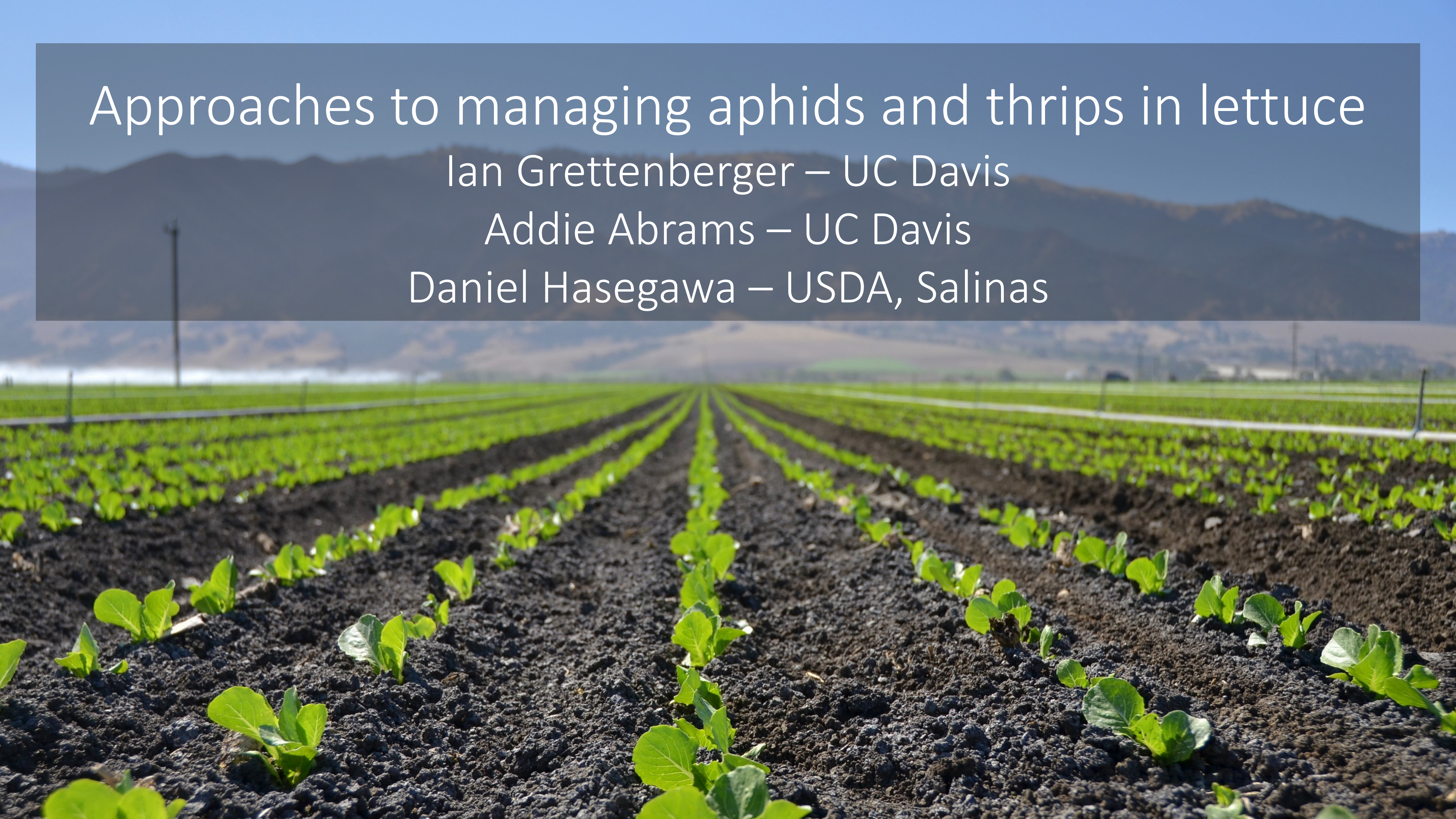
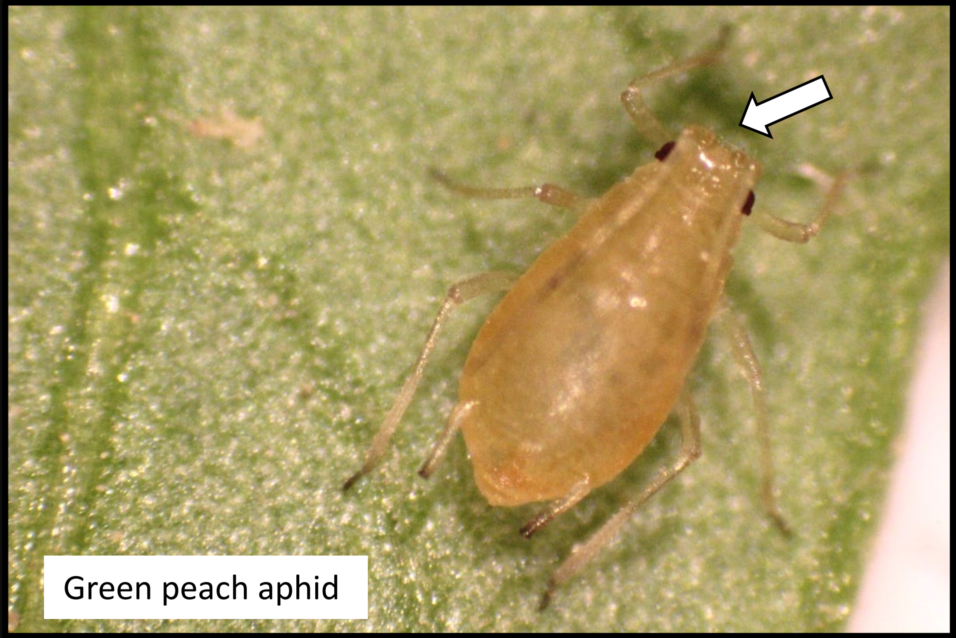
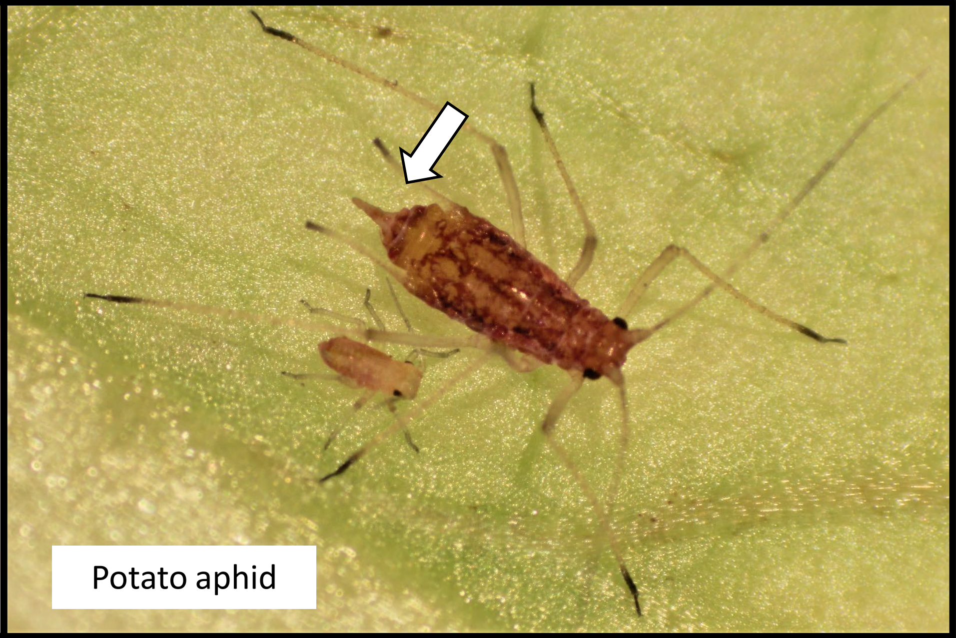
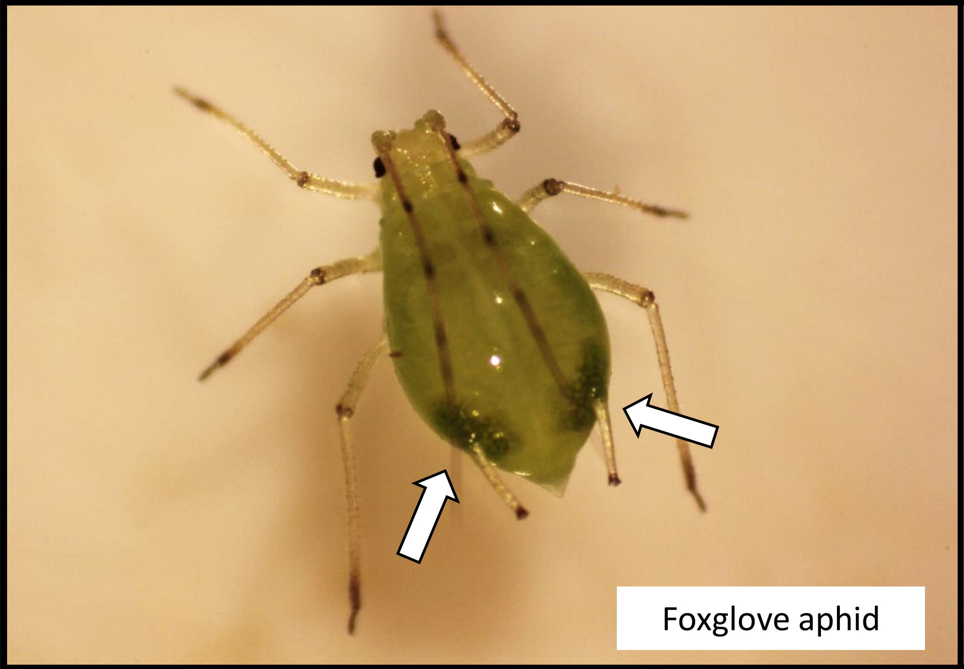


Approaches to managing aphids and thrips in lettuce

Ian Grettenberger – UC Davis
Addie Abrams – UC Davis
Daniel Hasegawa – USDA, Salinas

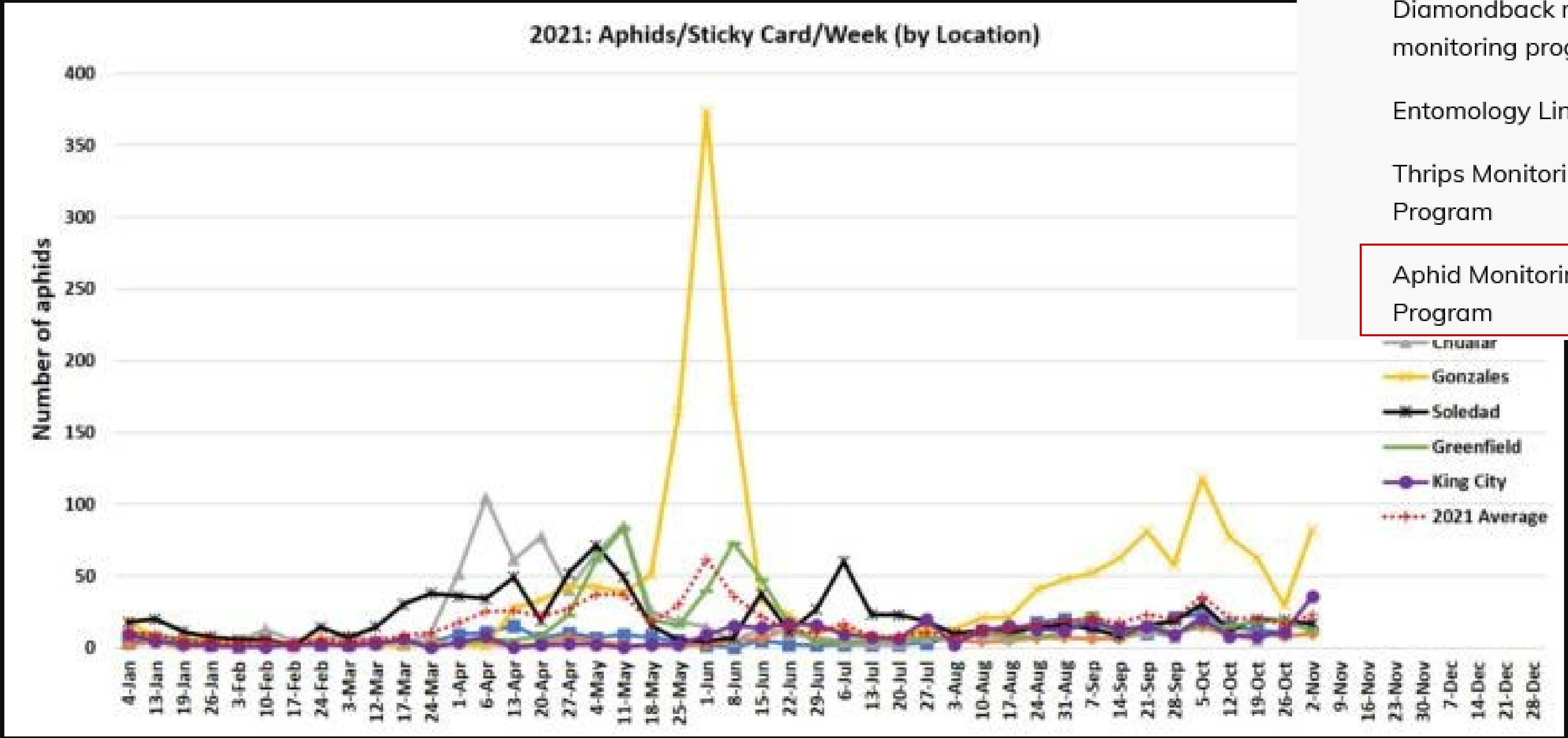

Green peach aphid

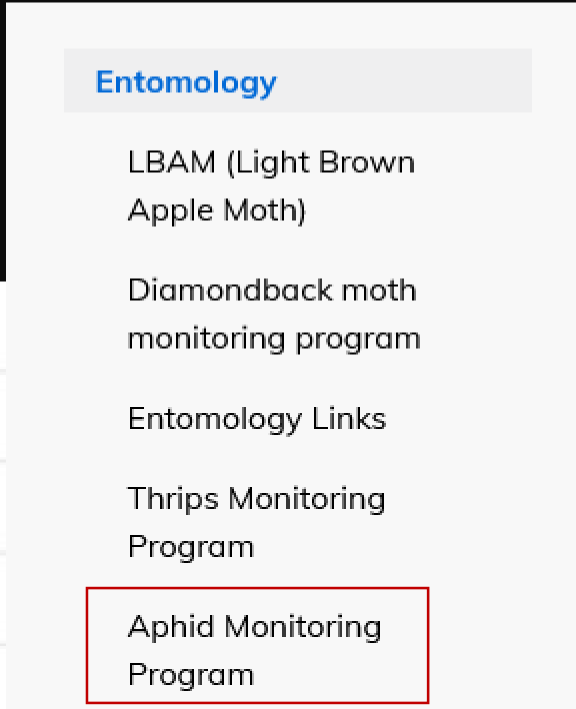

Potato aphid


Foxglove aphid


Lettuce aphid

2021 aphid sticky trap monitoring (Daniel Hasegawa)





Strategies for aphid management

Prevention

- Sanitation
- Host plant resistance

Biological control

- Conservation
- Augmentative*

Identification

Scouting

- Frequent
- Windward edges

Chemical control

- Timely applications
- Different modes of action

Strategies for aphid management

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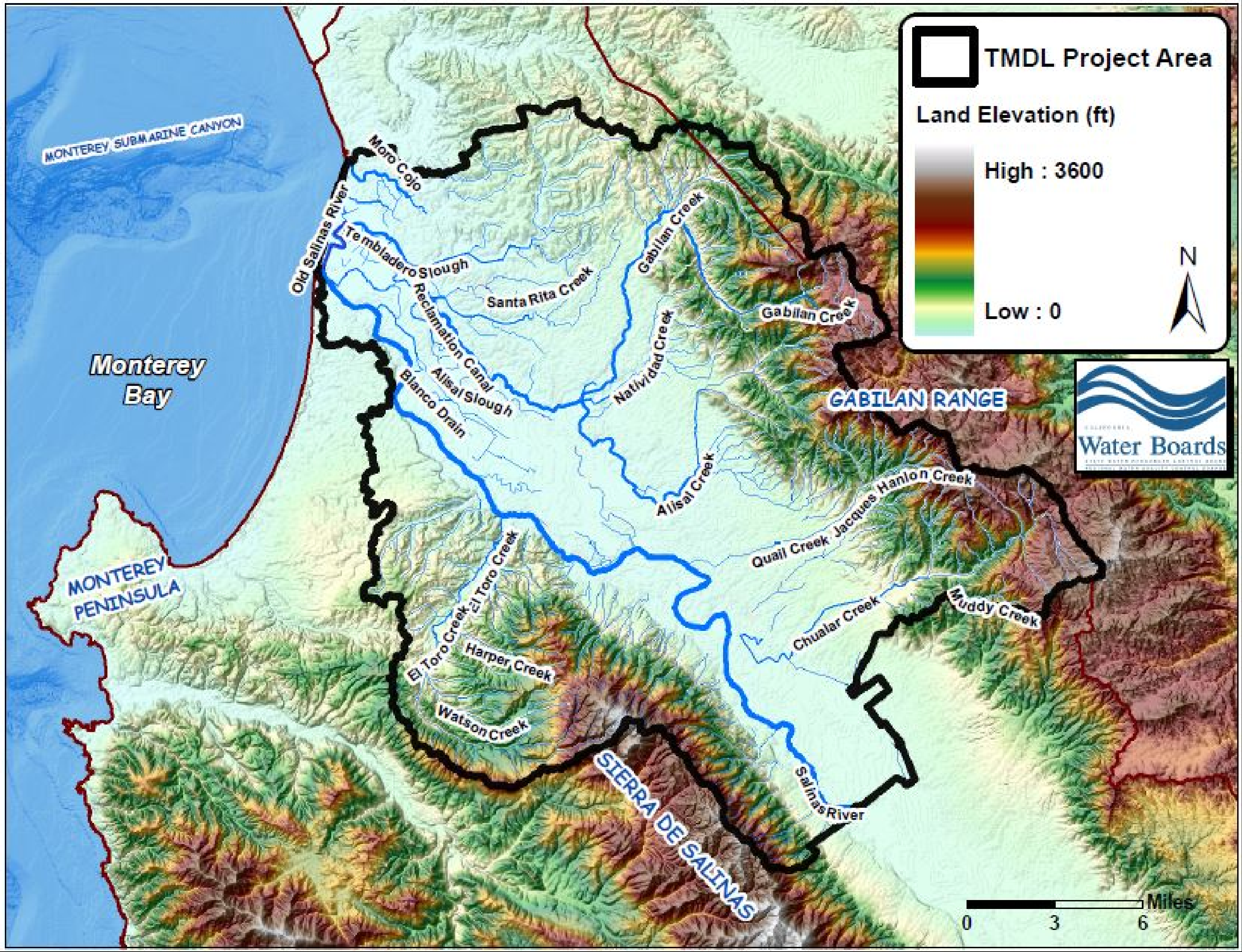
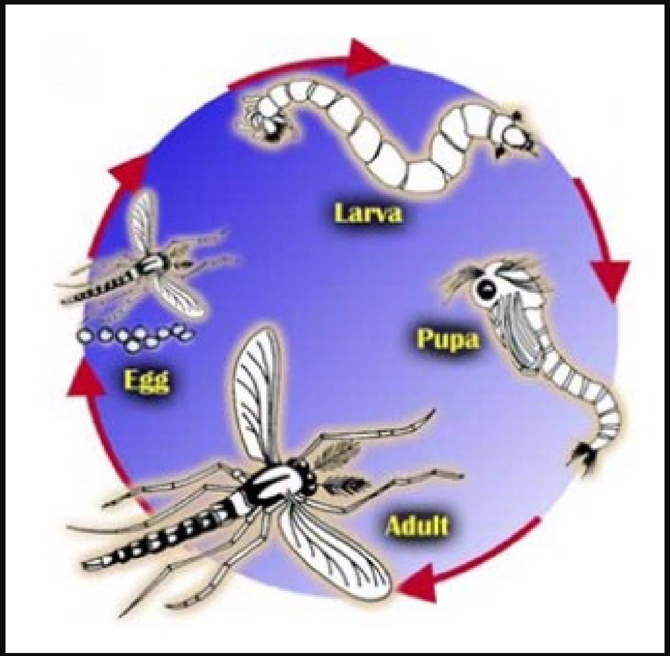


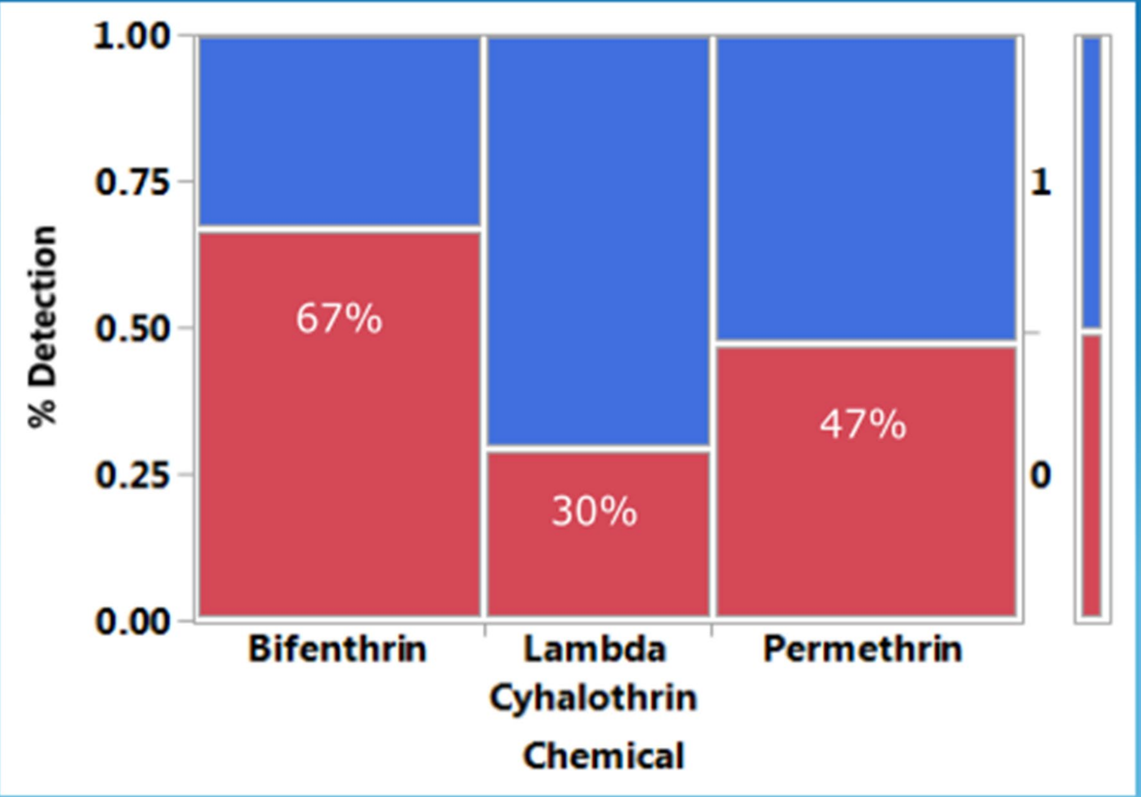
TMDL Project Area
Land Elevation (ft)
High : 3600
Low : 0
N
Water Boards
MONTEREY SUBMARINE CANYON
Monterey Bay
MONTEREY PENINSULA
GABILAN RANGE
SIERRA DE SALINAS
Moro Cojo
Old Salinas River
Tembladero Slough
Reclamation Canal
Santa Rita Creek
Gabilan Creek
Natividad Creek
Alisal Slough
Blanco Drain
Alisal Creek
Jacques Hanlon Creek
Quail Creek
Chualar Creek
Muddy Creek
El Toro Creek
Harper Creek
Watson Creek
Salinas River
Miles
0
3
6


Larva
Pupa
Egg
Adult


K. Kroeker

2012-2016, DPR

Detections in Salinas by Chemical



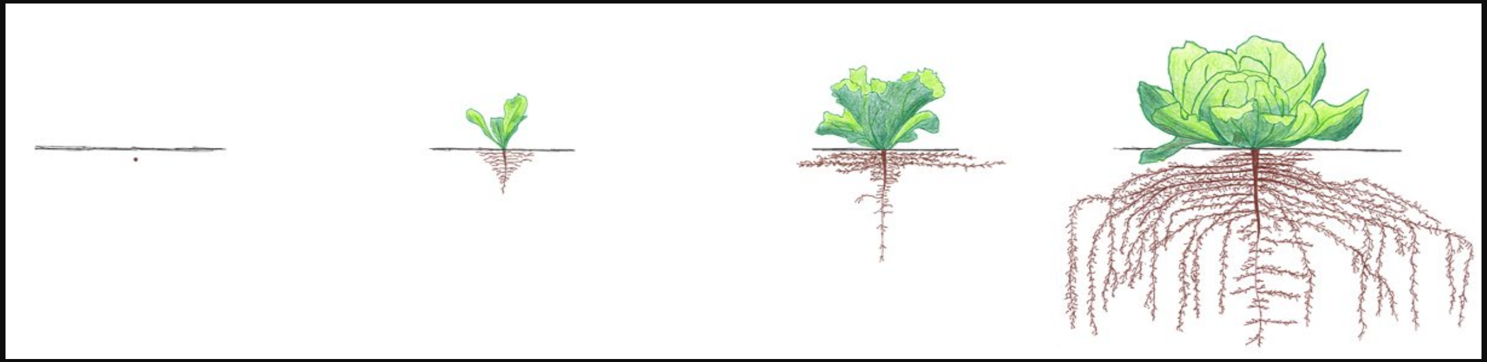
Significantly higher detections for bifenthrin, followed by permethrin and lambda-cyhalothrin (N=271, Chi-square test, $p < 0.0001$)

Pesticide Contamination Prevention Act Review Process Triggered by Detections of Imidacloprid in Groundwater

Sept 2021

Objective

Test/demonstrate alternative management tactics to reduce and/or replace current use pattern of pyrethroids and neonicotinoids for aphids



At-planting

- Untreated
- Seed slot application of imidacloprid
- Clothianidin seed-treatment
- Seed slot application of biologicals (*Beauveria* + *Trichoderma*)

Foliar

- Untreated
- Pyrethroids + Neonicotinoids
- Alternatives

Thiamethoxam+ lambda-cyhalothrin	Zeta-cypermethrin+ imidacloprid	Thiamethoxam+ lambda-cyhalothrin

Sulfoxaflor	Spirotetramat	Flonicamid

Overview of USDA-Spence farm vs. grower field trials

USDA-Spence trials

- 1 in 2019
- 2 in 2020

→ All treatments, full factorial design

Grower trials

- 2 in 2020

→ More limited design

Few aphids

USDA-Spence trials

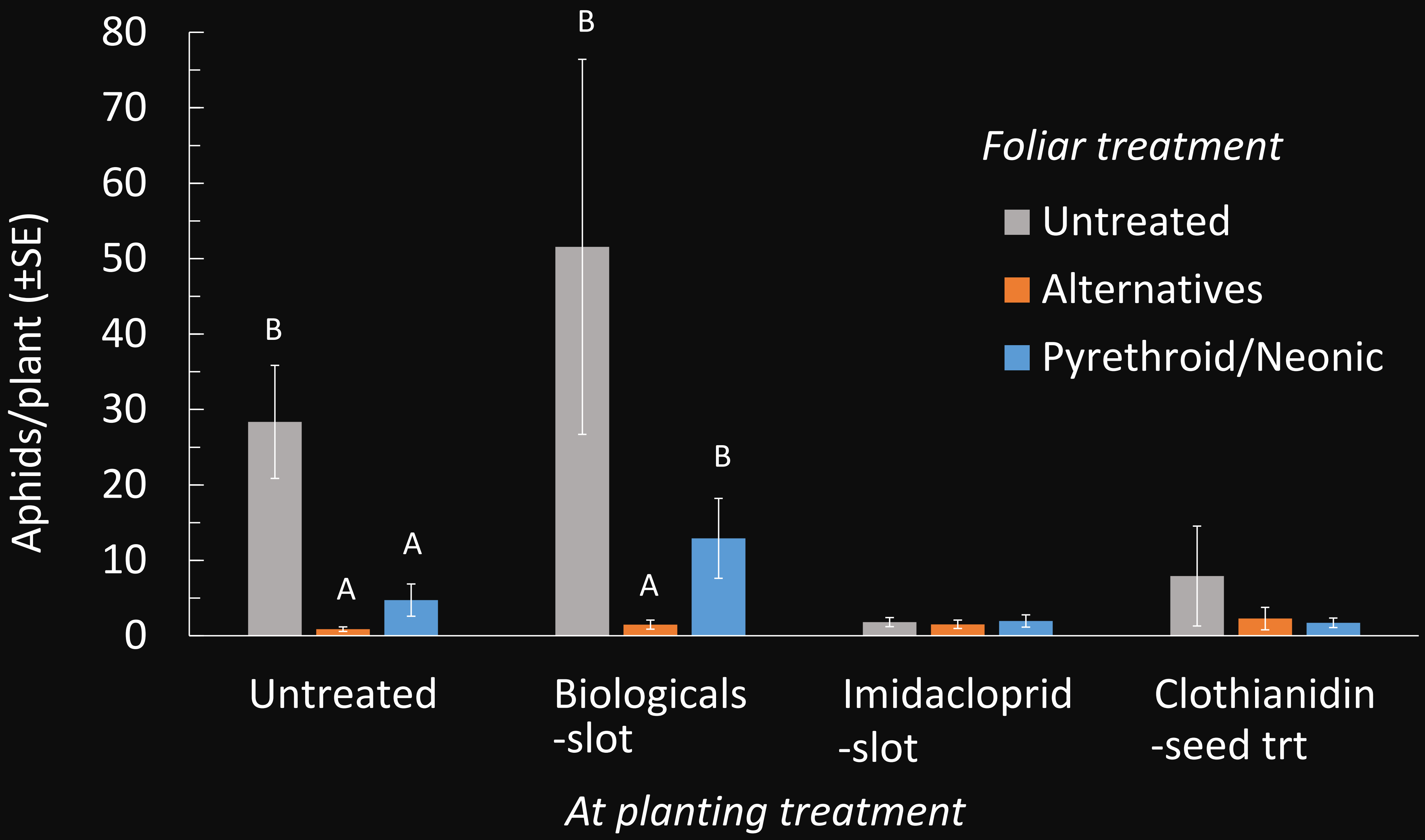
- 1 in 2019
  - 9/11 plant
  - Dec. harvest
- 2 in 2020
  - July 15 plant
  - Oct. harvest
  - Sept 23 plant
  - Dec. harvest

- Type = Romaine
- Variety = True Heart
- Row spacing = 40 inches
- Seedlines per bed = 2

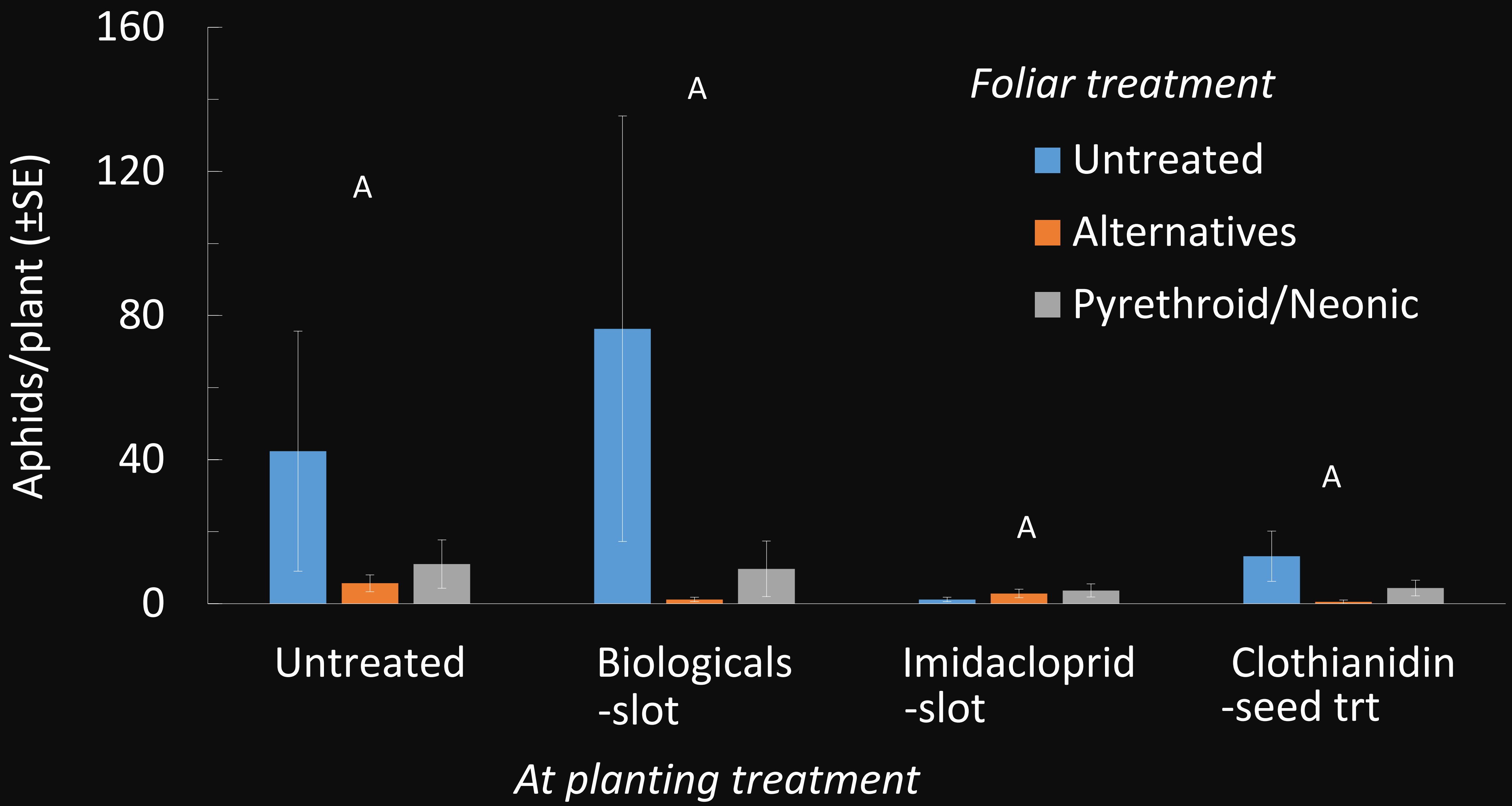
2019 USDA farm trial

- Low aphids early, plenty late at harvest
- Midway through season (2 months after planting):
  - Couldn't detect effect of foliar treatments
  - Did see significant effect of at-planting
  - Primarily due to control vs. imidacloprid-slot

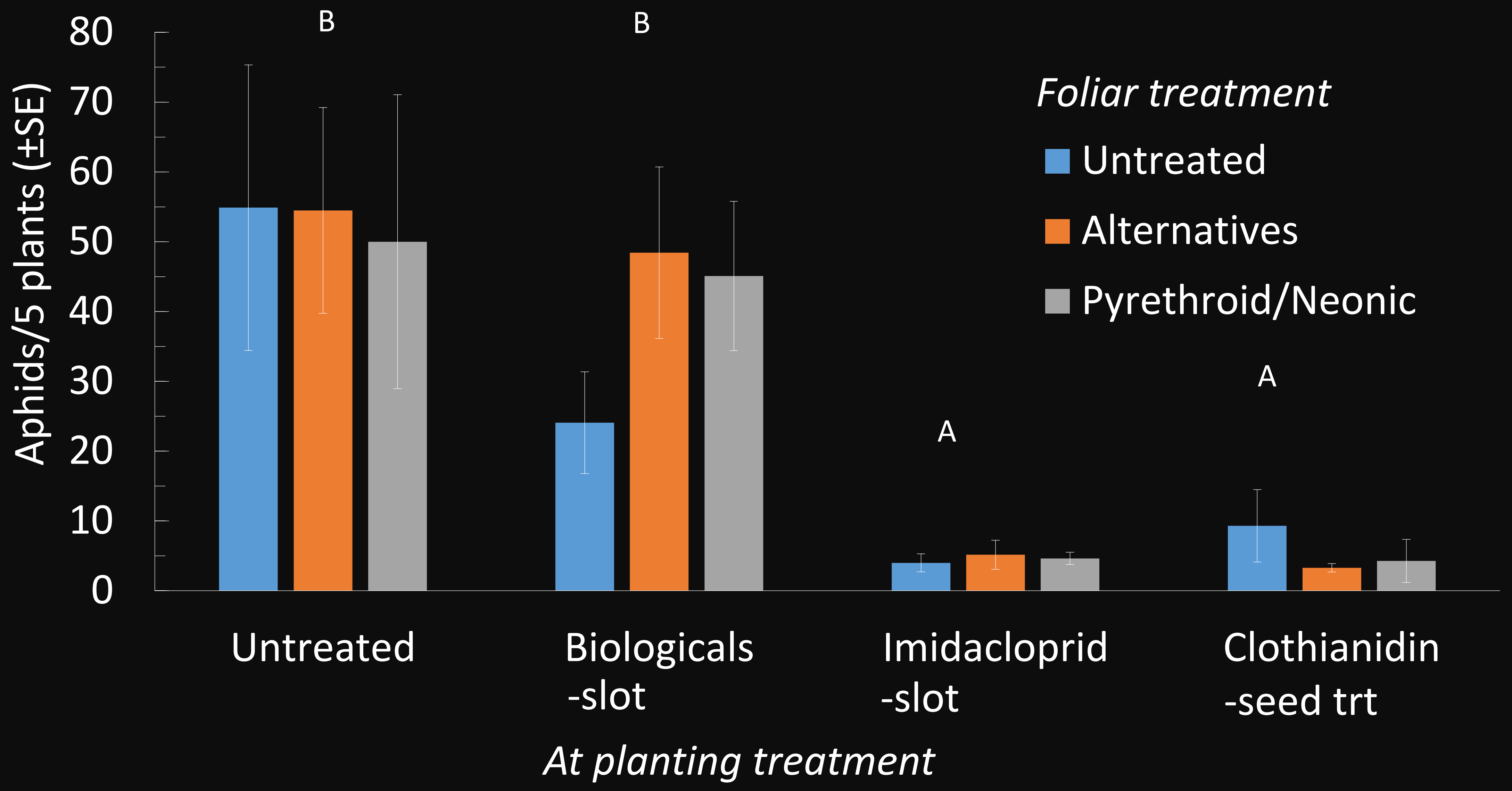
2019 USDA farm trial: at harvest (plot)



2019 USDA farm trial: at harvest (cage)



2020 trial 1: post-planting (early, plot)



2020 trial 1

- Plenty of aphids early, fewer at harvest
- At harvest:

  Caged plants

  - Significant effect of at-planting treatment
  - (low reps) → but effect appeared driven by reduction in imidacloprid-slot trt primarily

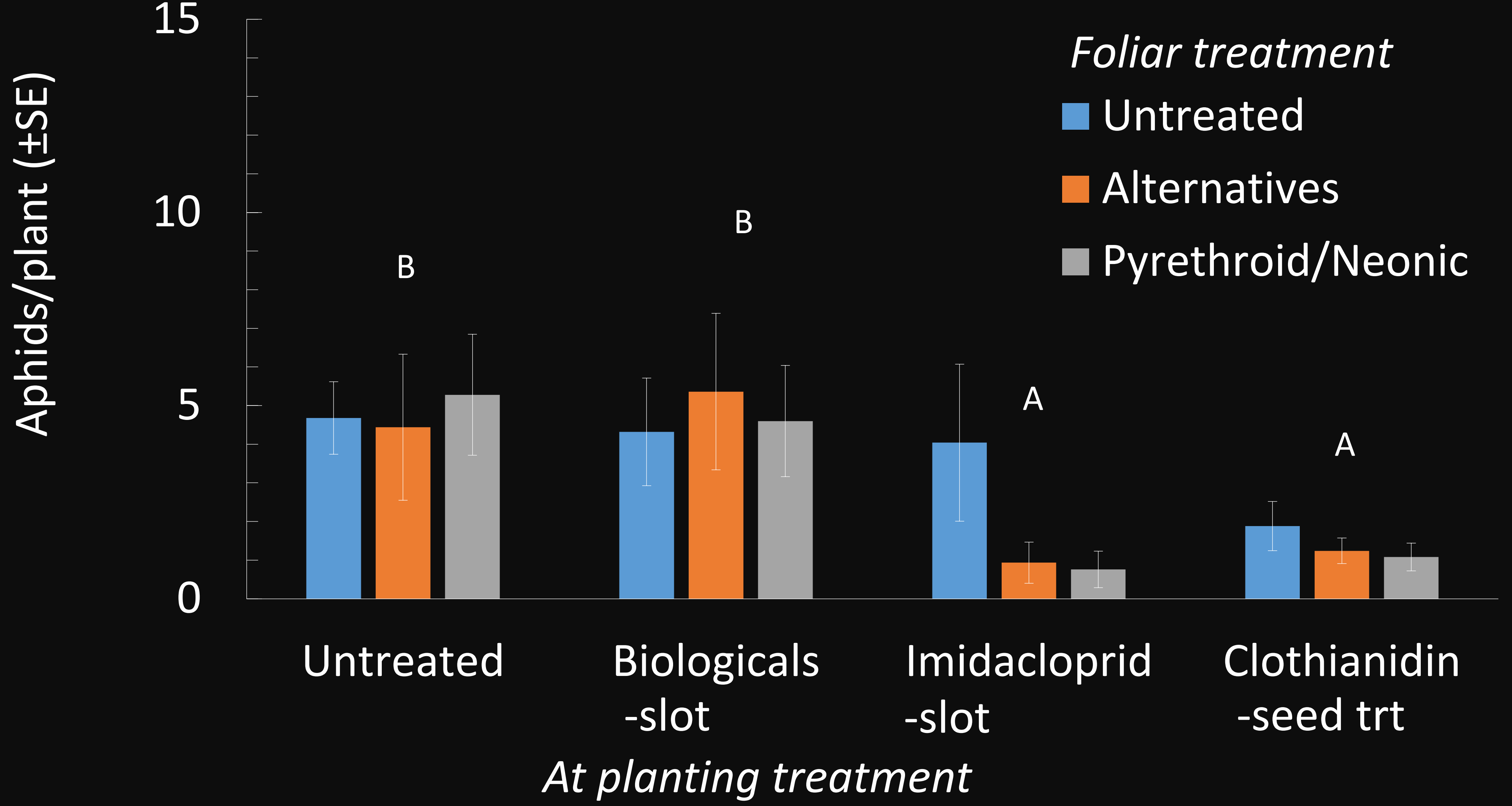
  Plots

  - No at-planting effects
  - Effect of foliar treatment
    control & Pyr/Neo > alternatives

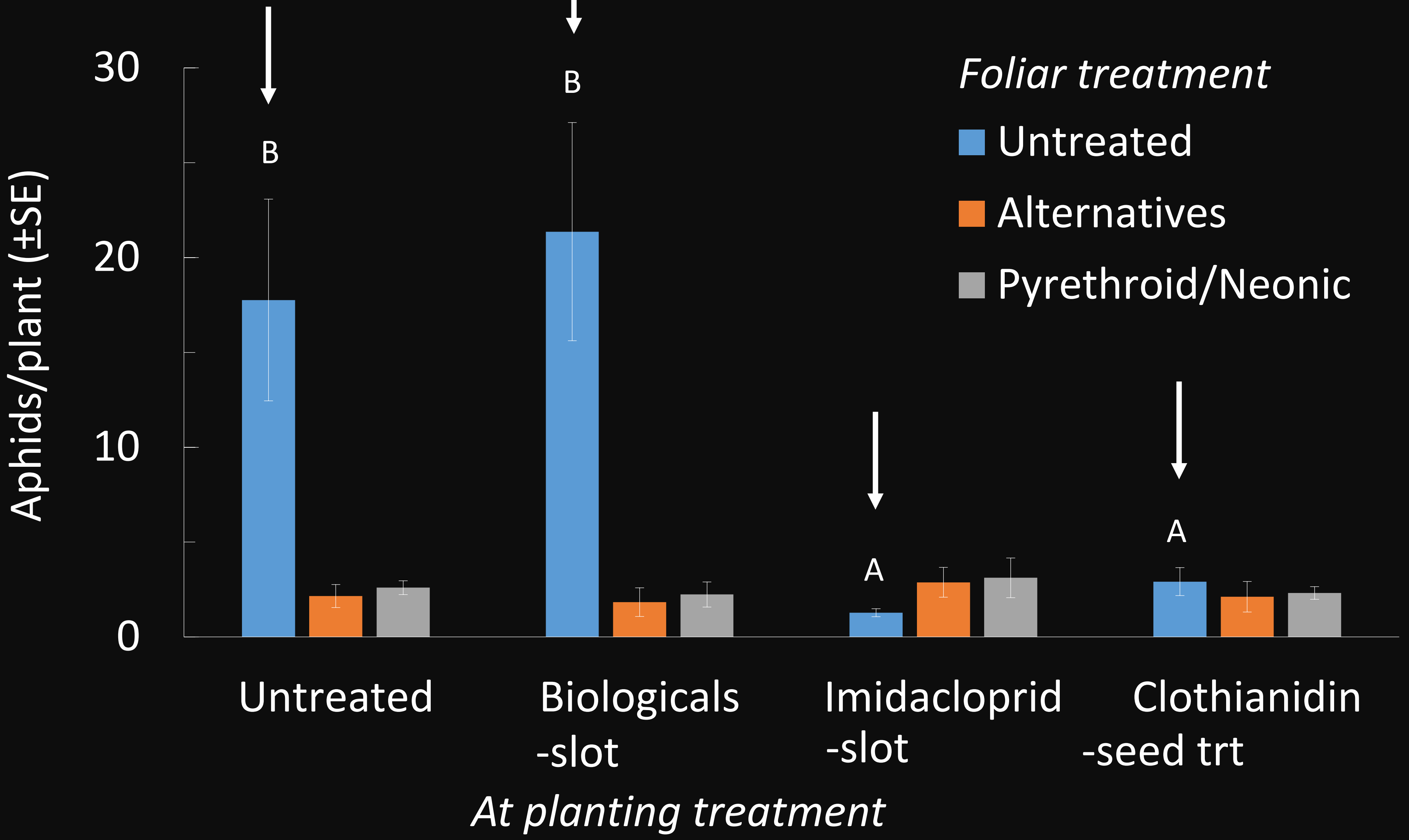
2020 trial 2

- Low aphid populations early
- Built midway through the trial

2020 trial 2: post-planting (early, plot)



2020 trial 2: at harvest (plot)



Summary

- Consistently: “alternatives” foliar rotation” did as well as Pyr+Neo
- Effect of at-planting chemical treatments early in 2/3 trials, both clothianidin and seed-trt and slot-imidacloprid worked
- No effect of biologicals
- Both the clothianidin coating and imidacloprid slot treatments reduced aphid numbers through the end of the trial WITHOUT foliar sprays in 2/3 trials
- In one of the trials, the aphids were pretty low at end of trial and we didn’t see any at-planting treatment effects


D. Hasegawa

Objective

Evaluate applications of insecticides using an automated thinner for thrips

Current standard

Automated thinner/sprayer

Possibilities compared to standard broadcast:

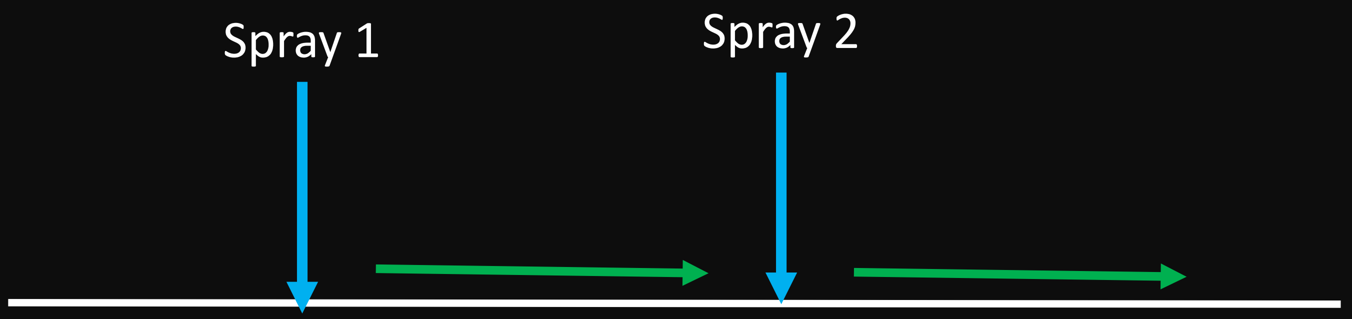
- Same "per-plant" rate → less insecticide
- Different, higher "per-plant" rate → greater efficacy?

Combo?

Experimental design

Two application timings

- *Application 1* : ~two weeks post-seeding (auto-thinning stage)
- *Application 2* : 10-14 days later (manual thinning stage)



Three trials

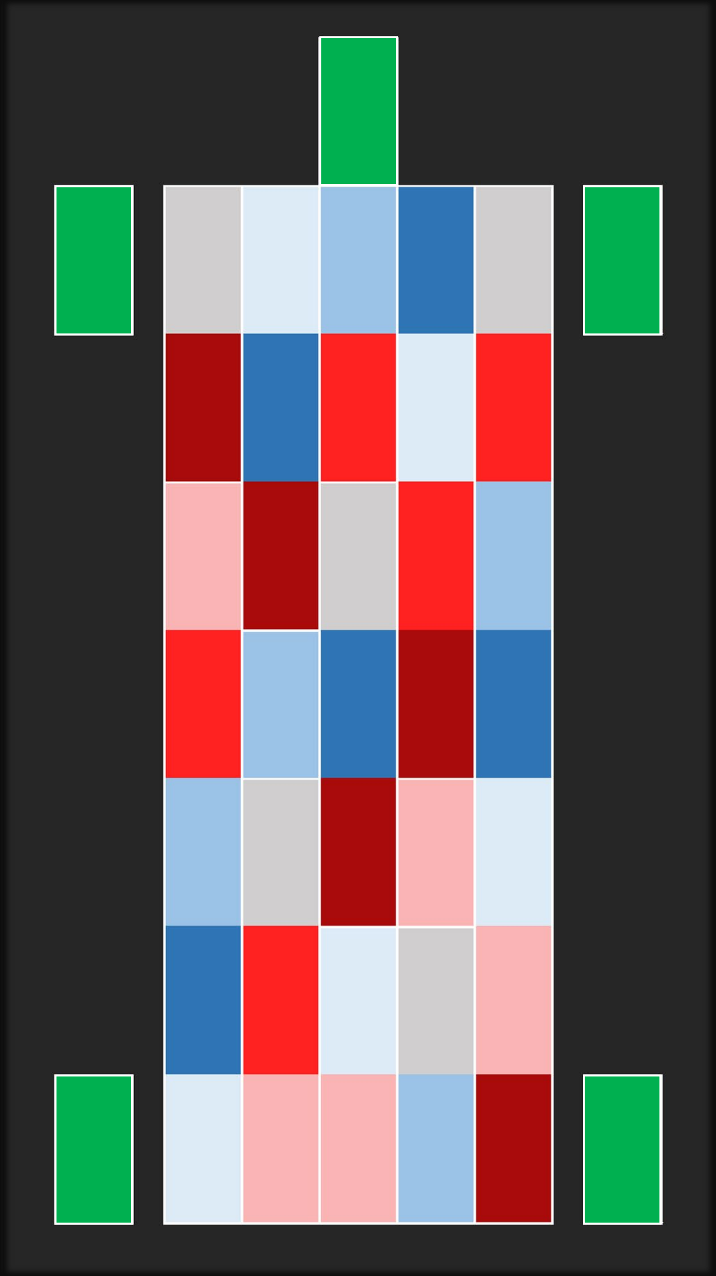
<u>Trials 2 and 3</u>

- Insecticide
  - Radiant (spinetoram)
  - Exirel (cyantraniliprole)
- Rate
  - Comparable to grower standard (1/10th)
  - Mid-range
  - High
- Two applications
- + Grower standard at high label rate at Spray 2 timing

Trial 1

Trial design 2 and 3

- Treatments
  - Green = grower standard
- Insecticide
  - Radiant (spinetoram) - Reds
  - Exirel (cyantraniliprole) - Blues

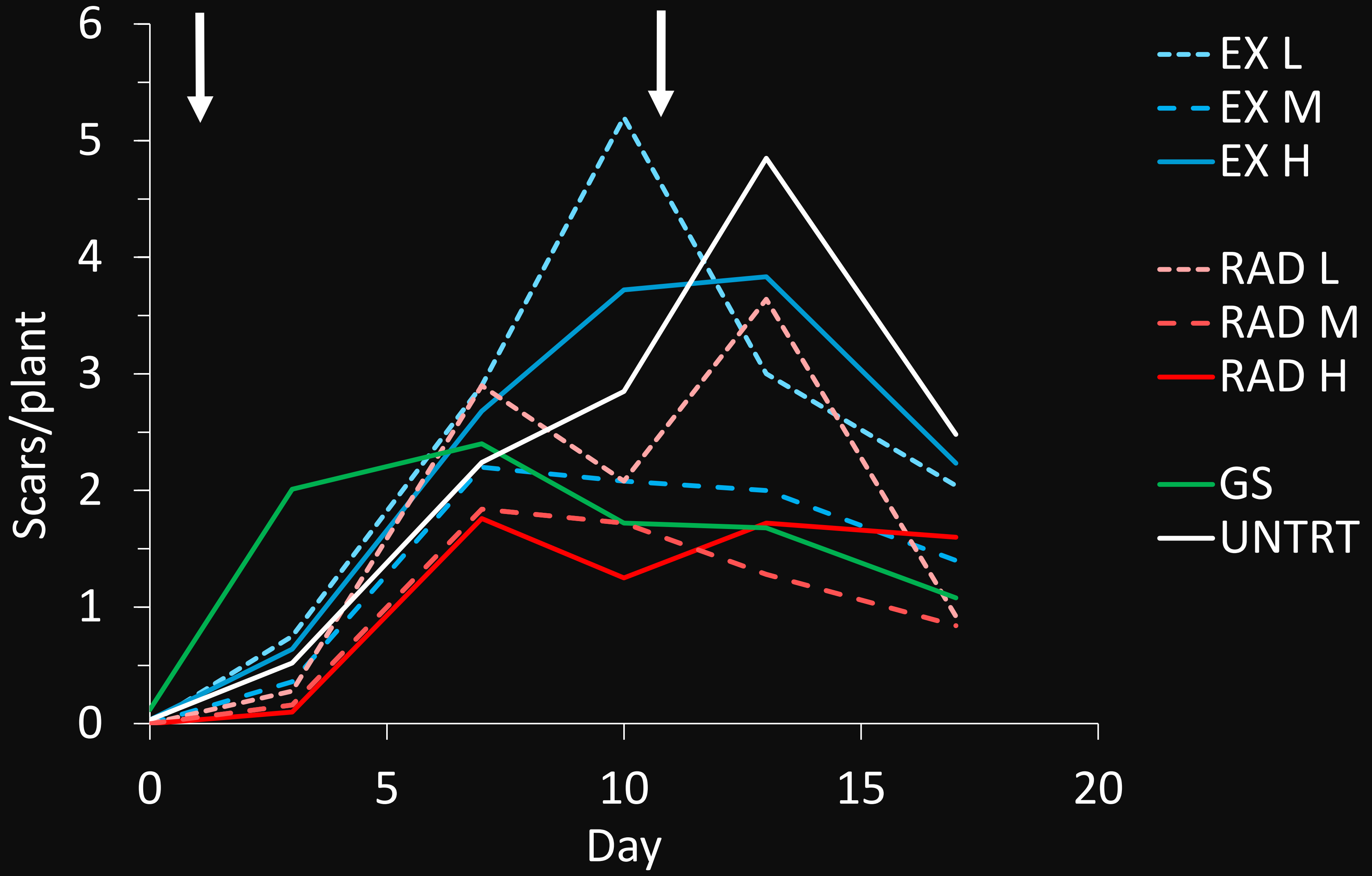


Data

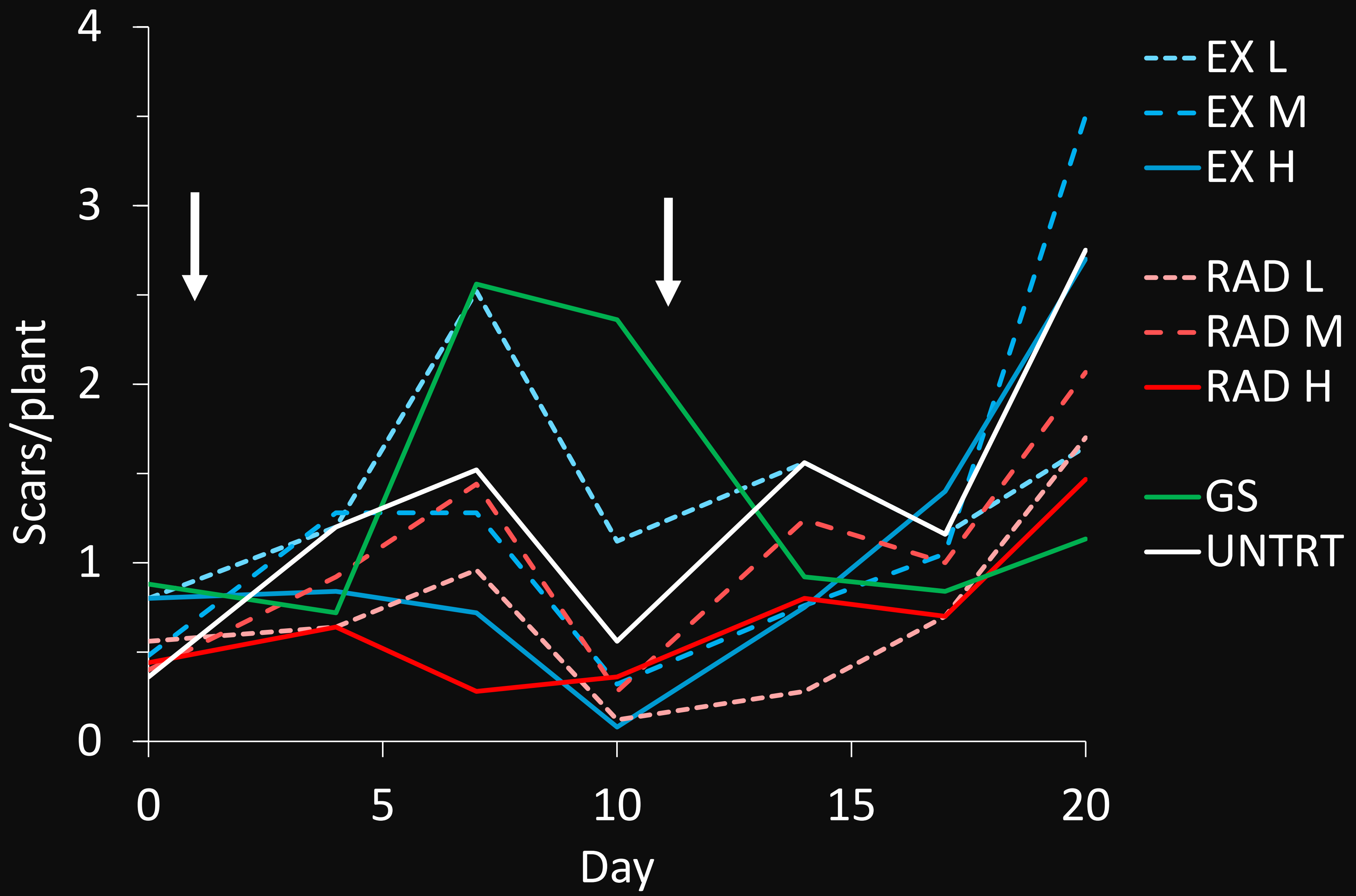
- Pulled plants after applications to follow effects on thrips populations (thrips+thrips damage)
  - + aphids
- Final evaluation shortly before harvest to measure INSV and Sclerotinia incidence



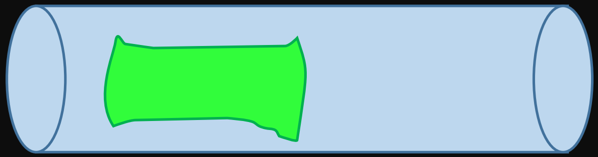

Scars – July trial – no differences

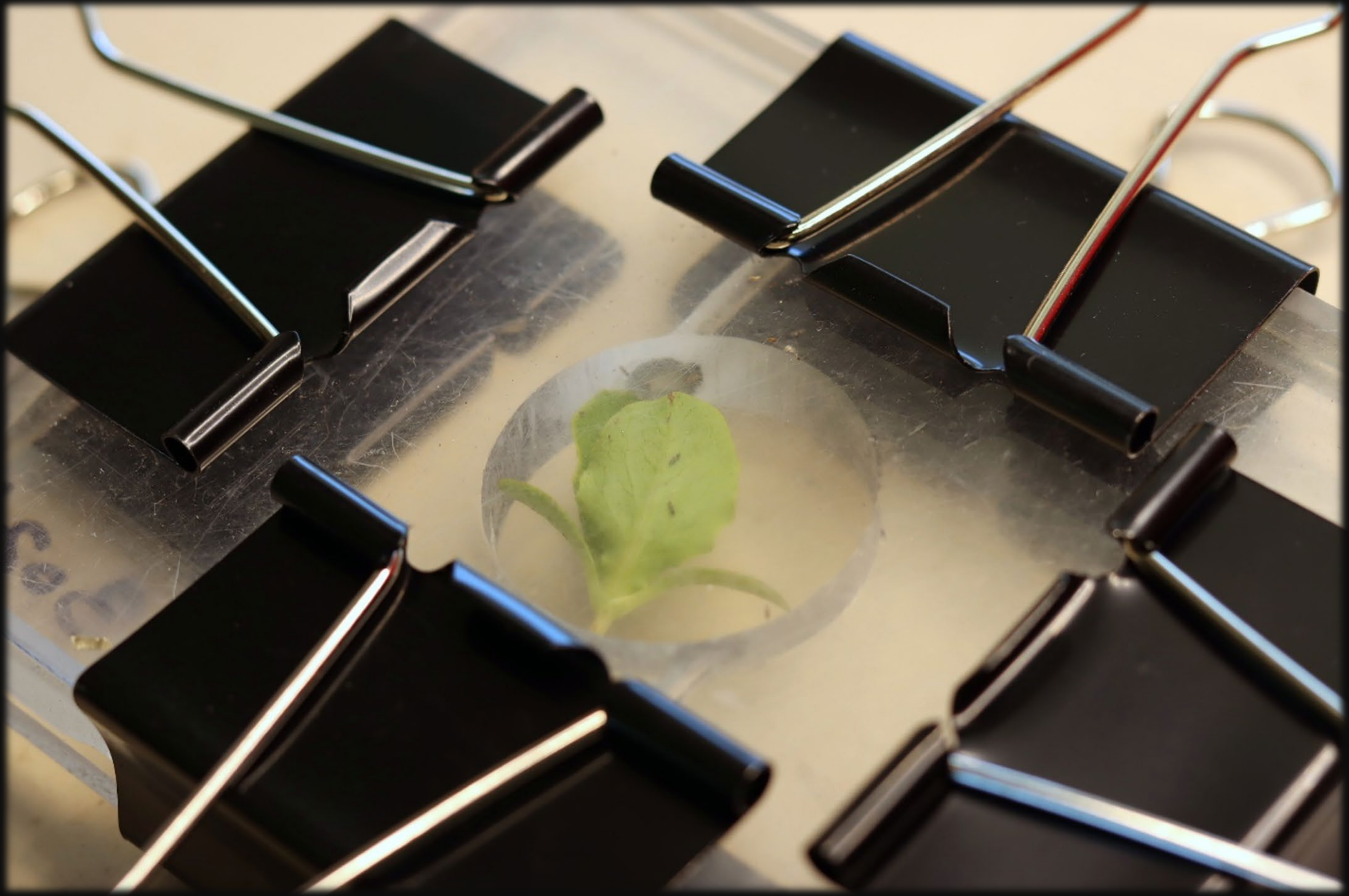


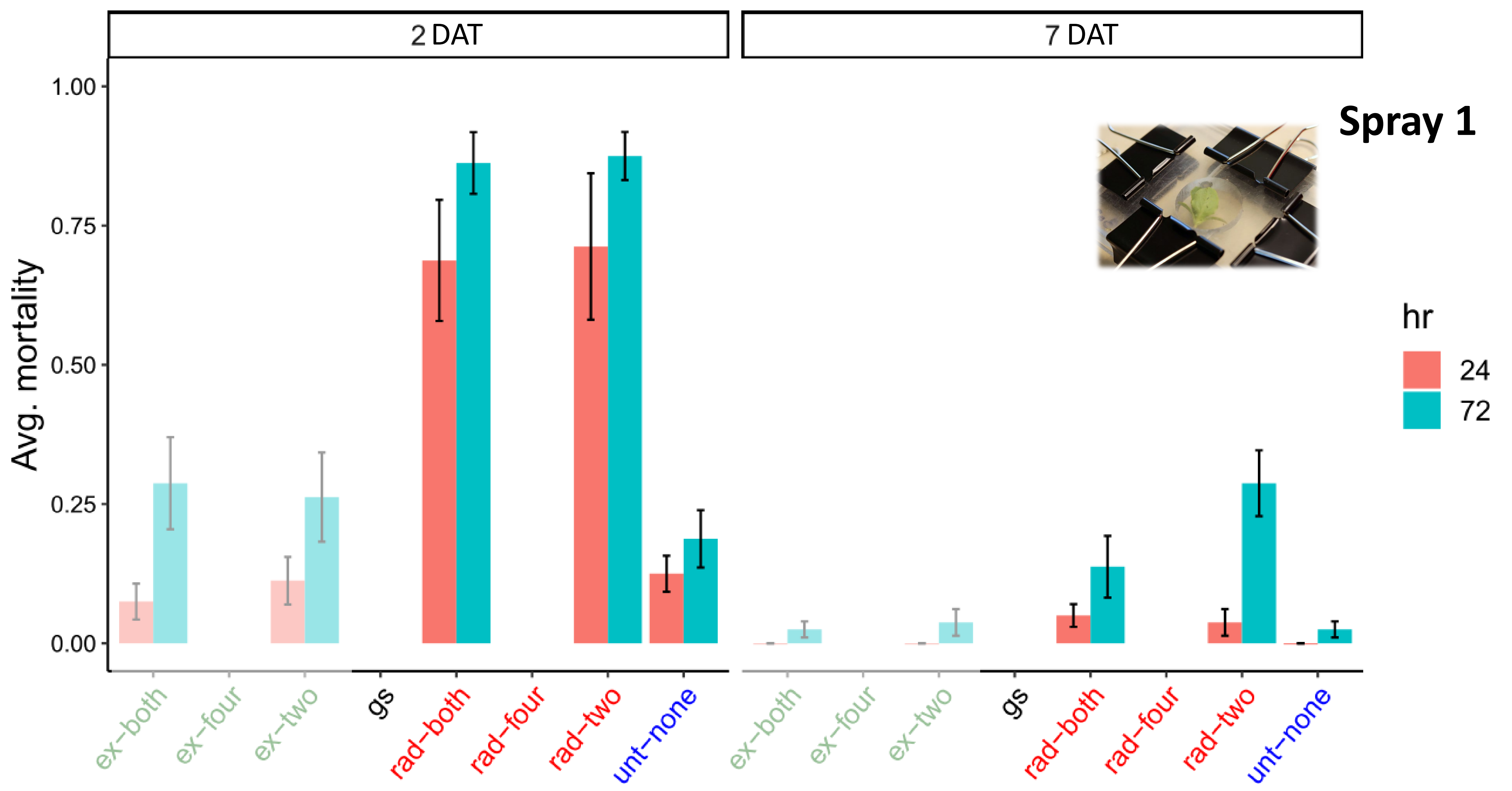
Scars – Sept. trial – no differences

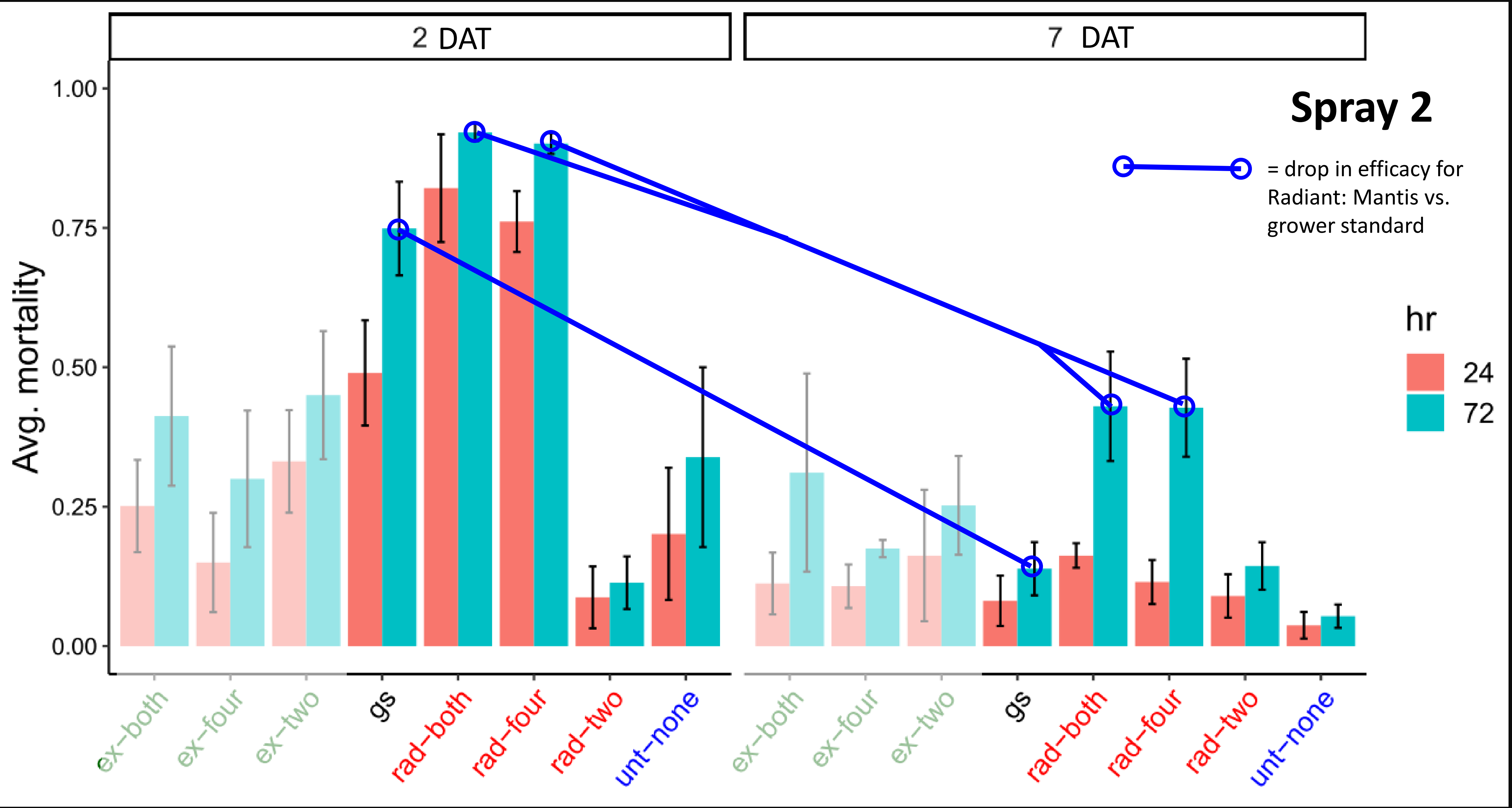


Trial 1+2 – additional bioassays for “residual efficacy”



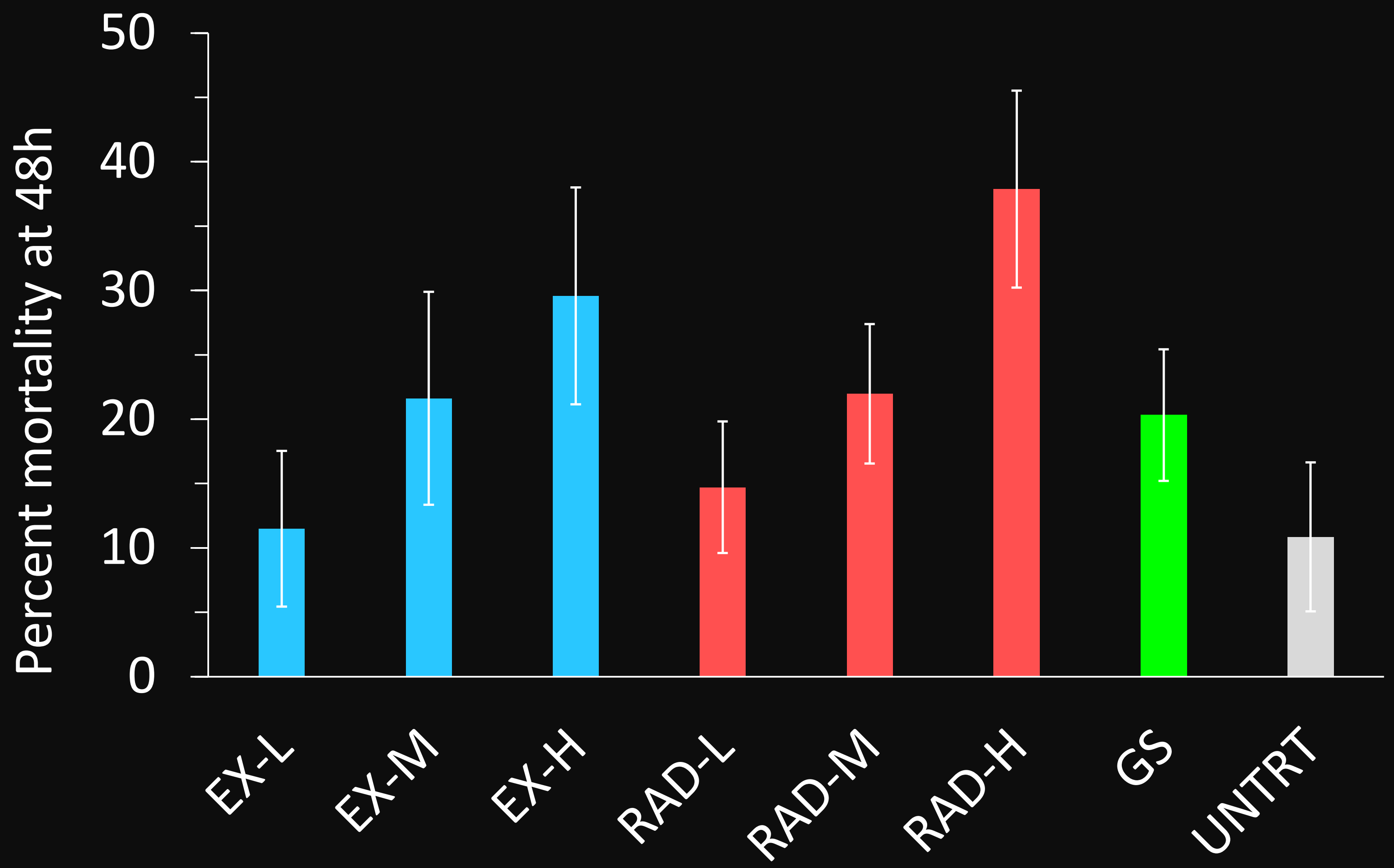



Spray 1
2 DAT
7 DAT
Avg. mortality
1.00
0.75
0.50
0.25
0.00
ex–both
ex–four
ex–two
gs
rad–both
rad–four
rad–two
unt–none
hr
24
72

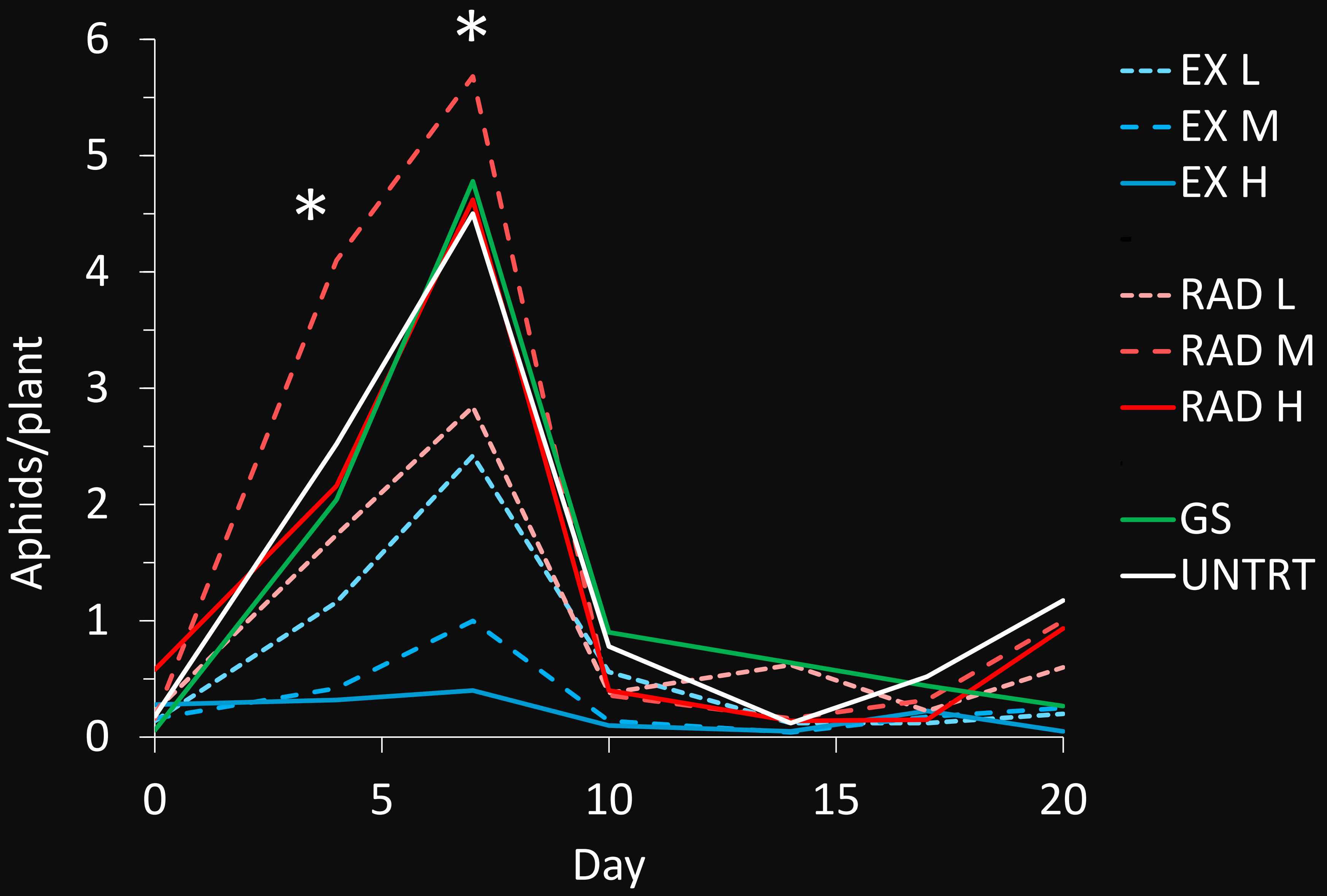


2 DAT
7 DAT
Spray 2
= drop in efficacy for Radiant: Mantis vs. grower standard
Avg. mortality
1.00
0.75
0.50
0.25
0.00
hr
24
72
ex–both
ex–four
ex–two
gs
rad–both
rad–four
rad–two
unt–none

Vial bioassay: 3 DAT (spray 2)



Aphids – Sept trial



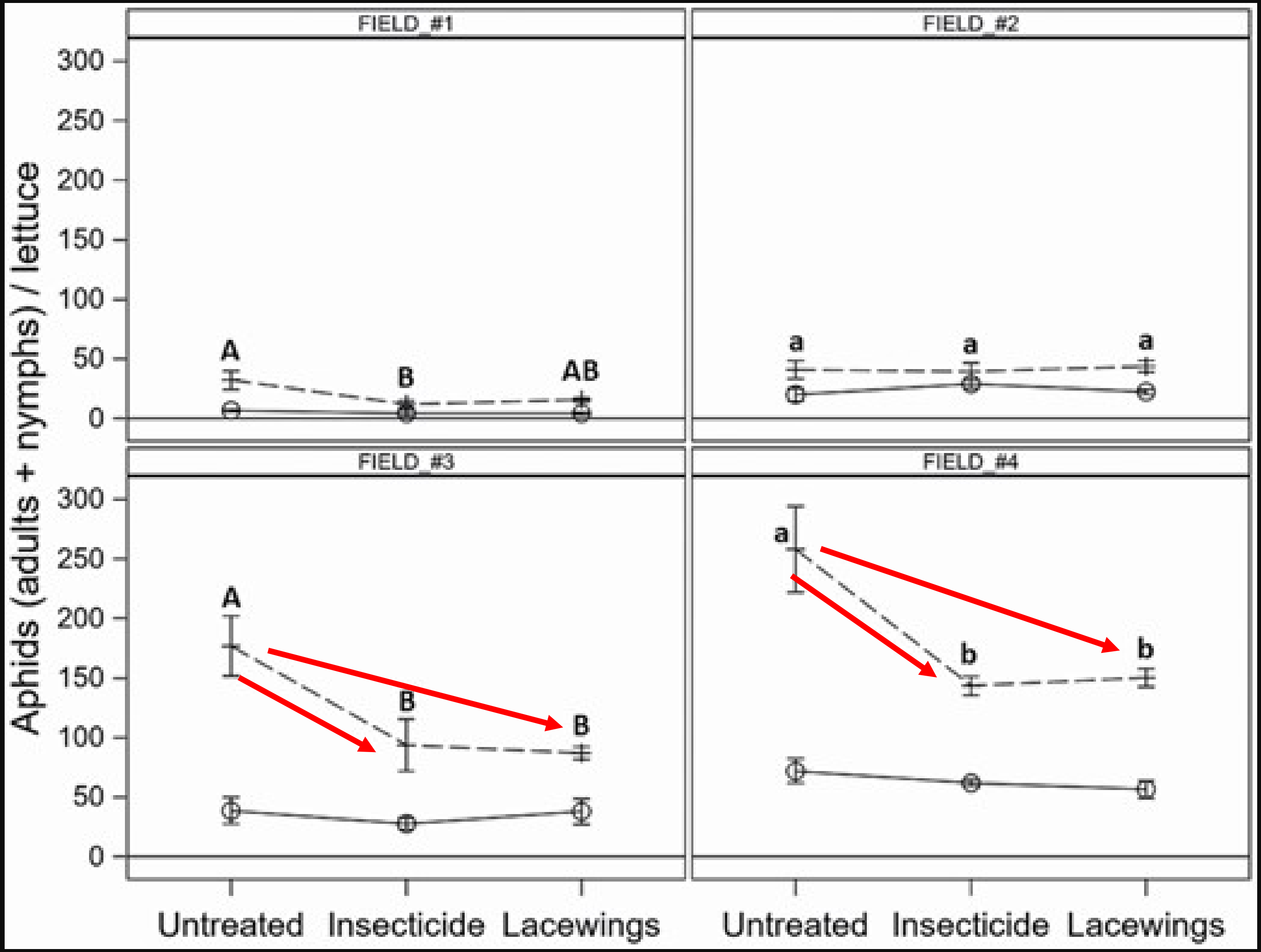
What have we learned about precision applications?

- Hold a lot of promise for reducing insecticide loads and/or improving efficacy
- Early-season thrips applications – challenge at least experimentally to show benefits
- Systemic insecticides → aphids?

Objective

Evaluate efficacy of drone-released natural enemies for management of aphids and thrips

Prior work

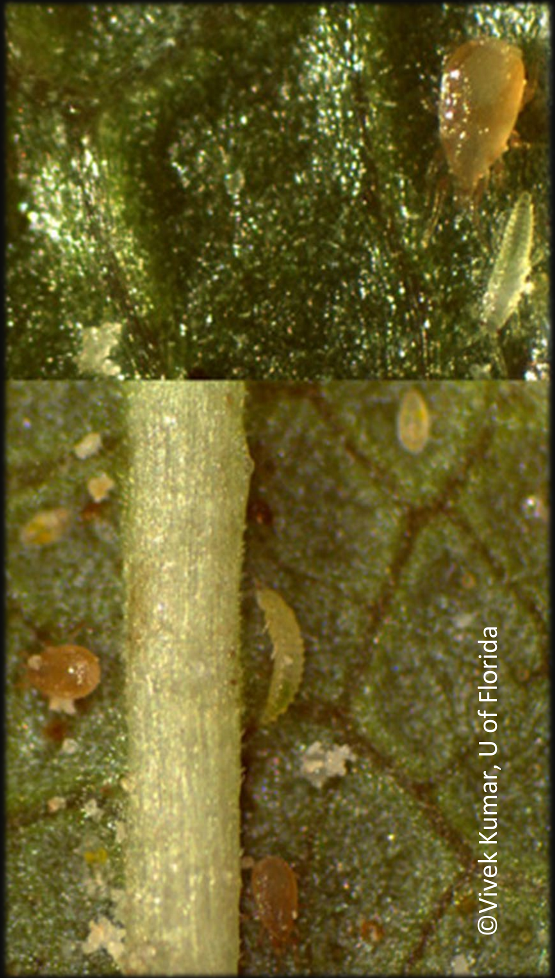


Del Pozo-Valdivia, Morgan, and Bennett, 2021

Aphids and thrips control

Green lacewings

Neoseiulus cucumeris



Acknowledgements

- Huntington Farms
- Braga Fresh
- Parabug
- USDA farm staff
- Jasmine Rodriguez
- Kevin Goding
- Grettenberger and Hasegawa lab personnel

- Department of Pesticide Regulation
- CA Leafy Greens Research Board

Questions?