Managing cucumber beetles and squash bugs in organic systems

Jaime C. Pinero
Lincoln University
IPM program
Jefferson City, MO 65101
pineroj@lincolnu.edu

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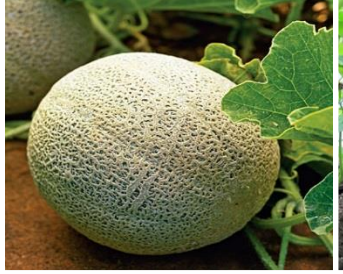
Integrated Pest Management
Lincoln University Cooperative Extension

Learn what pests to expect based on what you grow








Spotted cucumber beetle

Striped cucumber beetle

Squash vine borer

Squash bugs

Mites

Seedcorn maggot

How to manage cucurbit pests?

Pest identification

Pest monitoring

Economic thresholds

Cucumber: average 1 beetle/plant

Zucchini: average of 5 beetles/plant

Cultural controls

- Host plant resistance
- Transplanting
- Crop rotation
- Crop density / spacing
- Soil quality management
- Sanitation
- **Trap cropping**
- Cover crops
- Use of mulches
- Intercropping
- Alter planting / harvest dates

Biological control

- Releasing beneficial insects
- Conserving / enhancing habitat

Behavioral control

- **Mass trapping**

Insecticides

Early-season control is key!

Trap Cropping

(effective against cucumber beetles and squash bugs, it has potential for squash vine borer management)

Trap Cropping

- **Trap Crops**: Very attractive plants that are planted next to a higher value crop so as to attract pest
- Pest numbers on the unsprayed cash crop can be reduced
- Based on our research:
  - ✓ **Blue Hubbard squash** is at least is 55 times more attractive to spotted cucumber beetles, 25 times more attractive to striped cucumber beetles and 20 times more attractive to squash bugs than **zucchini**.

Aggregations of spotted cucumber beetles on young Blue Hubbard squash **(trap crop)**

Blue Hubbard squash: An excellent trap crop

Very attractive to adult cucumber beetles and squash bugs
<u>Not susceptible</u> to bacterial wilt

Squash Vine Borer

2011-2015

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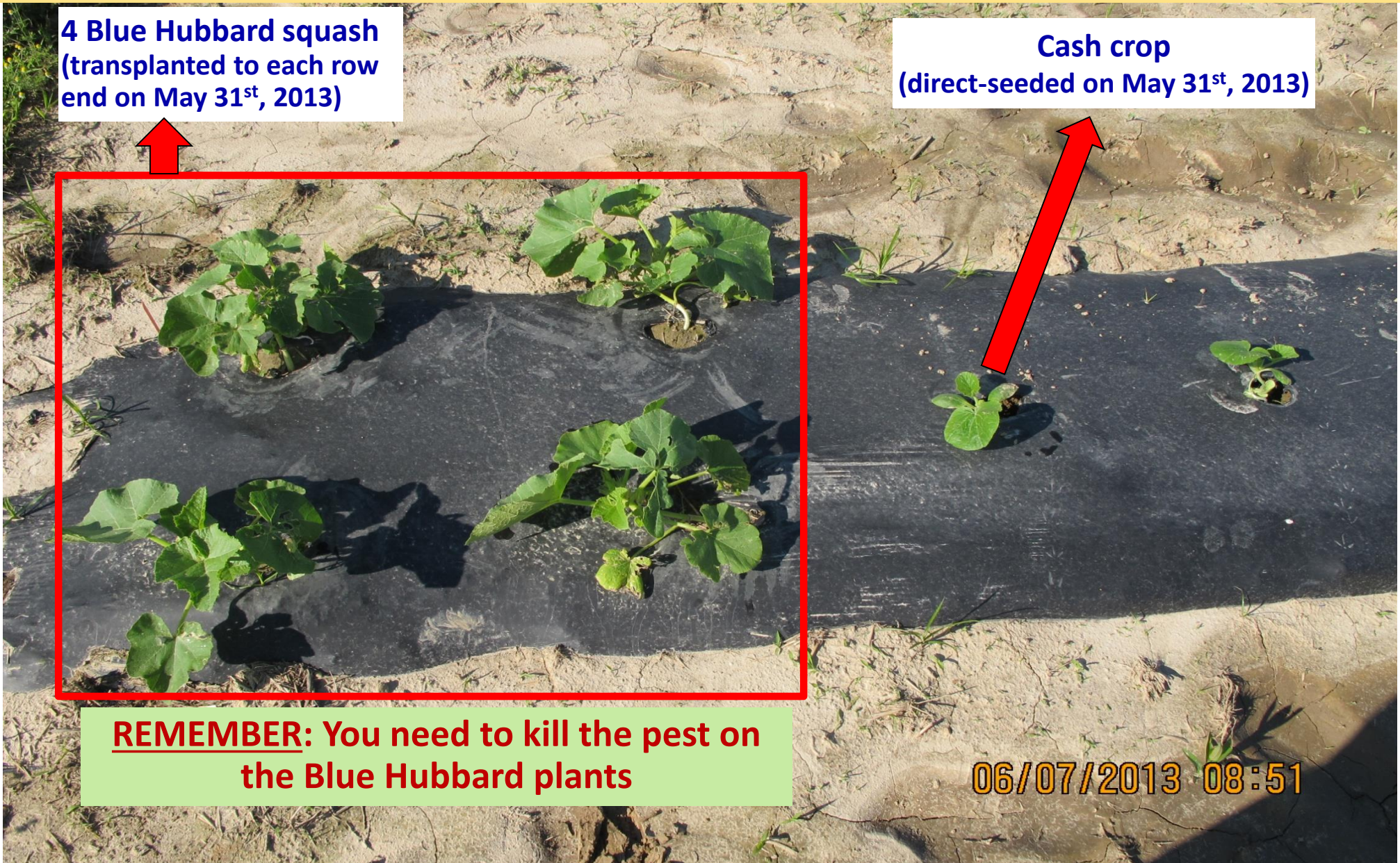
At Lincoln University research farms:

Most insect pests (squash bugs, spotted and stripped cucumber beetles) consistently found in trap crop plants

CASH CROPS NOT SPRAYED

- **2002-2015:** Trap Crop plants located at the row ends
- 8 trap crops per row protected 70 Zephyr squash plants (cash crop)



Lincoln University George Washington Carver farm – Jefferson City, MO


Lincoln University George Washington Carver farm – Jefferson City, MO
This integrated approach was made possible due to the presence of trap crop plants placed at row ends.
Why?
Zucchini cash crop with Blue Hubbard as trap crop at row ends
Sorghum/sudan grass cover crop for weed suppression
Buckwheat cover crop to suppress weeds and bring pollinators

On-farm trap cropping research

Scaling Up the Use of Trap Crops for Insect Control in Mechanized Squash Production

NORTH CENTRAL SARE Sustainable Agriculture Research & Education

Rusty Lee

Clint Elmore

William Lee

2012 SARE Farmer Rancher Grant

Lee Farms, LLC

THE CERES TRUST

"Optimizing Trap Cropping Systems for Key Insect Pests and Enhancing Beneficial Arthropods in Cucurbit Crops".

Jaime Pinero, Principal Investigator.
Three farmer cooperators.

Pierpont Farms
Columbia, Missouri
Family Farm

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Pierpont Farms is a family-owned and run vegetable farm located just outside the city limits of Columbia, MO. We practice sustainable methods utilizing compost, cover crops, trap crops, row covers, irrigation from a pond and crop rotations along with many other non-chemical methods of ongoing soil improvement. We utilize high tunnels to extend our season and protect tender crops.

We grow a wide variety of produce including heirloom, slicing and cherry tomatoes, lettuces and other greens, cucumbers, summer and winter squash, sweet potatoes, carrots, beets, garlic, herbs and others.

What about profits?

"I became convinced that trap cropping works great"

Jose Fonseca (Home-Grown Produce, St. Charles, MO)

✓Jose Fonseca has fully adopted the trap cropping approach. He has not applied **any** insecticides to his cucurbit cash crops in 6 years (2012-2017). He reduced insecticide use by 90% in 2011.

✓Jose has reduced inputs and increased income. He is selling his cucurbits as "insecticide-free" thereby increasing awareness about the benefits of using IPM.

By not spraying insecticides to the cucurbit cash crops, Jose's estimates that his cost-savings are around **$ 200 per acre** (cost of insecticide, time, and fuel savings).

His estimated savings in 10 acres using trap crops: ca. $ 2,000

Killing options

Organic insecticides:

Spinosad-containing insecticides are effective at killing cucumber beetles. However, they are ineffective at controlling squash bugs.

Entrust SC Naturalyte Insecticide - 1 Quart (OMRI Certified Organic - Spinosad)

$419.95

Pyrethrin-containing insecticides, such as Azera® and Pyganic®

Azera Insecticide

$337.65
Free Shipping!

Size/Description	
gallon (128 oz)	Buy 1: $337.65 each Buy 2 or more: $334.79 each

Azera= Azadirachtin 1.20% (neem oil)
+ 1.40% Pyrethrin
High rate= $126 per Acre (48 oz)
1 oz Azera= $2.64
12 hr Re-entry Interval (REI)
Zero Pre-Harvest Interval (PHI)
Direct contact & 4-5 day deterrent
Dissipates after 1-2 days (rainy weather?)

PyGanic Crop Protection EC 1.4 II

$49.95 - $184.69
Free Shipping!

Size/Description	
quart (32 oz)	Buy 1: $49.95 each Buy 2 or more: $49.49 each
gallon (128 oz)	Buy 1: $184.69 each Buy 2 or more: $181.80 each

PyGanic= 1.40% Pyrethrin (chrysanthemum extract)
High rate= $60 per Acre (42 oz)
1 oz PyGanic= $1.44
12 hr Re-entry Interval (REI)
Zero Pre-Harvest Interval (PHI)
"Can be used on day of harvest"
Direct contact & 2 week deterrent

Mass trapping

(cucumber beetles only)

Mass trapping cucumber beetles

1-gallon jugs painted yellow and baited with one floral-based lure provides the best visual / olfactory combination for capturing both spotted and striped cucumber beetles.

2012 research at LU Carver farm:

20 mass trapping devices captured **3,906** cucumber beetles in 6 weeks (watermelon)

- Milk or juice jug. Cost: $ 0
- Floral-based lure. AgBio Inc. (Tel: 303.469.9221; E-mail: agbio@agbio-inc.com)
- Killing agent: soapy water.
- Lure lasts 4-5 weeks, depending on weather.

On-farm research

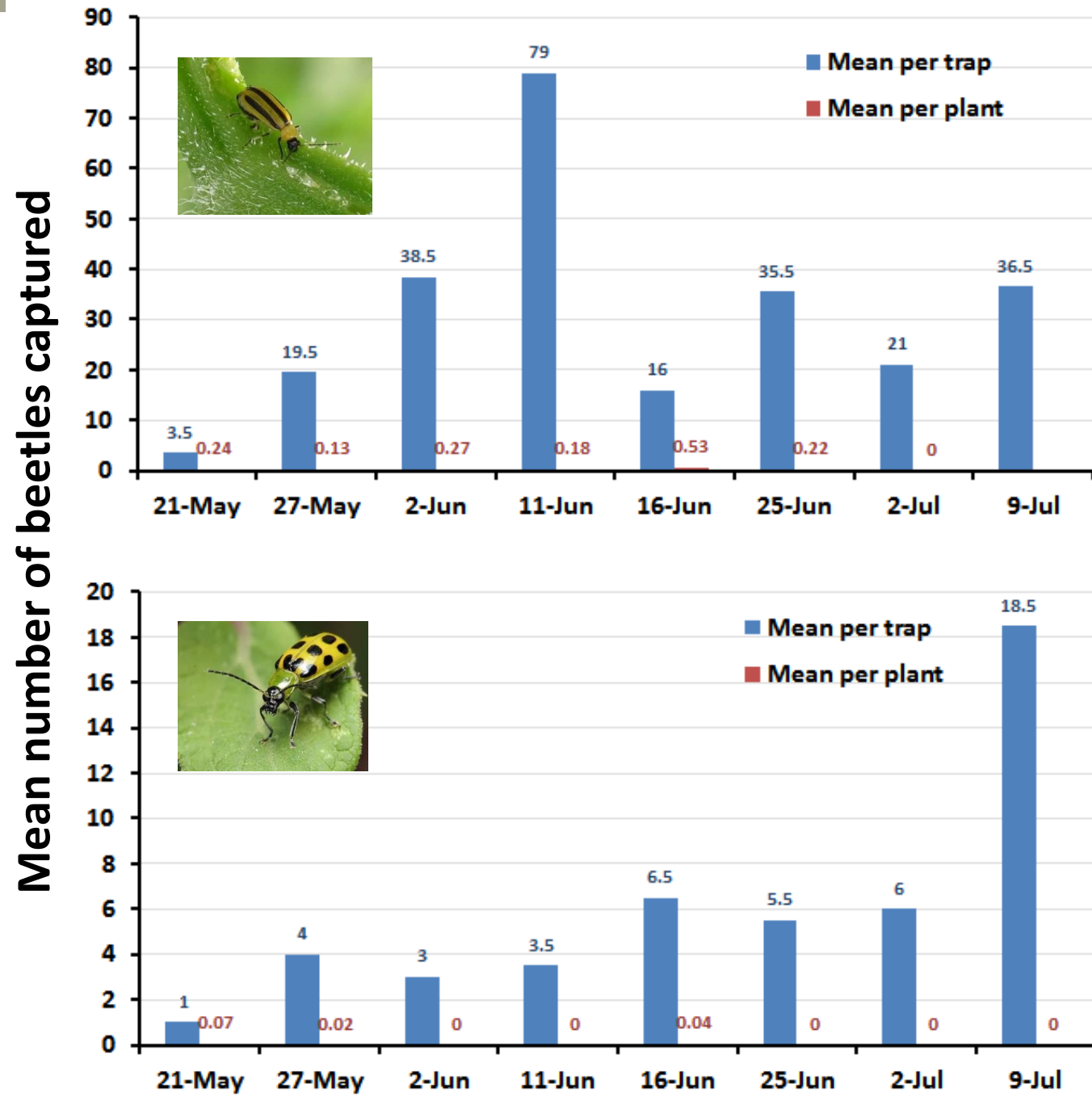
Lee Farms

Truxton, MO

2015 RESULTS

Zucchini plot

- From 13 May to 9 July, 2015, odor-baited jugs captured **3,715** cucumber beetles
- **Economic threshold (5 beetles / plant) was never reached**



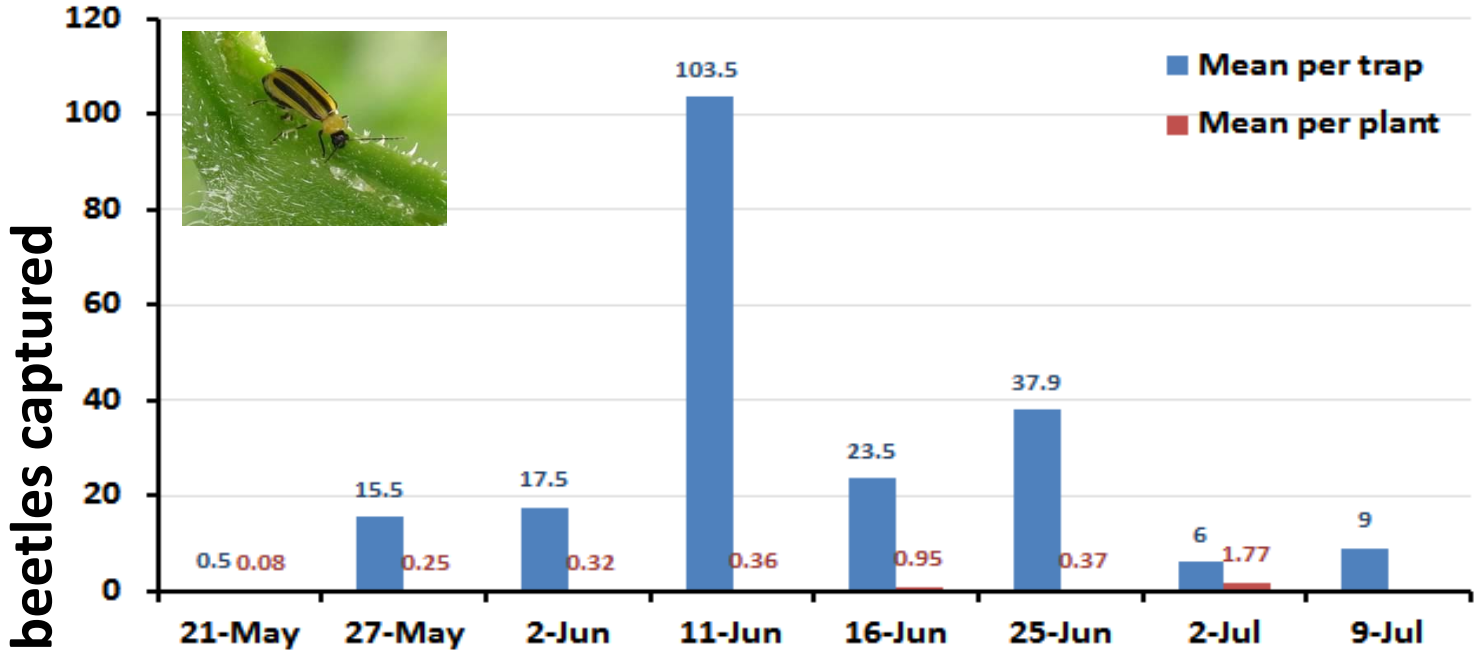
On-farm research

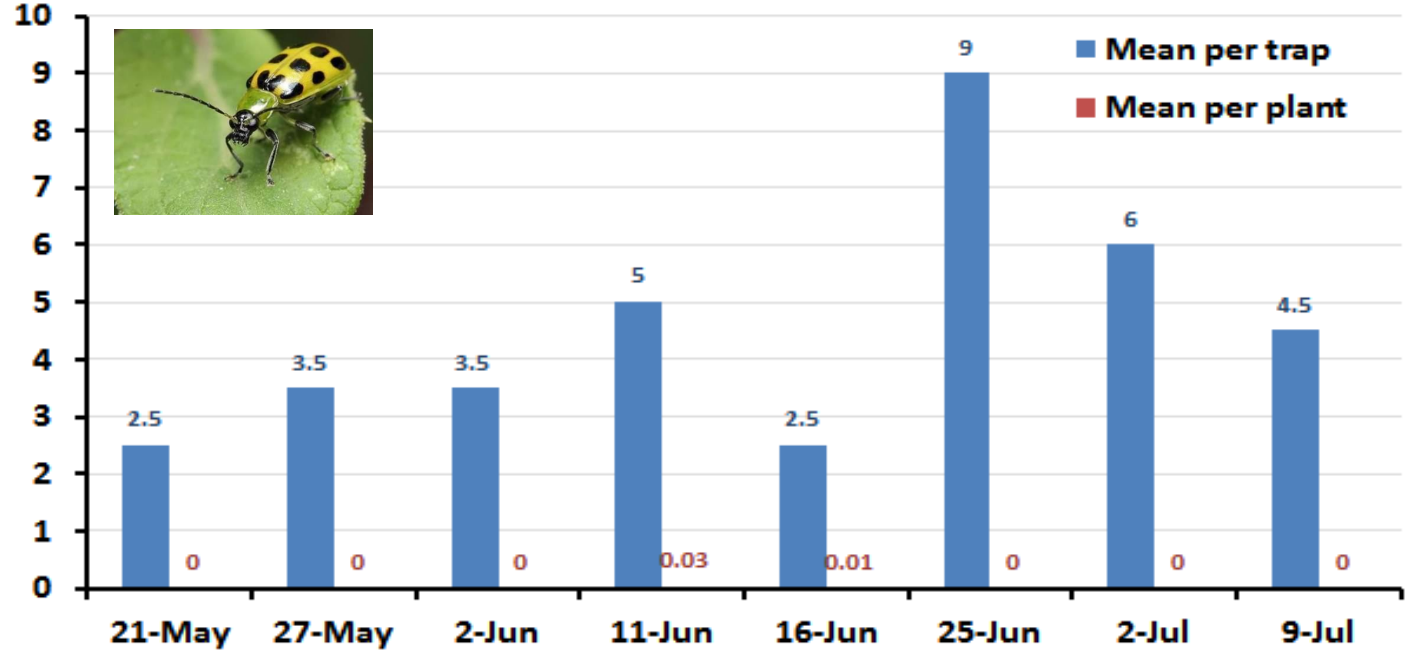
Lee Farms

2015 RESULTS

Cucumber plot

- From 13 May to 9 July, 2015, odor-baited jugs captured **2,901** cucumber beetles
- Economic threshold (1 beetle / plant) was reached once (2 Jul.) for striped beetles (but plants were large, so risk not very high)





2016 study (Lee Farms)

The new mass trapping system developed by the Lincoln University IPM program can be used as part of a broader IPM program aimed at managing cucumber beetles.

DATE	Total no. striped cucumber beetles	Average no. striped beetles per trap	Average no. striped cucumber beetles per plant	Ratio*
April 29 - May 12	1,632	108.8	11.9	9.1
May 13- 17	579	38.6	3.7	10.4
May 18-22	141	9.4	1.3	7.2
May 23-31	501	33.4	2.9	11.5
June 1-6	176	11.7	0.5	23.4
June 7-14	188	12.5	0.75	16.7
Total captured	**3,217**			

FIGURE 3-A. View of the cucumber beetle mass trapping devices deployed in a summer squash plot in Truxton, MO

Using mass trapping for fall clean-up

- Study conducted in the fall of 2015
- **GOAL**: To kill as many striped and spotted cucumber beetles as possible to minimize populations for the spring of 2016
- 15 yellow traps baited with AgBio lure and stun pill (deployed on Sep. 25, 2015)
- Traps inspected every 2 weeks
- Results (2.5 months)

DATE	Total striped	Total spotted
October 9	2	507
October 26	0	1,182
December 2	0	352
TOTAL	**2**	**2,041**

"We can't solve problems by using the same kind of thinking we used when we created them"

- Albert Einstein