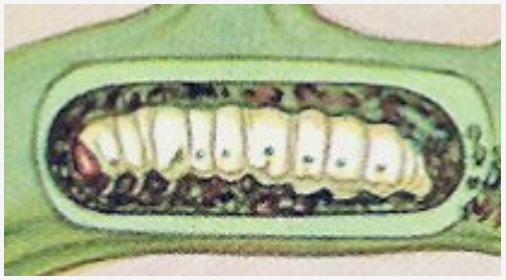
Pumpkin Pest Management:
Insect Pests



Celeste Welty
Extension Entomologist
Ohio State University
February 2017

Pumpkin Pests

Key	Common	Occasional
Cucumber beetles	**Squash vine borer**	**Two-spotted spider mite**
	Squash bug	**Pale-striped flea beetle**
	Aphids	Squash beetle
	Seedcorn maggot	Globular springtails

Cucumber beetles: key pests of melons, cucumbers, pumpkins & squash

Feeding damage

Vectors of bacterial wilt disease

Cucumber beetle feeding damage

light

moderate

heavy

Bacterial wilt of cucurbits: Vectored by cucumber beetles

- Transmitted in feces
- Enter via plant wound
- Moisture needed
- Cotyledon stage most susceptible

Bacterial wilt: Hosts

- Cukes & melons
  - Well-known killer
- Squash & pumpkins
  - Recently adapted to kill
  - Slower to kill

Bacterial wilt of cucurbits: Vectored by cucumber beetles

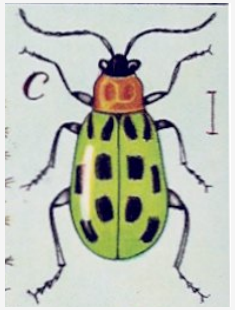
- **Infective beetles**
  - **Overwintering**
    - **1%**
  - **2nd generation (Jul-Sep)**
    - **8-12%**
  - **More if feeding 72 hrs than 12 hrs**

Bacterial wilt of cucurbits

Beetle species common in cucurbits:

- **Known vectors:**
  - **Striped cucumber beetle**
  - **Spotted cucumber beetle**


striped


spotted

Bacterial wilt of cucurbits

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- **Known vectors:**
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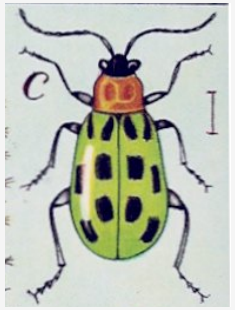
striped



spotted

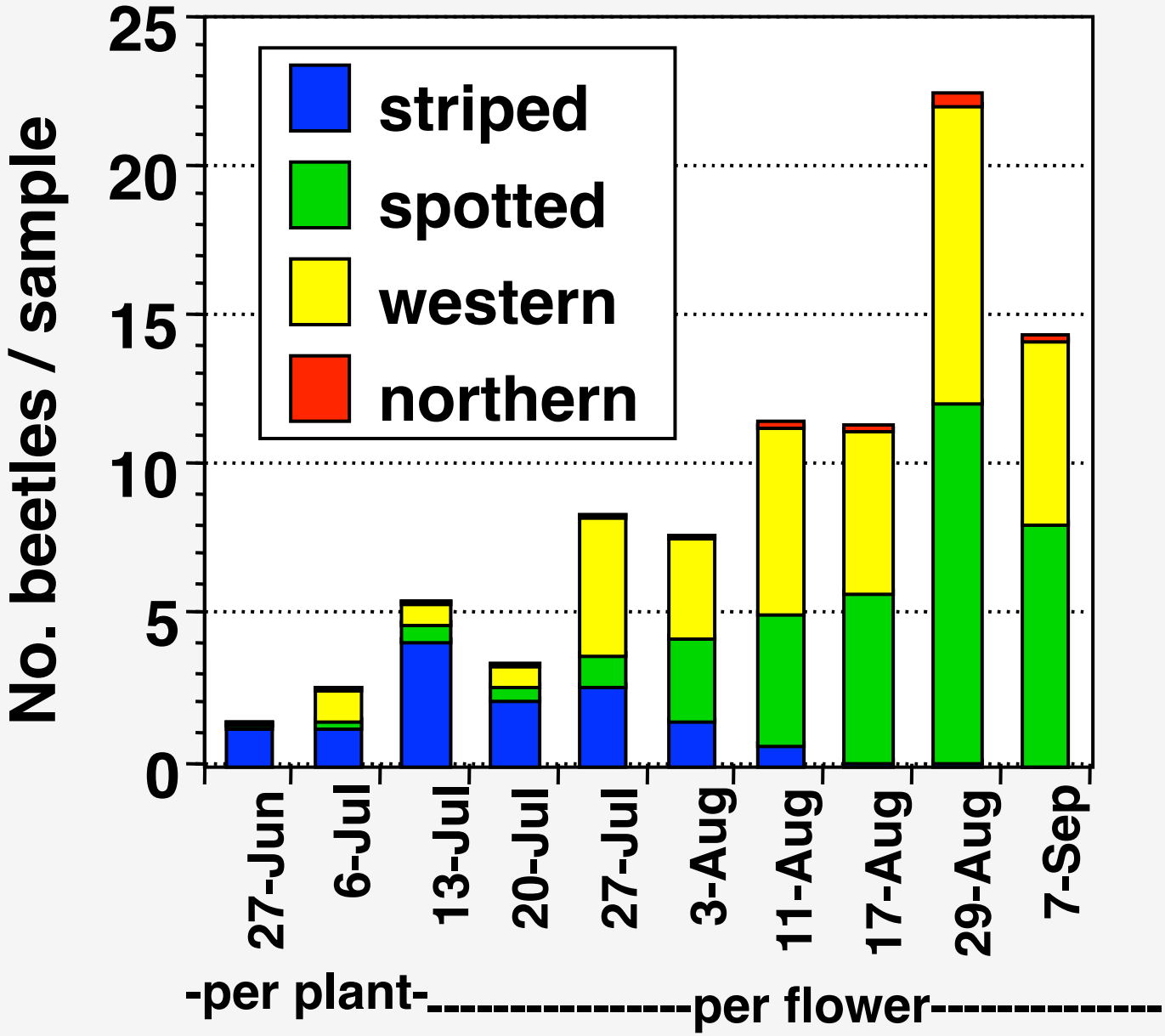
- **Not known to vector:**
  - Western corn rootworm beetle
  - Northern corn rootworm beetle
  - Pale-striped flea beetle


western


pale-striped


northern

Species of cucumber beetles on squash



Biological control

- Parasitoids
- Predators
- Nematodes

Natural enemy of cucumber beetles

- Parasitoid fly, *Celatoria*
- Looks like a small house fly
- Kills adult cucumber beetles
- Common in Ohio
  - Striped cucumber beetle, adults:
    - 0 to 38% in survey 13 farms, 2003 & 2004
  - Spotted cucumber beetle, adults:
    - 4% at 1 site, 2000
- We need to encourage its survival!

Biological control:

studies in 2014-2016
with Molly Dietrich & Mary Gardiner

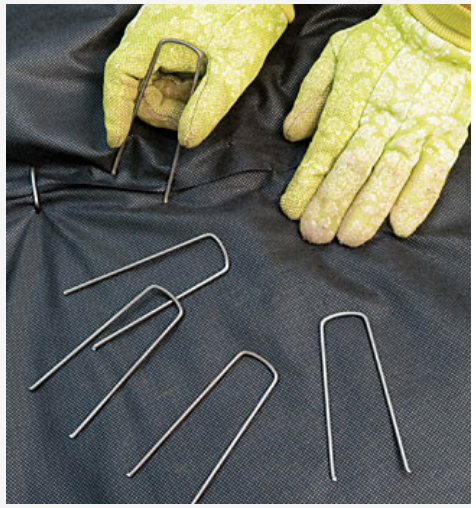
- Pitfall sampling for predators
- Predation on cucumber beetle eggs
  - Above & below ground
  - Video surveillance
- Results
  - Ants
  - Harvestmen (daddy longlegs)
  - Wolf spiders
- Gut contents analysis

Beetle infected with nematodes (purchased, sprayed)

Insectary planting as refuge for natural enemies

- Adult parasitoids need nectar
- Adult predators need pollen
- Plant flowering border at field edge to enhance biocontrol

Row covers



- Lightweight row covers
  - Agribon-19
- Good option for organic production

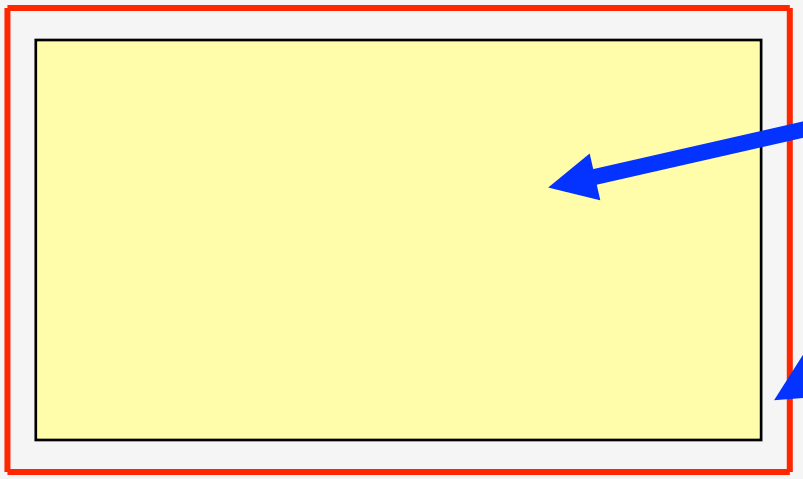
Row covers

- Recent trials with muskmelon
- Better bacterial wilt control if left on for 10 days after first female flowers
- Picture: removal on July 19th

Cultural controls

- Plant late (mid-June)
  - After initial peak invasion
- Beware of mulch made of organic matter (e.g. straw)
  - Favors development of larvae in soil
- Trap cropping

Trap cropping



cash crop (pumpkins)

perimeter trap crop of maxima squash (treated with insecticide)

- Planting time
  - 2 weeks earlier for trap crop
- Insecticide options
  - Use in trap crop only
  - High rate in trap, low rate in cash

perimeter trap crop of buttercup squash around muskmelon

Chemical control

- Conventional options
- Organic options
- Thresholds

Insecticide options

- Seed applied systemics
  - FarMore FI 400 (since 2009)
- Soil applied systemics
  - Admire Pro (since 2000) or generics
  - Platinum 2SC
- Foliar applied
  - Before flowering:
    - Sevin; Pounce or other pyrethroids
  - During flowering:
    - No good choices due to honey bee toxicity
    - Never spray in morning

Dead striped cucumber beetle under pumpkin seedlings, after in-furrow soil treatment with Admire at time of direct seeding

Seed Treatment

- **Efficacy: as good as in-furrow treatment**
- **Duration:**
  - **Control usually good through 2nd leaf stage**
  - **Control usually poor by 4th leaf stage**
  - **Control most important at cotyledon stage, when most susceptible to bacterial wilt**
- **Advantages**
  - **Convenience; easier application**
  - **Lower rate of a.i. per acre**
    - **~25 times less for pumpkins**
    - **~2 times less for pickles**
  - **Lower cost**

Cucumber beetle management on seedling cucurbits: scout until the 4-leaf stage

Stage	Threshold
cotyledon & 1-leaf	0.5 beetle/plant
2-leaf to 4-leaf	1 beetle/plant
>4-leaf	3 beetles/plant

Cucumber beetle management on maturing pumpkins & squash

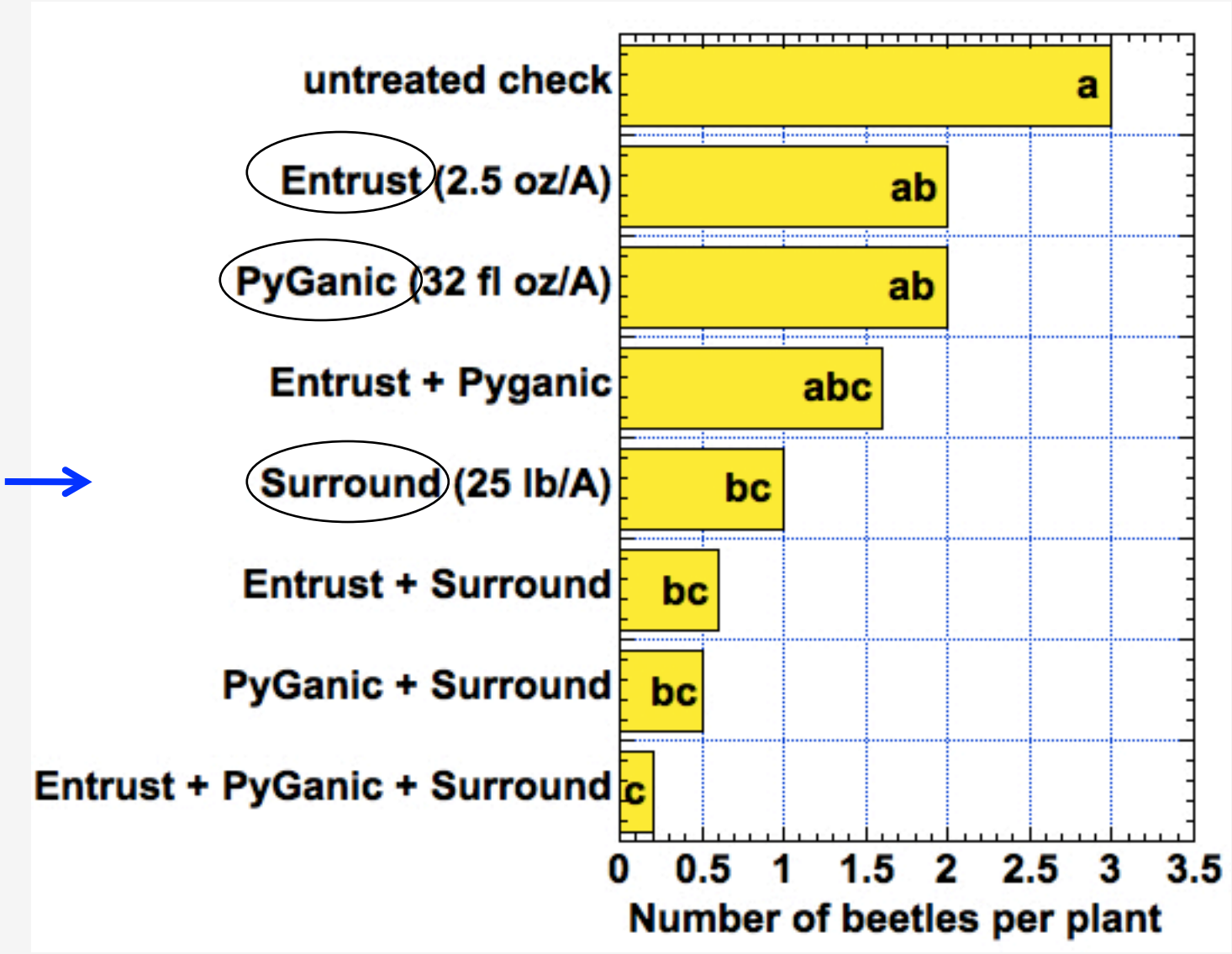
- Scout for damage
  - Examine 50 fruit weekly
  - Feeding usually starts on fruit stem ('handle')
- Threshold (tentative):

  20% of fruit with scars on fruit stem

Cucumber beetle & OMRI insecticides

Active ingredient	Product
pyrethrins?	PyGanic
spinosad?	Entrust
kaolin?	Surround
neem oil?	Trilogy
Beauveria?	Mycotrol
any + CideTrak D?	

Cucumber beetle trial, UMass, 2009: 3 foliar applications on 1, 8, 15 June



Novasource®
Tessenderlo Group

Surround® WP

Crop Protectant

OMRI™ Listed
Organic Materials Review Institute

Cucurbit Vegetables
Such as cucumber, summer and winter squash, pumpkin, citron melon, muskmelon, and watermelon

PEST	LBS/ACRE	APPLICATION INSTRUCTIONS
Cucumber beetle, grasshoppers	25-50	Suppression only*. Start prior to infestation, applying every 5-7 days, with the first two applications 3 days apart.
Powdery mildew		Suppression only*. Apply every 7-14 days as required to maintain coverage.
Sunburn and heat stress	25-100	See I D.
*If complete control is needed, consider using supplemental controls.		

Cost ~ $22 for 25-lb bag

‘Surround’

- Registered in 2000
- A.I. = kaolin (clay)
- ‘Particle film technology’
- Broad spectrum crop protectant
- Photosynthesis not affected
- Acceptable for organic crop production
- Made by Engelhard Corp.

- Cucurbits: use 25 - 50 lb/A at 5-7 day intervals to suppress cucumber beetles

Repellent: ‘Surround’

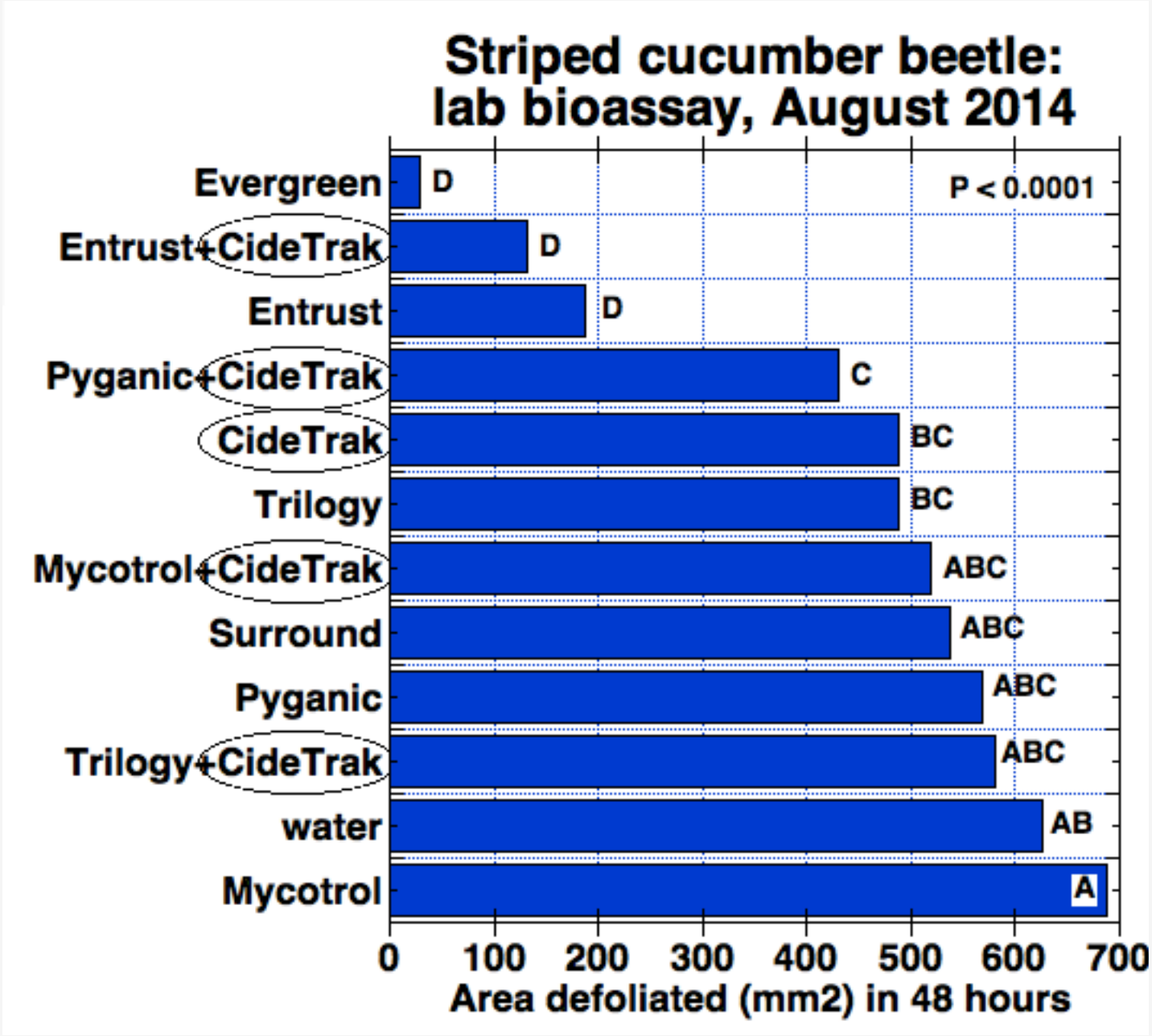
Pumpkins 2001

Cantaloupe 2012

CideTrak D

- Buffalo gourd root powder
- Cucurbitacin
- Gustatory stimulant
- Not insecticide
- Mix with insecticide
- 3.1 oz/A
- OMRI list (as adjuvant)
- Made by Trécé Inc.
- Costs $92.50 for 4-lb bag (@CPS)

Cucurbita foetidissima


Striped cucumber beetle:
lab bioassay, August 2014
P < 0.0001
Evergreen
Entrust+CideTrak
Entrust
Pyganic+CideTrak
CideTrak
Trilogy
Mycotrol+CideTrak
Surround
Pyganic
Trilogy+CideTrak
water
Mycotrol
D
D
D
C
BC
BC
ABC
ABC
ABC
ABC
AB
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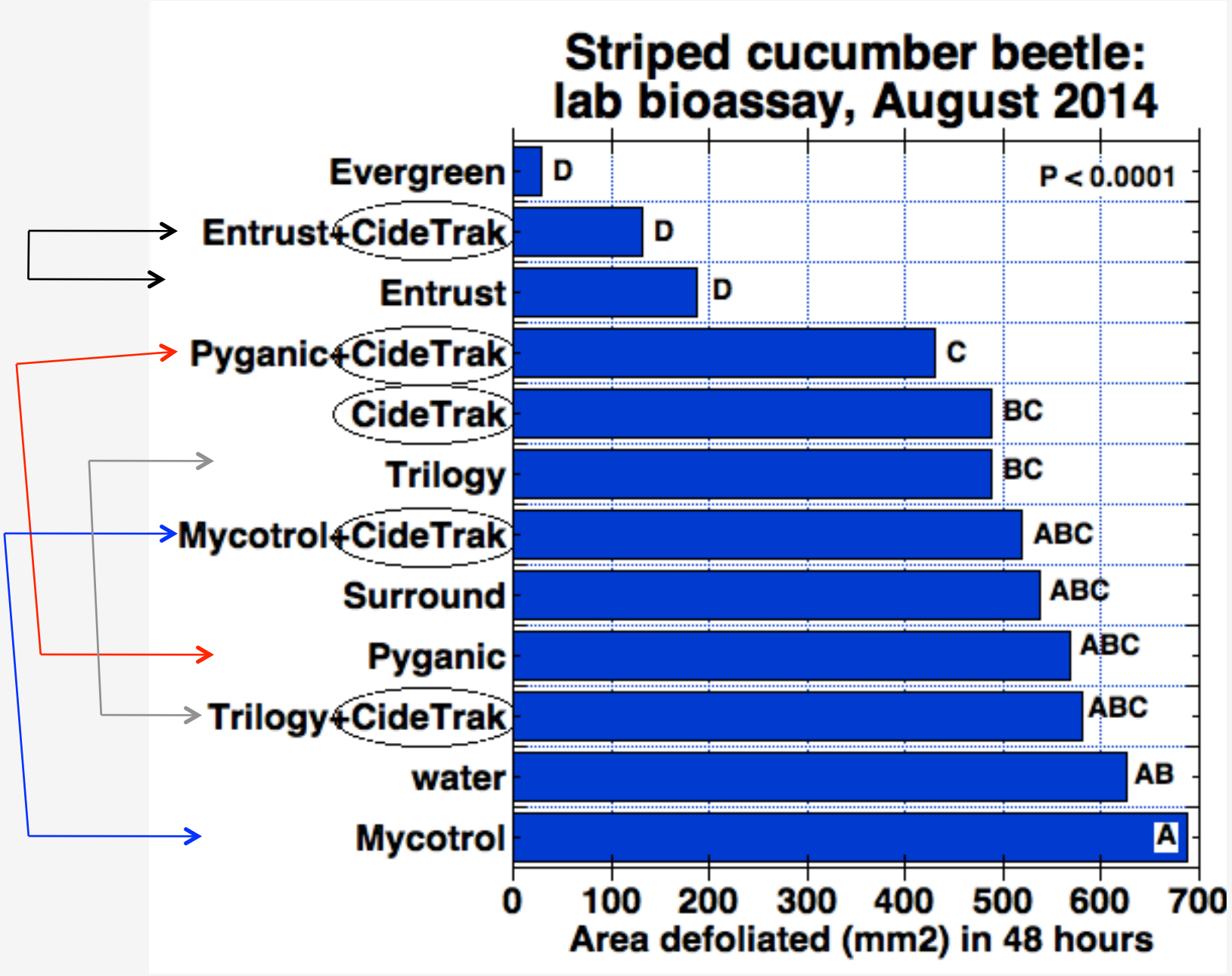
0
100
200
300
400
500
600
700
Area defoliated (mm2) in 48 hours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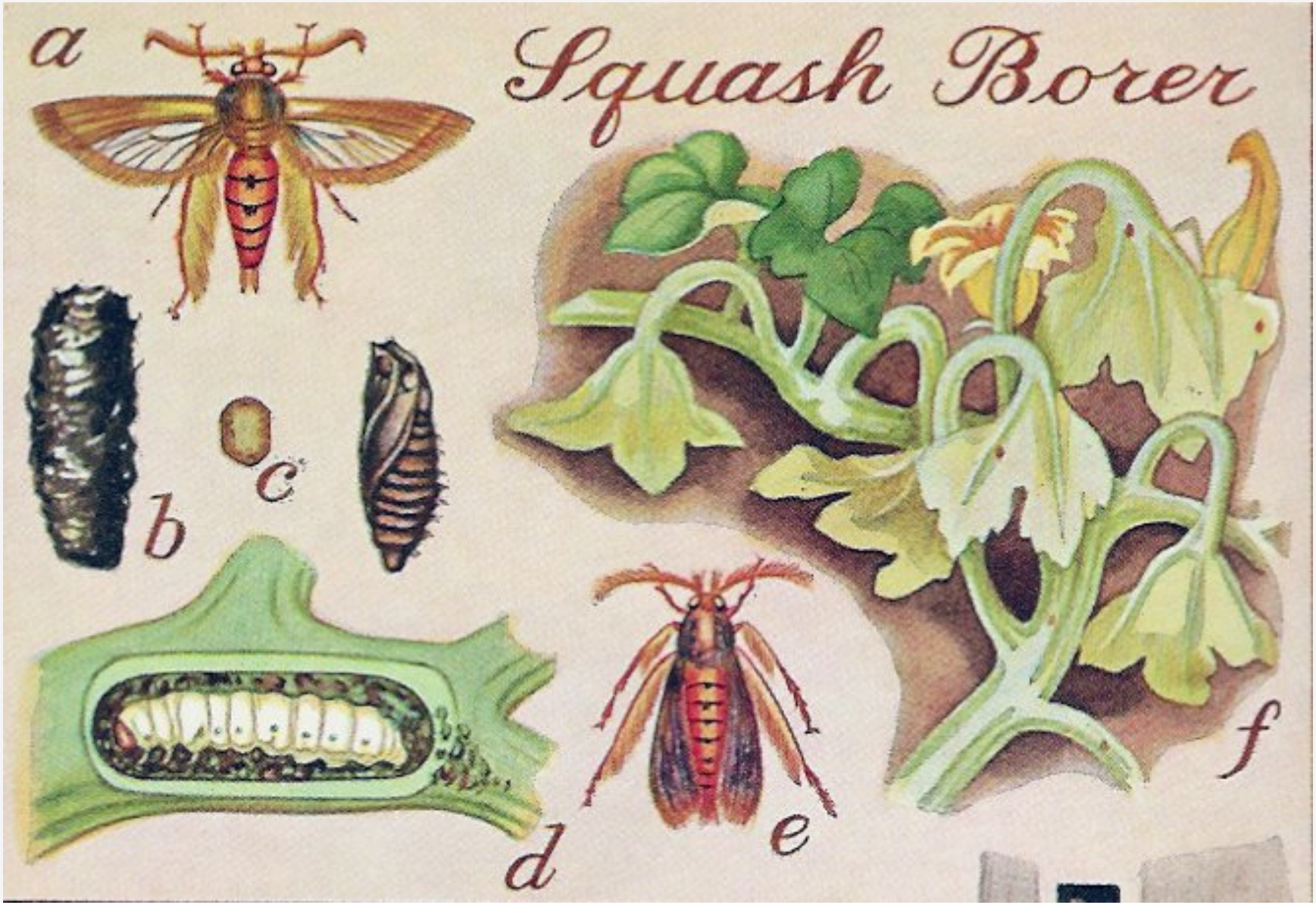
Area defoliated (mm2) in 48 hours

Summary of tactics

- **Biological**
  - Conserve parasitoid flies
- **Mechanical:**
  - Row covers
  - Mass trapping
- **Cultural:**
  - Plant late (mid-June)
  - Transplant rather than direct seed
  - Avoid straw mulch
  - Perimeter trap crop
- **Chemical**
  - Conventional
  - Organic

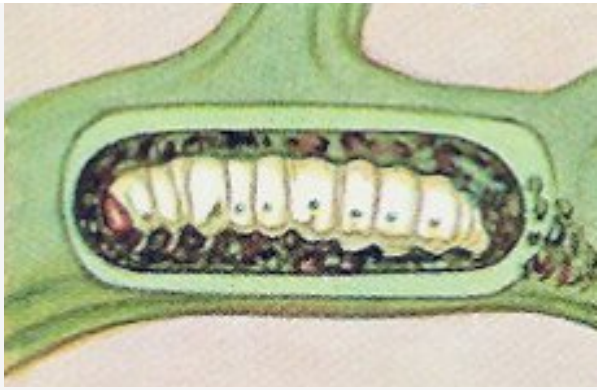
Squash Vine Borer: Life Stages



Squash Vine Borer: Management

- **Cultural**
  - Plant late for main crop
  - Small planting early as trap crop
- **Mechanical**
  - Row covers (until flowering)
- **Chemical**
  - Insecticide

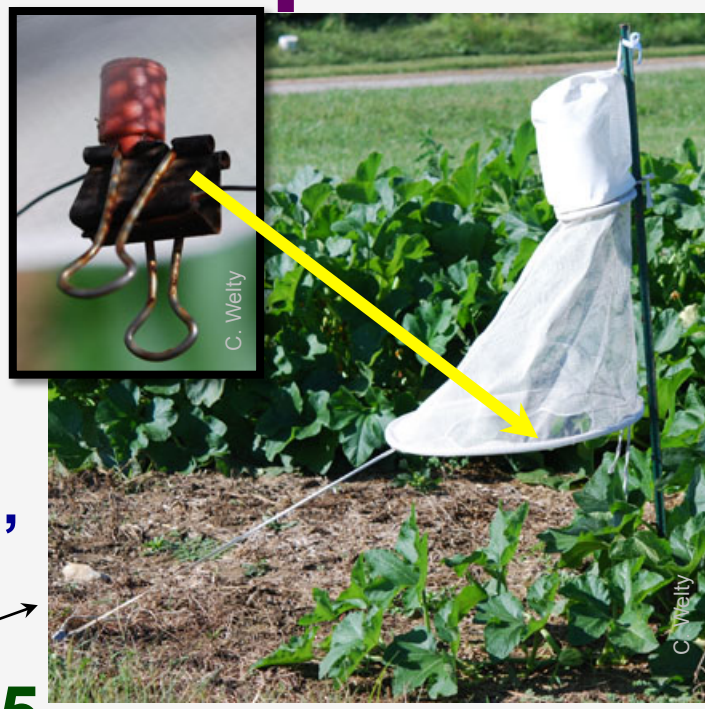
Squash Vine Borer: insecticides



- Direct spray at base of stems
- Timing:
  - 2 - 6 sprays, 1-2 weeks apart
  - At time of egg hatch
    - Estimate by catch of moths in trap
    - Peak hatch usually early July
- pyrethroid (Ambush, Asana, Baythroid, Brigade, Danitol, Permethrin, Pounce)
- pyrethrins + PBO (Evergreen)

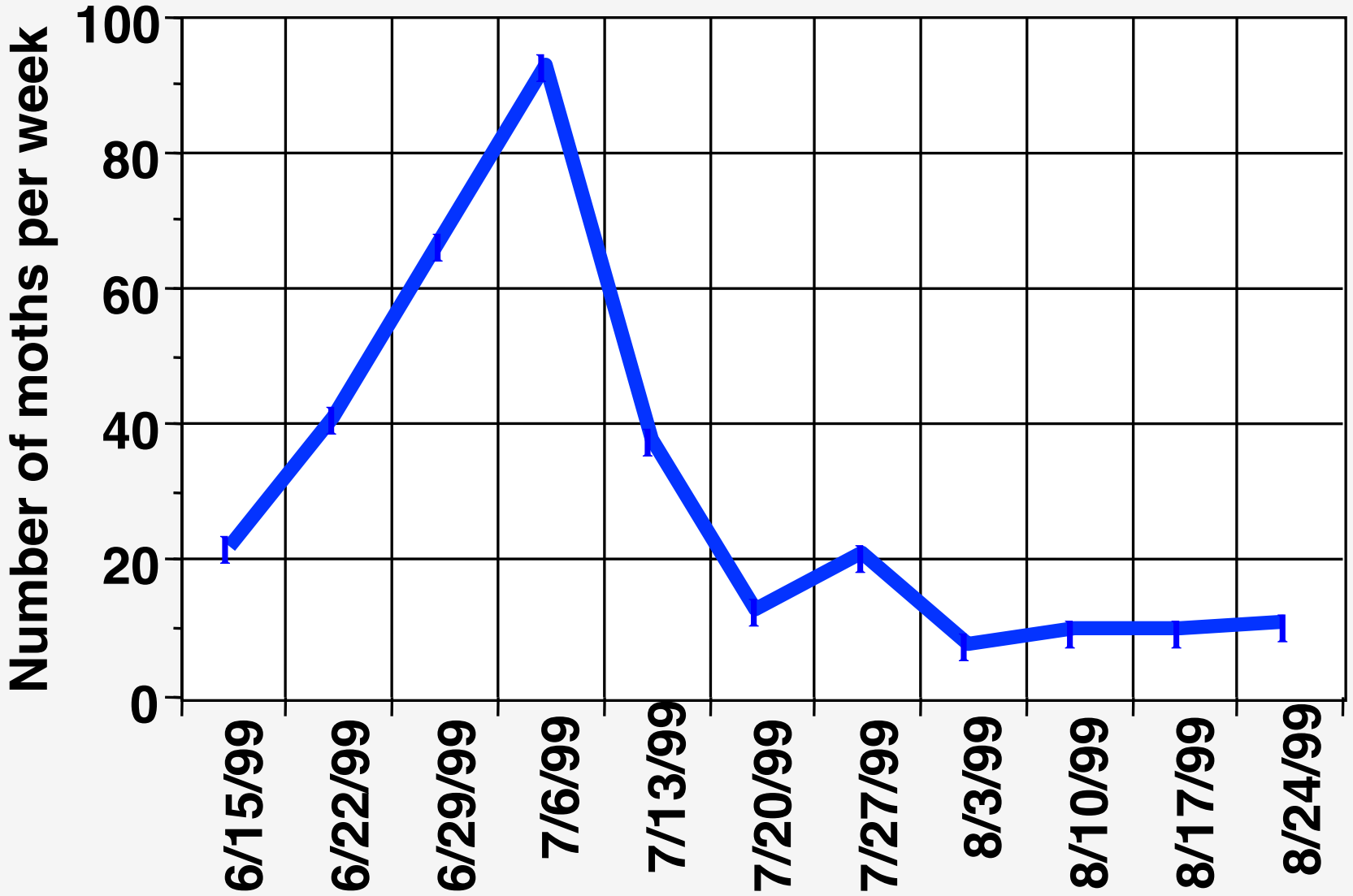
Squash vine borer: monitoring with pheromone trap

- **Lure attracts male moths**
- **Helps estimate time of egg hatch**
- **Supplies (from 'Great Lakes IPM', Vestaburg Michigan):**
  - **Scentry 'Heliothis' trap @ $55**
  - **Lures @$2.25, change lure every 4 weeks**
  - **Alternative: unitrap $9.95**



Squash vine borer moths in pheromone trap

Columbus, Ohio



Squash bug

eggs

adult

eggs hatching

young nymphs

older nymphs

Squash Bug: Damage

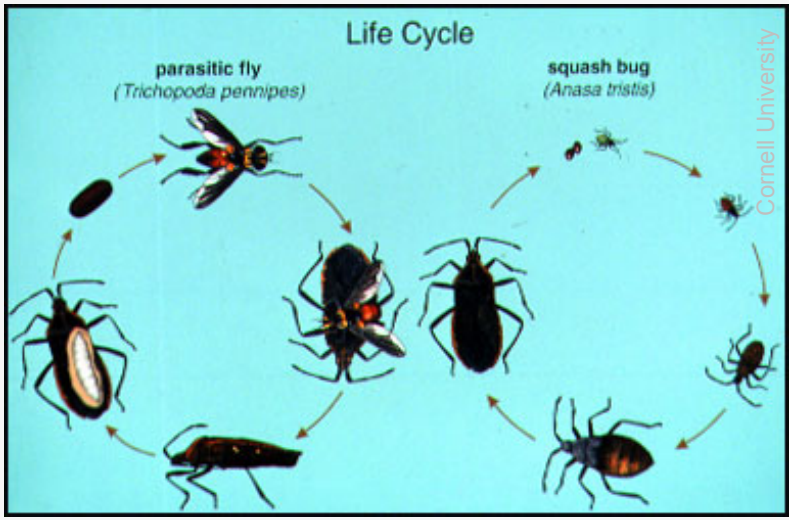
Zucchini plant killed by squash bug.

- **Suck sap- leaves, stems**
  - **Patches turn black, die**
- **Plants wilt**
  - **can die**
  - **can live but not develop fruit**
- **Bugs feed on fruit before harvest**

Squash Bug: Management

- **Cultural control**
  - Rotate with non-cucurbit crops
  - Promote early growth of crop
  - * Destroy crop remains
- **Mechanical control**
  - Row covers (until flowering)
  - Hand picking, especially eggs
  - Shelter traps: board or shingle

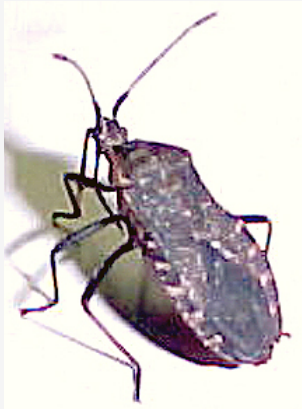
Squash Bug: Biological control



- **Feather-legged fly**
  - ***Trichopoda pennipes***
  - **lays egg on adult or large nymph**
- **Egg parasitoid wasps**
  - ***Gryon pennsylvanicum***
  - ***Ooencyrtus anasae***

Squash Bug: Chemical control

- Challenges
  - Nymphs more susceptible than adults
  - Hard to contact in canopy
  - Need good spray pressure
- Insecticide choices:
  - Conventional
  - OMRI

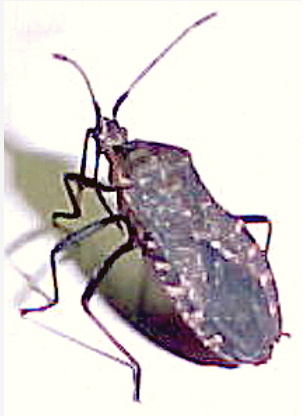


Squash Bug: Insecticides

- **Conventional**
  - **pyrethroids (Ambush, Asana, Baythroid, Capture, Danitol, Permethrin, Pounce) = *good***
  - **carbaryl (Sevin) = *poor***
- **Organic**
  - **spinosad (Entrust), nymphs only**
  - **pyrethrins**

Cucurbit Yellow Vine Disease

- New bacterial disease
- Infects squash, pumpkin, melon
- Not in cucumbers
- Vectored by squash bug
- Range
  - Oklahoma, Texas, Kentucky for 13 yrs
  - Confirmed in OH, MI in 2003



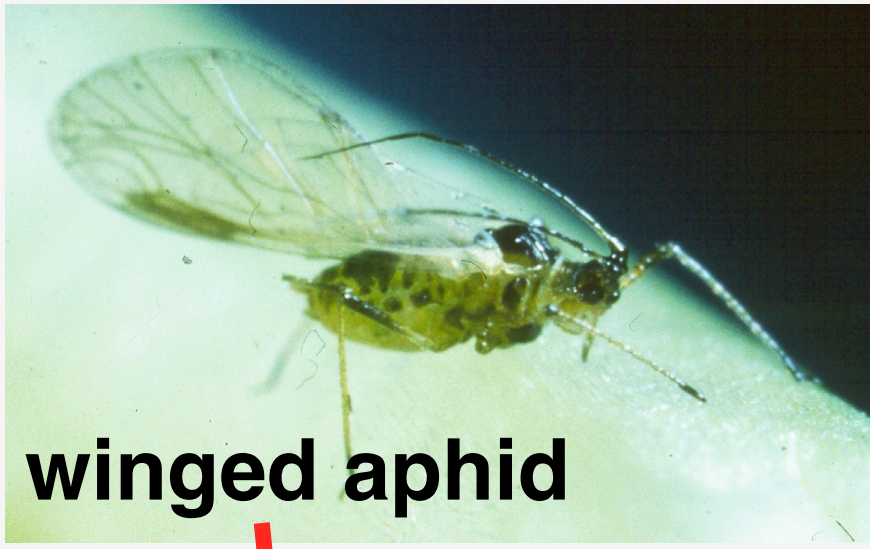
Cucurbit Yellow Vine Disease

- >28 days until symptoms seen
- First: plants usually turn yellow
- Cut stem shows phloem ring is brown
- Plants collapse prior to fruit maturity
- Please alert diagnostic clinic if found

Seedcorn maggot

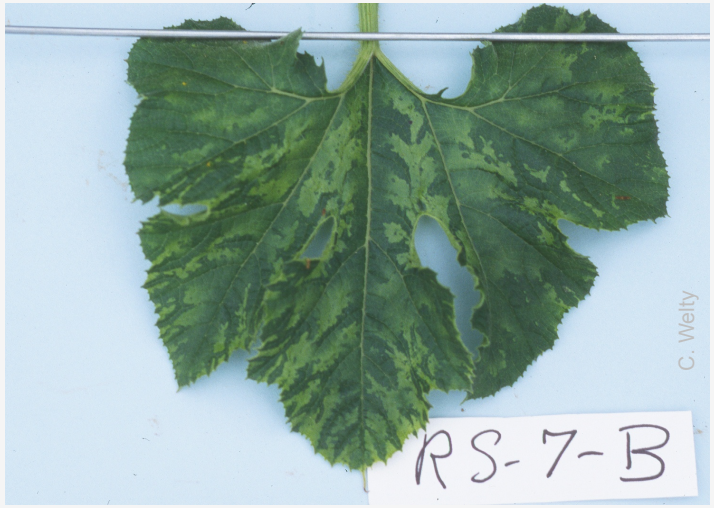
- **Attacks seeds & seedlings**
- **Direct seeded crops**
- **Cultural: delay planting until 3 weeks after organic matter incorporated**
- **Chemical: Admire in-furrow (although pest not listed on label)**

Aphids



- fly, land, taste
- bring in virus
- often do not colonize

Watermelon Mosaic Virus



Aphids & Viruses on Cucurbits

- **Tactics tested:**
  - Stylet oil
  - Row covers
  - Reflective mulch
  - Soil-applied systemic insecticides
  - Foliar insecticides
- **All helped control aphids, but none affected virus**
- **Best hope:** resistant varieties

Two-spotted spider mite

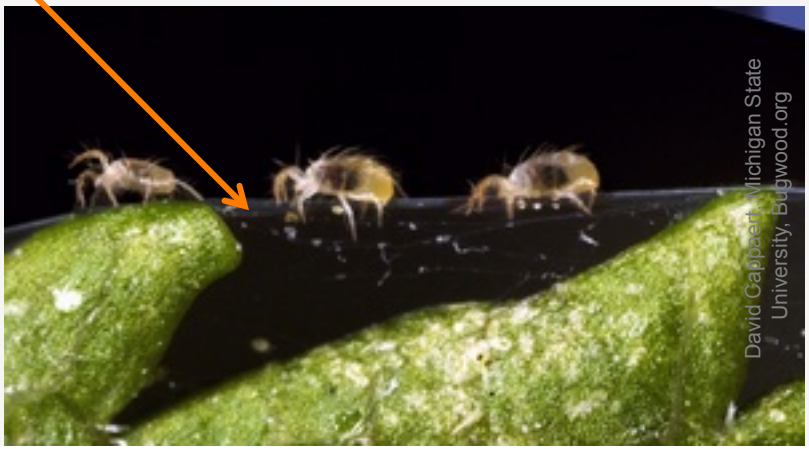
- Tiny
- Often overlooked
- Often mistaken for disease
- Build up in hot dry weather
- Worst along dusty edges

Two-spotted spider mite: symptoms

- **Watermelon**
  - **Yellow blotches**
  - **Brown lesions**
- **Zucchini**
  - **Stippling**

Two-spotted spider mite: diagnosis

- Fine webbing on leaf underside
- Scout by tapping leaf over paper, look for moving specks
- Early diagnosis for good control



Spider mite management

- Tolerable at low density
- Conserve natural predators
- Overhead irrigation can help
- Soft control:
  - Insecticidal soap
  - Hort. Oil
- Chemical control:
  - Agri-Mek or others

Miticide options:
pre-harvest interval

	Pumpkin	Cukes	Melons
Acramite	3 days	3 days	3 days
Agri-Mek	7 days	7 days	7 days
Dicofol	2 days	2 days	-
Dimethoate	-	-	3 days
MSR (Metasystox-R)	14 days	14 days	14 days
Oberon	7 days	7 days	7 days
Portal, FujiMite	-	1 day	3 days
Vydate	1 day	1 day	1 day
Zeal	7 days	7 days	7 days

the end

Info on fruit & veg. pests
u.osu.edu/pestmanagement

Questions?

e-mail: **welty.1@osu.edu**
office phone: **614 292 2803**