Diamondback Moth: Research Updates from Cooperative Extension

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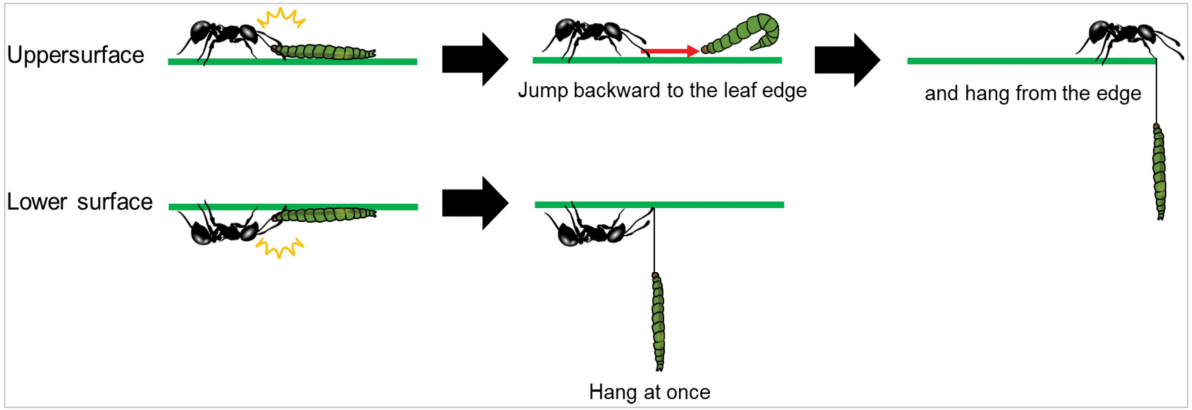
Diamondback moth, *Plutella xylostella*

- DBM is a global pest
- Specialist on cruciferous plants, including cabbage, broccoli, cauliflower, kale, etc.
- Larvae feed on leaves

Moths are small, about the length of 2 grains of rice. But females can lay 150 eggs in their lifetime and a generation can be produced in as little as 2 weeks.

Diamondback moth, *Plutella xylostella*

- Challenging to control due to year-round activity, long-distance migration, & lack of effective natural enemies
- Exhibit some clever behaviors to evade enemies (Ito & Yano 2024)



Diamondback moth, *Plutella xylostella*

- Pesticide resistance to both conventional & organic products
- First resistance reported in the 50s to DDT
- Resistance to 104 active ingredients reported (Arthropod Pesticide Resistance Database)
- Has been used as a model for understanding the rapid evolution of resistance genes

Efficacy trial for a new pesticide product

Maripaula Valdez-Berriz, UCCE Ventura

Oleg Daugovish
UCCE Ventura

Experiment conducted with cabbage "Supreme Vantage"

3 treatments

- Plinazolin Technology SC200 (isocycloseram)
- Conventional standard (Radiant SC, spinetoram)
- Untreated Control

Efficacy trial for a new pesticide product

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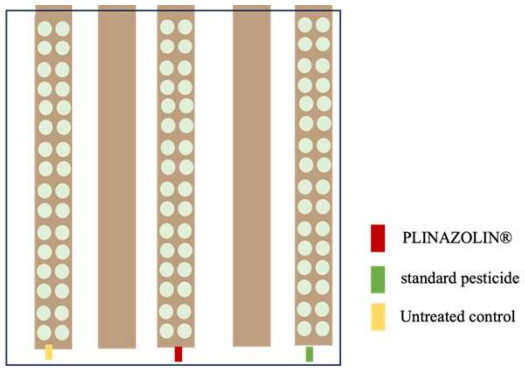

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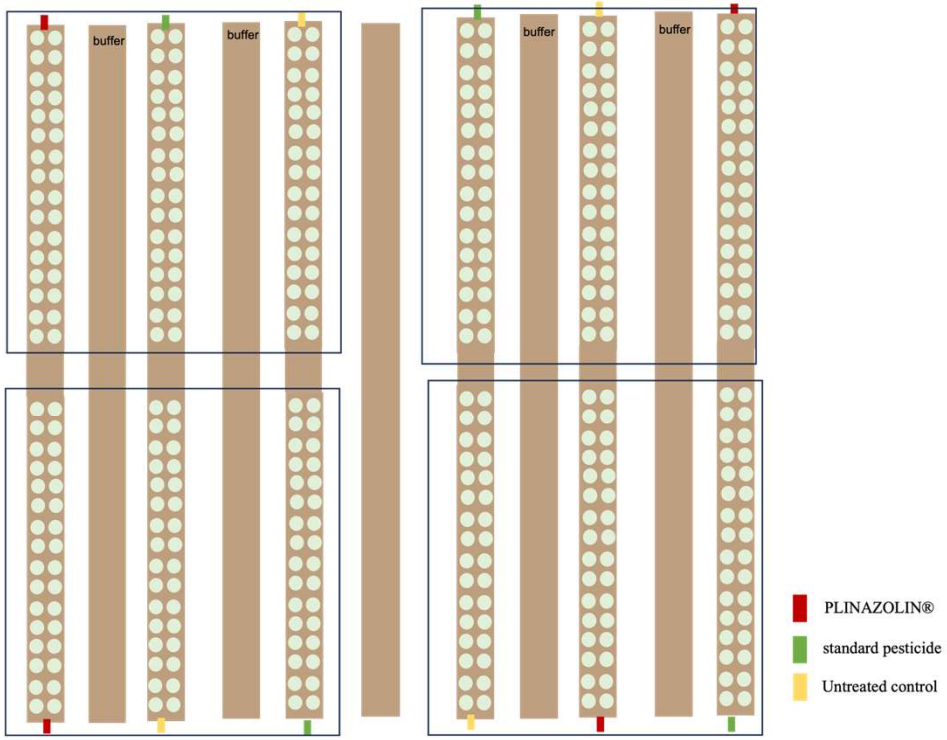

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4 replicates

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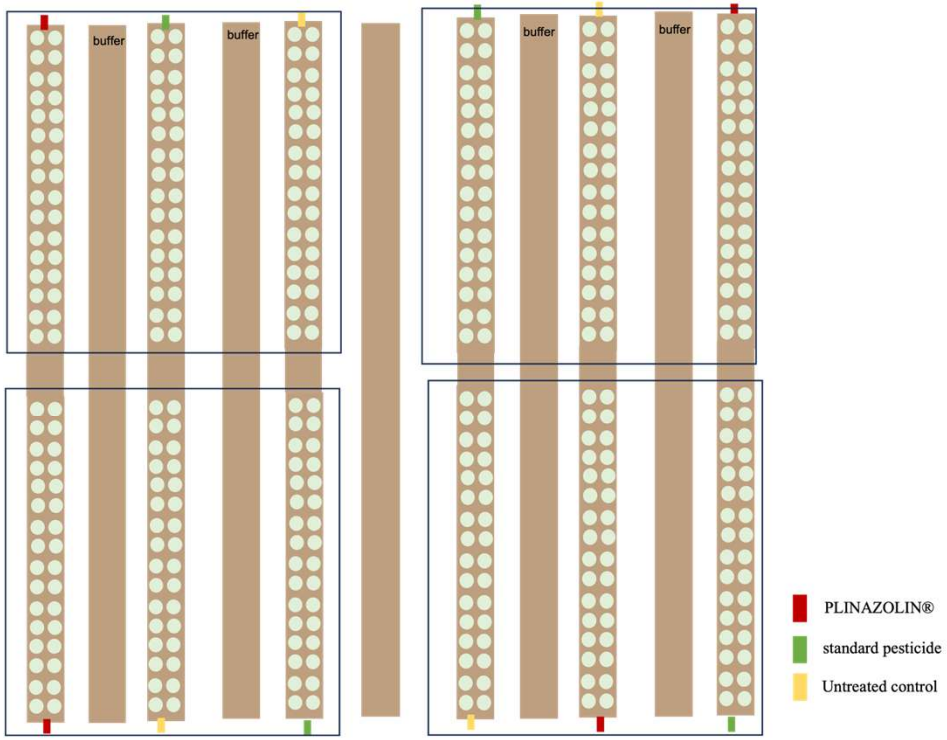

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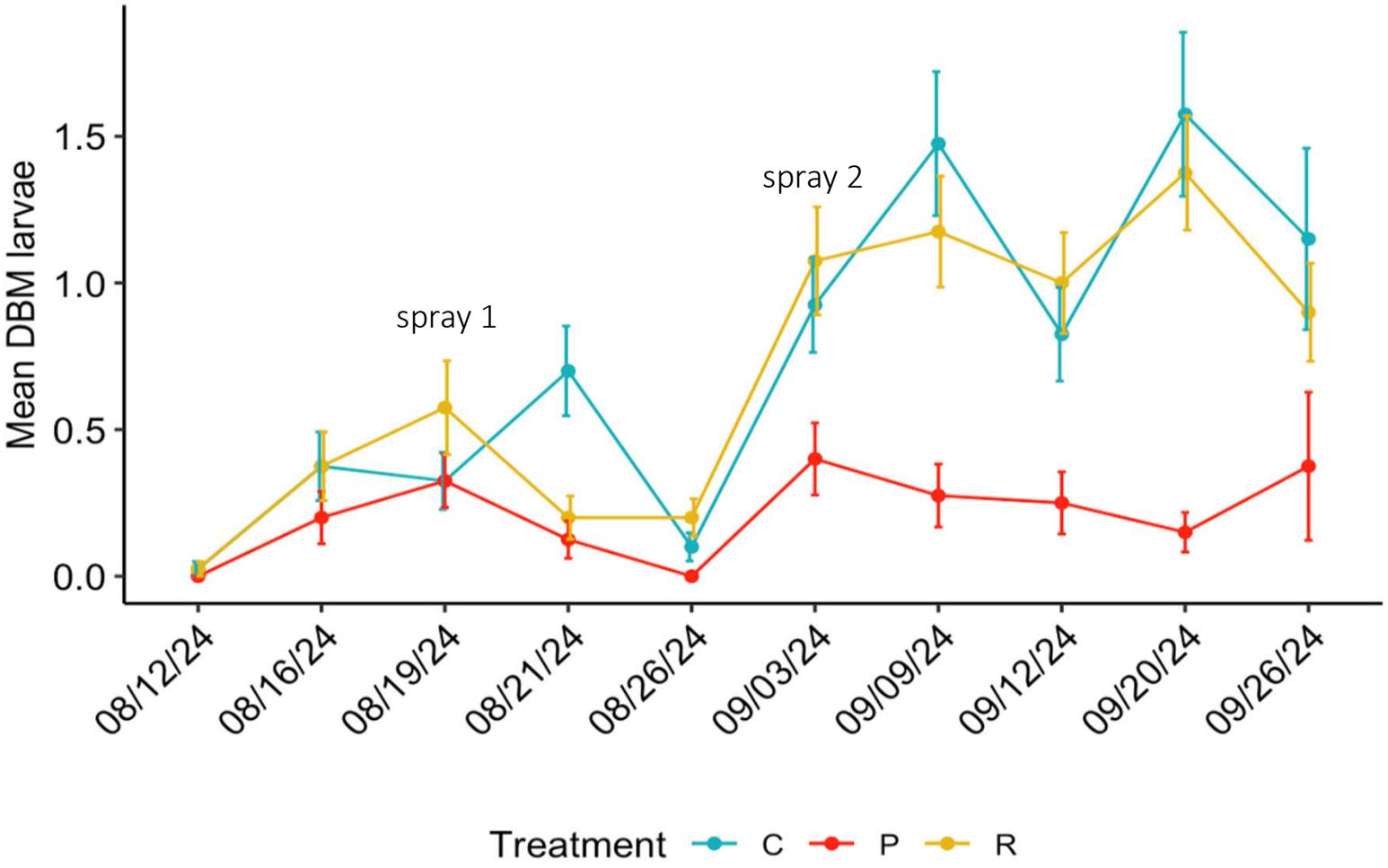
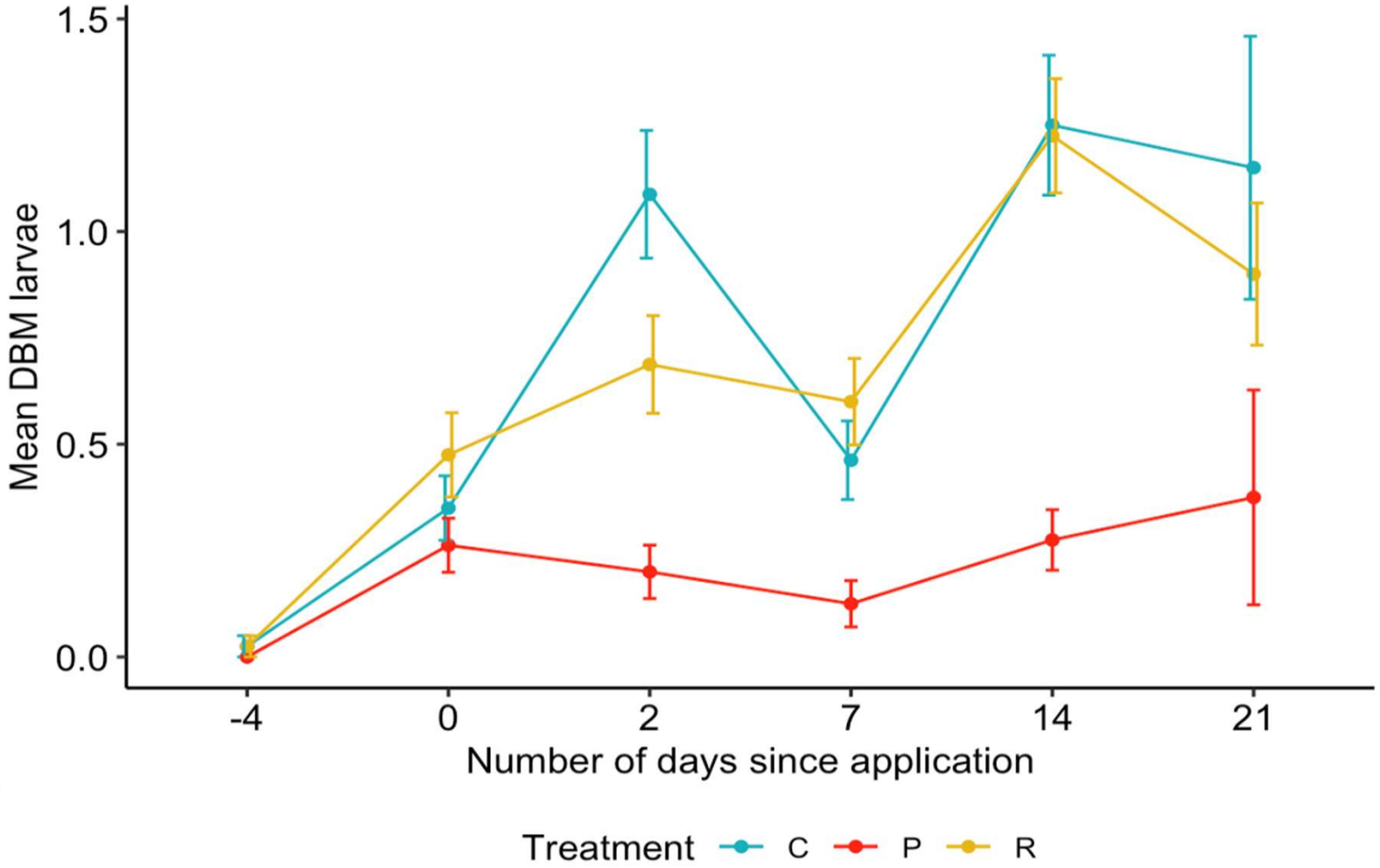
DBM larvae counts at 2, 7, 14, & 21 DAA

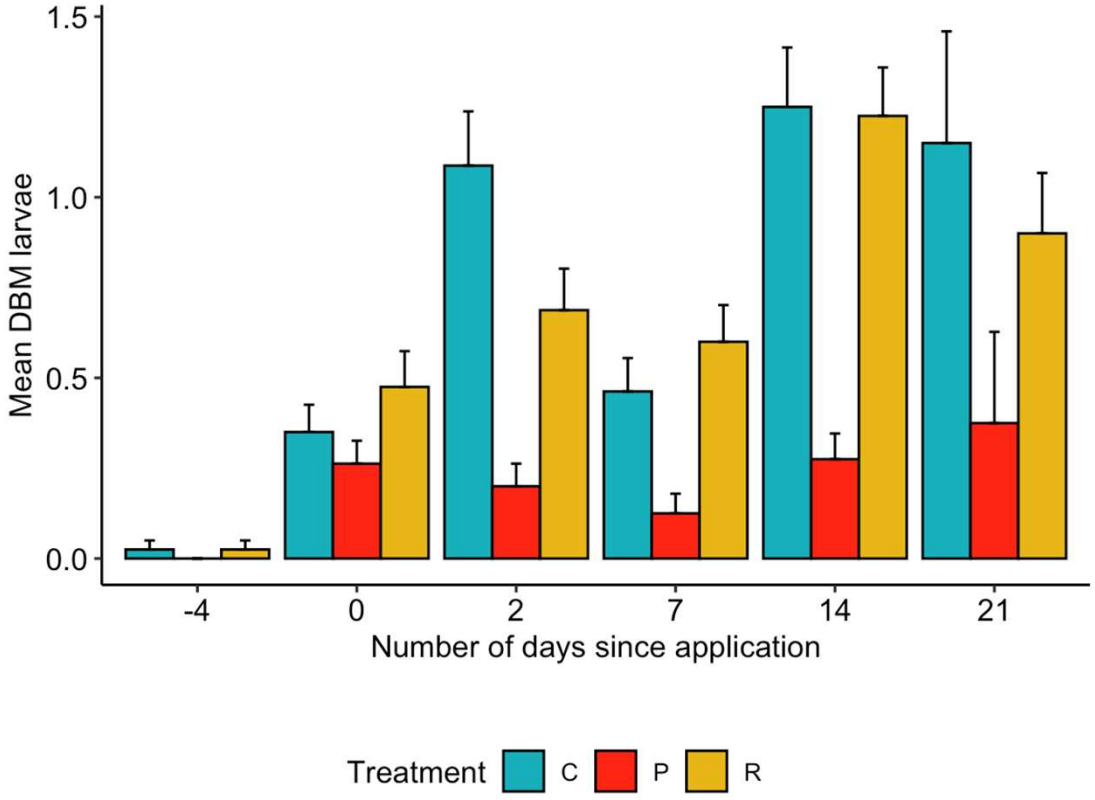
Injury on cabbage plants from Diamondback moth larvae. Photos taken 4 days after the second spray.

Time series showing average DMB larvae/plant in each treatment




1.5
1.0
0.5
0.0
Mean DBM larvae
-4
0
2
7
14
21
Number of days since application
Treatment
C
P
R

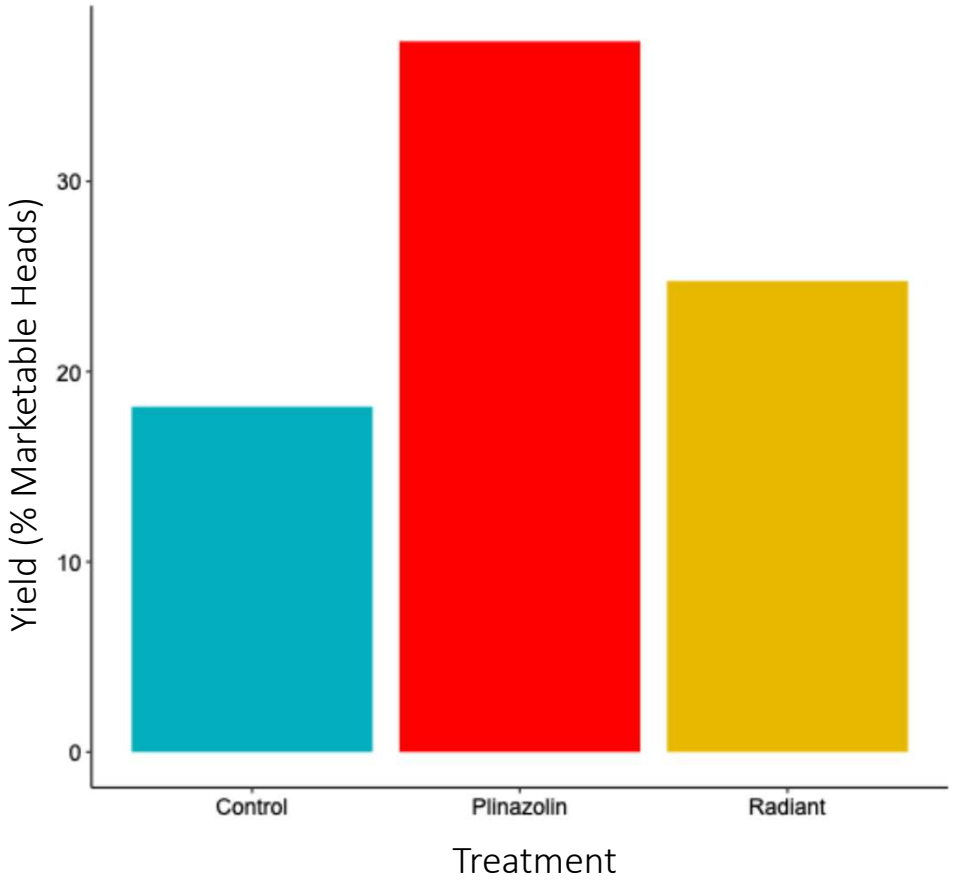
Pesticide Efficacy Trial



- PLINAZOLIN SC200 had significantly lower DBM counts compared to the control and compared to Radiant SC at each of the 4 sampling periods after application ($p<0.001$)
- PLINAZOLIN SC200 suppressed DBM larvae counts by a minimum of 67.4% (21 DAA) and maximum of 81.6% (2 DAA)

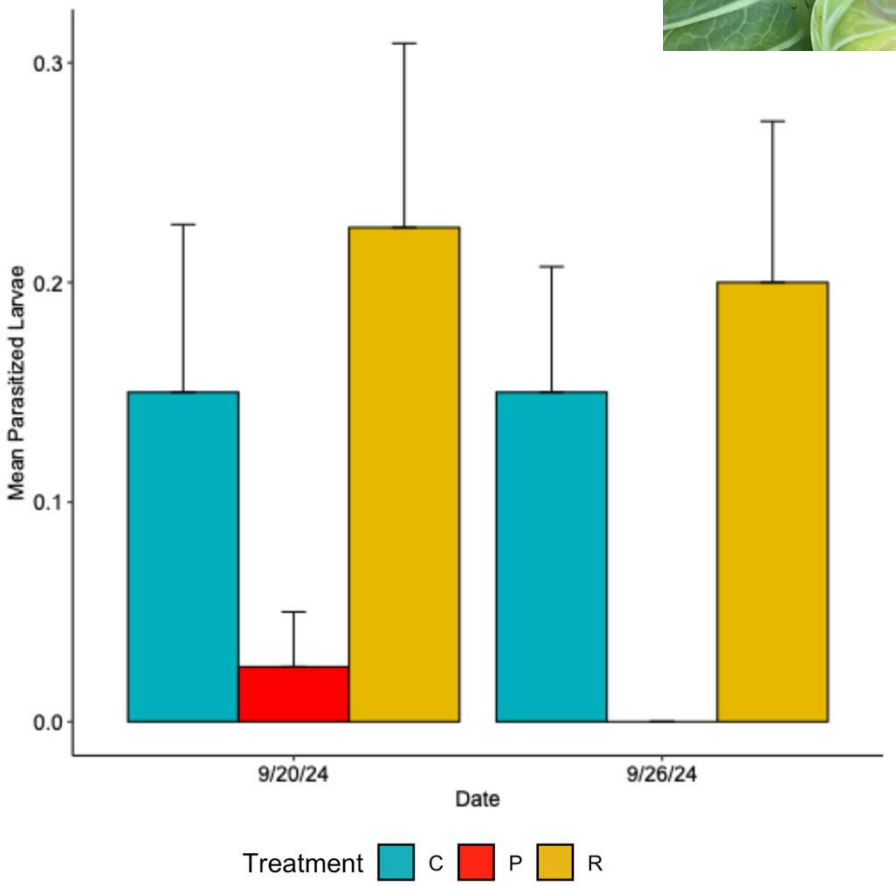
Take-away points

- PLINAZOLIN SC200 is an effective ingredient for controlling DBM
- Can expect yield improvements. Higher number marketable cabbage heads in Plinazolin treated beds (not sig.)



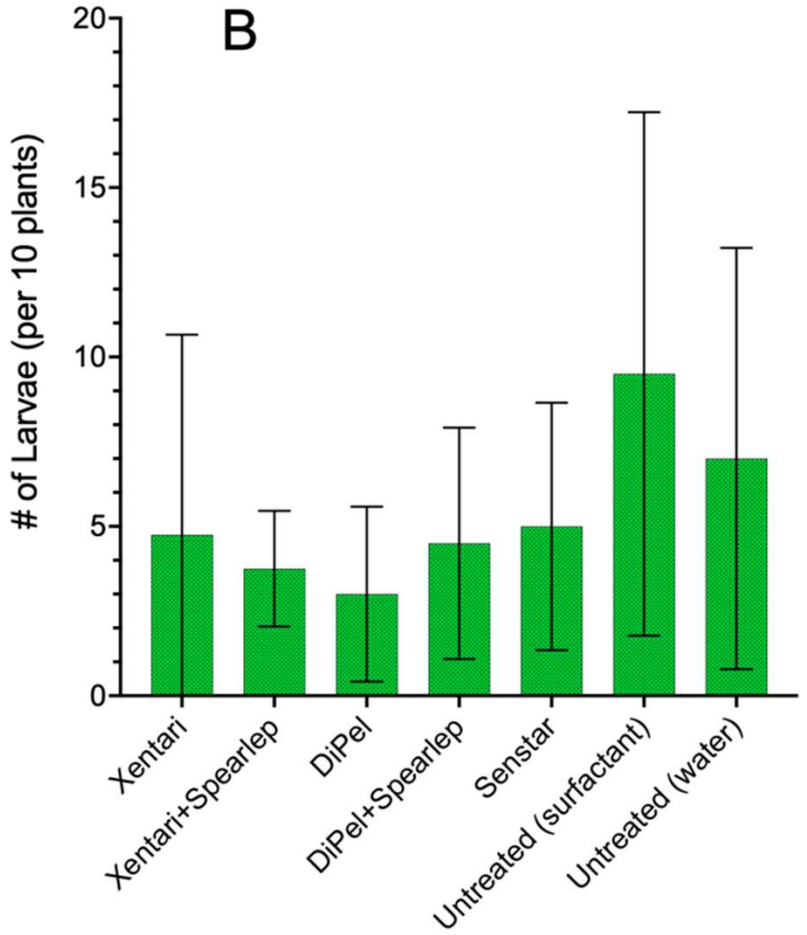
Take-away points – natural enemies

- We counted the number of parasitized DBM larvae at 14 DAA and 21 DAA after Spray 2
- Plinazolin had fewer parasitized larvae than the control ($p<0.05$) & fewer parasitized larvae than Radiant ($p<0.01$)
- It could be that this is an indirect effect, wherein Plinazolin killed enough larvae that Plinazolin-treated plants just weren't attractive enough to natural enemies, but it may be important to assess if Plinazolin has direct impact to natural enemies in future



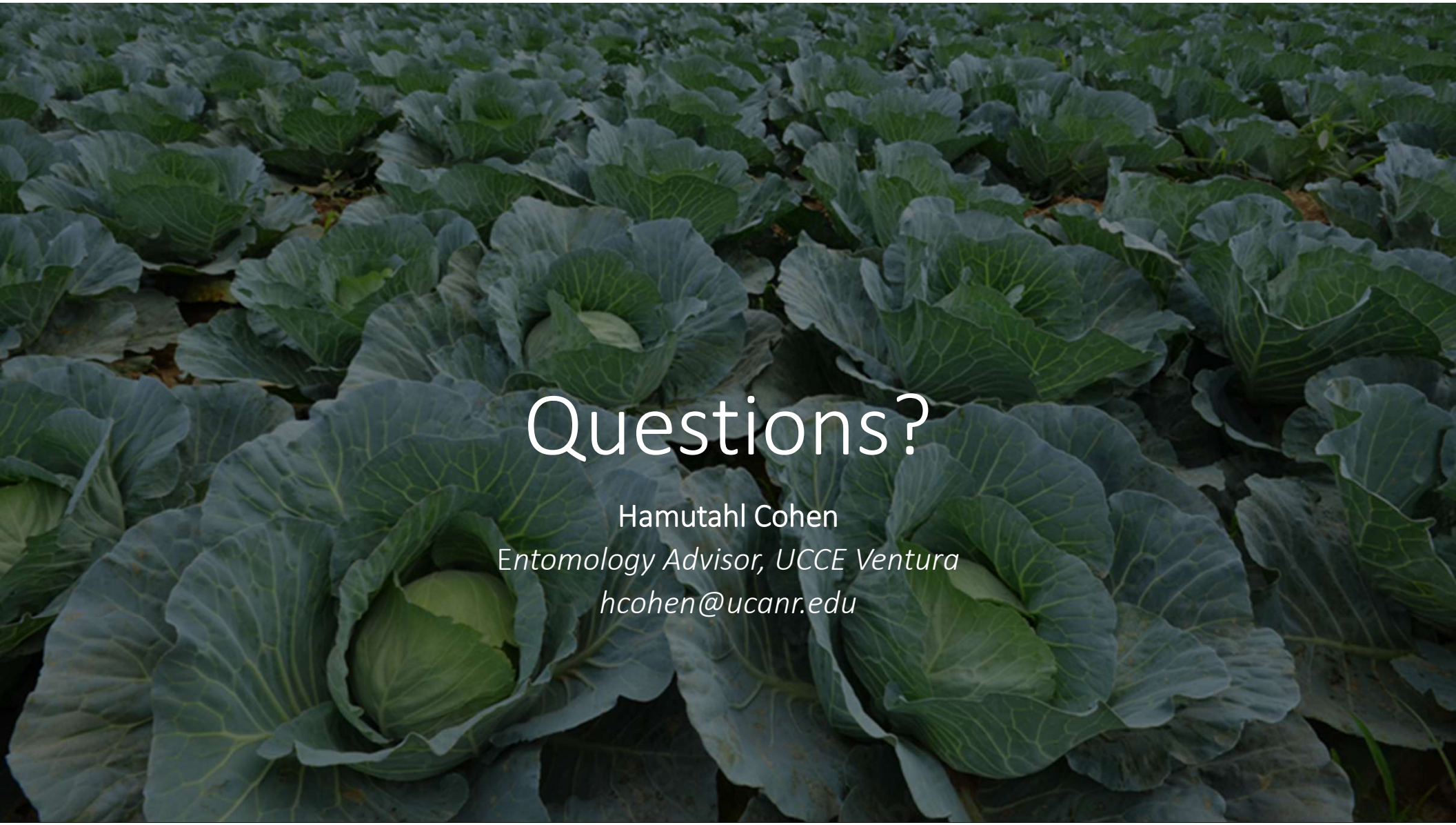
Take-away points

- Previous insecticide trials from our team (Daugovish & Valdez-Berriz 2022) found that larvae counts do not differ significantly between many products and water-treated control
- Illustrates the importance of conserving Plinazolin and managing for resistance



Resistance management

- If a DBM control failure occurs with an MOA, rotate to an alternate MOA.
- Rotate insecticides with different IRAC groups each DBM generation (3-4 weeks)
- Within a generation or use window, a MOA should not be used more than twice (preferably once).
- Reserve the most effective insecticides to protect the harvested portion of the crop.
- Never use insecticides off-label, especially in transplant production.
- If sequential plantings of cole crops are required, then avoid adjacent plantings and rotate IRAC groups per DBM generation time across all plantings.
- Coordinate regional selection-free period of one MOA to reduce the carryover of DBM resistant to a specific MOA from one season to the next.



Questions?

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Improving sustainability of DBM management in cruciferous vegetables

Ian Grettenberger
UCD (PI)

Matt Greishop
Cal Poly SLO

Daniel Hasegawa
USDA

Ricky Lara
CDFA

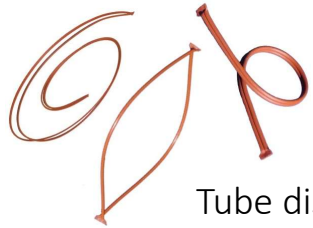
Oleg Daugovish
UCCE Ventura

Pheromone disruption tubes for DBM
(Pacific Biocontrol)

Objectives for 2025-2029

1. BMPs for mating disruption
2. Evaluate non-crop host use
3. Characterize on-farm parasitism levels
4. Track insecticide resistance

Mating Disruption



Tube dispensers

- Flowable material is available but not widely adopted, other products such as meso dispensers and tube dispensers have been developed
  - What is the efficacy of different products for reducing larva numbers?
  - What scale of application is needed for consistent presence of pheromone?
  - What methods of dispenser deployment (dispenser #, height, etc.) will reduce labor required?
  - What barriers are there to adoption?

meso-dispensers

- Will address these questions with a combination of small-scale and large-scale field trials as well as a grower survey

Flowable spray

Non-crop host use

We have visually observed

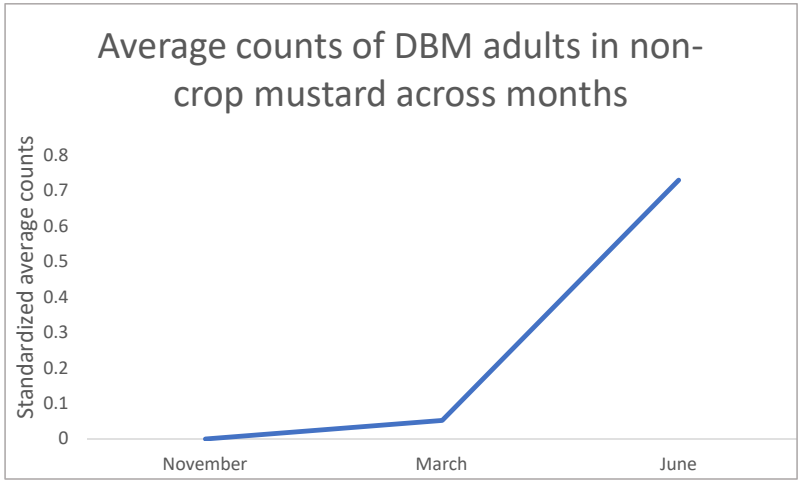
- DBM larvae feed on mustard cover crop
- DBM adults on wild mustard & radishes

Will quantify which species harbor DBM and at what time of year with active sampling methods

Will quantify DBM preference for non-crop plants using choice-tests in greenhouse settings

Assess resistance levels of DBM in wild brassicas

Maripaula Valdez-Berriz, UCCE Ventura



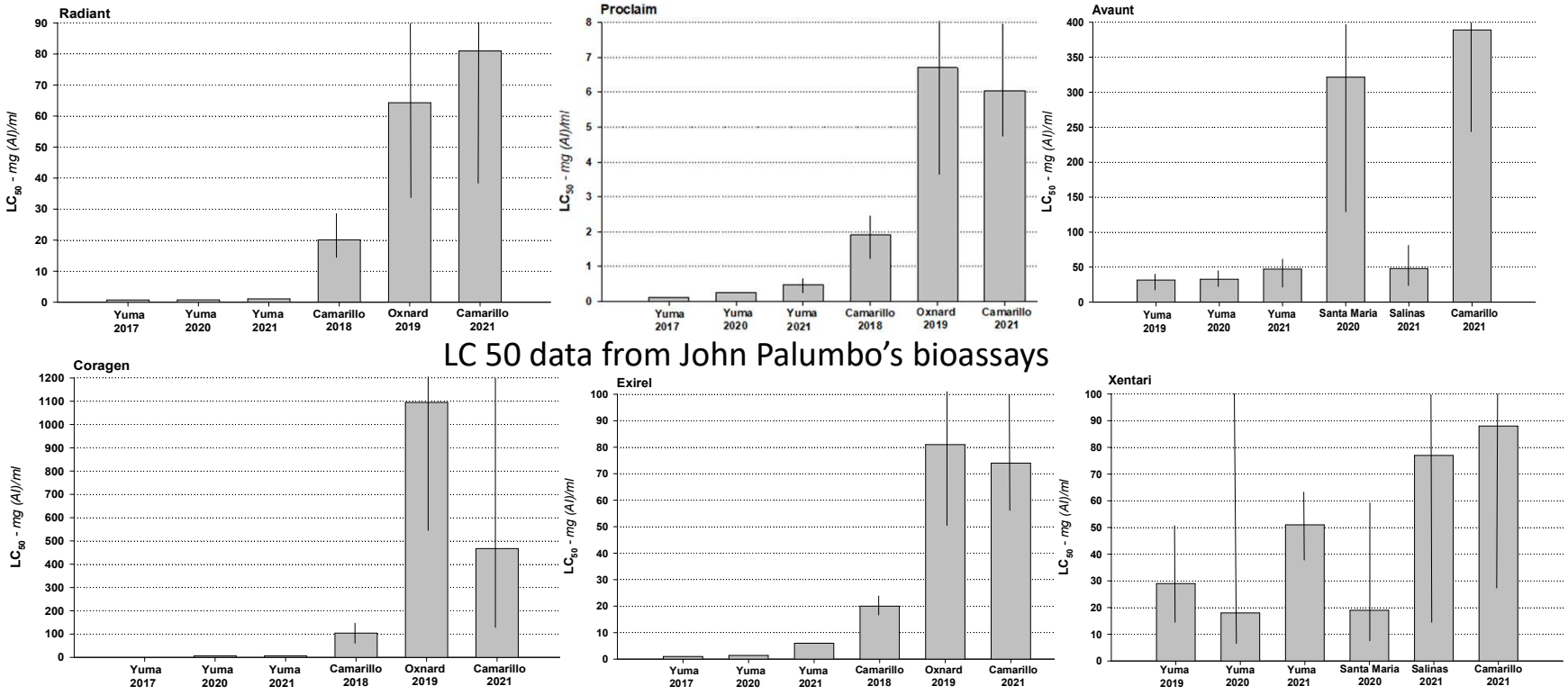
Parasitism Levels

- *Diadegma insulare* is likely the most common parasitoid of diamondback moth in California

- Will survey parasitism levels in both fields and non-crop areas

Tracking insecticide resistance in Ventura Co.

We are 'champions' in DBM resistance



LC 50 data from John Palumbo's bioassays

Tracking insecticide resistance in Ventura Co.

- Resistance is constantly changing
- Monitor key materials systematically in Salinas, Ventura, and Santa Maria
- In additional lab experiment, will assess how long it takes for resistance to degrade in populations not exposed to pesticides
- Share results out to growers (sign up for newsletter today!)