in Summer Squash and Zucchini Cultivars



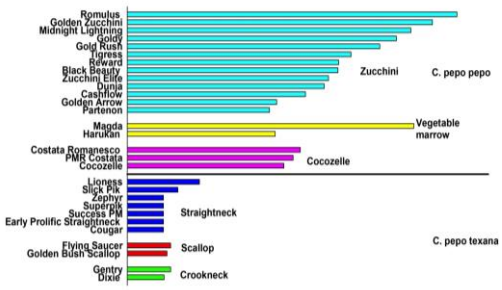
SCB Damage in Cucumber Cultivars



SCB Damage in Melon Cultivars

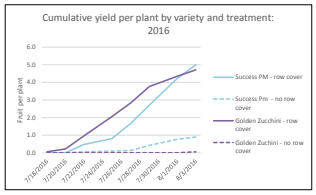


SCB Damage Ratings by Market Class

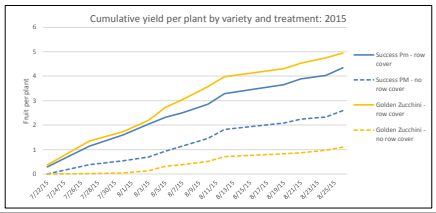


Early Season Row Cover

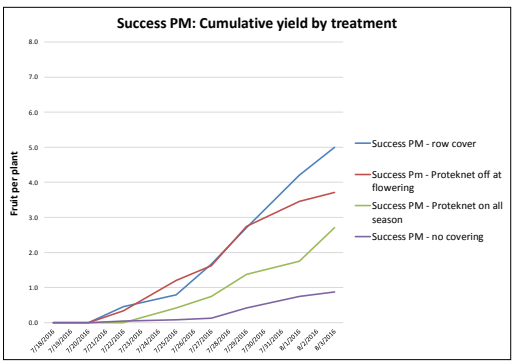
- Protects through vulnerable growth stages
  - Direct feeding damage
  - Bacterial wilt transmission
- Suitable for smaller acreages
- Applied immediately after transplanting or before seedling emergence
- Remove at flowering for cultivars needing pollination
- Weed management can be a challenge

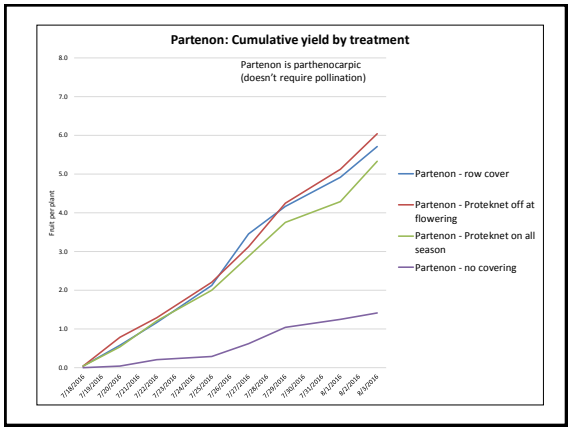


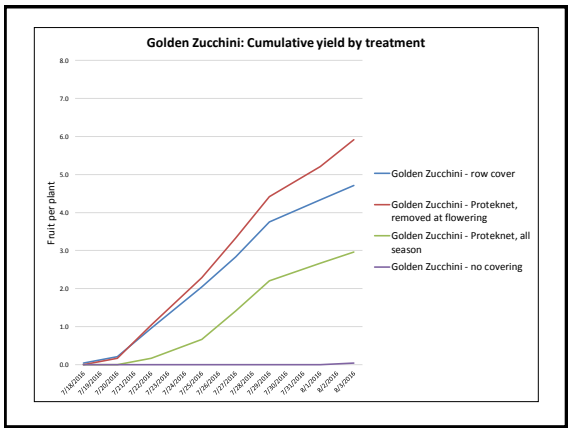
Success PM does not attract the same degree of beetle damage as Golden Zucchini. However, in 2016 the beetle pressure was exceptionally high, leading to significant bacterial wilt infection in uncovered Success PM plants and almost total failure of uncovered Golden Zucchini.

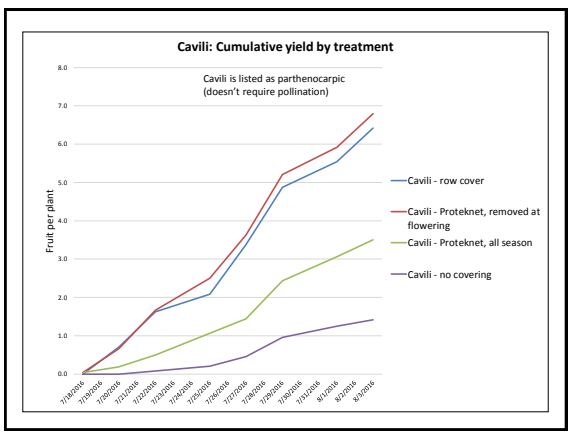


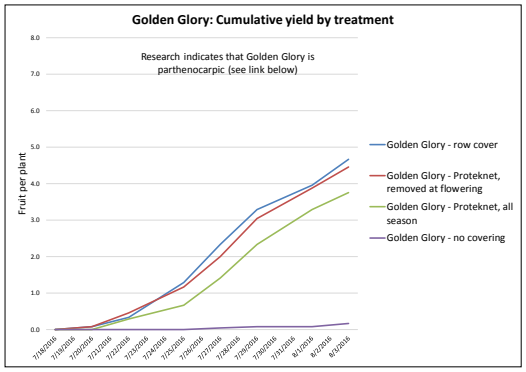
Each cultivar showed a different response to row cover treatments




Partenon: Cumulative yield by treatment
Partenon is parthenocarpic
(doesn't require pollination)
Fruit per plant
Partenon - row cover
Partenon - Proteknet off at flowering
Partenon - Proteknet on all season
Partenon - no covering


Golden Zucchini: Cumulative yield by treatment
Fruit per plant
Golden Zucchini - row cover
Golden Zucchini - Proteknet, removed at flowering
Golden Zucchini - Proteknet, all season
Golden Zucchini - no covering


Cavili: Cumulative yield by treatment
Cavili is listed as parthenocarpic
(doesn't require pollination)
Fruit per plant
Cavili - row cover
Cavili - Proteknet, removed at flowering
Cavili - Proteknet, all season
Cavili - no covering



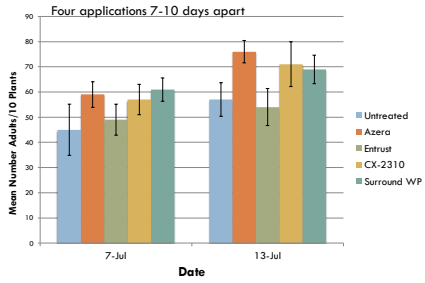
http://www.hort.cornell.edu/expo/proceedings/2014/Vine%20crops/Seedless%20squash%20Reiners.pdf

Adapting PTC to organic systems

- More suitable for larger acreages
- The trap crop must be more attractive than the main crop
  - Hubbard, Buttercup often used as trap crop
- Trap crop flowering earlier will help
- Yellow sticky cards may enhance attractiveness of trap crop
- Surround (kaolin clay) can decrease attractiveness of main crop
- No effective insecticide to kill adults
- We can aggregate on trap crop, but how to reduce the population?

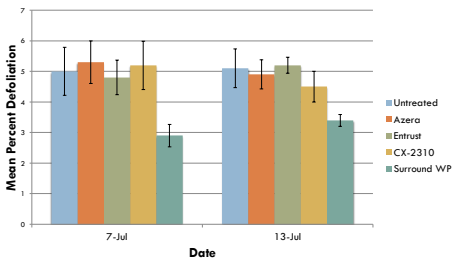
Plants treated with Surround

Insecticide Efficacy Trial



Data courtesy of Brian Nault, trial funded by IR-4

Insecticide Efficacy Trial



Data courtesy of Brian Nault, trial funded by IR-4

Research Questions:

- Will striped cucumber beetle adults lay more eggs on a trap crop vs the main crop?
- Will destruction of the trap crop reduce adult emergence and reduce overwintering populations?

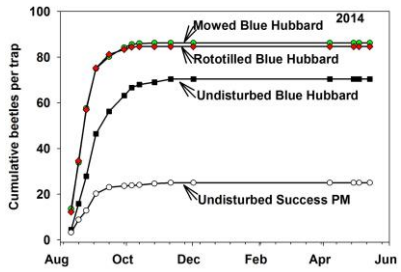
Trial: Managing Beetles on Trap Crop

- Conducted in 2014 and 2016
- Blue Hubbard paired with either Golden Zucchini or Success PM (10-20 plants/plot)
- Beetle numbers and damage ratings collected in 2014 but not 2016
- Hubbard plants were mowed, rototilled, or undisturbed
- 2 emergence cages placed over each variety in each plot – adult emergence monitored

2014 Trial Design

- Three Blue Hubbard tillage treatments- mowed, rototilled or no tillage after beetle numbers decline but before adult emergence.
- Main crop had no tillage
- 5 reps of each treatment completely randomized
- Measured beetle number and rated damage
- Two emergence traps per plot

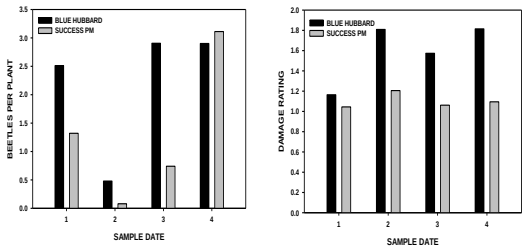
2014 Trial Results



Beetles numbers and damage on trap crop and main crop (2014)

Sampled weekly after transplanting

Higher numbers on Success PM on 4th sampling date may reflect earlier flowering



2016 Trial Design

Importance of trap crop being more attractive than main crop

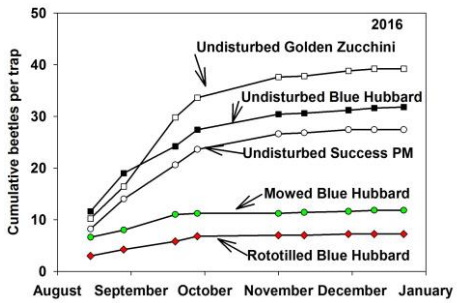
Blue Hubbard did not protect Golden Zucchini. Success PM seems inherently resistant even in the absence of a choice.

Golden Zucchini

Blue Hubbard

Success PM

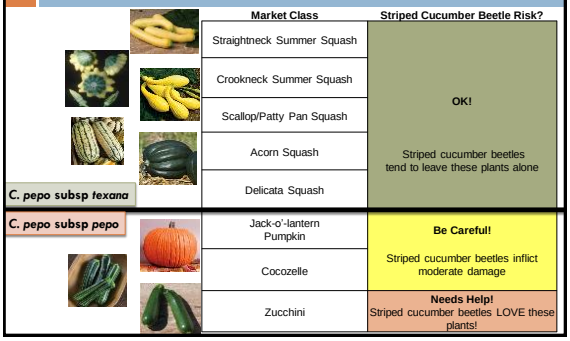
2016 Trial Results



Take – home messages

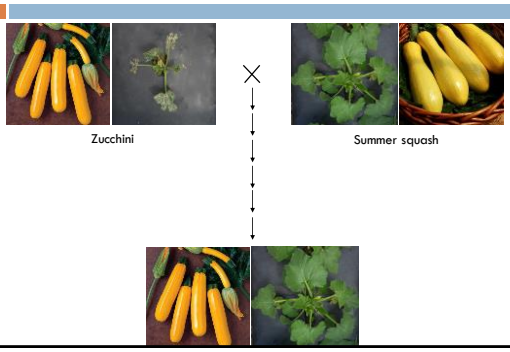
- In the absence of effective insecticides an integrated, long-term strategy is essential
- Row cover is very effective for smaller acreages
- Differences in cultivar attractiveness can be exploited
  - Some cultivars inherently not attractive
  - Perimeter trap cropping and trap crop destruction may reduce populations over time

C. *pepo* Breeding Work Underway

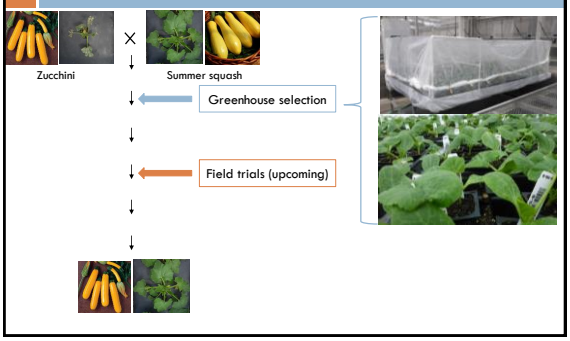


	Market Class	Striped Cucumber Beetle Risk?
C. pepo subsp *texana*	Straightneck Summer Squash	OK! Striped cucumber beetles tend to leave these plants alone
	Crookneck Summer Squash	
	Scallop/Patty Pan Squash	
	Acorn Squash	
	Delicata Squash	
C. pepo subsp *pepo*	Jack-o'-lantern Pumpkin	Be Careful! Striped cucumber beetles inflict moderate damage
	Cocozelle	
	Zucchini	Needs Help! Striped cucumber beetles LOVE these plants!

Breeding Work Underway



Breeding Work Underway



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- We value your feedback! Please fill out the follow up survey that you will receive by email.
- Thank you for coming!

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