Stink bugs: Challenging pests in organic systems

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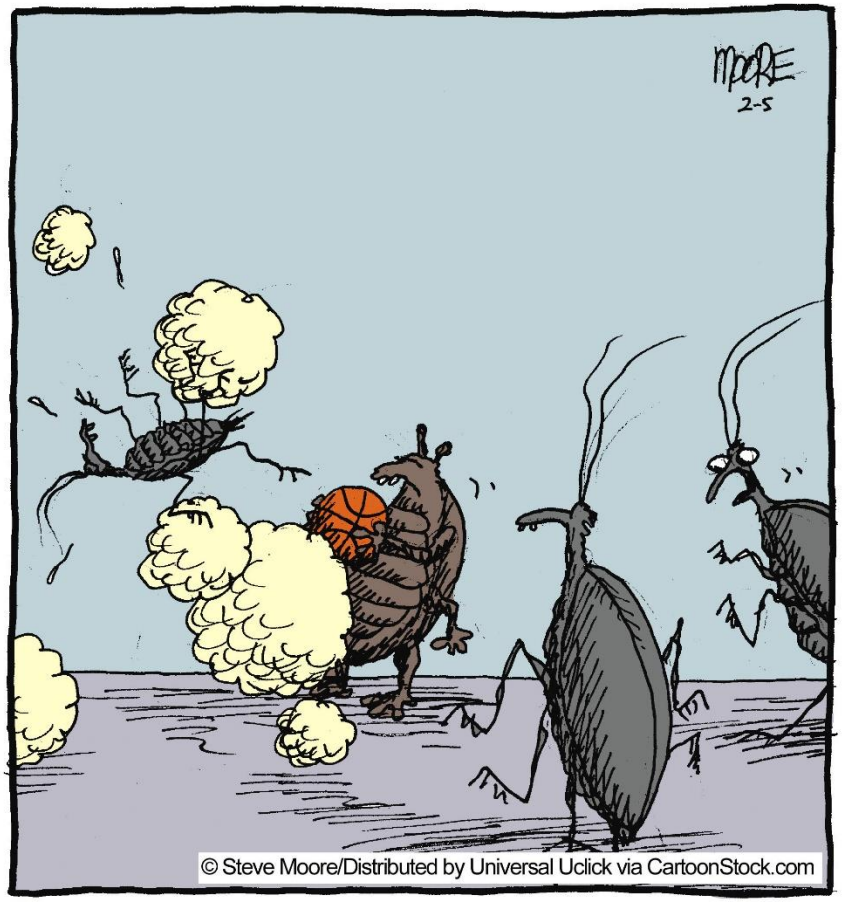
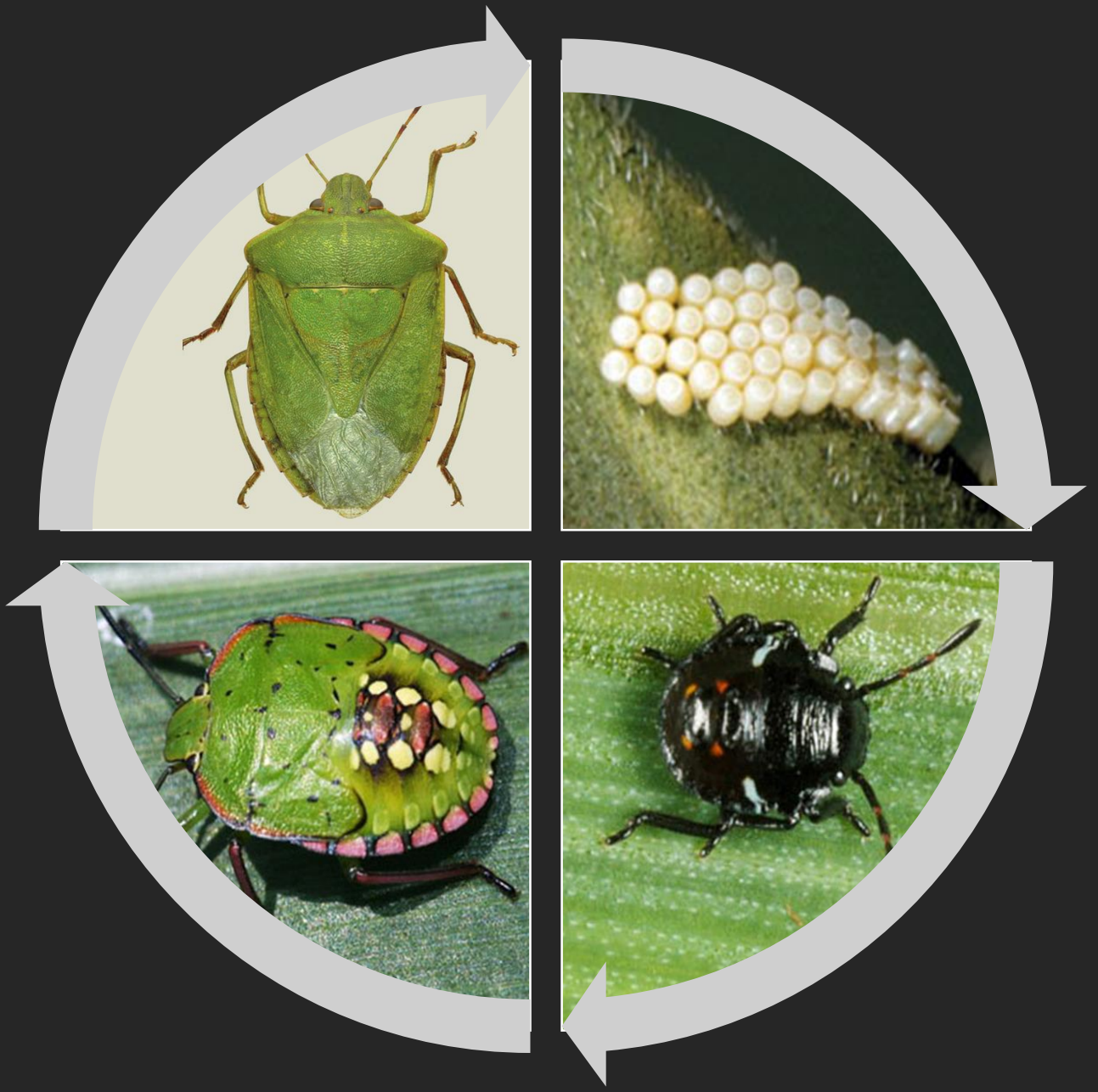
Agriculture and Natural Resources



"I *hate* playing stinkbugs! Every time we press them on defense, they just let 'er rip!"

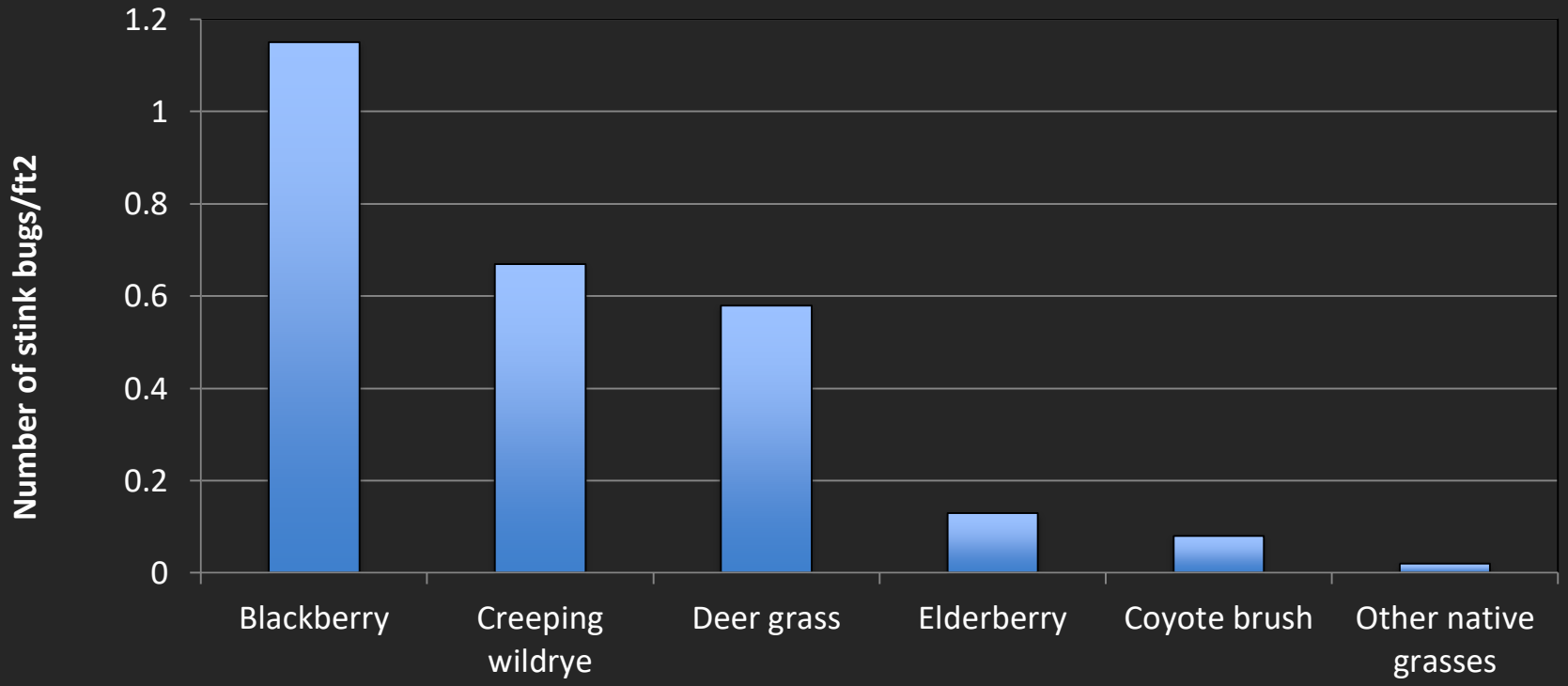
Life cycle

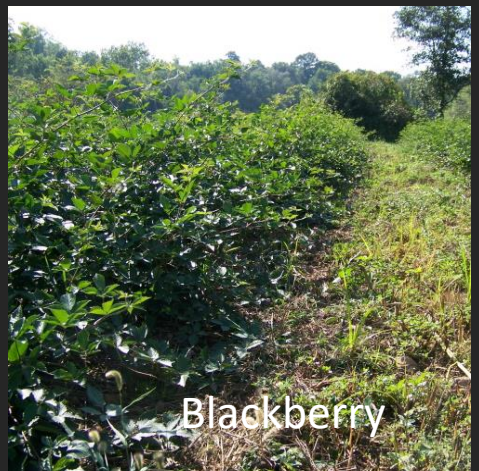


Non-crop hosts, polyphagy

Overwinter behind tree bark, buildings, boards, and leaf litter

Overwintering sites: Consperse, red shouldered and southern green





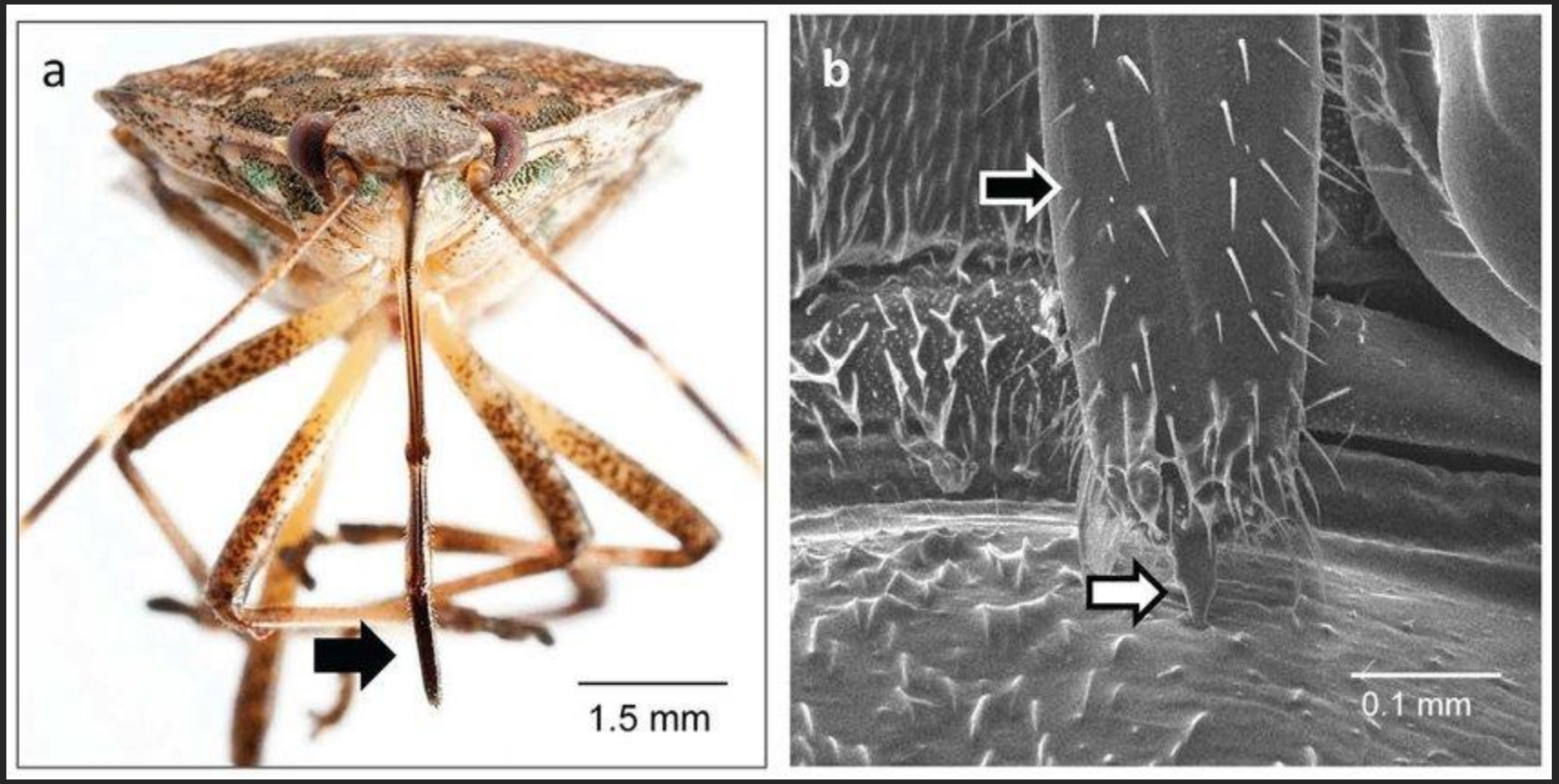
Stink Bug Seasonal Movement

Emerging population reproduces on mustard, wild radish and cheeseweed

First generation moves into tomatoes

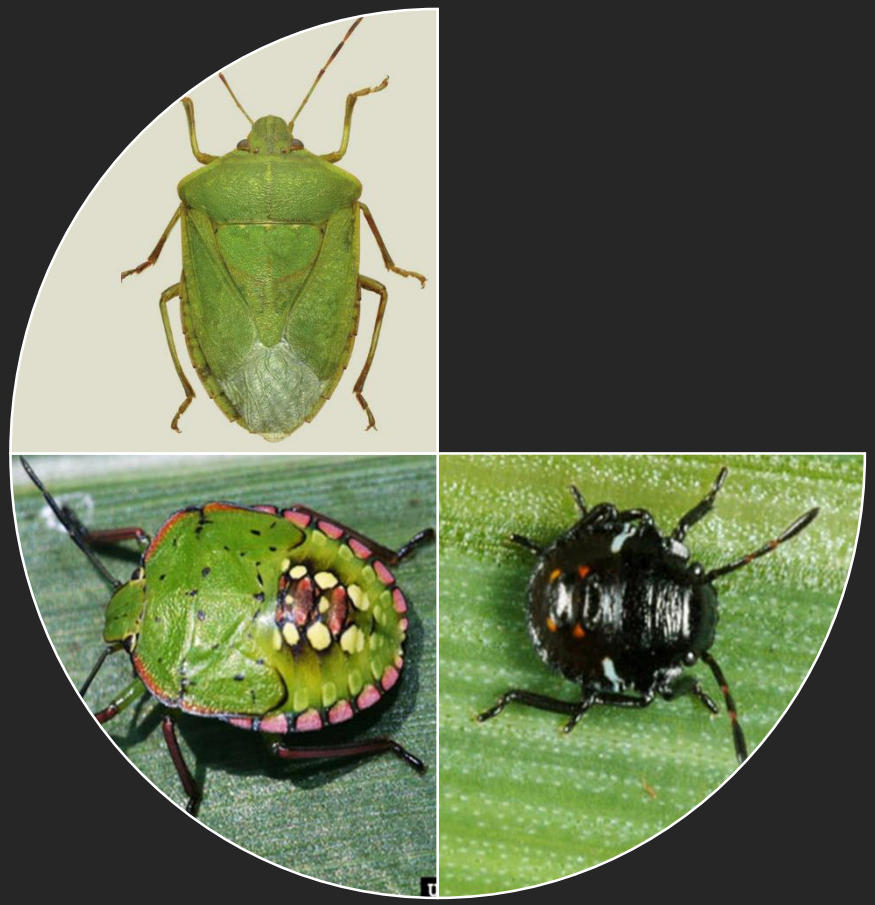
After harvest, stink bugs move to blackberry and under tree bark in riparian areas to overwinter

Damage



Damage

Damage

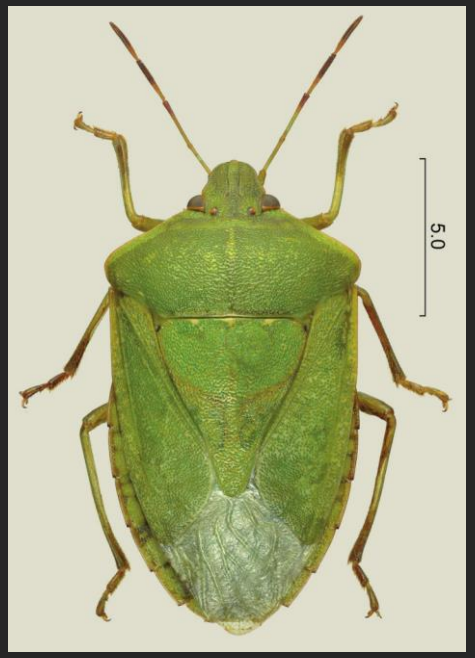


- Produce a defensive secretion, also can serve as alarm pheromone
- Generally on the larger side as adults
- Nymphs range from tiny to as big as adults
- Several generations per year
- Adults can be long-lived
- Populations are variable (outbreaks)
- Can be challenging to manage with insecticides, even in conventional systems

Red shouldered stink bug

Consperse stink bug

Southern green stink bug



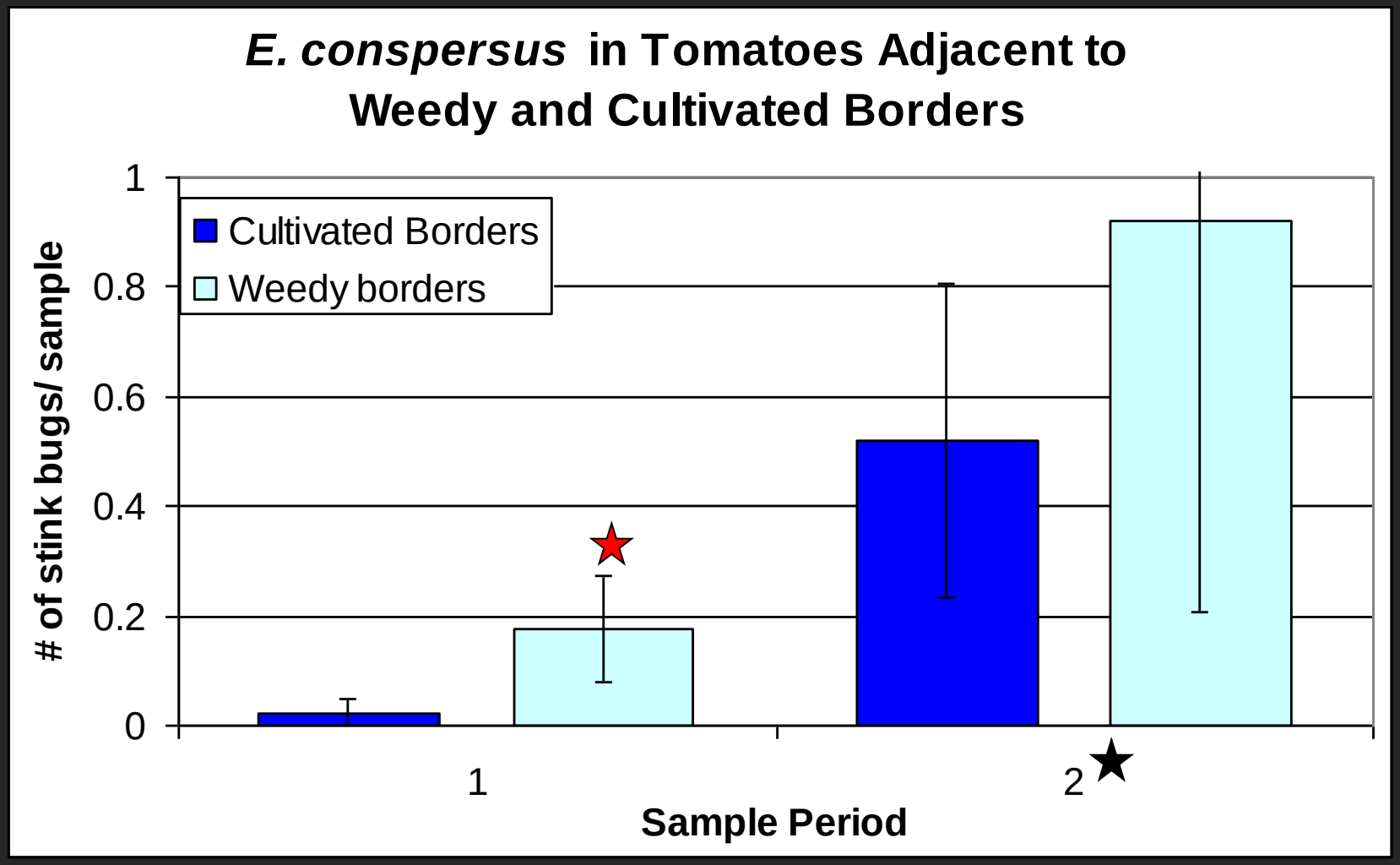
Say’s stink bug

Harlequin bug

Chemical tools?

- Stink bugs are difficult to control with organic insecticides
- Some organic insecticides, such as pyrethrum, can often be disruptive to naturally occurring biological control.

Replacement of vegetation



★ Significantly greater than non-host border ($p < 0.05$)

★ Mean of four fields not treated with insecticide for stink bugs

Border weed control

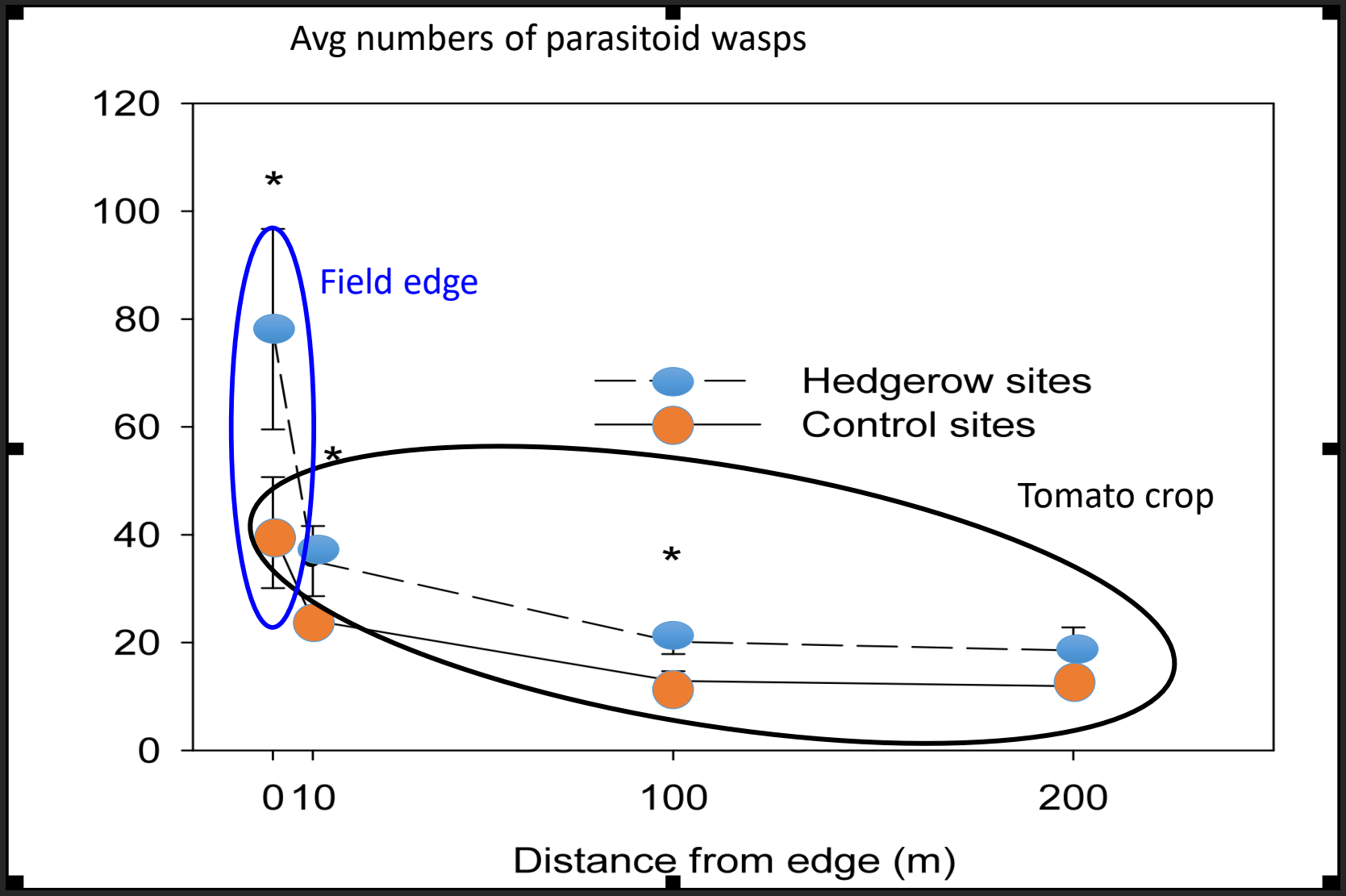
- Early spring cultivation of field borders destined to be adjacent to tomato fields
- Field-scale or farm-scale elimination of habitat is likely to have the greatest influence

Parasitoid wasps (and other natural enemies) attack stink bug eggs

Egg parasitoid wasps (Scelionid), 15-25% parasitism in tomatoes

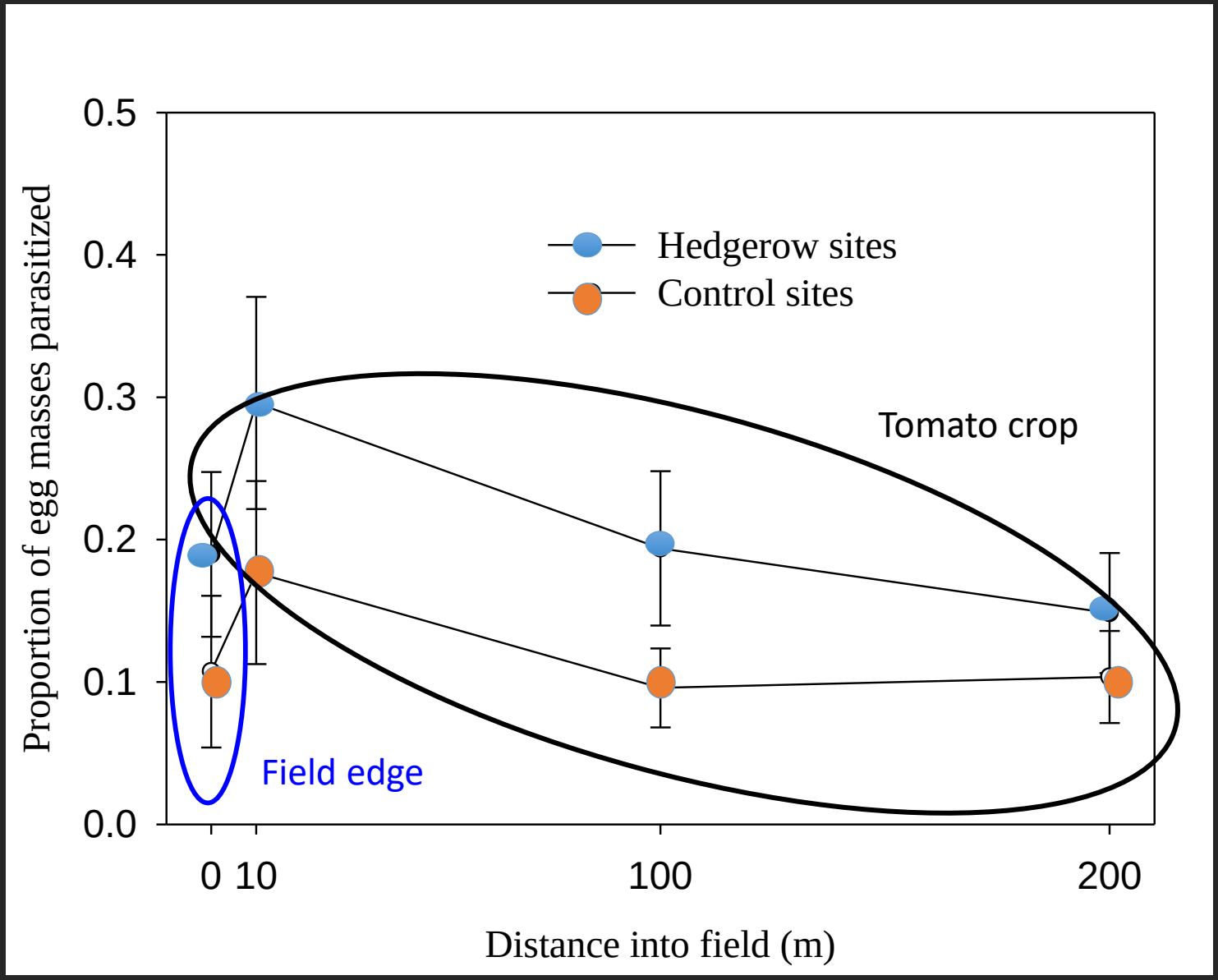
Hedgerow of flowering plants enhance natural enemies and biocontrol

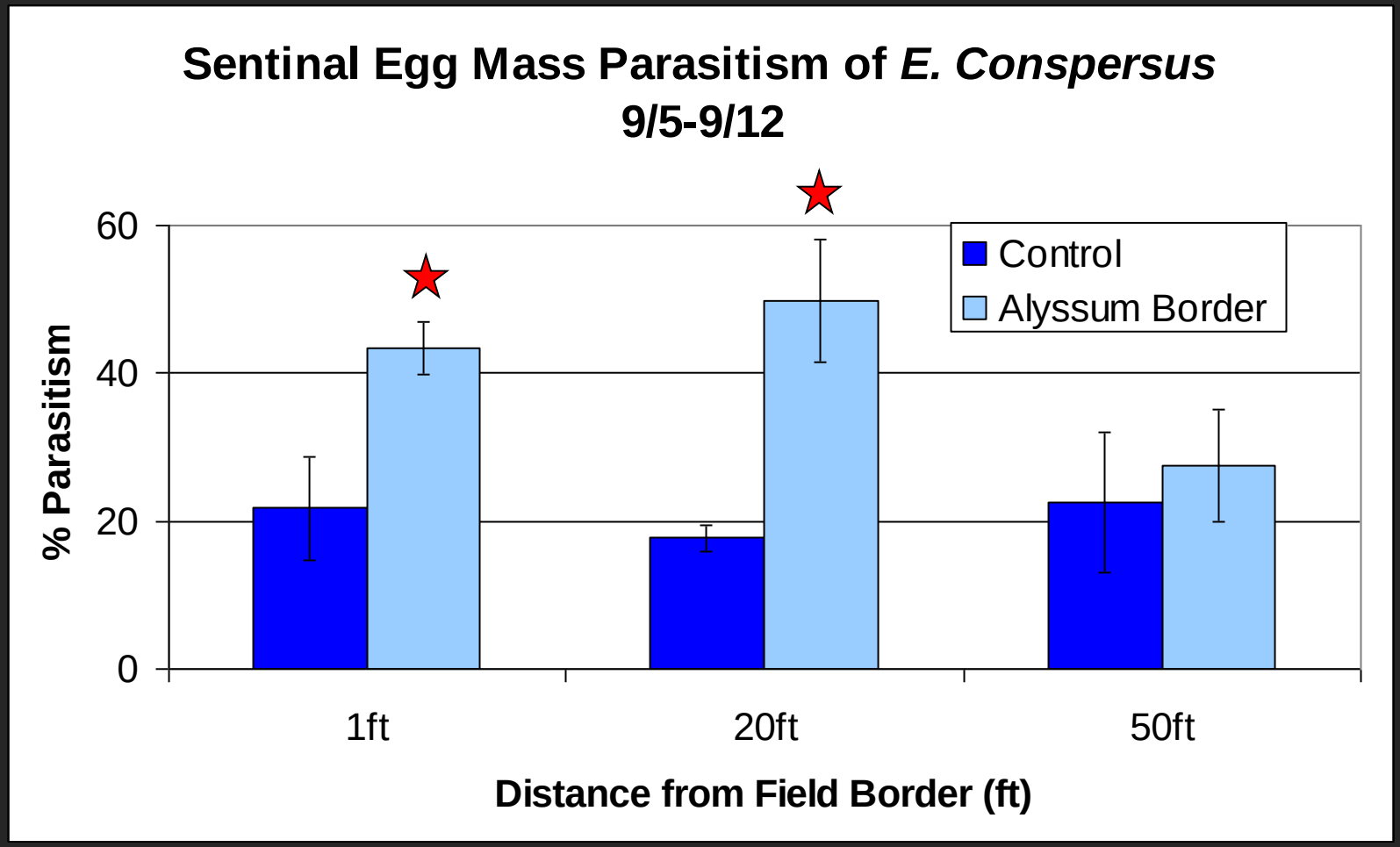
Hedgerows had more parasitoid wasps and exported more parasitoid wasps into adjacent crops than weedy edges



Hedgerows and parasitism of stink bug egg masses

Stink bug parasitism in tomato fields 10% higher with hedgerows





★ Significantly greater than the control ($p < 0.05$)

What about stink bugs new to CA?

Brown marmorated stink bug: A threat to California nut crops?

Brown marmorated stink bug feeding on developing pistachios.

The UCR research is part of a nationwide USDA Specialty Crop Research Initiative-funded program to monitor and control brown marmorated stink bug.

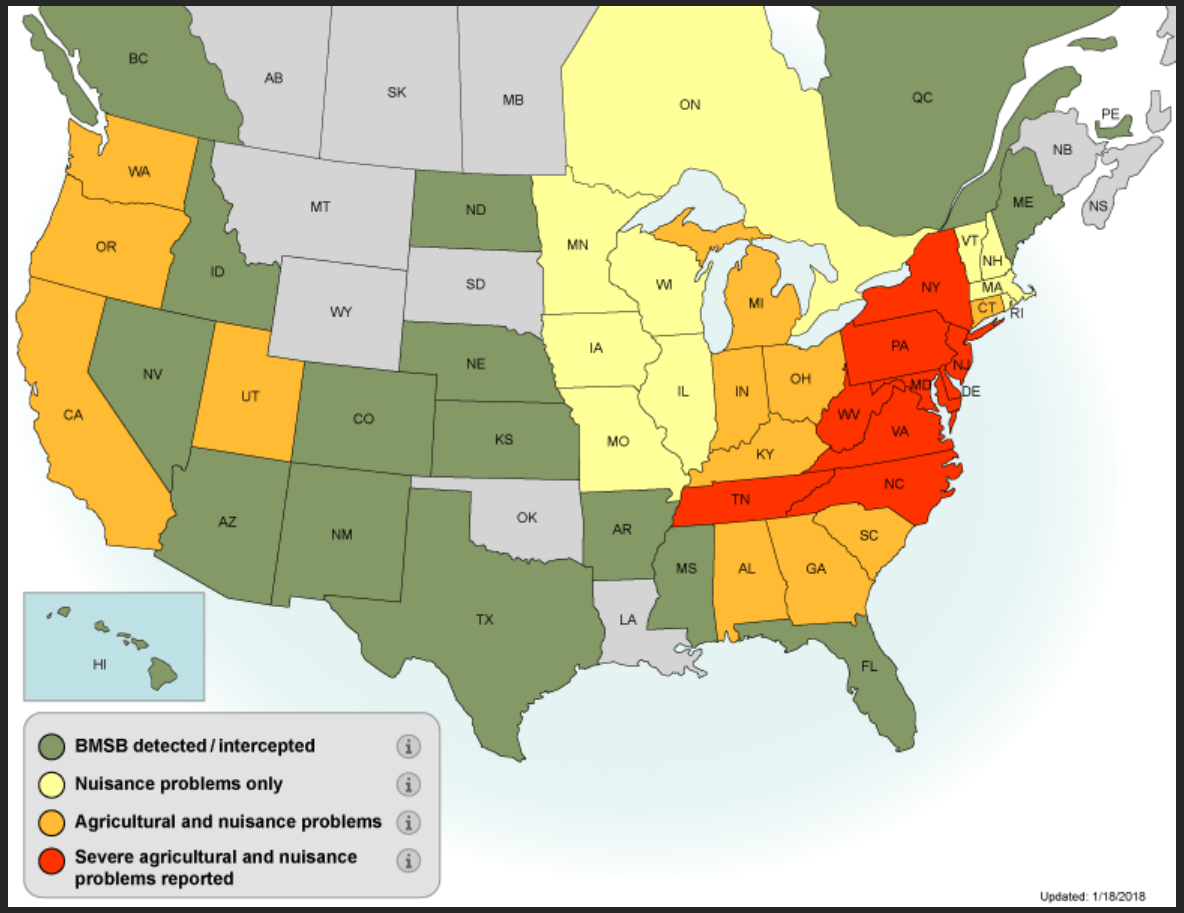
Stink Bug Threatens High-Dollar Crops in California

By Christina Herrick | August 22, 2017

1 of 5

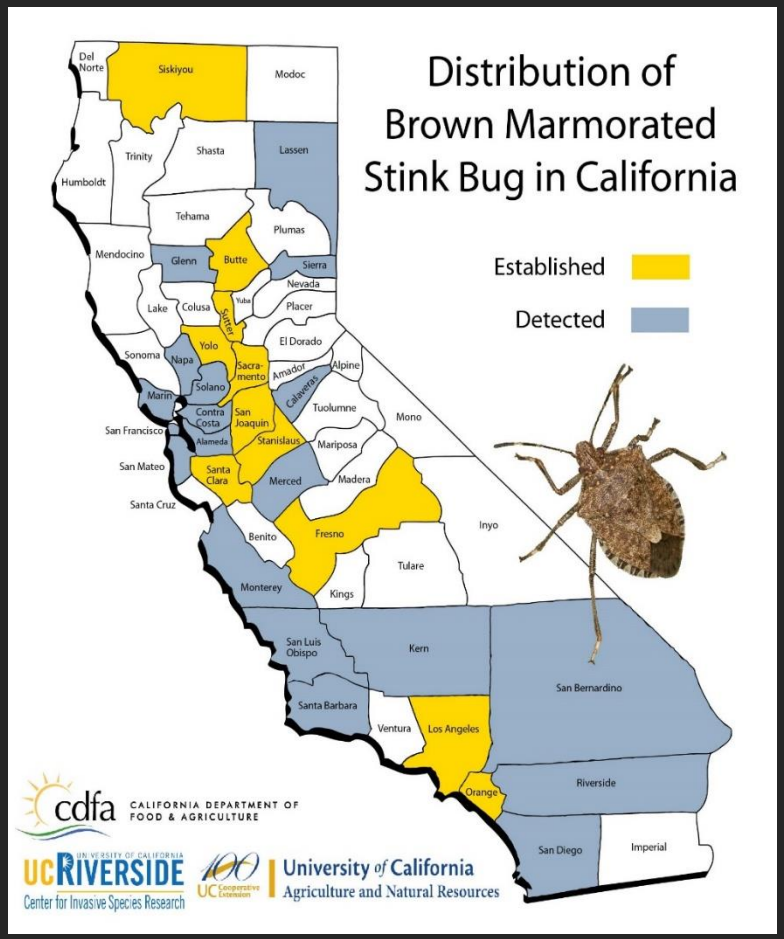
These gummed nuts could be an indication of the presence of brown marmorated stink bug in this almond orchard. (Photo: Jhalendra Rijal)

BMSB in the US

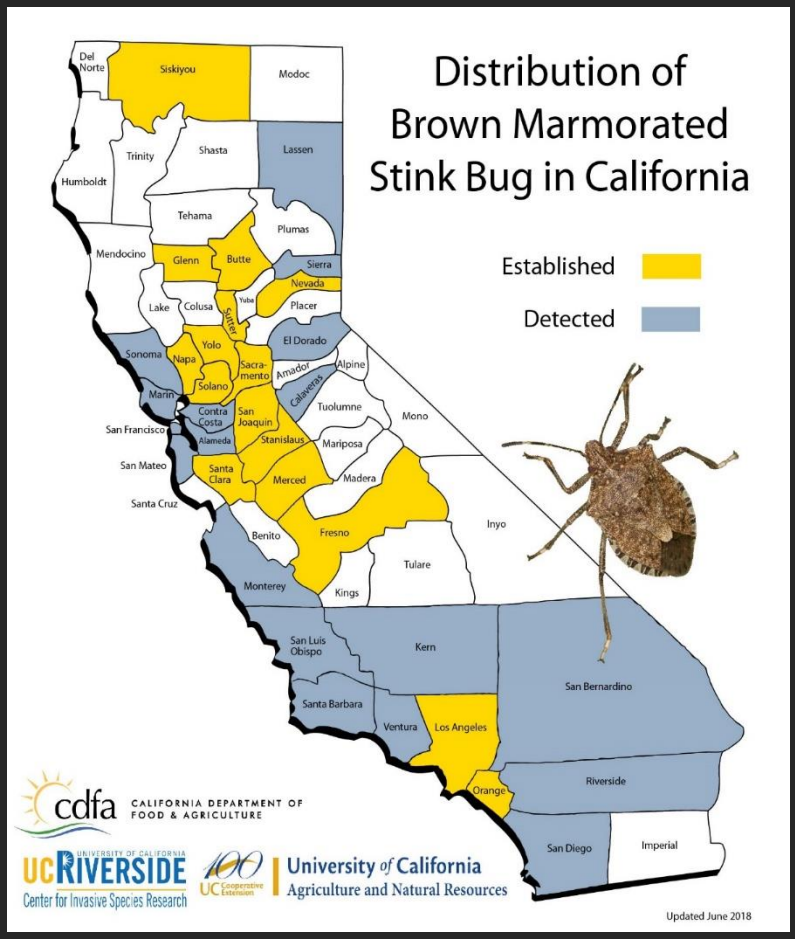


BMSB in California

2017



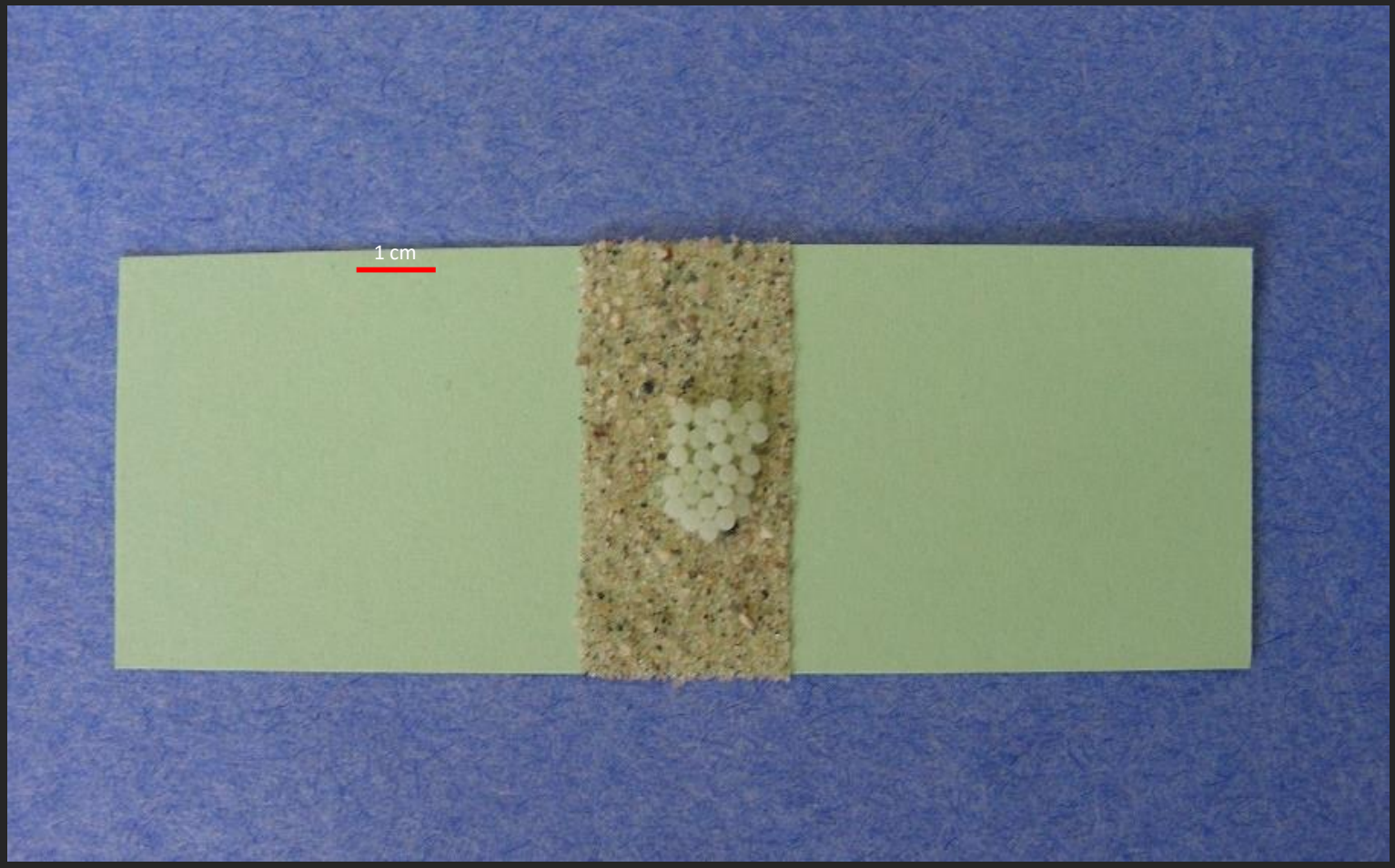
2018




Tree in Sacramento CA 2015
Photo: Chuck Ingles

Sentinel Egg Cards for Brown Marmorated Stink Bug

cdfa
CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE



Imaging Sentinel Egg Cards

Percent of eggs consumed through predation of sentinel eggs on tree trunks, mean±SEM, Sacramento Region*.

WHAT IS FEEDING ON EGGS?

Year	% damage	N = # sentinel cards
2014	5.3±2.1	49
2015	11.2±2.1	218
2016	21.7±3.2	184
2017	26.3±2.4	303

*June through October

Spider Feeding on Eggs

BMSB

Ground Beetle Feeding on BMSB Sentinel Eggs, Sacramento 2015

BMS
B

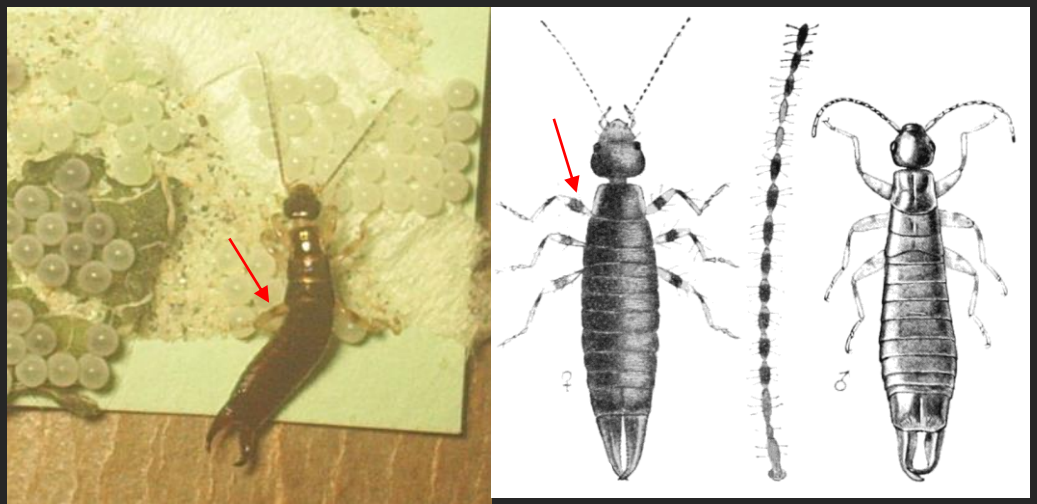
Over 8 hr period, middle of night, 5 minute sequences

BMSB

Parasitoid, *Ooencyrtus* ?

BMSB Earwigs (Dermaptera)

European earwig



Ring-legged earwig

Trap crops

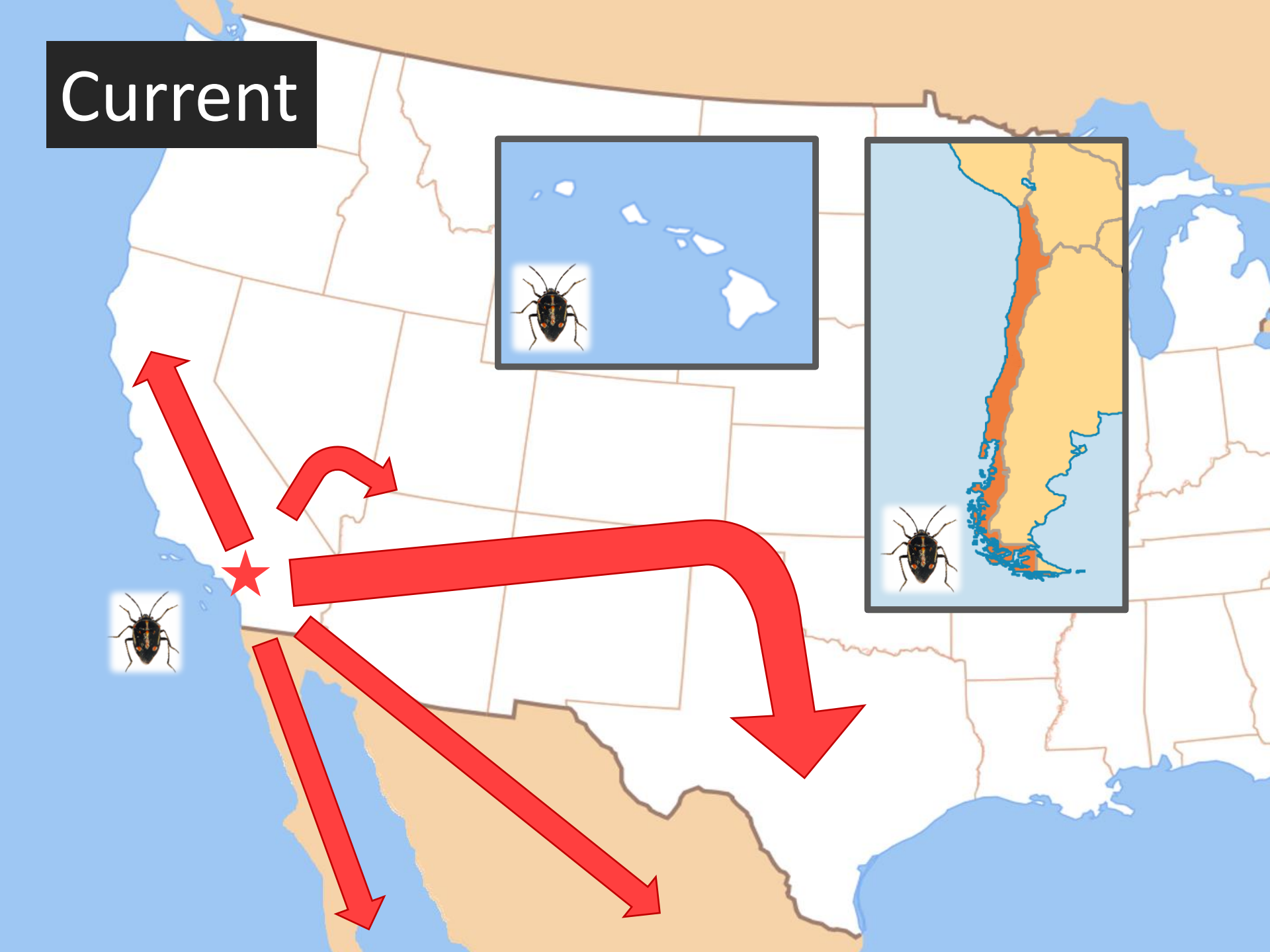
Bagrada bugs damage an array of crops

http://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=4047
http://urbanhomestead.org/journal/2012/07/11/bad-bad-bagrada-bug/
http://www.chowbacca.com/2014/08/bagrada-bugs-bother-bounty-grumpy.html

Young plants are most susceptible

JC Palumbo

2008

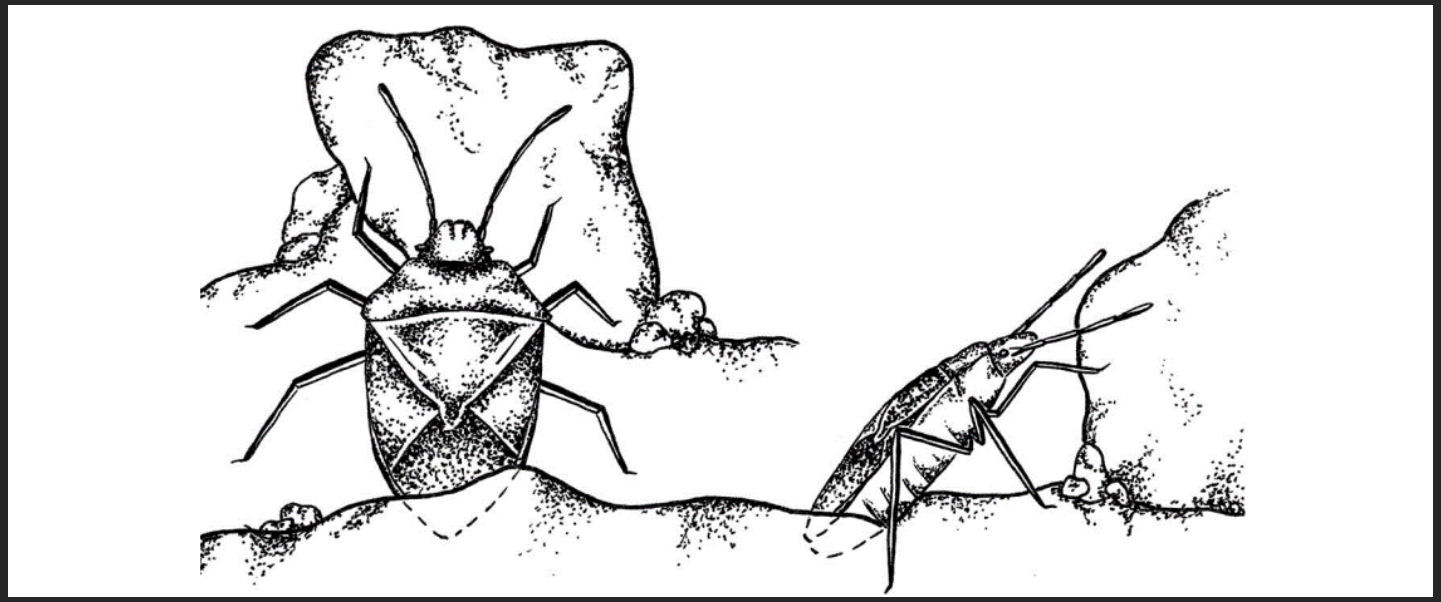

Current

Organic management of bagrada

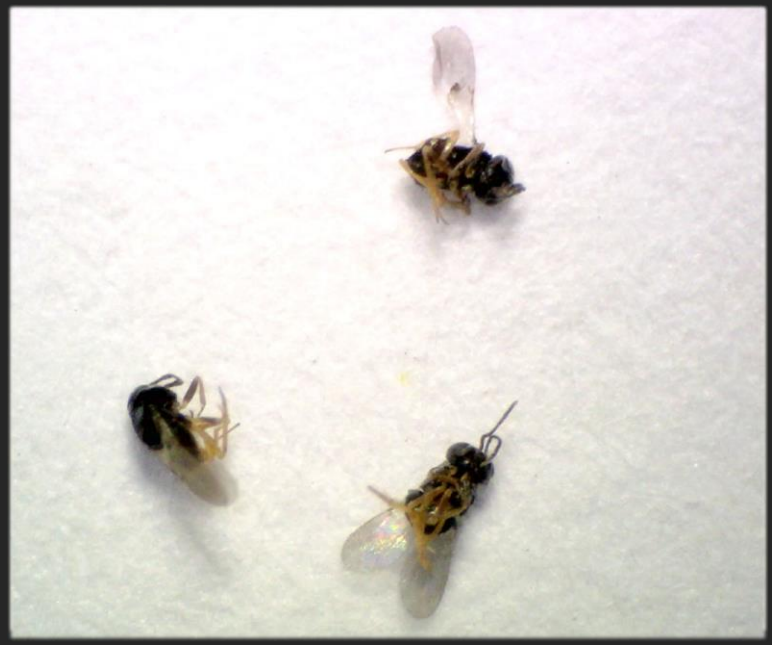
- Chemical management
- Natural enemies?
- Row cover
- Weed management
- Post-harvest residue destruction
- Trap crops
- Vacuums
- Avoidance
- Scouting/risk assessment

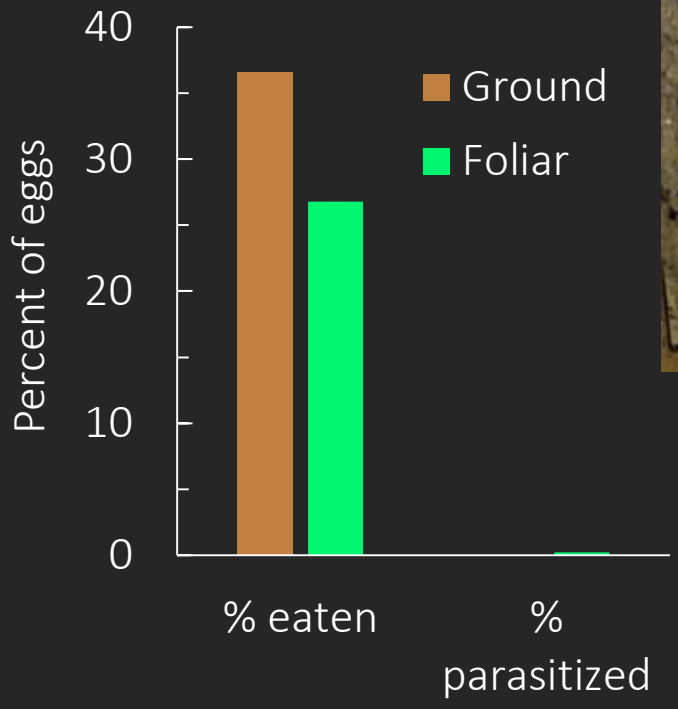
Biological control?

- Likely minimal control by generalist predators
- Specialized natural enemies not yet present




40
30
20
10
0
Percent of eggs
Ground
Foliar
% eaten
% parasitized

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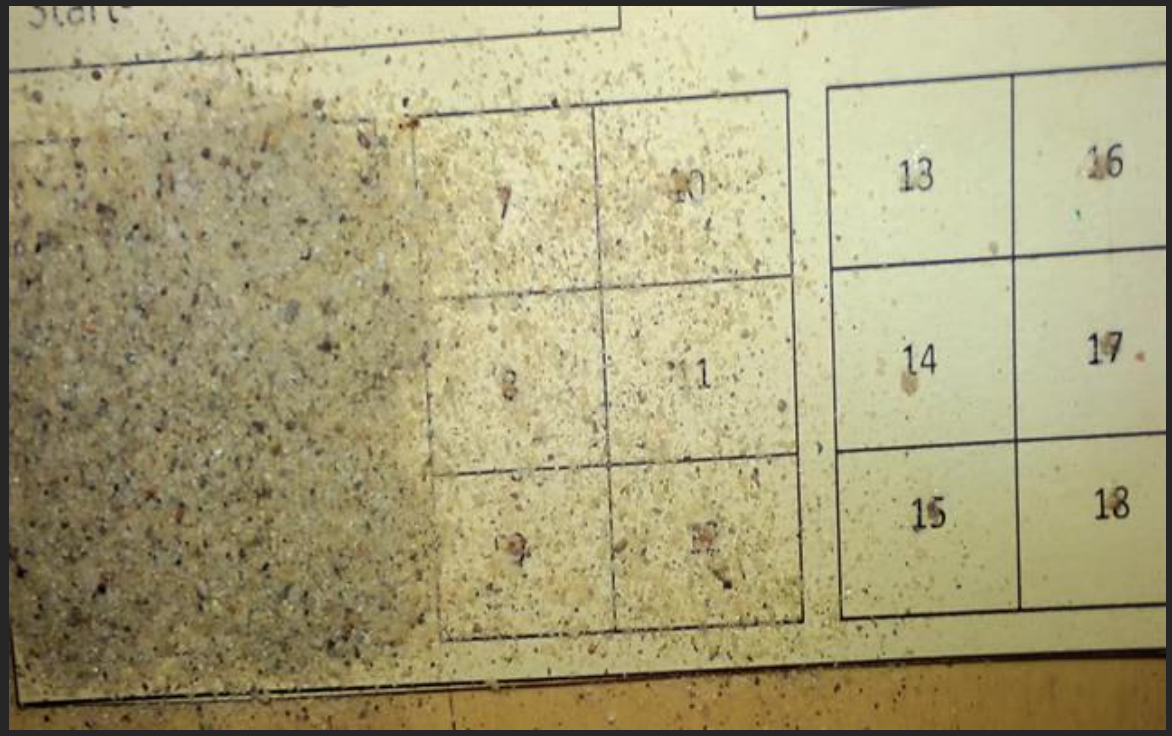
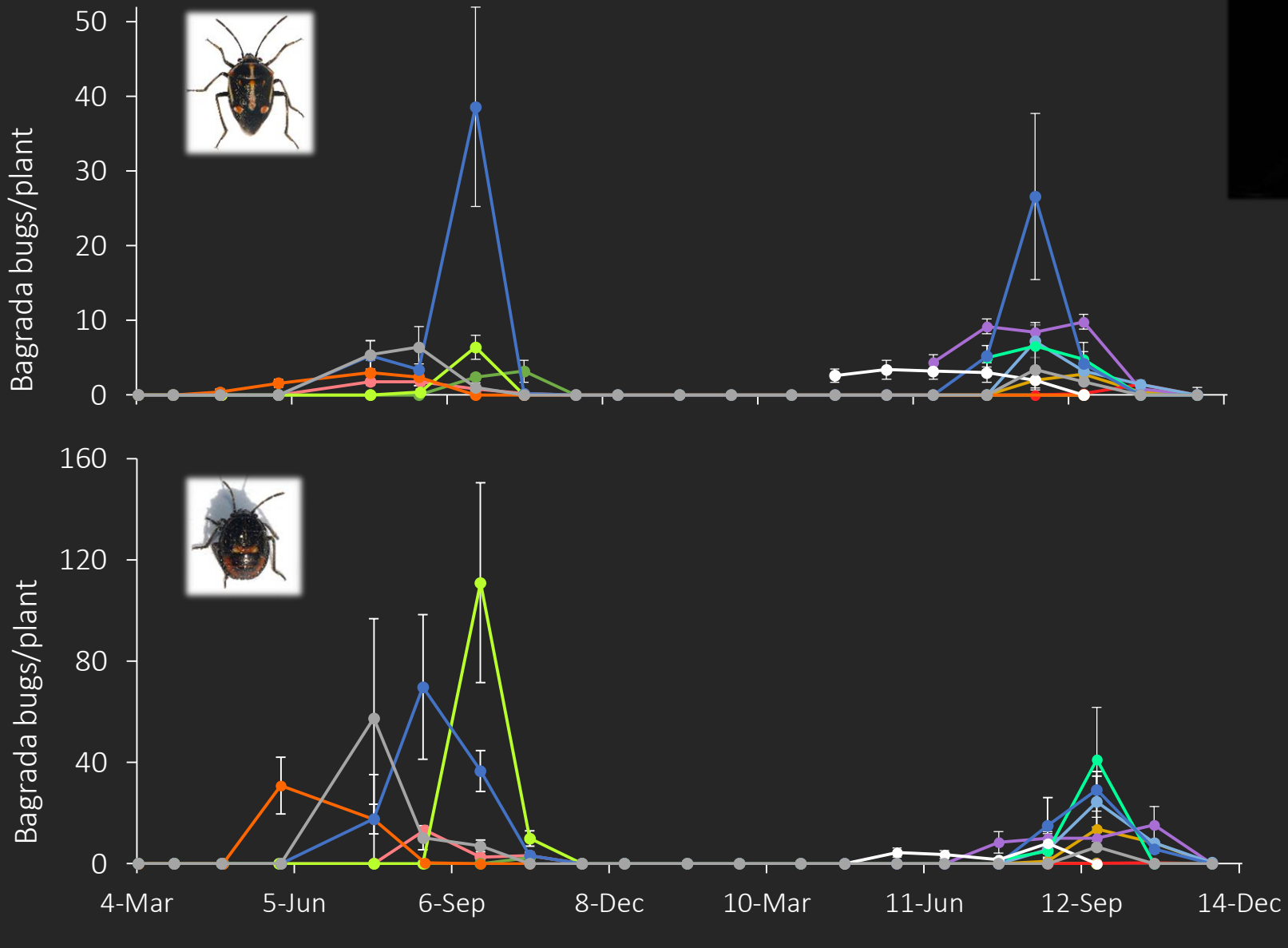

13
16
14
17
15
18

Shortpod mustard sites



Bagrada bugs and weeds

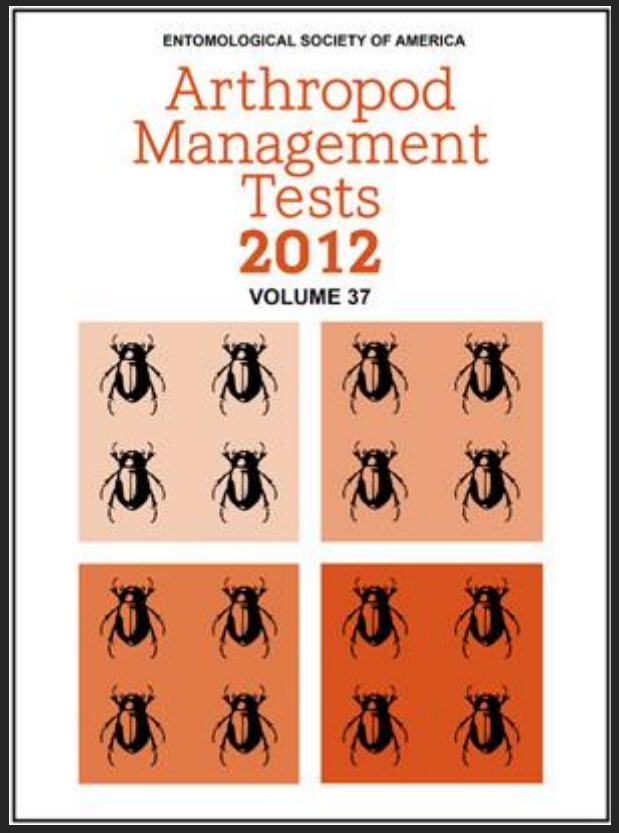
- A small subset of the total flora are primary hosts
- Weed characteristics critical → dry down+movement
- Management and scouting → IPM framework

Acknowledgements

- Grower and PCA cooperators
- Funding: CDFA
- Slides:
  - Rachael Long (UCANR)
  - Frank Zalom (UCD)
  - Joanna Fisher (UCD)
  - Charlie Pickett (CDFA)

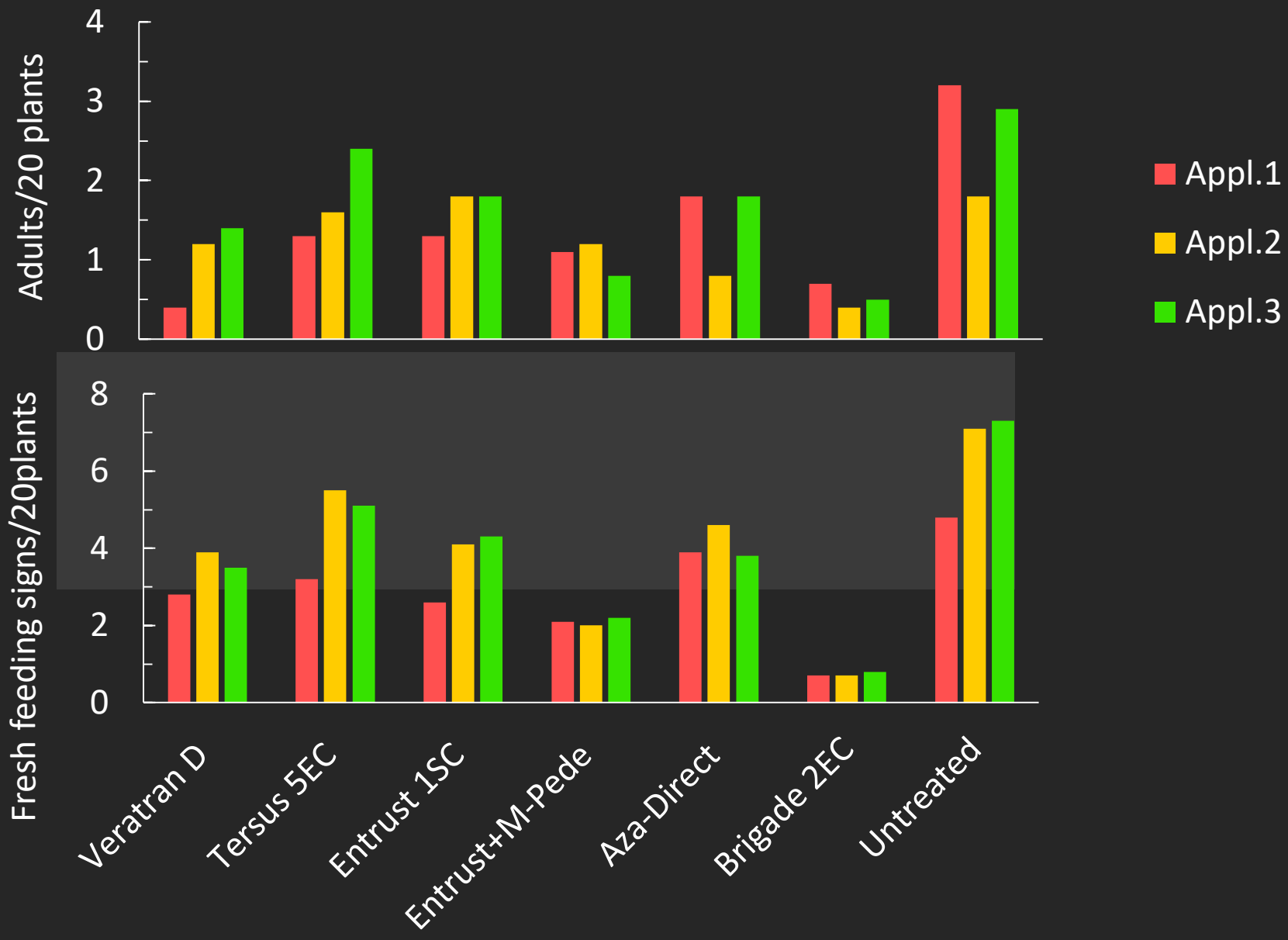
Questions?

Organic insecticide work from AZ

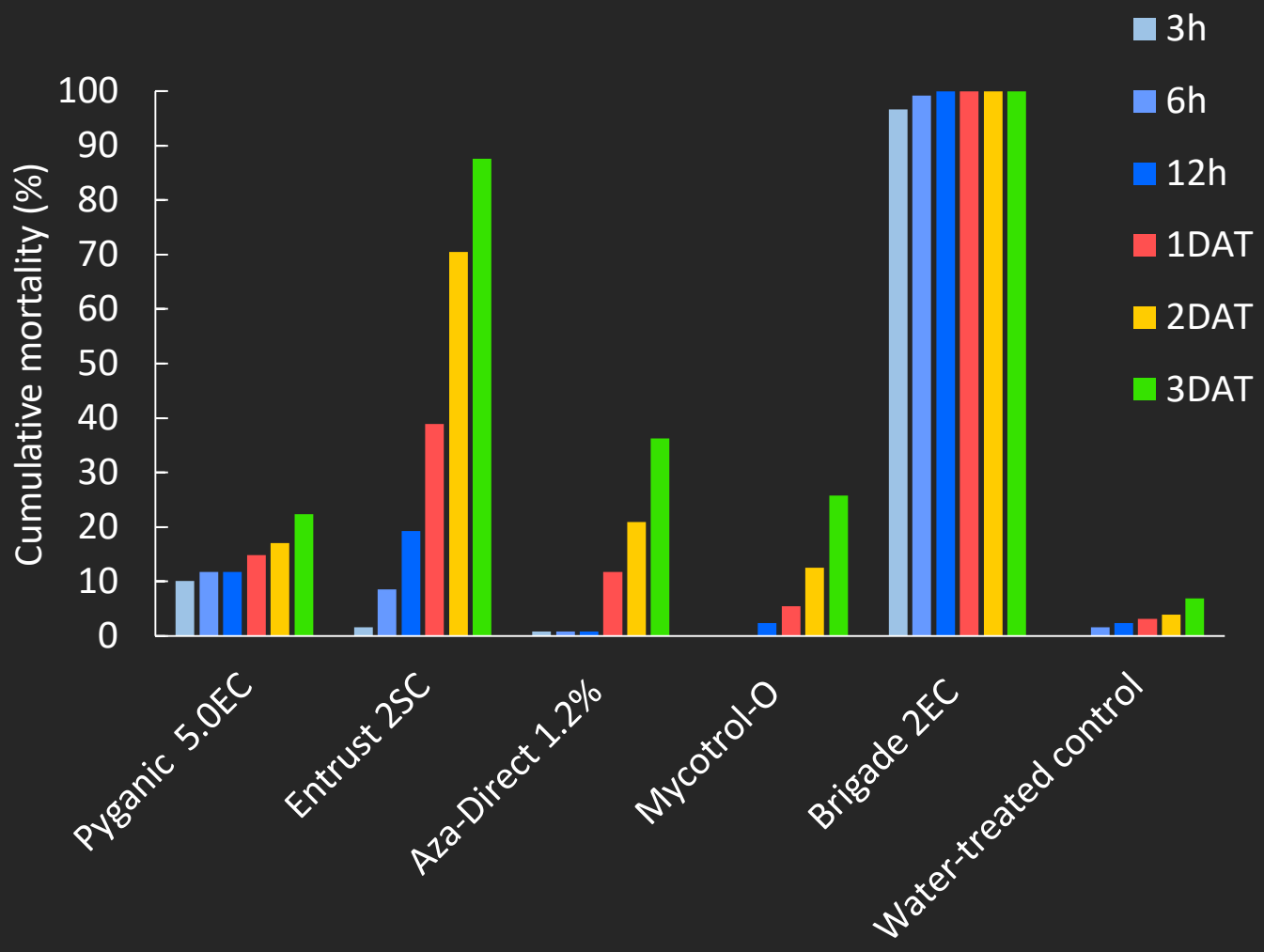


Dr. John Palumbo,
University of Arizona

Field trials in broccoli



Petri dish spray assay #1



Petri dish spray assay #2