Management of insect pests in lettuce and cole crops - research update

Ian Grettenberger, Cooperative Extension Specialist

UC Davis Dept. of Entomology & Nematology/
UC Cooperative Extension

Daniel Hasegawa, Eric Brennan, Danny Karp, Dylan Beal

Erika Bueno, Caroline Donohew, Anna DiPaola, Briley Mullin

Kuo et al. 2014

Thrips populations and thrips INSV infection in nurseries

Selma
Visalia
Tulare
Ridgecrest
Delano
Bakersfield
Los Angeles
Hanford
Lemoore
Corcoran
Lake Isabella
McFarland
Wasco
Parkfield
Shandon
Santa Monica
Long Beach
Creston
Idria
San Ardo
Panoche
Bitterwater
Lonoak
Pinnacles
National Park
Coburn
Elsa
Pine Canyon
Metz
Greenfield
Soledad
Fort Romie
Molus
Gonzales
Penvir
Chualar
Spence
Monterey Zoo
Spreckels

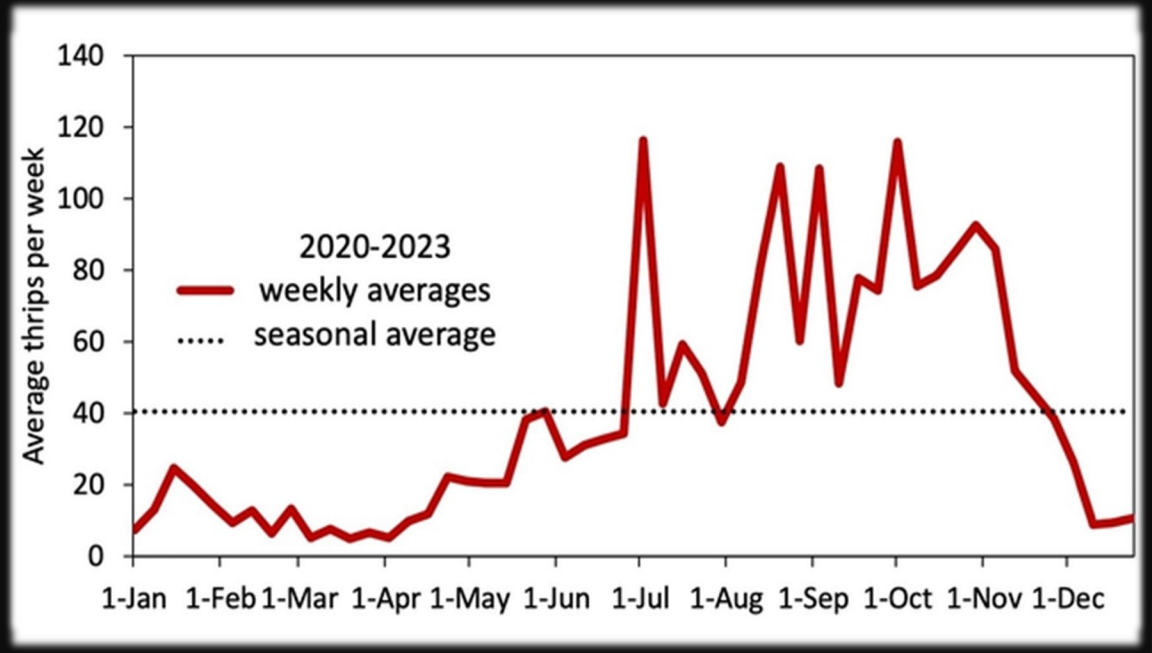
SALINAS VALLEY AGRICULTURE

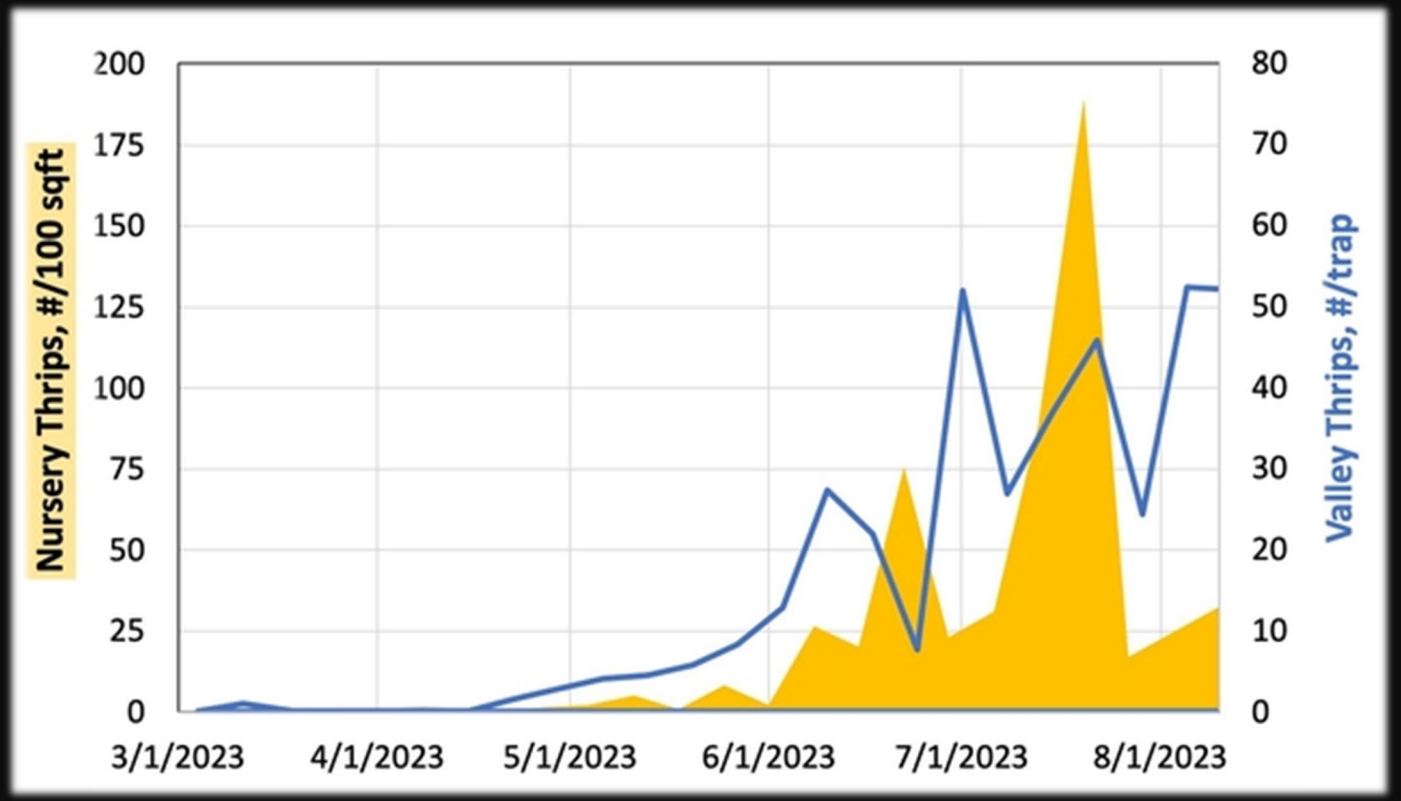
Highlighting agricultural developments, problems, research, & issues for central coast CA

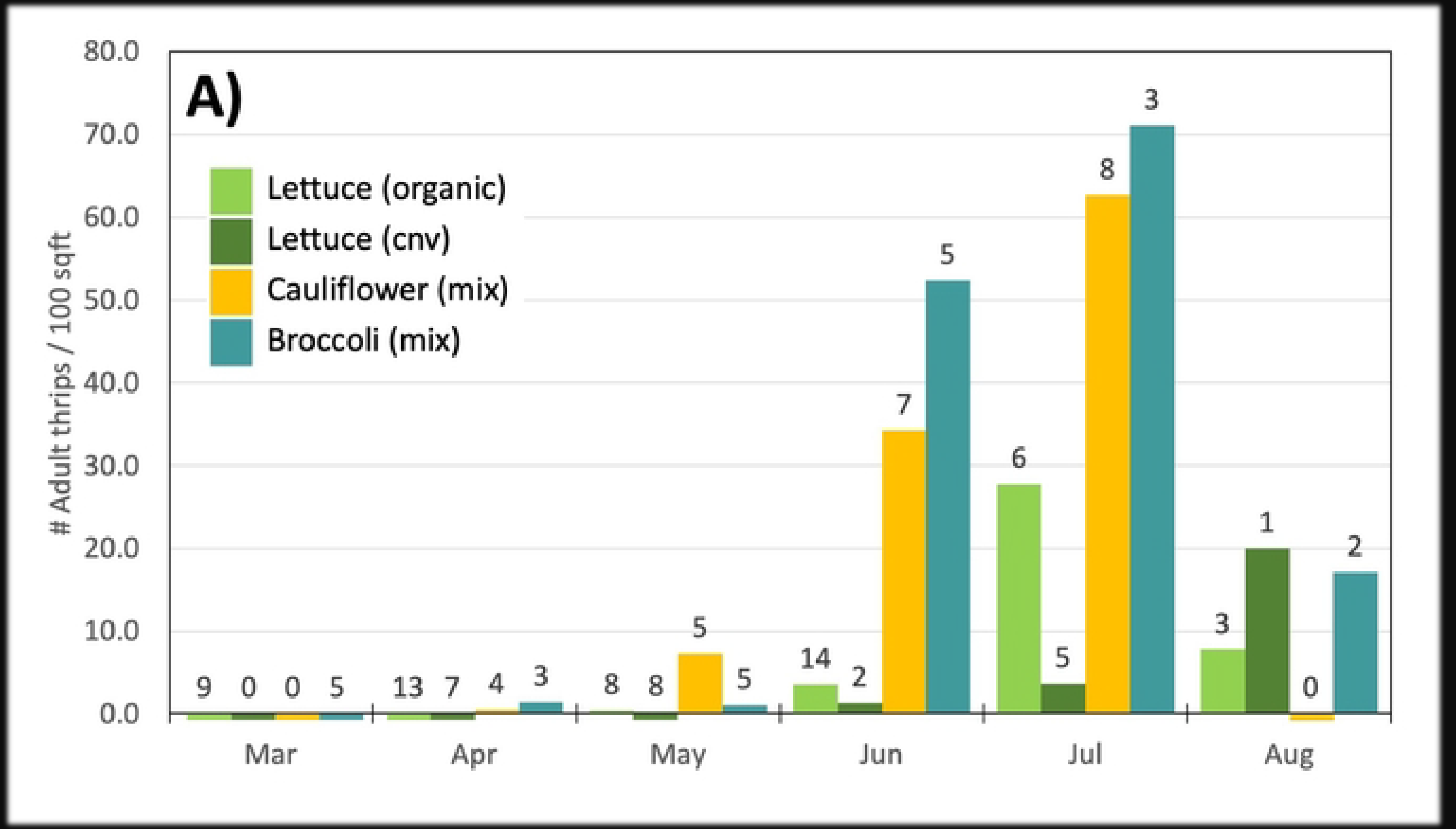
Research Update: Sampling for INSV+ thrips in vegetable transplants

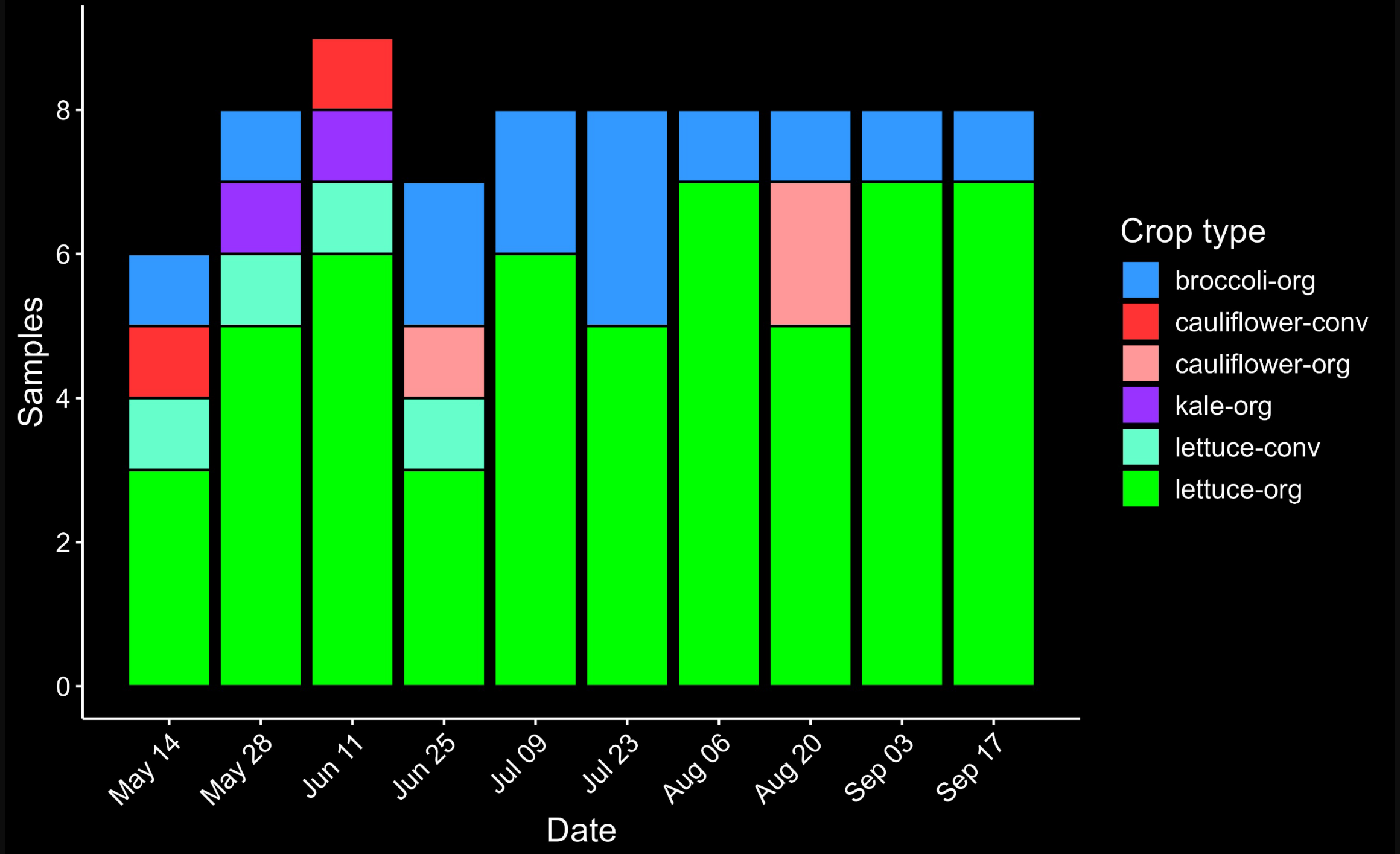
Author: Kirsten Ann Pearsons

Published on: October 10, 2023


Average thrips per week
140
120
100
80
60
40
20
0
2020-2023
weekly averages
seasonal average
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec


Nursery Thrips, #/100 sqft
200
175
150
125
100
75
50
25
0
Valley Thrips, #/trap
80
70
60
50
40
30
20
10
0
3/1/2023
4/1/2023
5/1/2023
6/1/2023
7/1/2023
8/1/2023


A)
Adult thrips / 100 sqft
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Lettuce (organic)
Lettuce (cnv)
Cauliflower (mix)
Broccoli (mix)
9 0 0 5
13 7 4 3
8 8 5 5
14 2 7 5
6 5 8 3
3 1 0 2
Mar
Apr
May
Jun
Jul
Aug


Samples
0
2
4
6
8
May 14
May 28
Jun 11
Jun 25
Jul 09
Jul 23
Aug 06
Aug 20
Sep 03
Sep 17
Date
Crop type
broccoli-org
cauliflower-conv
cauliflower-org
kale-org
lettuce-conv
lettuce-org

DEWALT
20V MAX
Ent Curation Tools

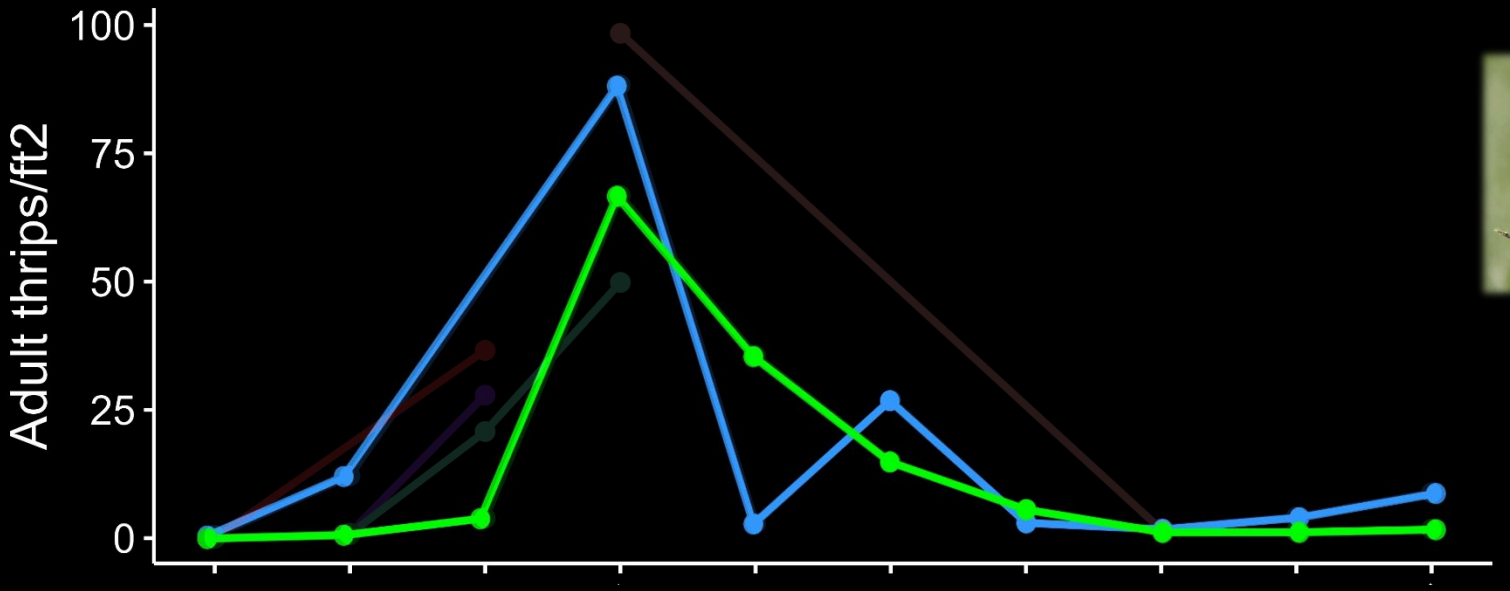
RYOBI

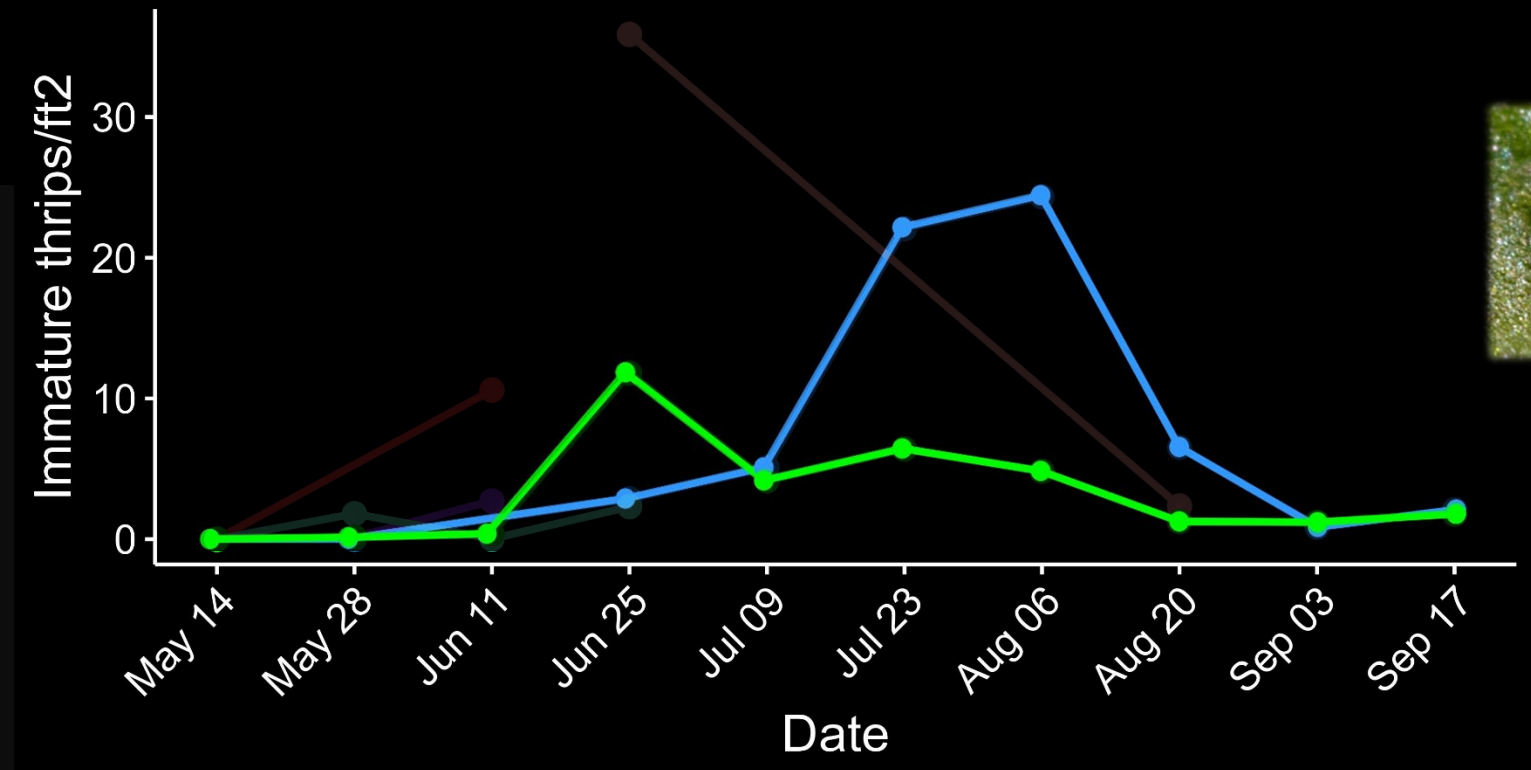
88,450

60,138

26,426

23,649





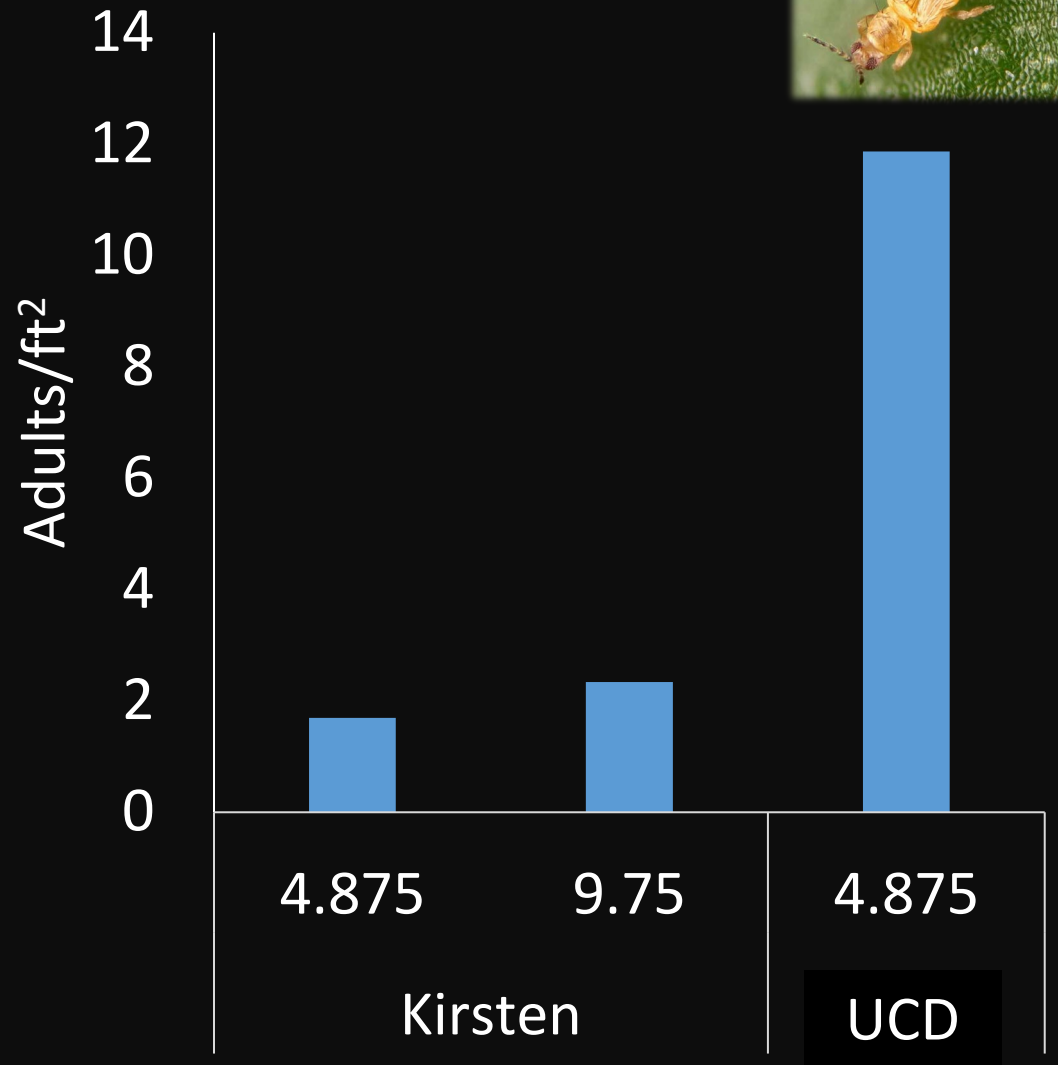
Crop type

broccoli-org

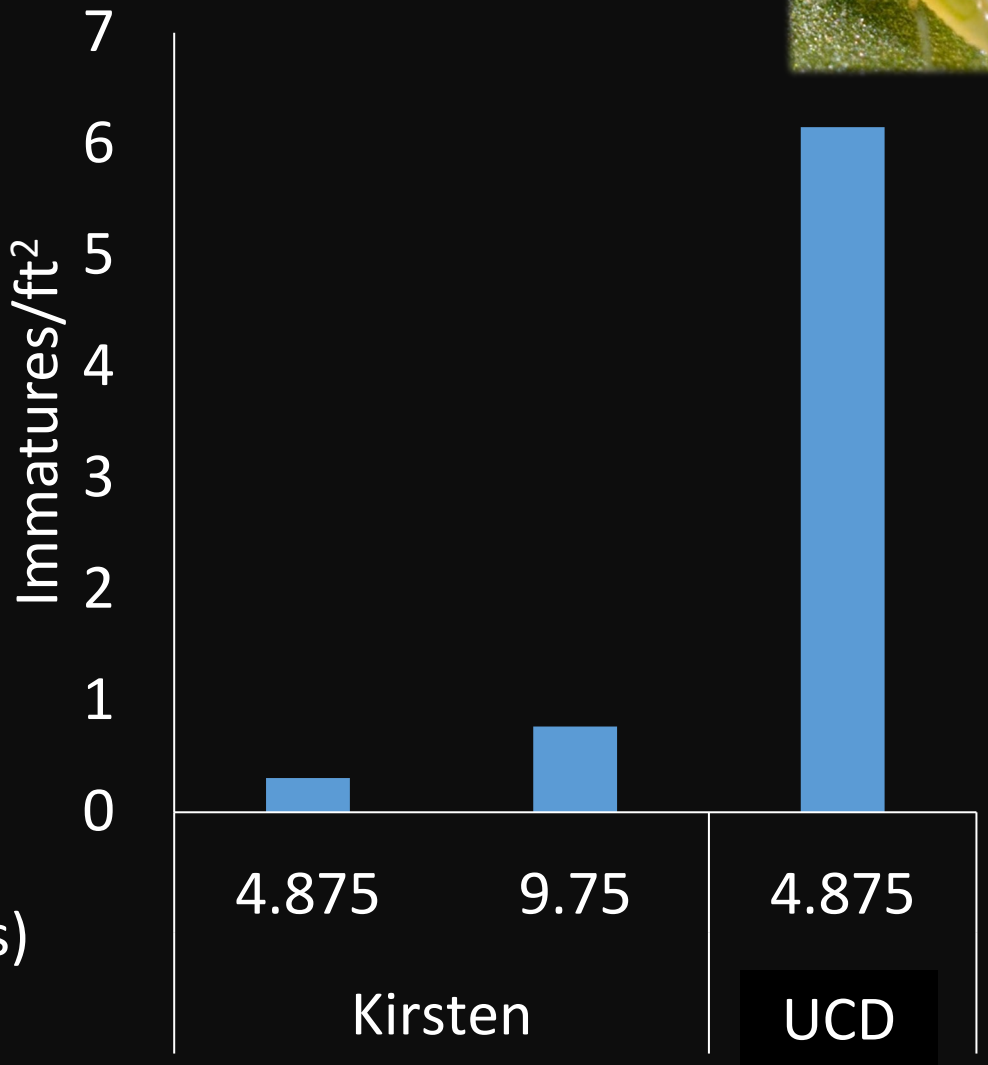
lettuce-org

DEWALT
20V MAX
Ent Curation Tools

RYOBI

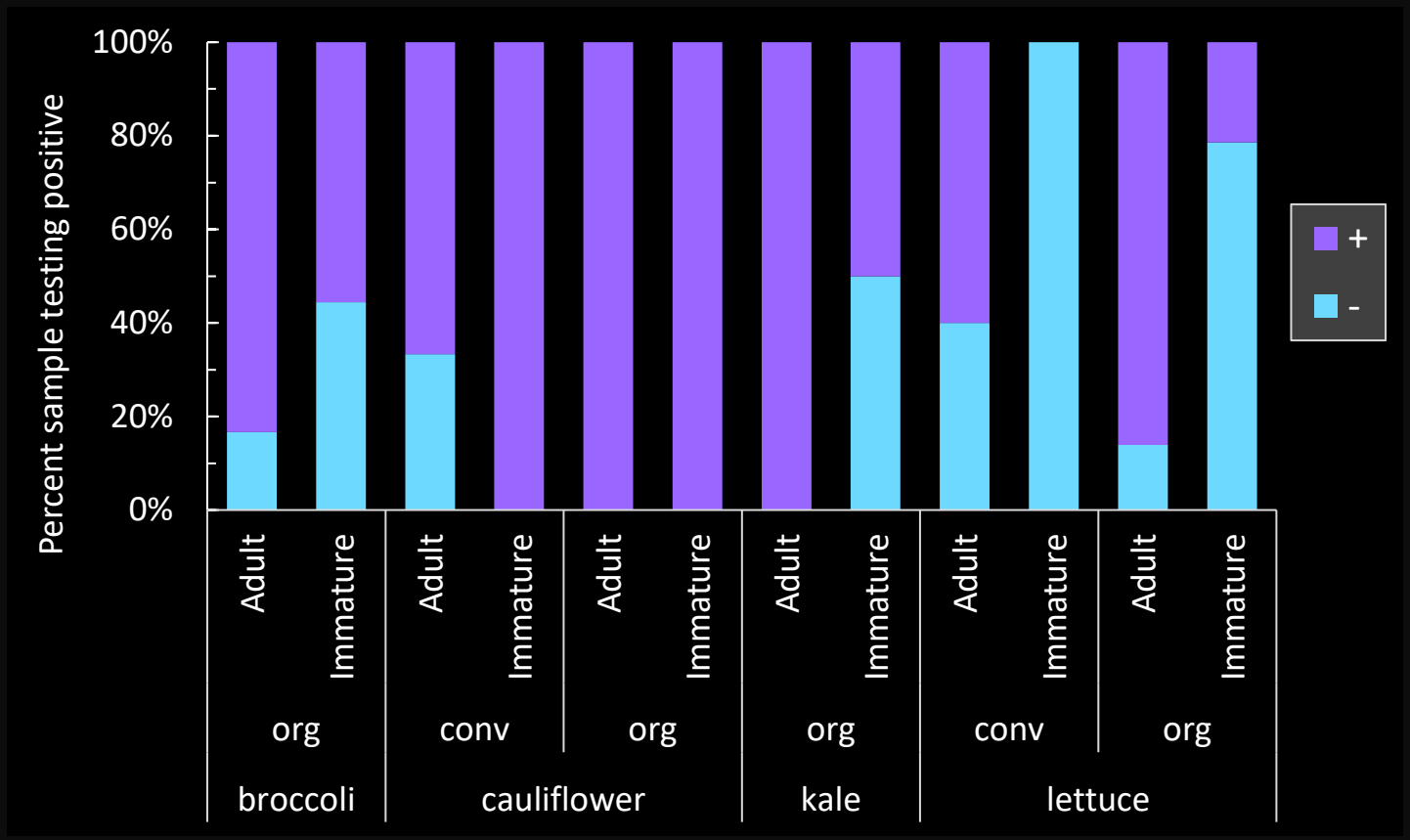

Adults/ft²
14
12
10
8
6
4
2
0
4.875
9.75
4.875
Kirsten
UCD

time (s)


Immatures/ft²
7
6
5
4
3
2
1
0
4.875
9.75
4.875
Kirsten
UCD

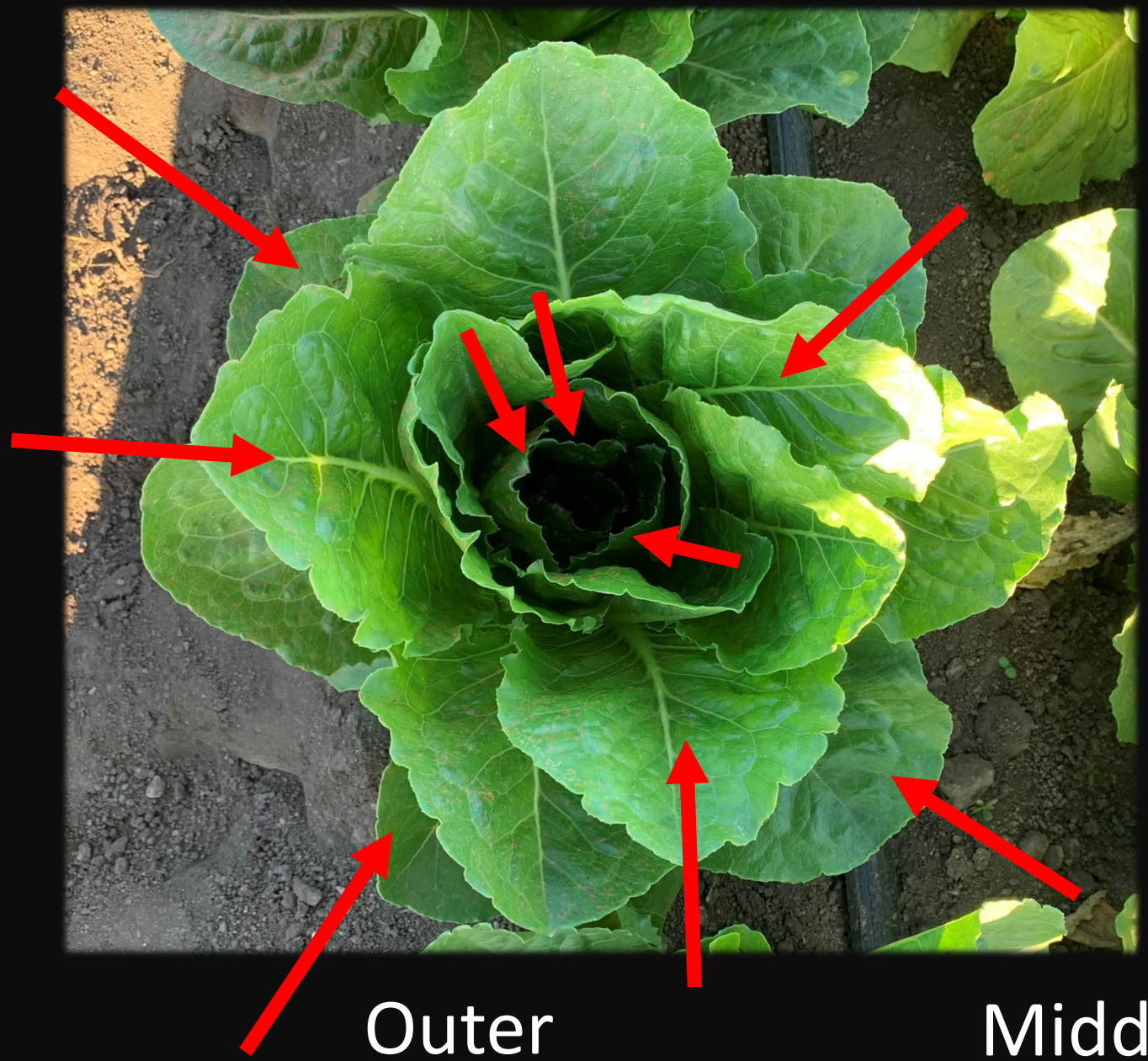
INSV/thrips species testing

- **Little INSV**
  - 5/122 samples – 4.1% - group testing
- Wester flower thrips in all samples
- Onion thrips present
- Negative on TSWV

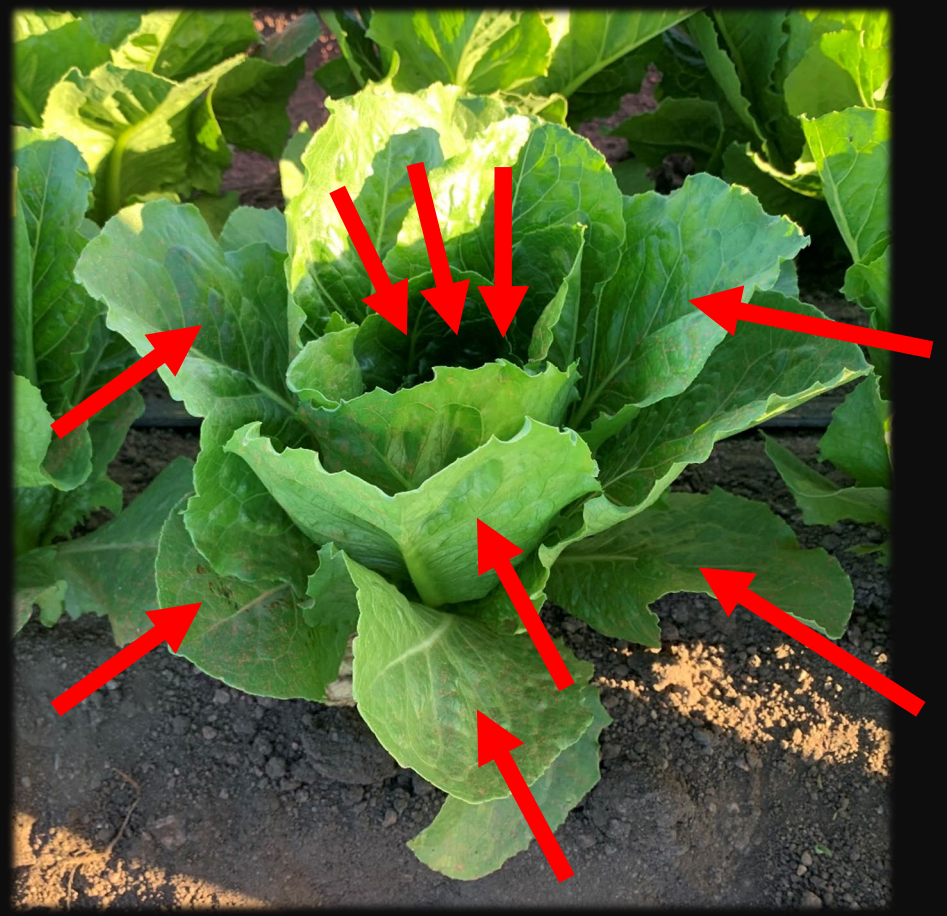


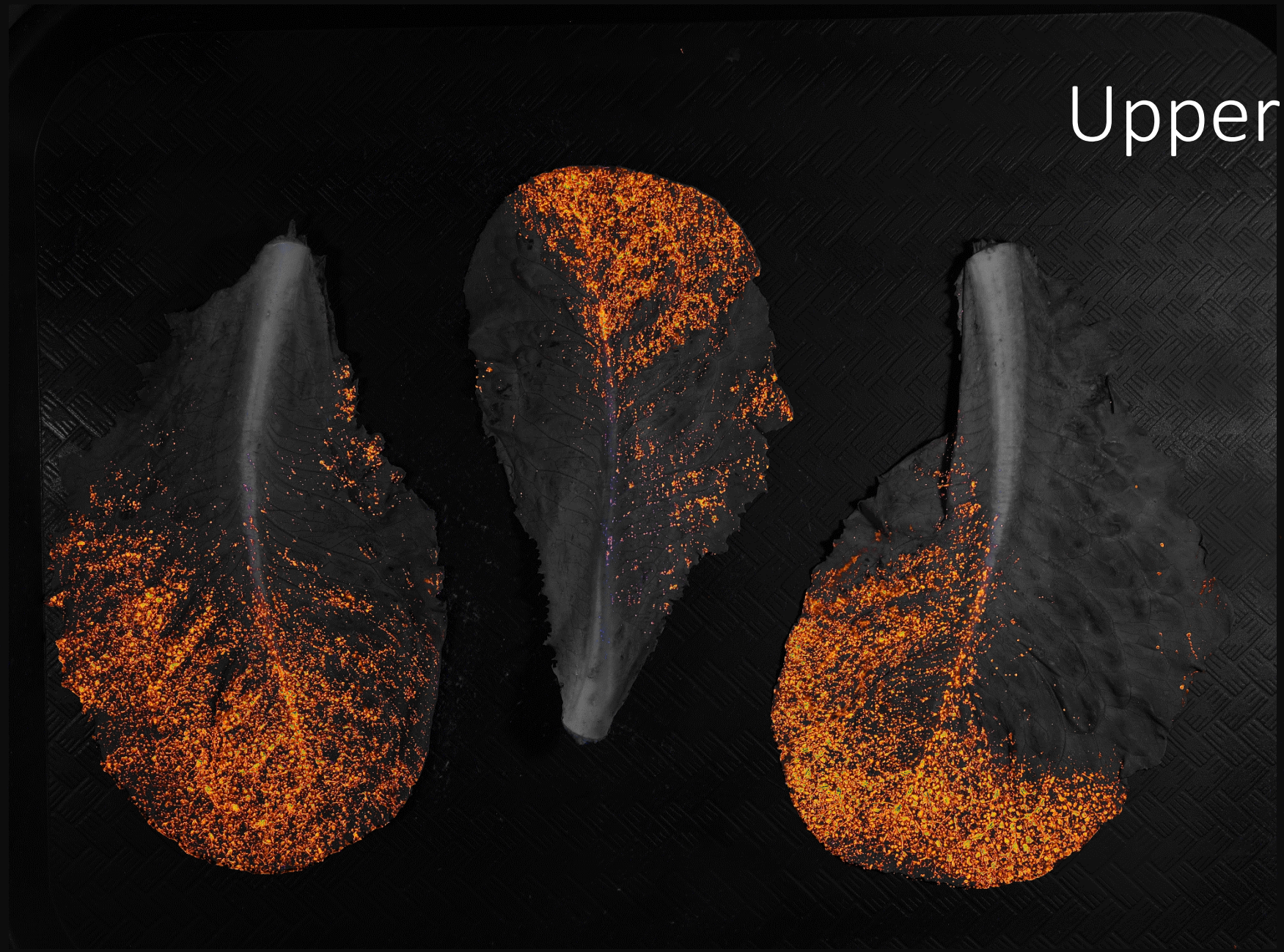
Coverage:
Adjuvant × Volume × Leaf location

- 3 Adjuvants
  - Embrece-EA (16 oz/100gal)
  - SYL-COAT (8 oz/100gal)
  - ~~Dyne-Amic (16 oz/100gal)~~
- 2 Volumes
  - 60 GPA
  - 90 GPA
- 2 time points



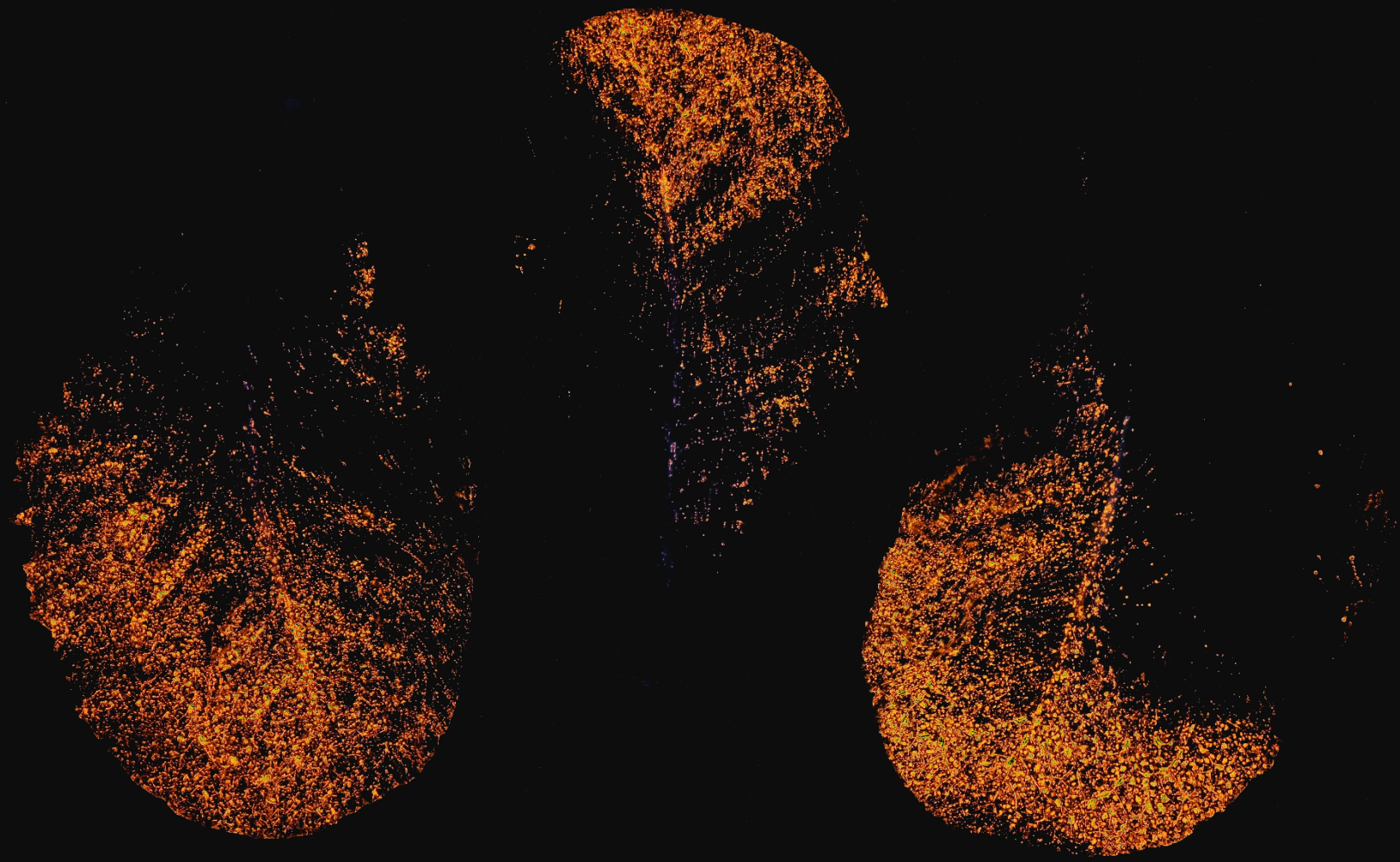
Inner



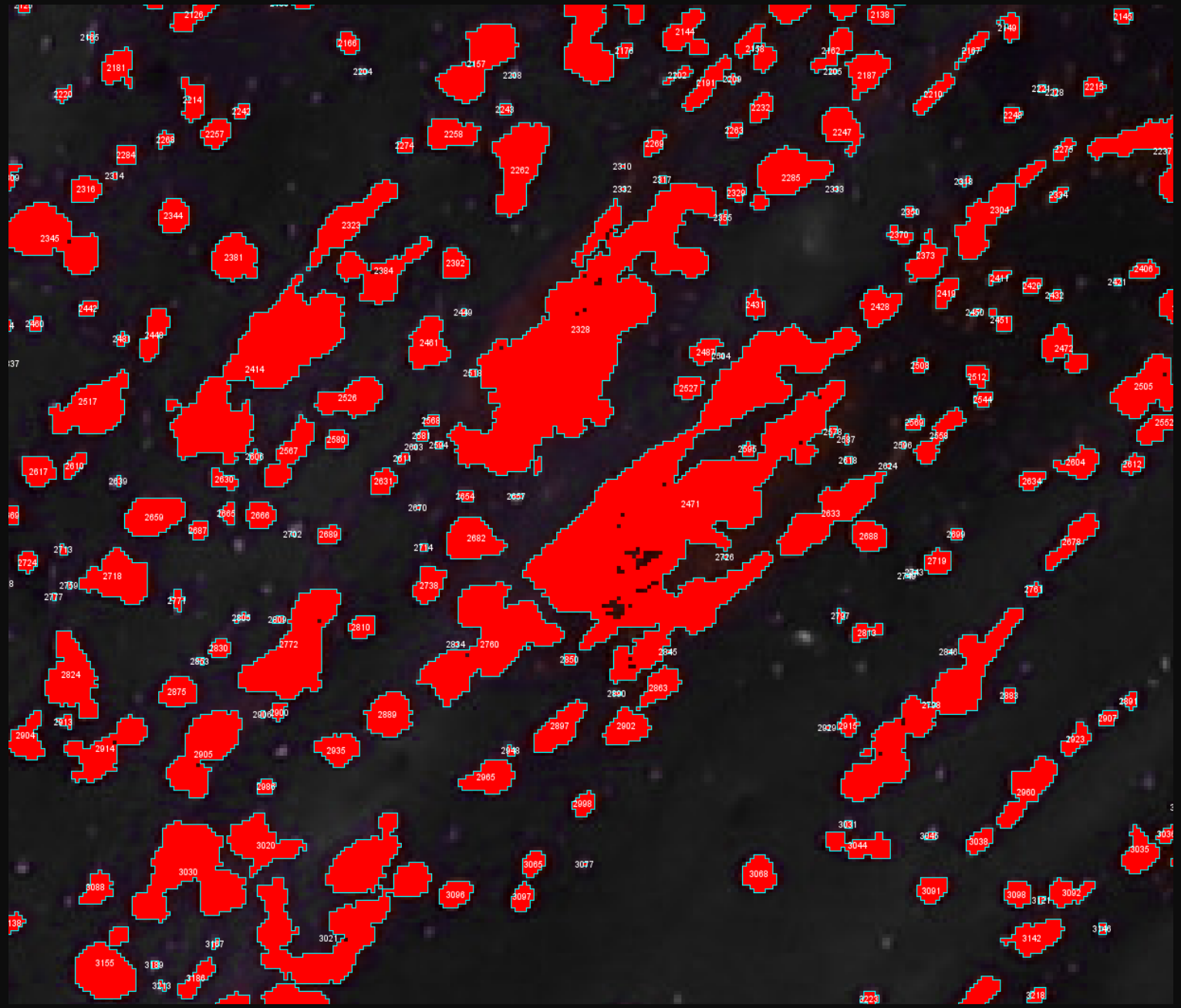


Outer
Upper surface

Outer
Upper surface



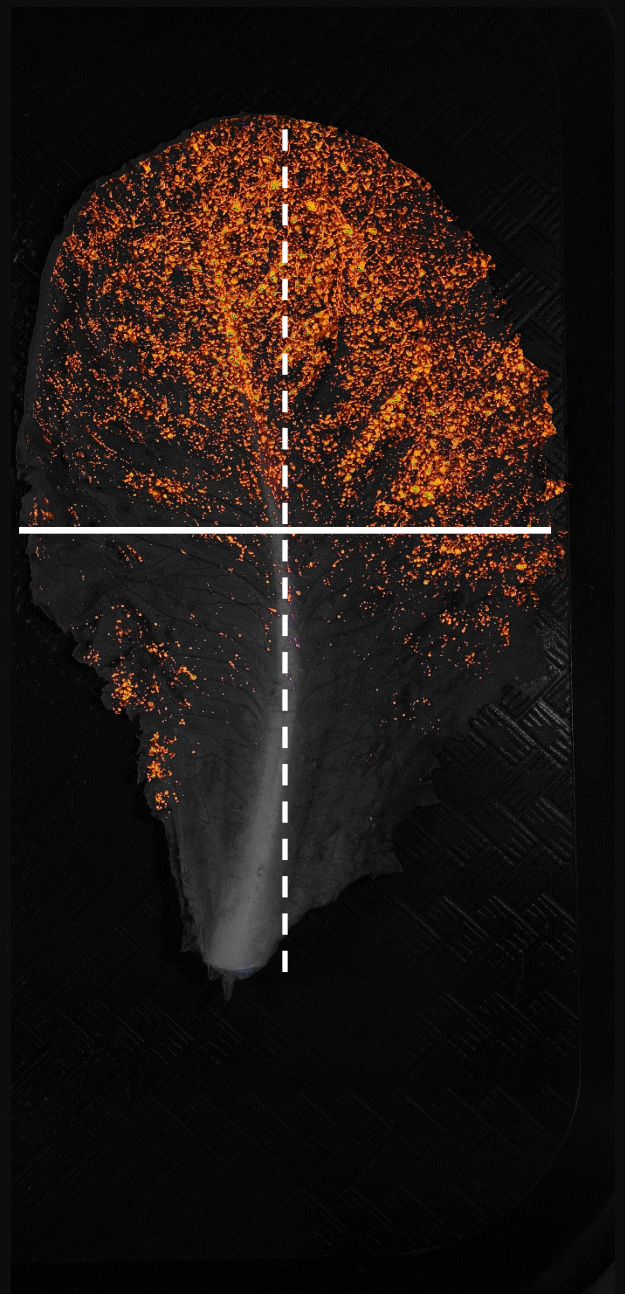
Outer
Lower surface



Outer
Upper

Top half

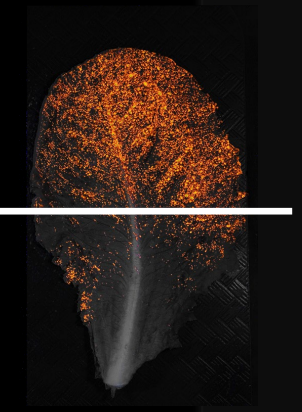
Bottom half



FULL

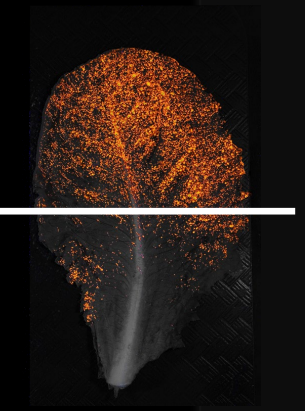
Embrece-EA 60GPA
Embrece-EA 90GPA
SYL-COAT 60GPA
SYL-COAT 90GPA
Percent coverage
0
5
10
15
Outer
Middle
Inner
Surface
Upper surface
Lower surface

HALF



Embrece-EA 60GPA
Embrece-EA 90GPA
SYL-COAT 60GPA
SYL-COAT 90GPA
Upper surface
Percent coverage
30
20
10
0
Outer
Middle
Inner
Half
Top half
Bottom half

HALF



Embrece-EA 60GPA | Embrece-EA 90GPA | SYL-COAT 60GPA | SYL-COAT 90GPA

Lower surface

Percent coverage

30
20
10
0

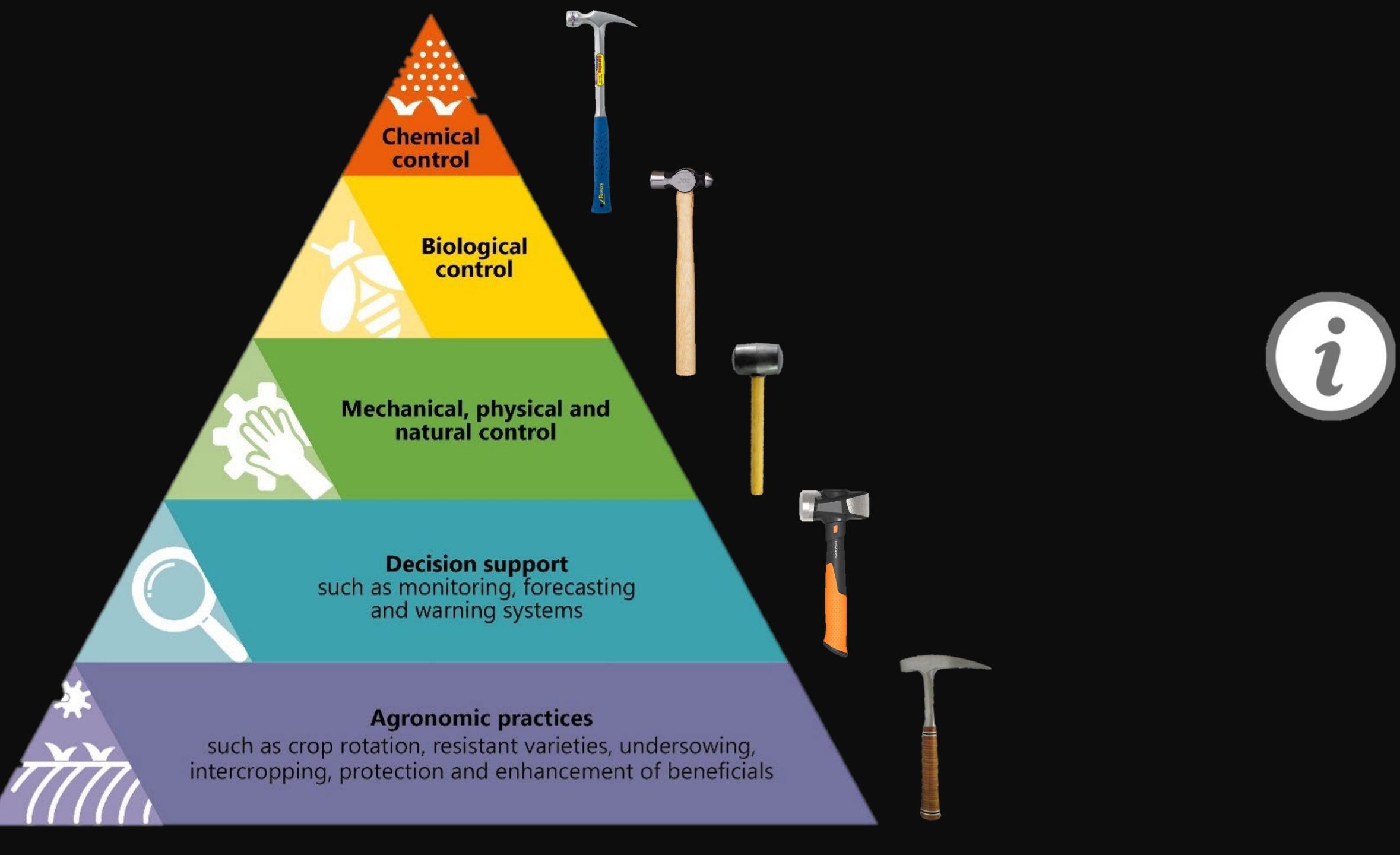
Outer Middle Inner | Outer Middle Inner | Outer Middle Inner | Outer Middle Inner

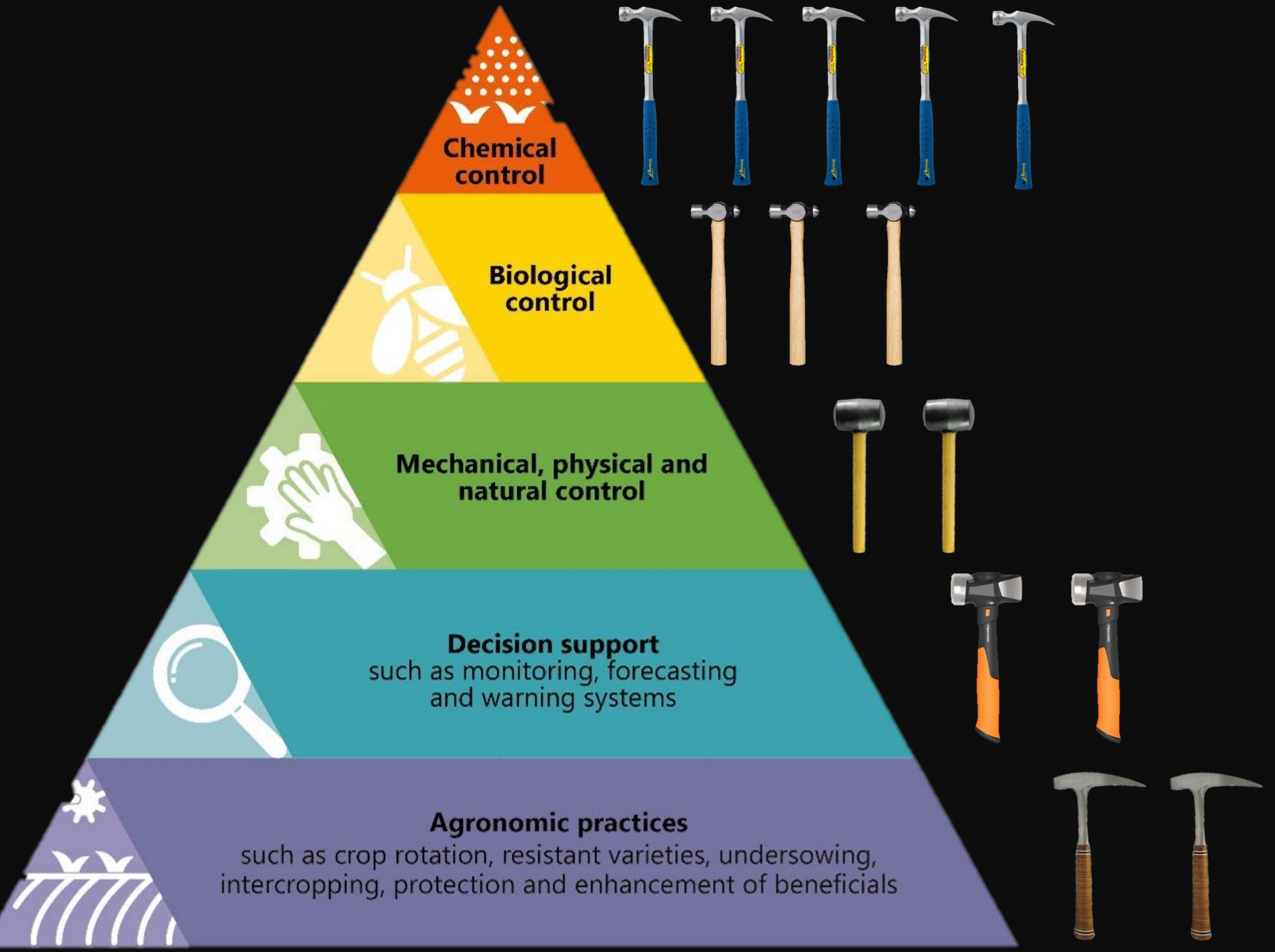
Half
Top half
Bottom half

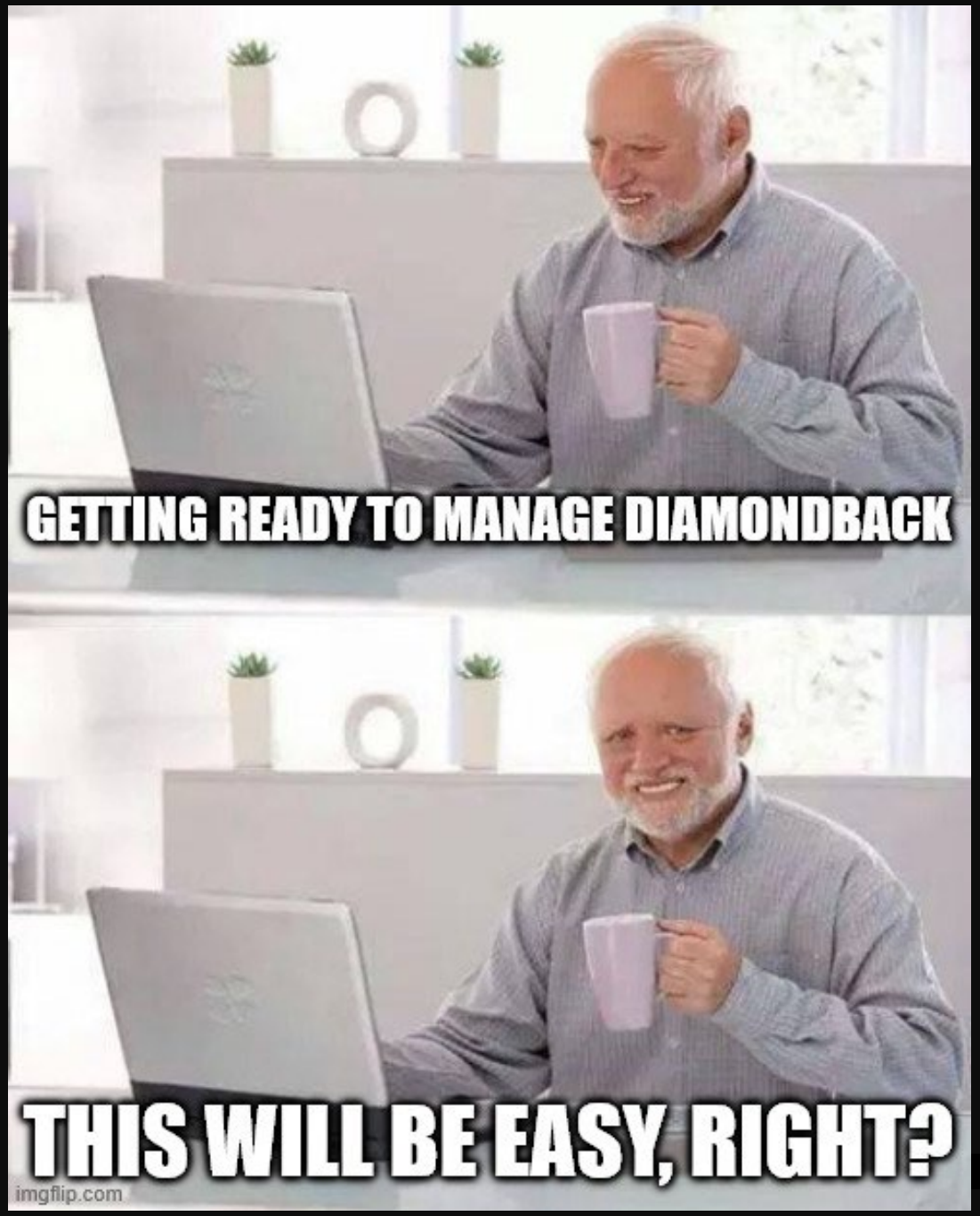
Habitat and Biocontrol (CDFA)

PIs:
Daniel Hasegawa, Eric Brennan, Ian Grettenberger, Danny Karp

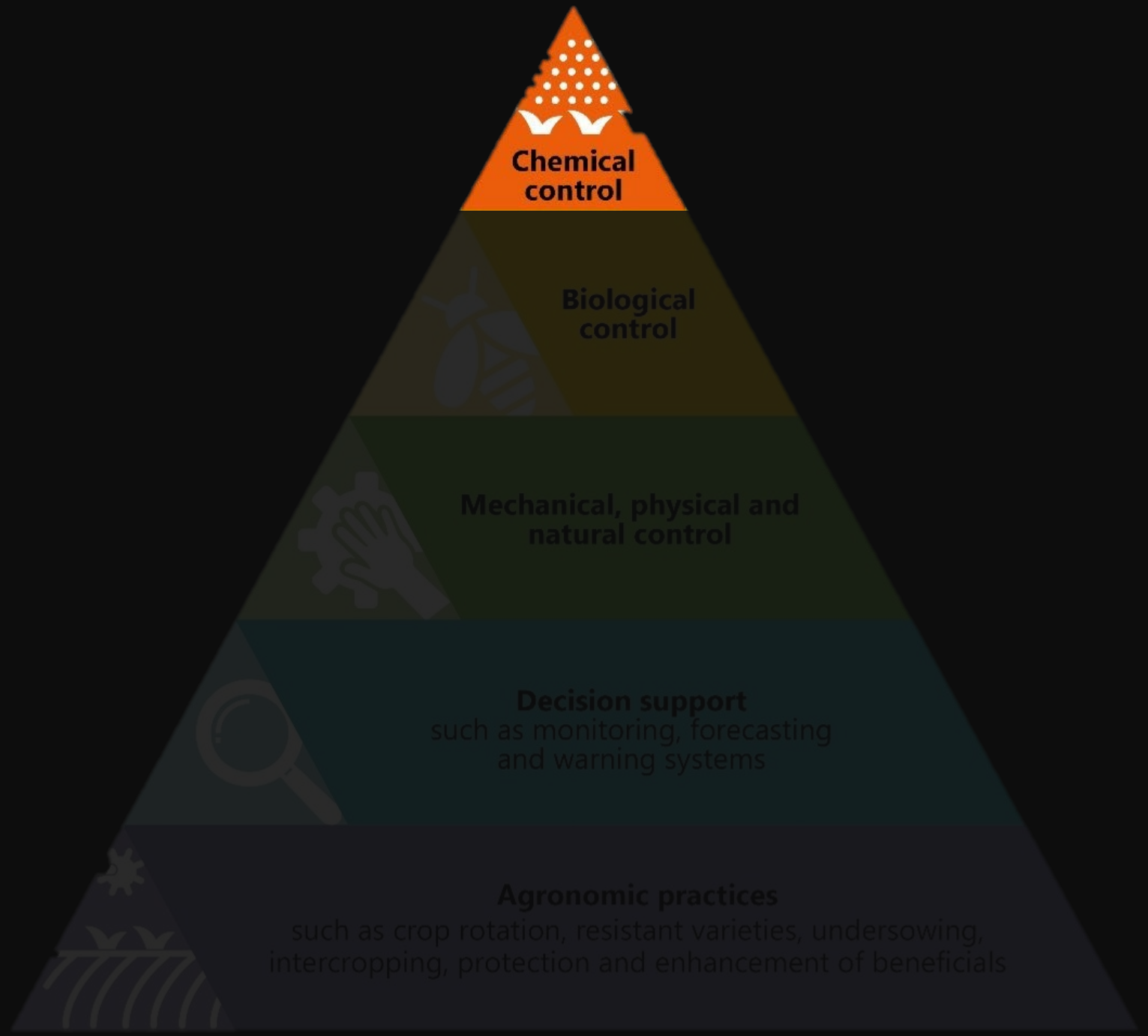
Key personnel:
- Anna DiPaola (Postdoctoral researcher)
- Briley Mullin (PhD student)
- Jasmin Azad-Khan (Asst. Specialist)

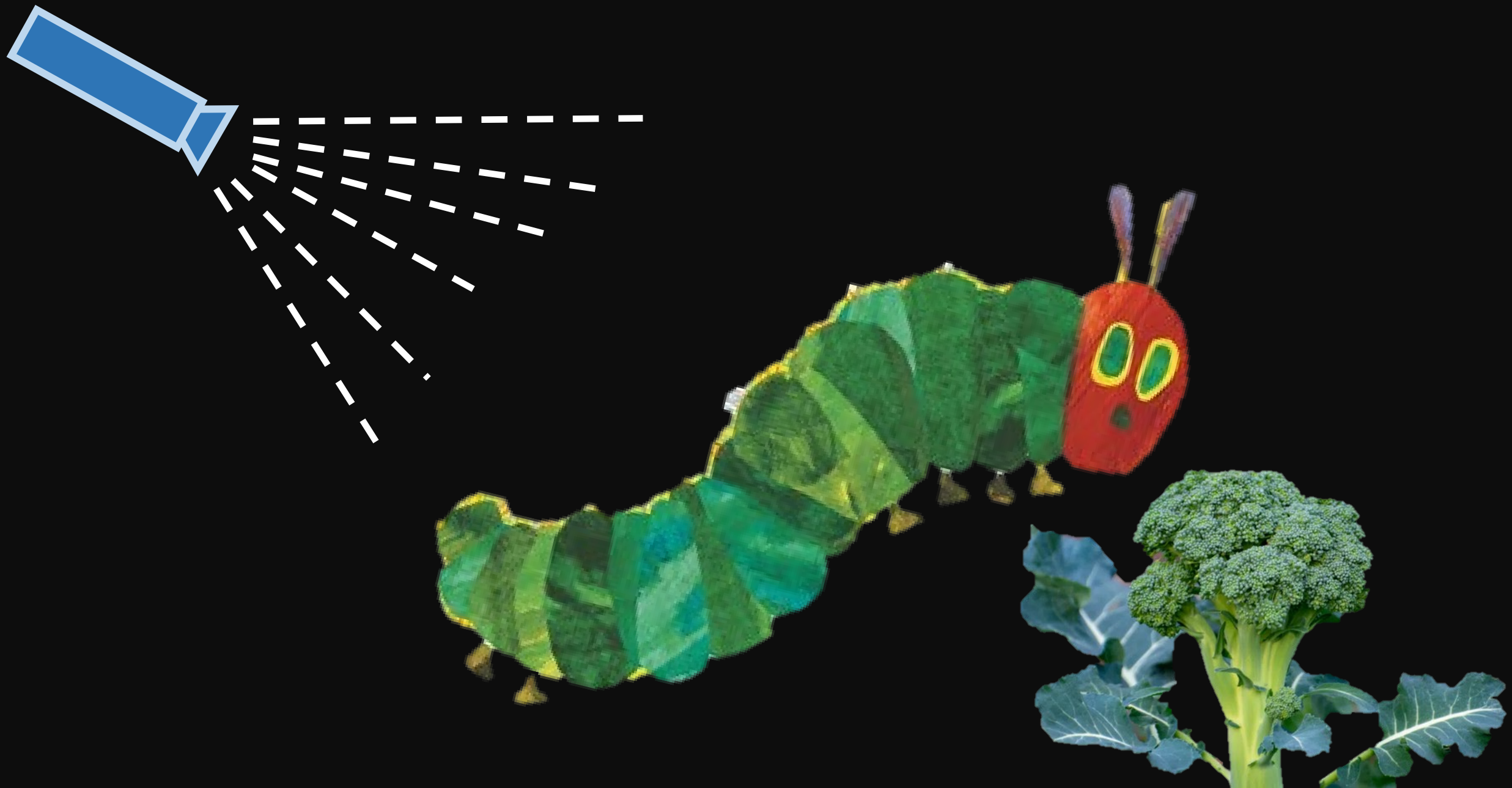

Chemical control
Biological control
Mechanical, physical and natural control
Decision support
such as monitoring, forecasting and warning systems
Agronomic practices
such as crop rotation, resistant varieties, undersowing, intercropping, protection and enhancement of beneficials


Chemical control
Biological control
Mechanical, physical and natural control
Decision support
such as monitoring, forecasting and warning systems
Agronomic practices
such as crop rotation, resistant varieties, undersowing, intercropping, protection and enhancement of beneficials


GETTING READY TO MANAGE DIAMONDBACK
THIS WILL BE EASY, RIGHT?
imgflip.com

Insecticide resistance

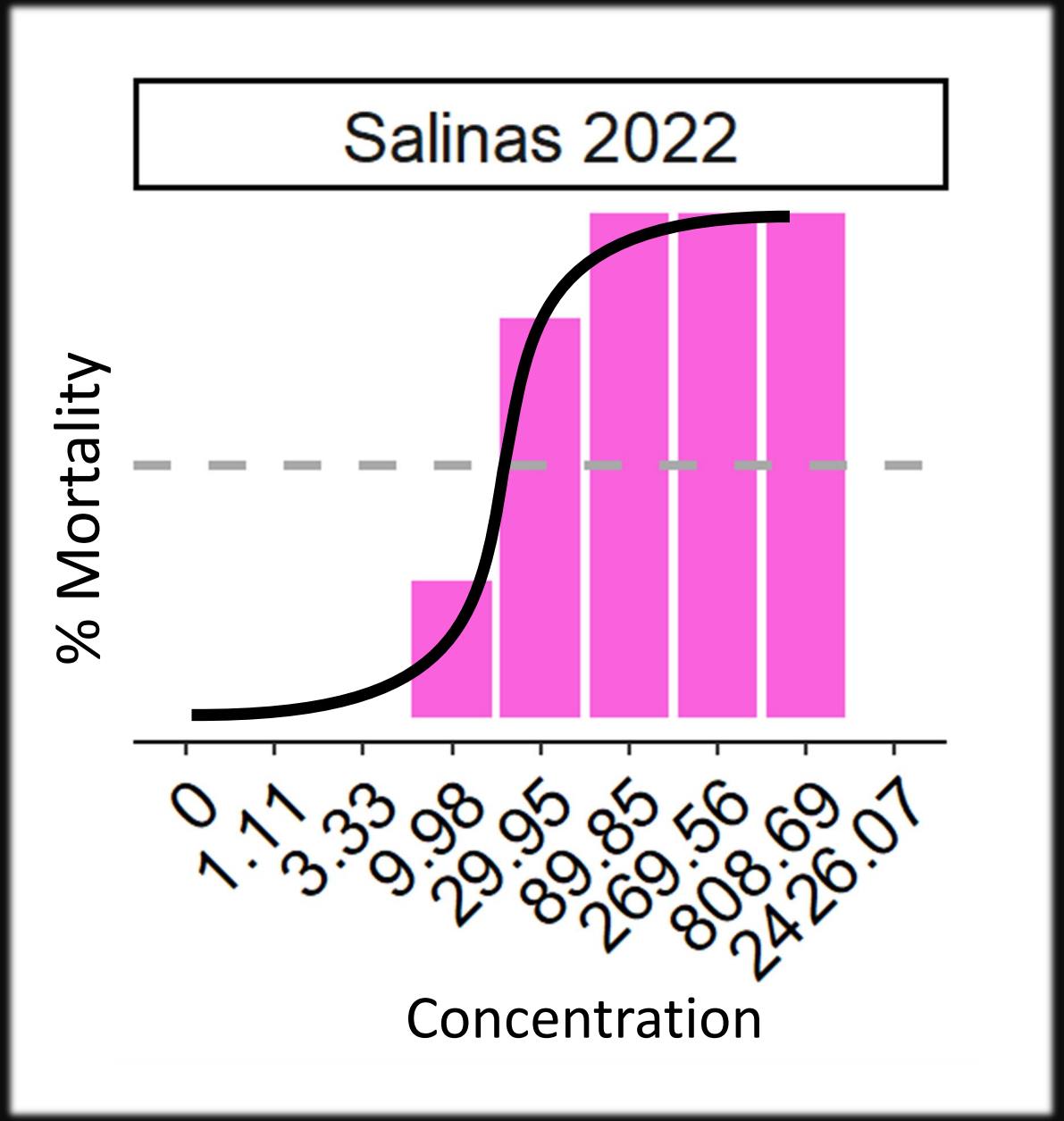

Chemical control
Biological control
Mechanical, physical and natural control
Decision support
such as monitoring, forecasting and warning systems
Agronomic practices
such as crop rotation, resistant varieties, undersowing, intercropping, protection and enhancement of beneficials

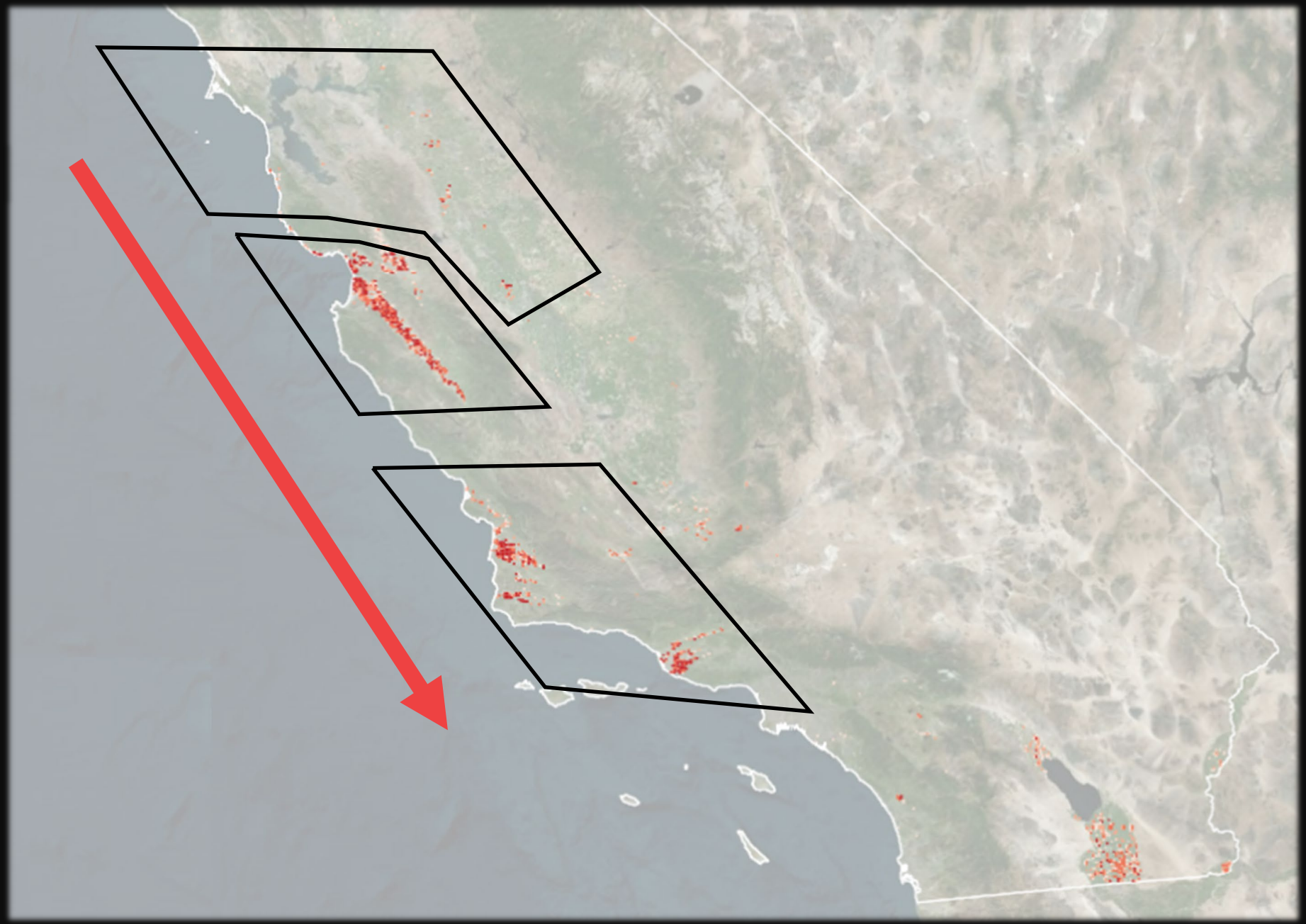


Problem: Insecticide-resistant diamondback moths

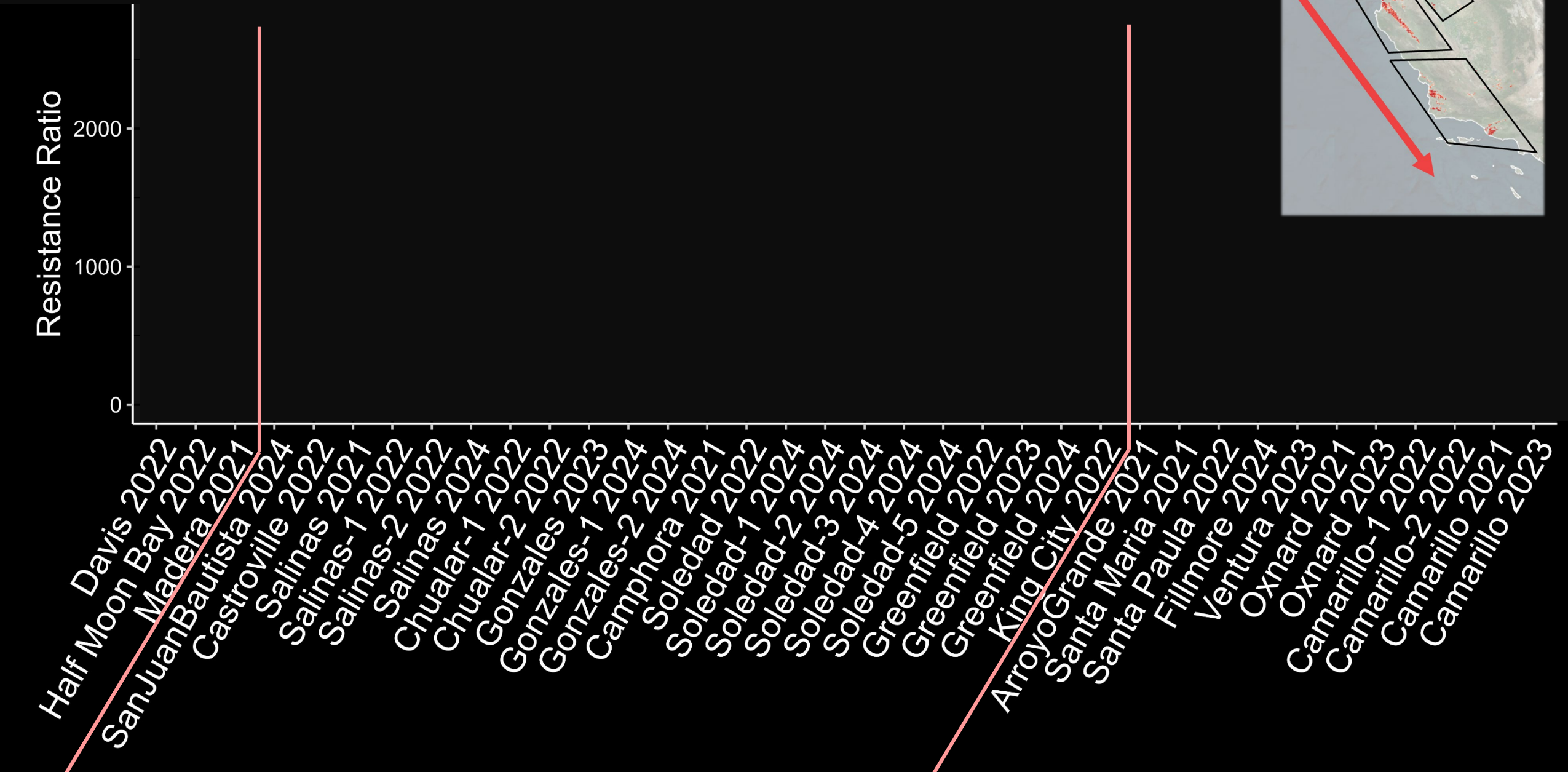
Resistance monitoring

Resistance monitoring – leaf dip assay

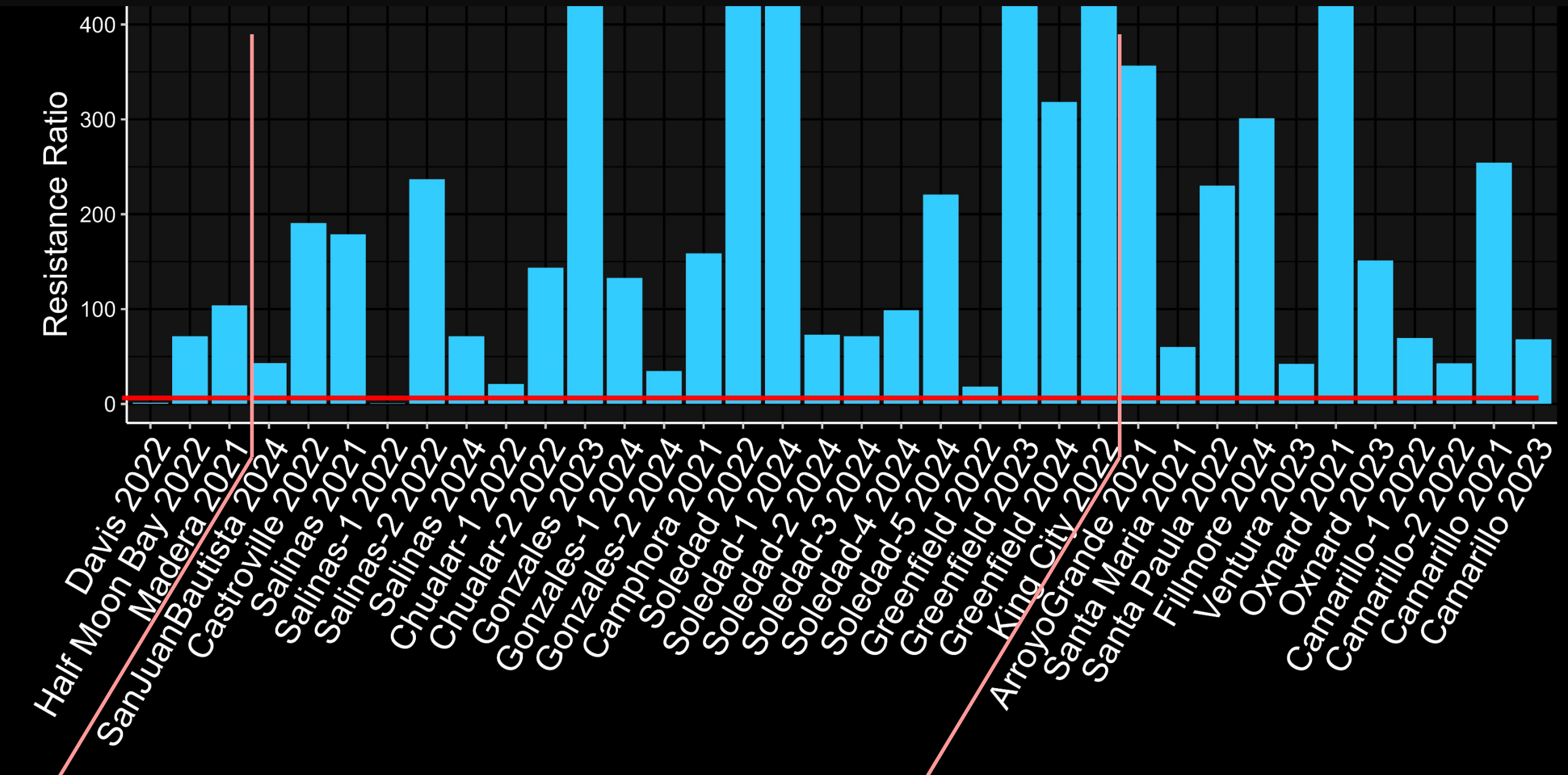

Salinas 2022
% Mortality
0
1.11
3.33
9.98
29.95
89.85
269.56
808.69
2426.07
Concentration



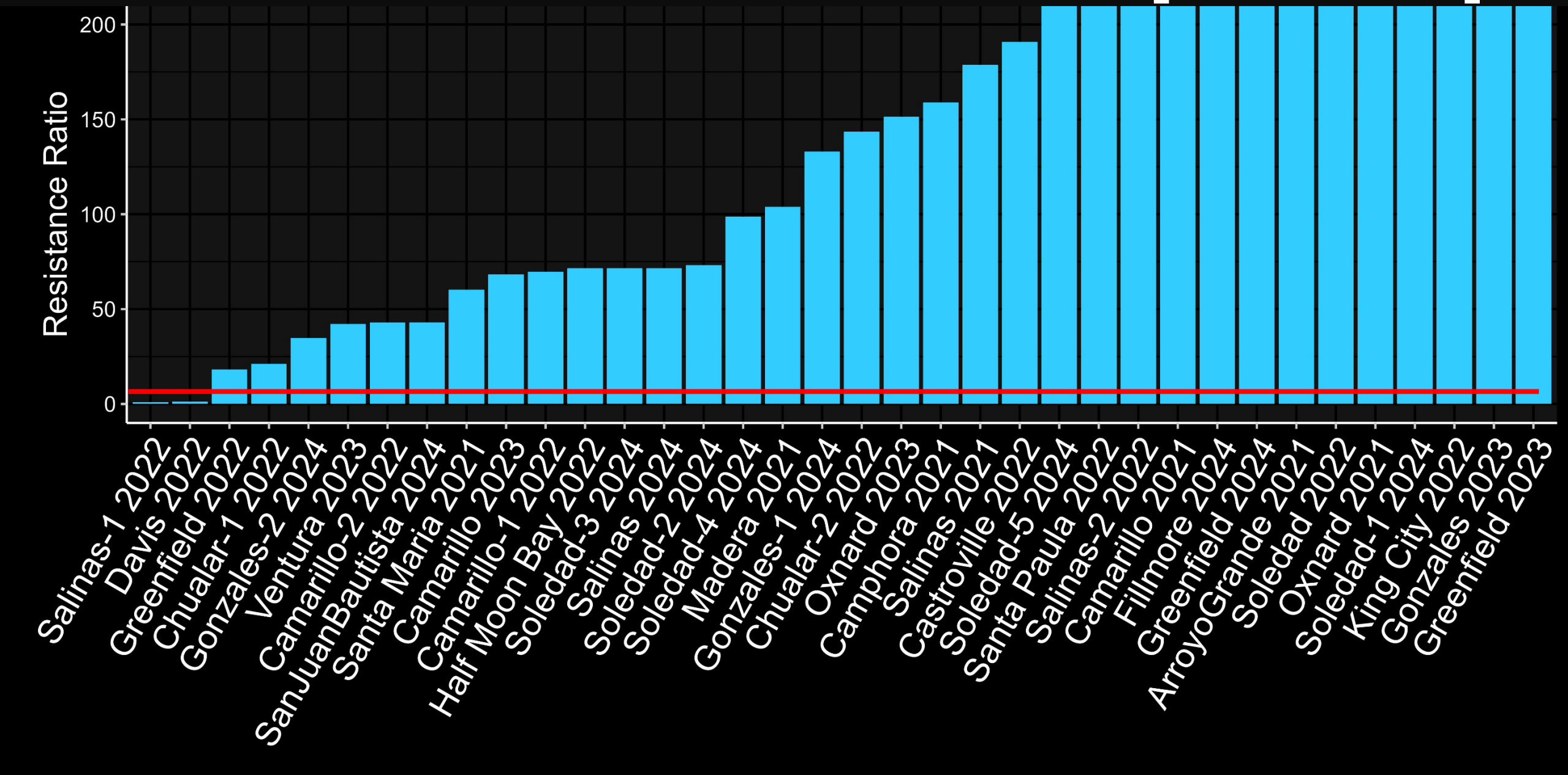
Chlorantraniliprole – Coragen (diamide)



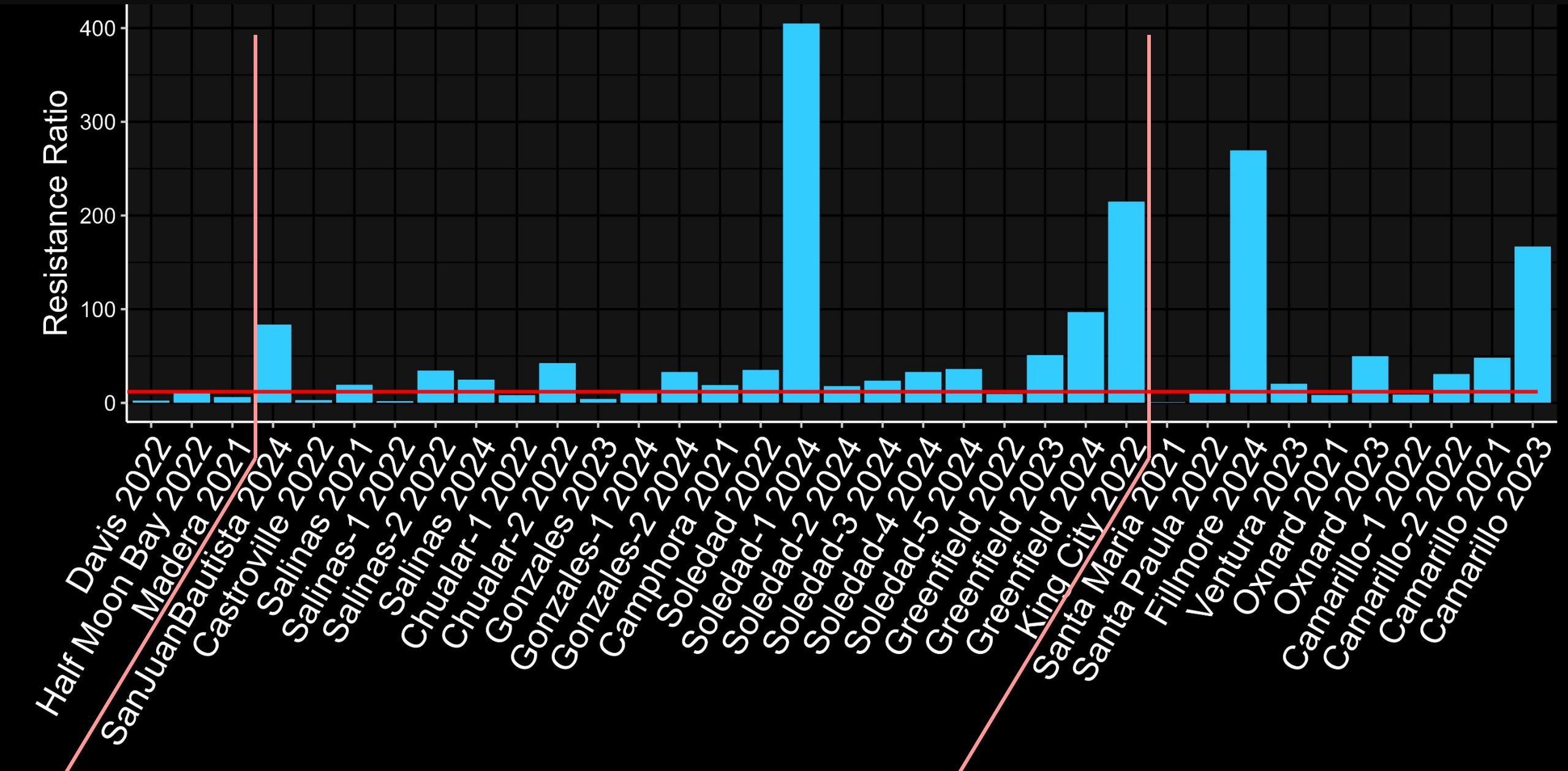
Chlorantraniliprole – Coragen (diamide)



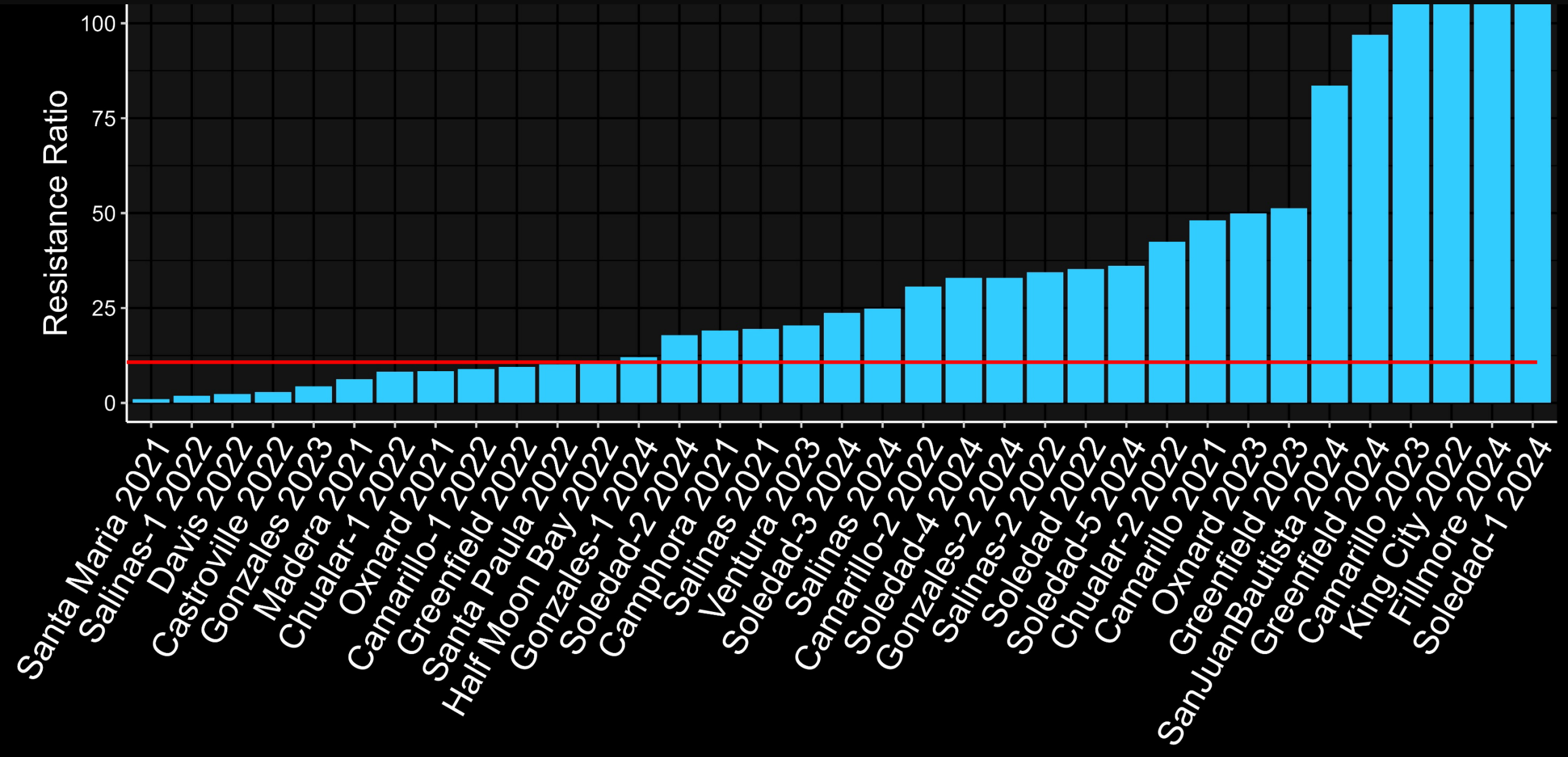
Chlorantraniliprole – Coragen (diamide)



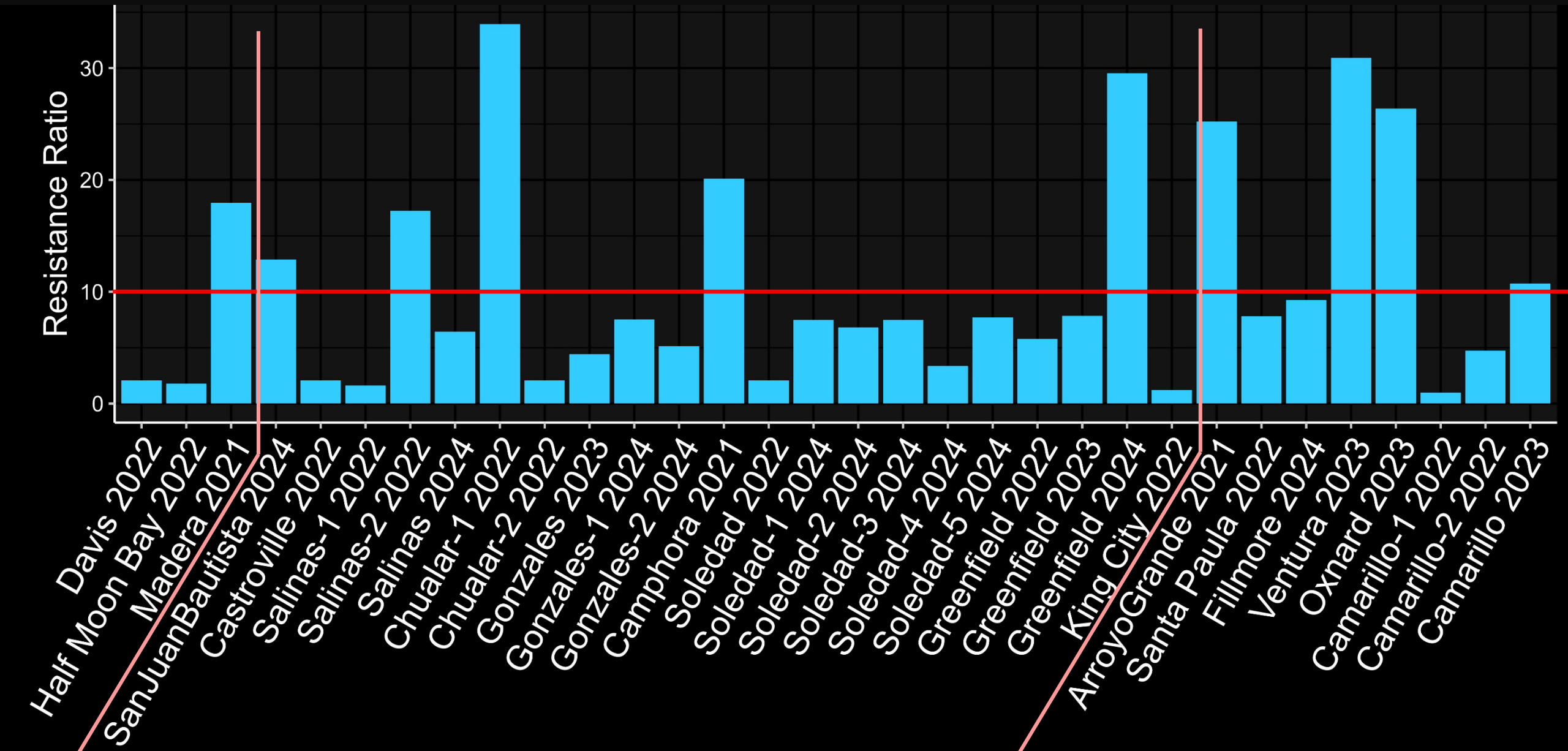
Cyantraniliprole – Exirel/Verimark) (diamide)



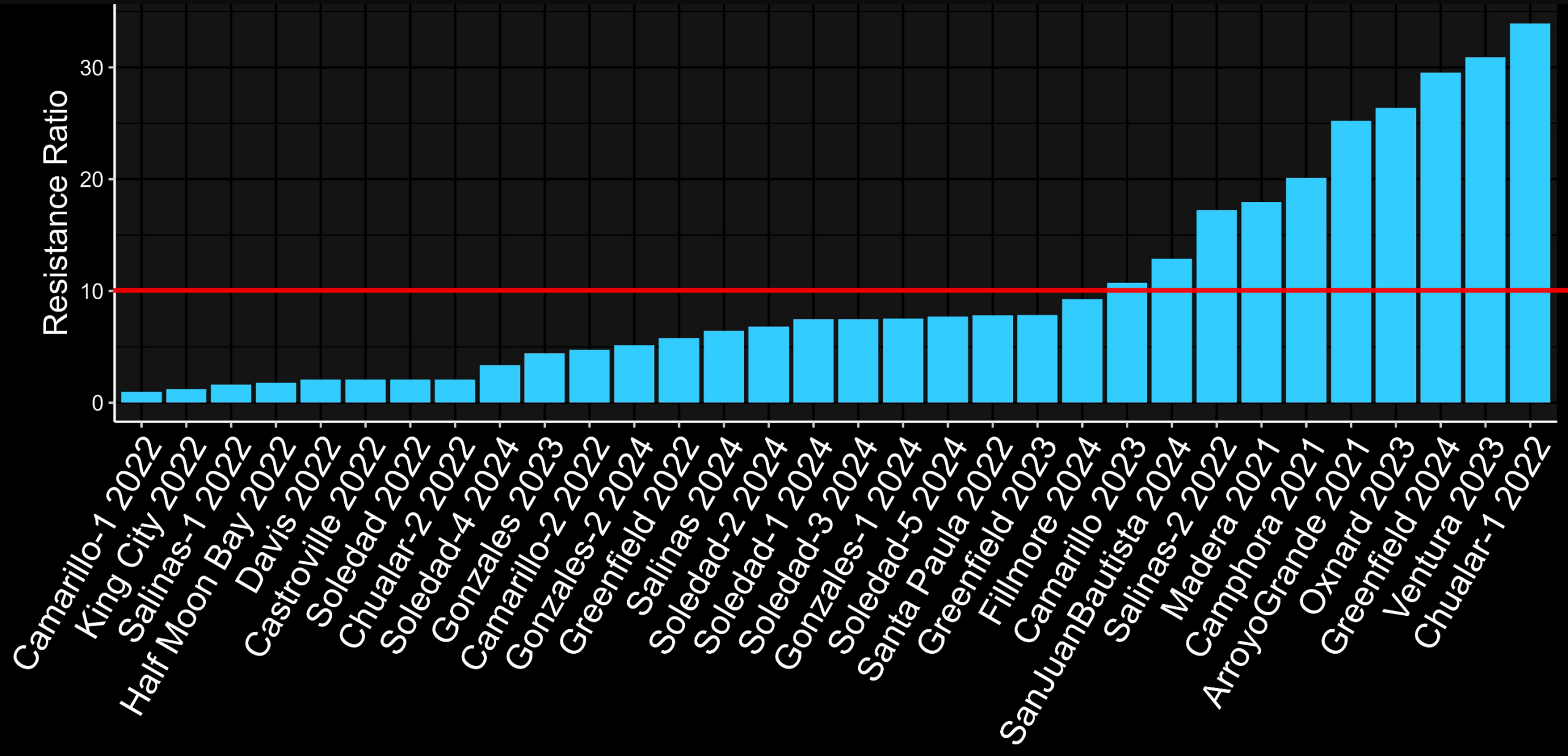
Cyantraniliprole – Exirel/Verimark) (diamide)



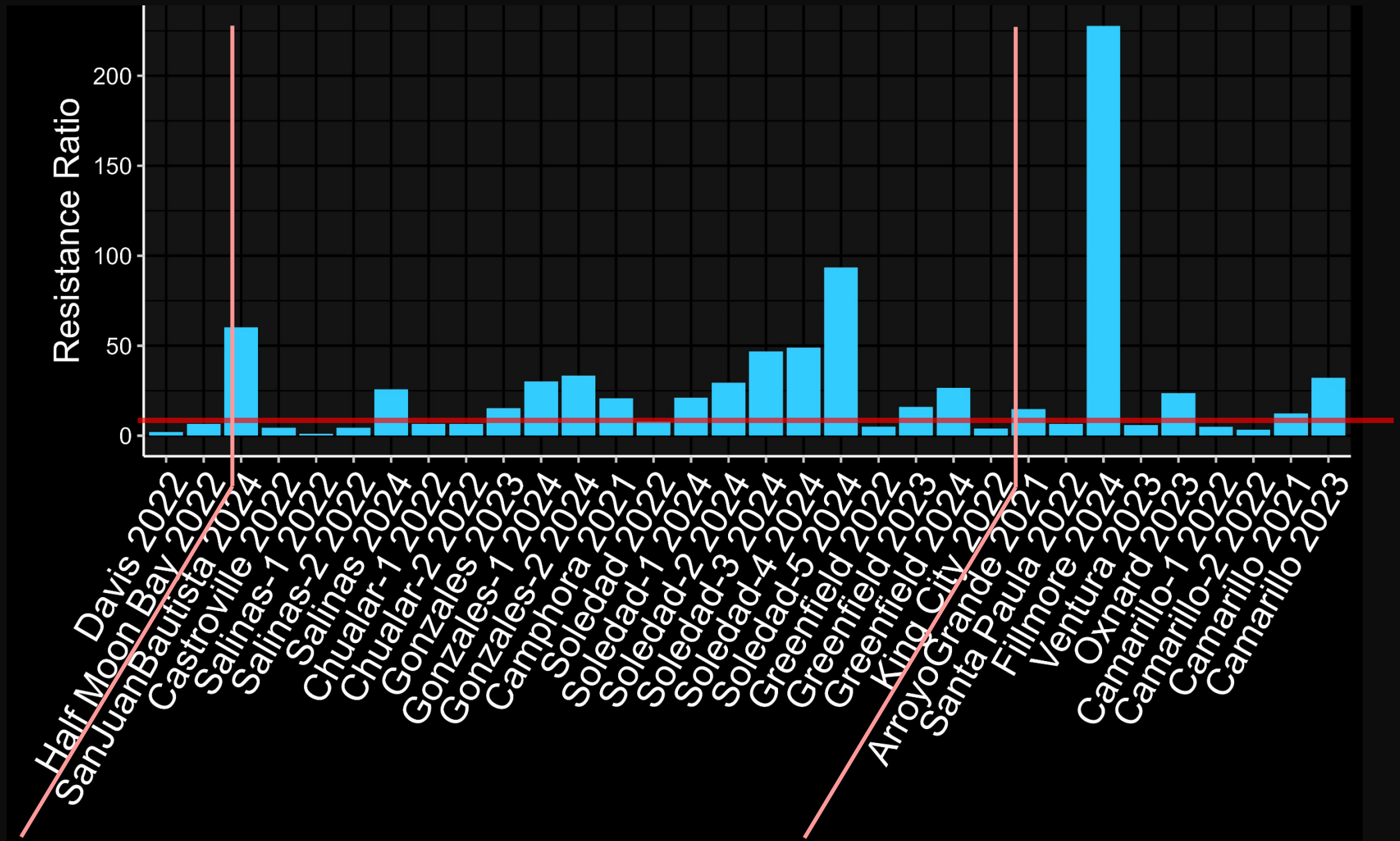
Emamectin benzoate Proclaim



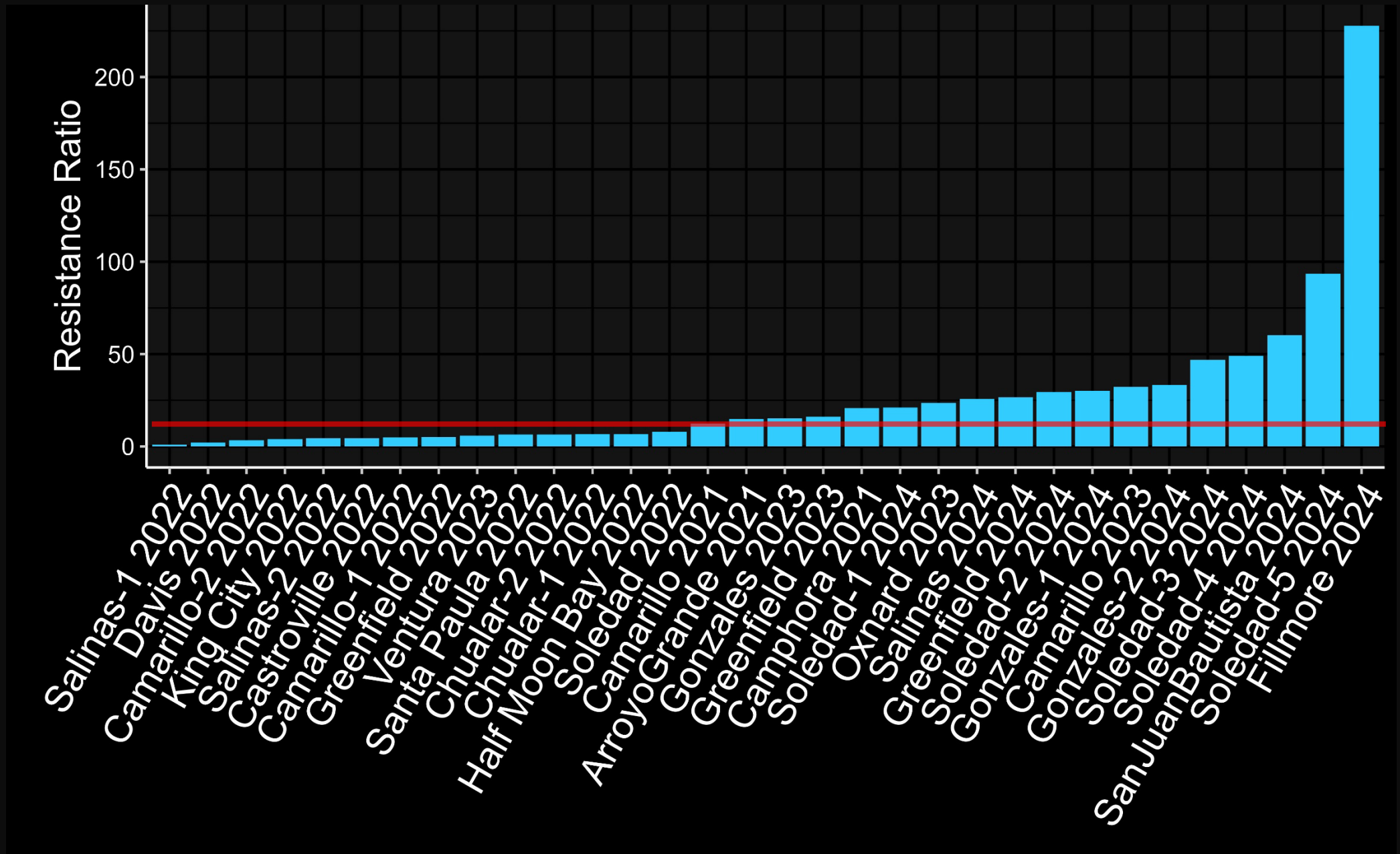
Emamectin benzoate Proclaim



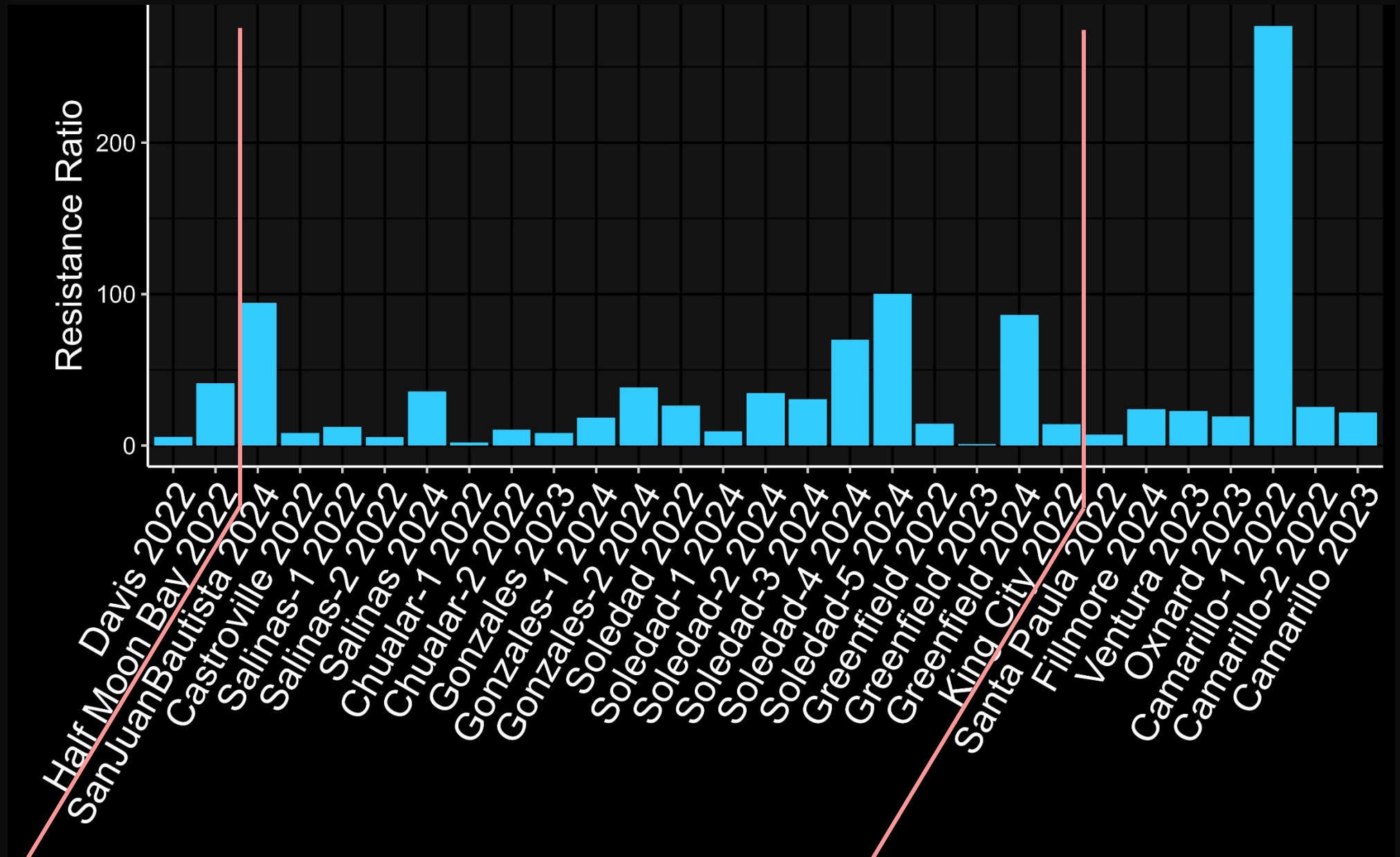
Spinetoram – Radiant (spinosyn)



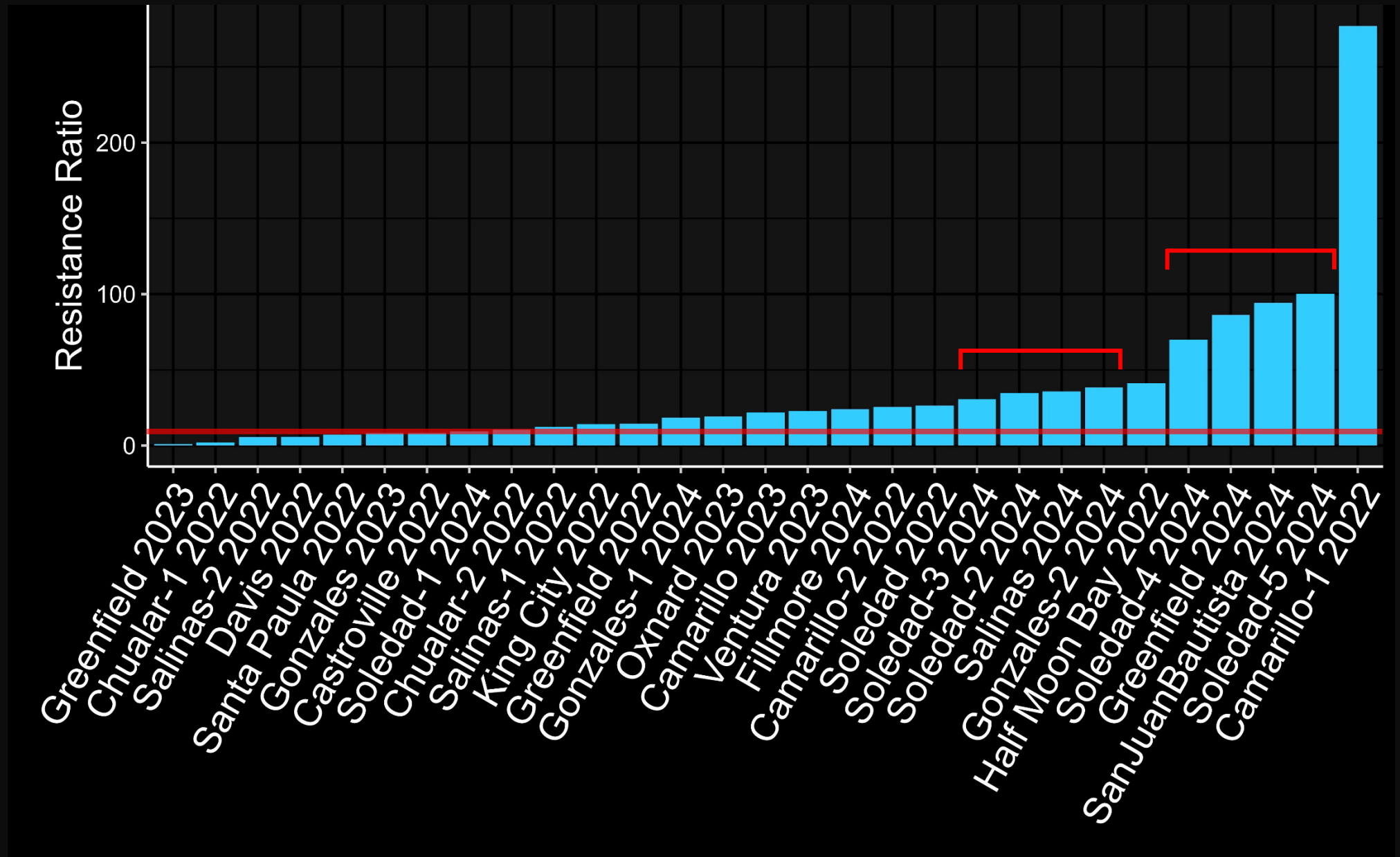
Spinetoram – Radiant (spinosyn)



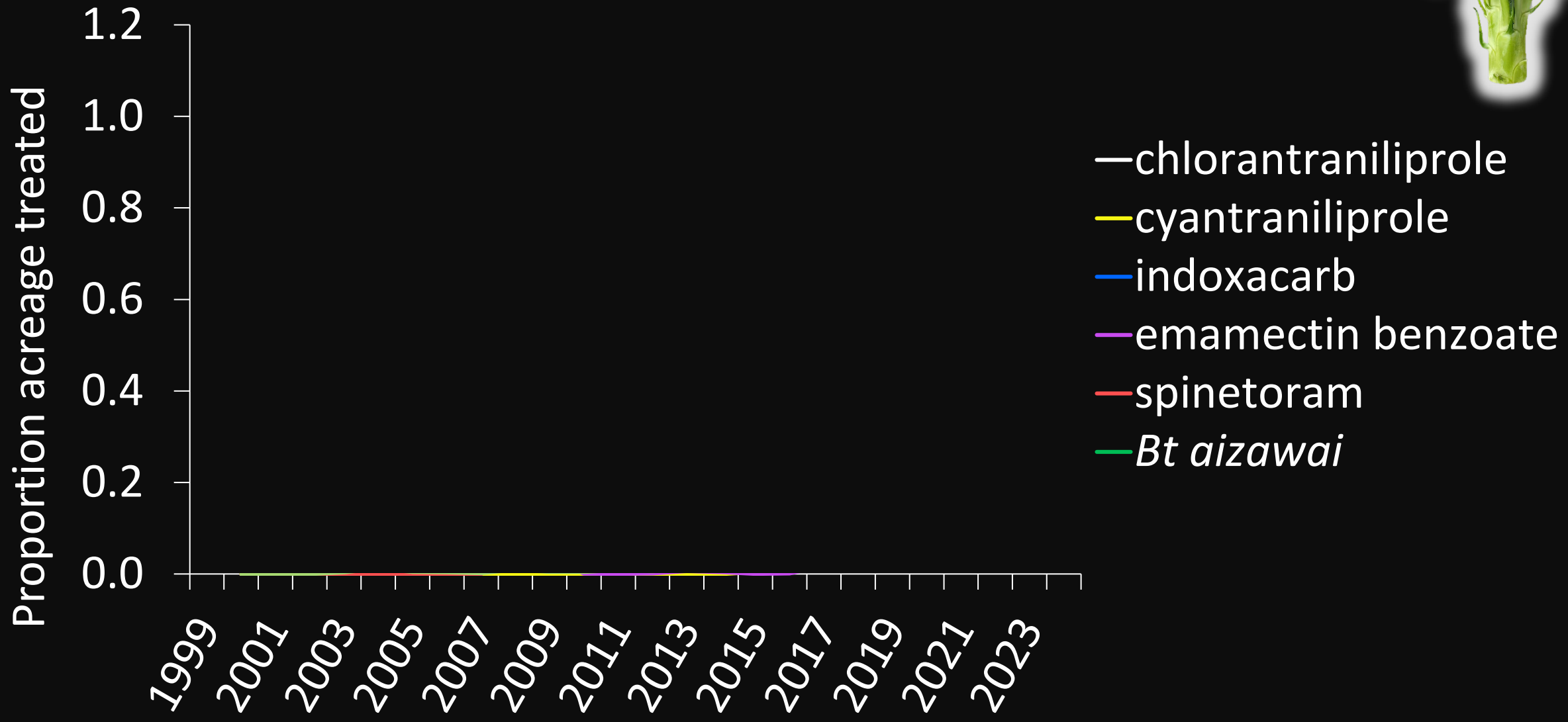
Bacillus thuringensis/Bt aizawai - XenTari

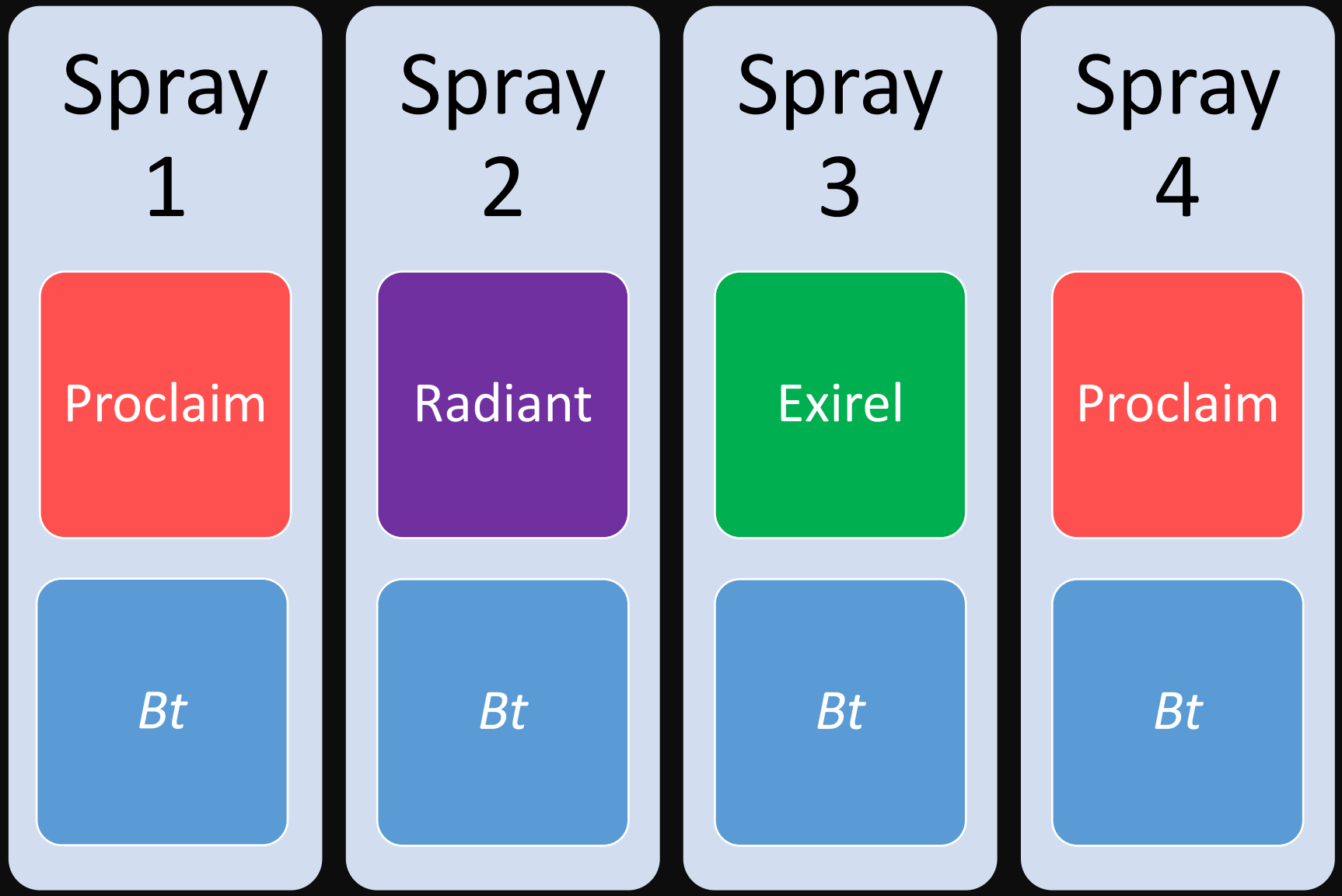


Bacillus thuringensis/Bt aizawai - XenTari



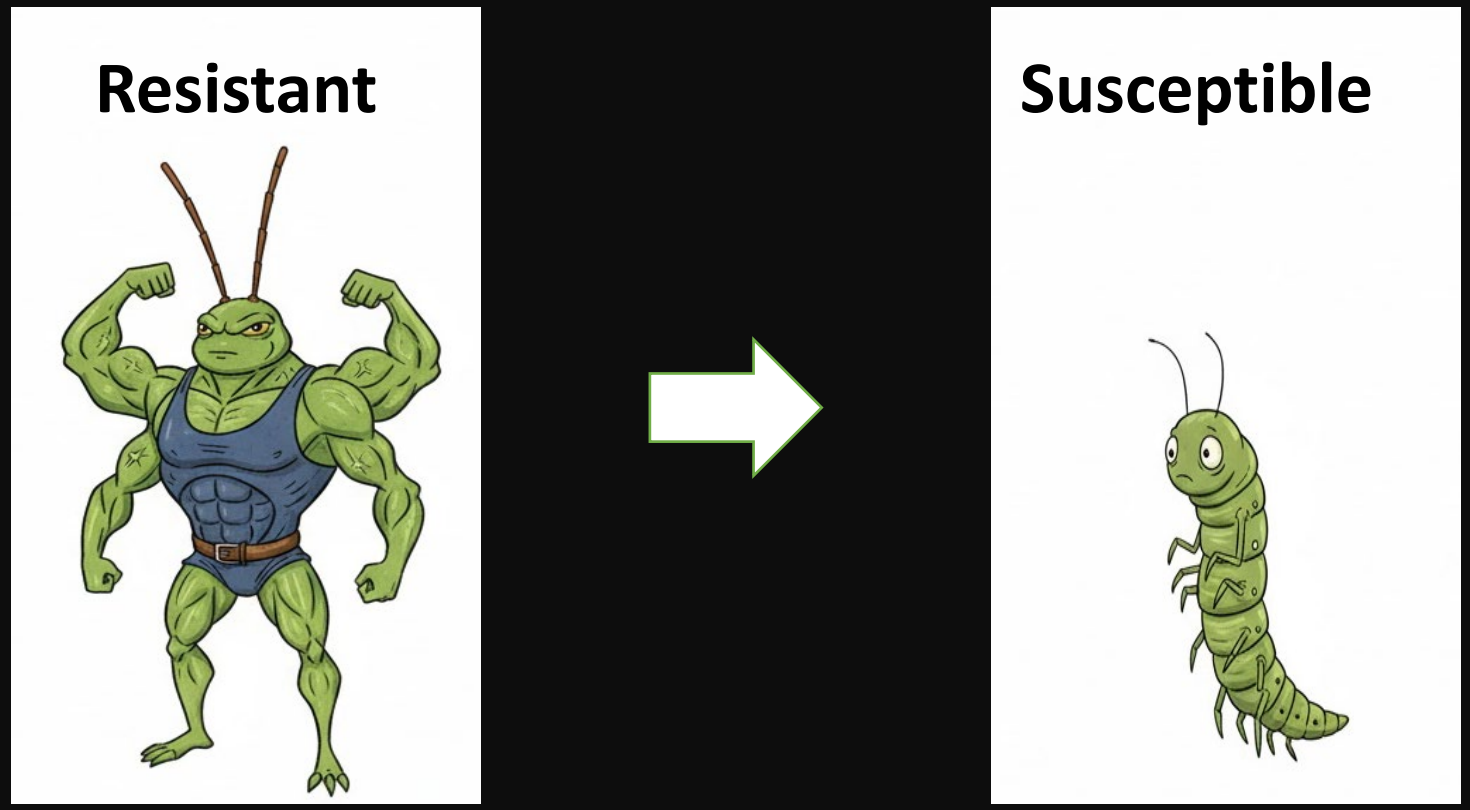
Monterey Co. - broccoli



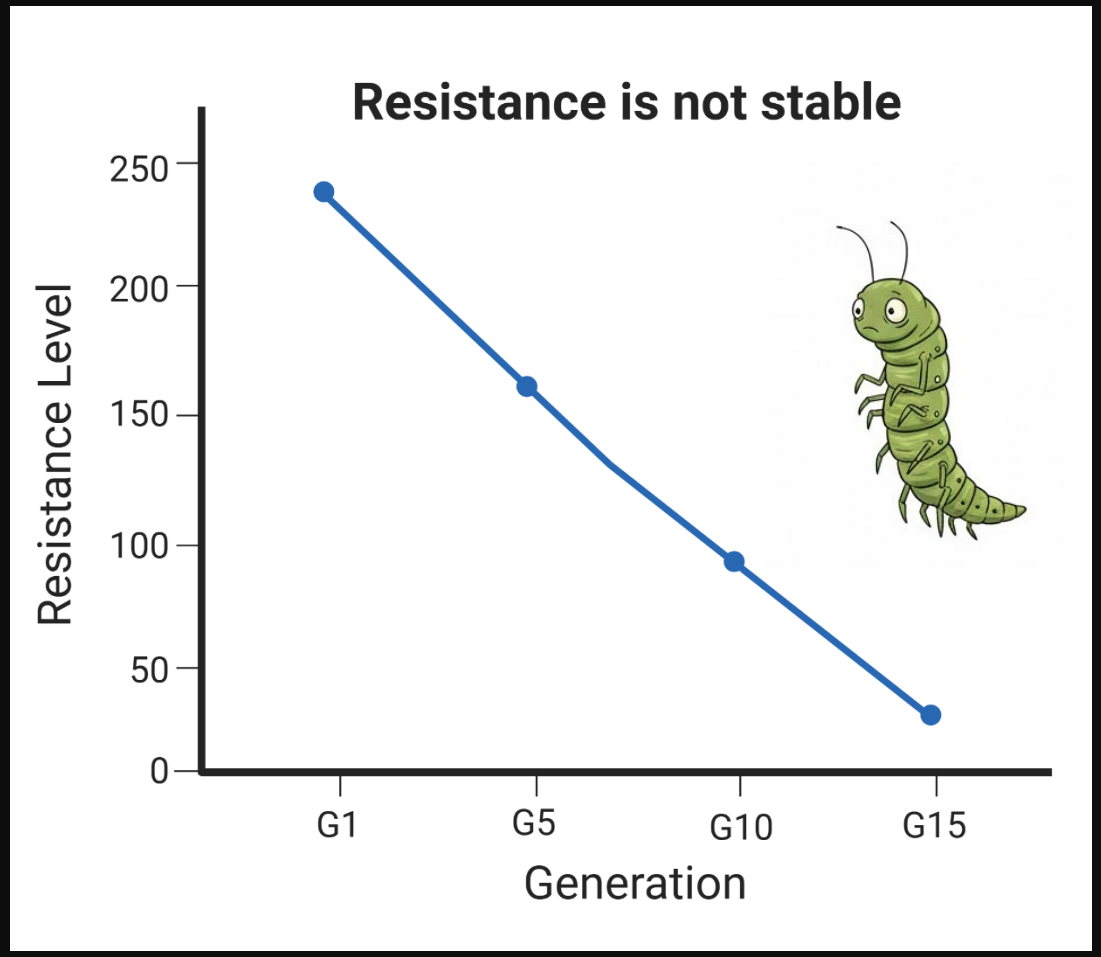

Spray 1
Proclaim
Bt
Spray 2
Radiant
Bt
Spray 3
Exirel
Bt
Spray 4
Proclaim
Bt

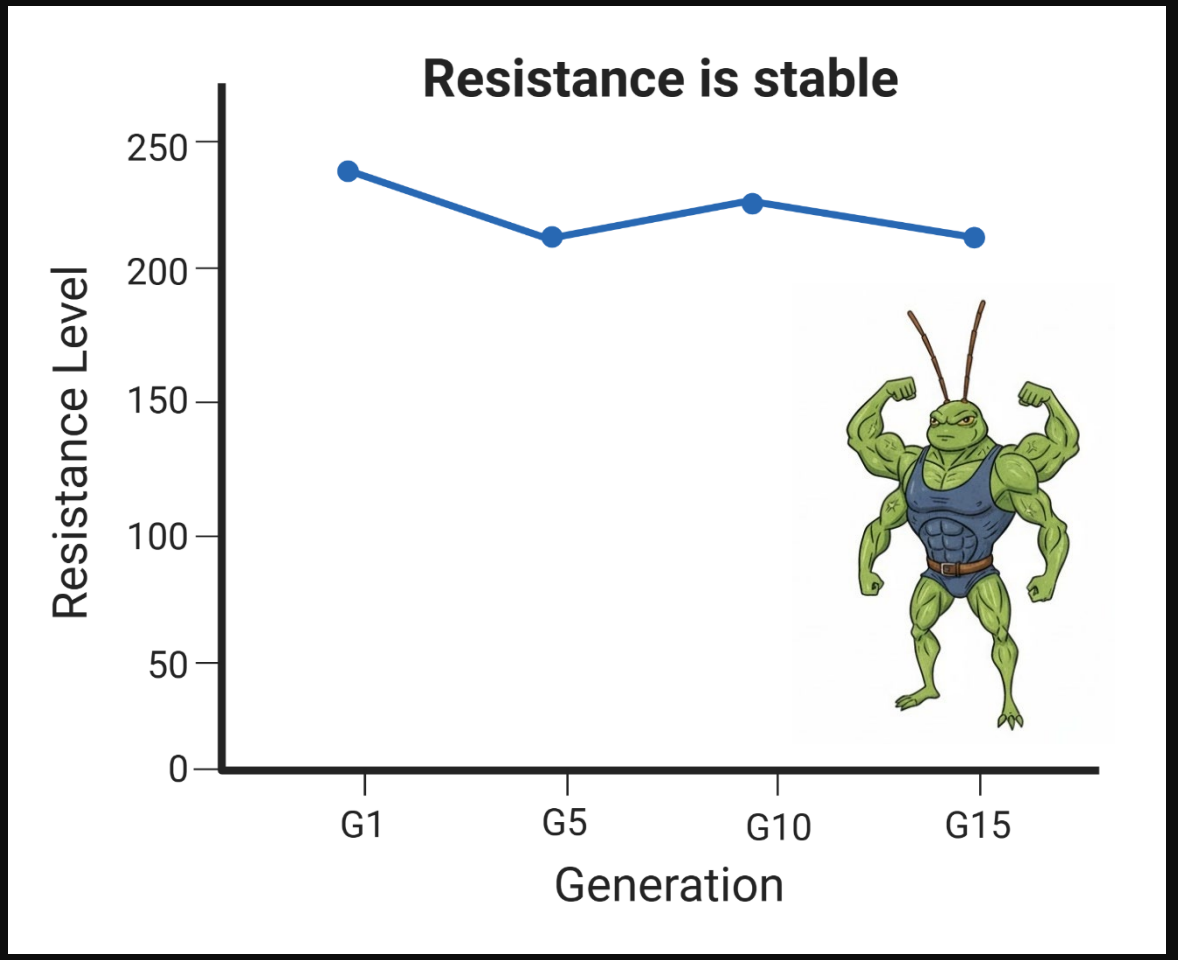
Resistance stability: Does resistance stick around?

- Tells us whether pests stay resistant or become susceptible again after we stop using a product



Resistance stability: Two scenarios



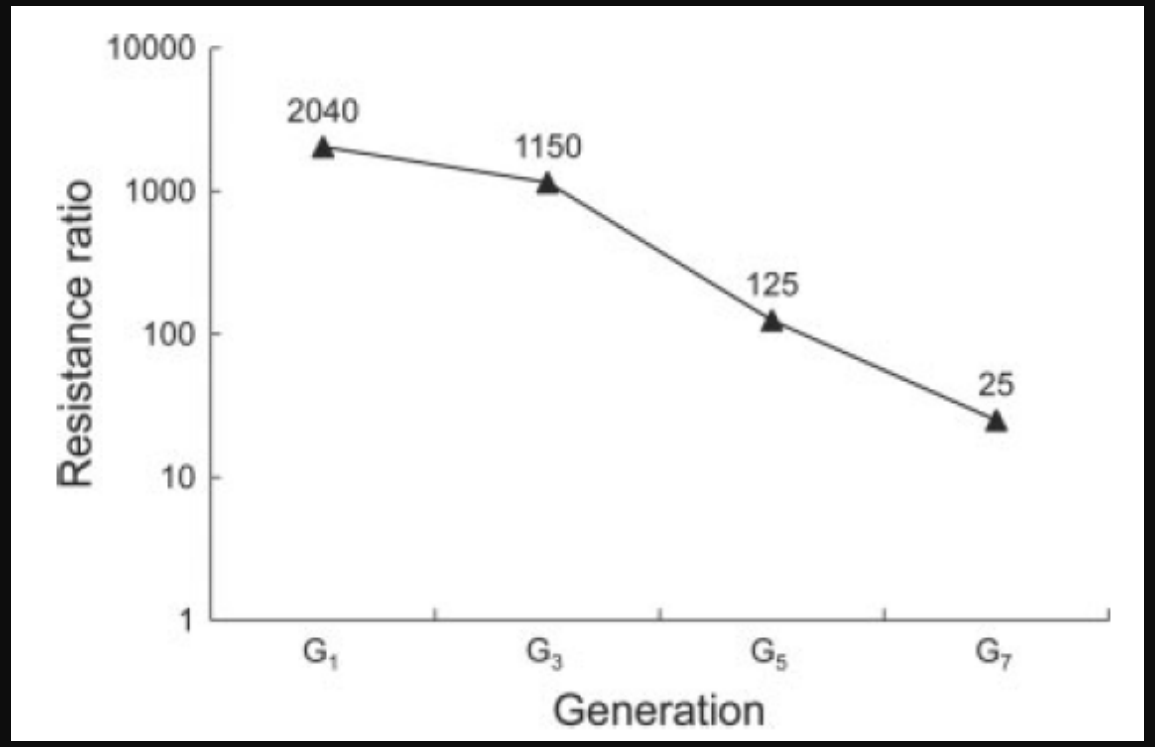


Why study resistance stability?

- It tells us whether rotating chemistries will actually work.
  - Rotation only restores susceptibility **if resistance is unstable**.
  - If resistance is stable, rotations may not be effective.
- How valuable is a product long-term?
  - Stability determines whether older chemistries are worth saving or replacing.

Resistance stability in DBM

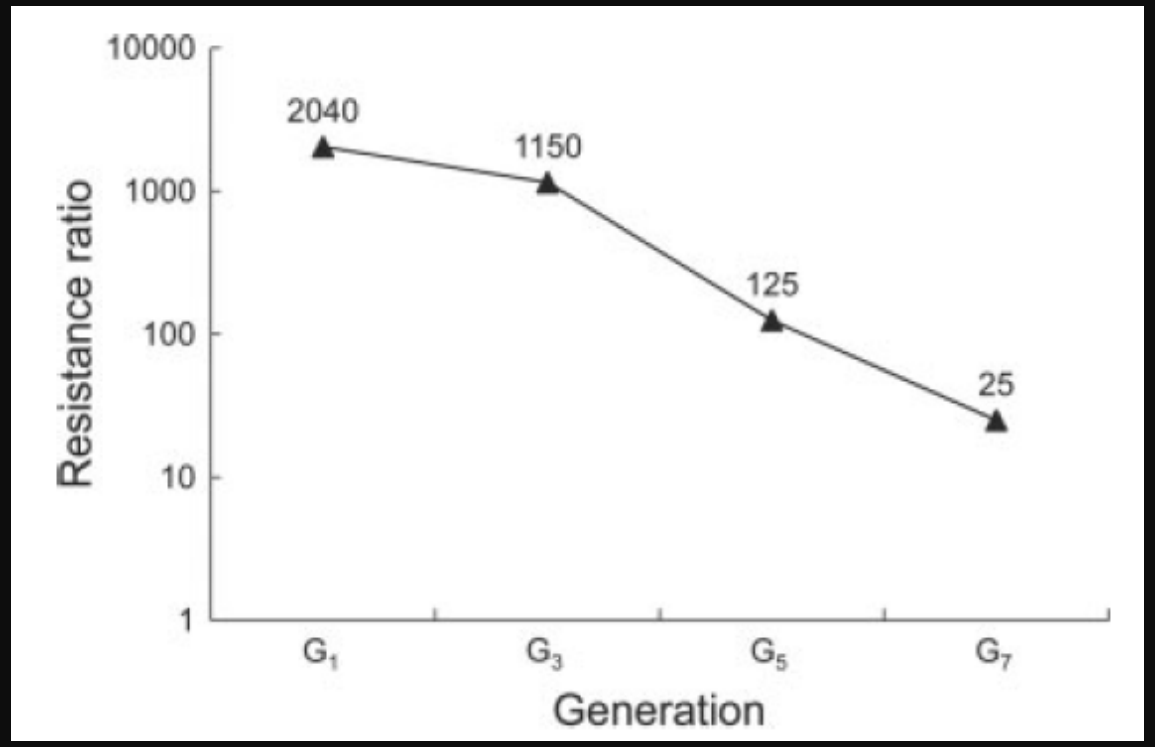
- DBM population from China (Wang et al. 2012)
  - No exposure to the Diamide Chlorantraniliprole for 7 generations
  - Resistance is unstable



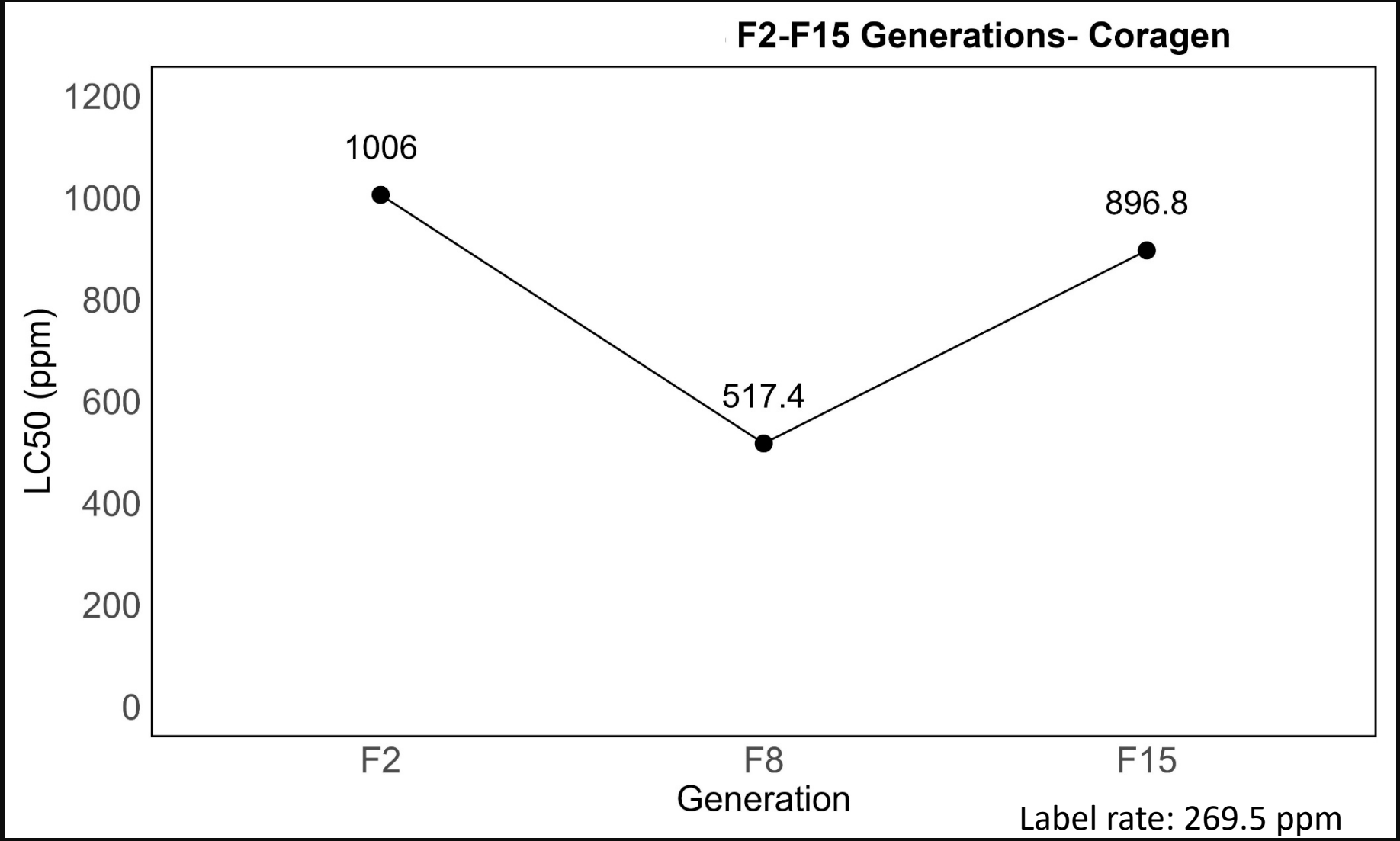
Resistance stability in DBM

- DBM population from China (Wang et al. 2012)
  - No exposure to the Diamide Chlorantraniliprole for 7 generations
  - Resistance is unstable

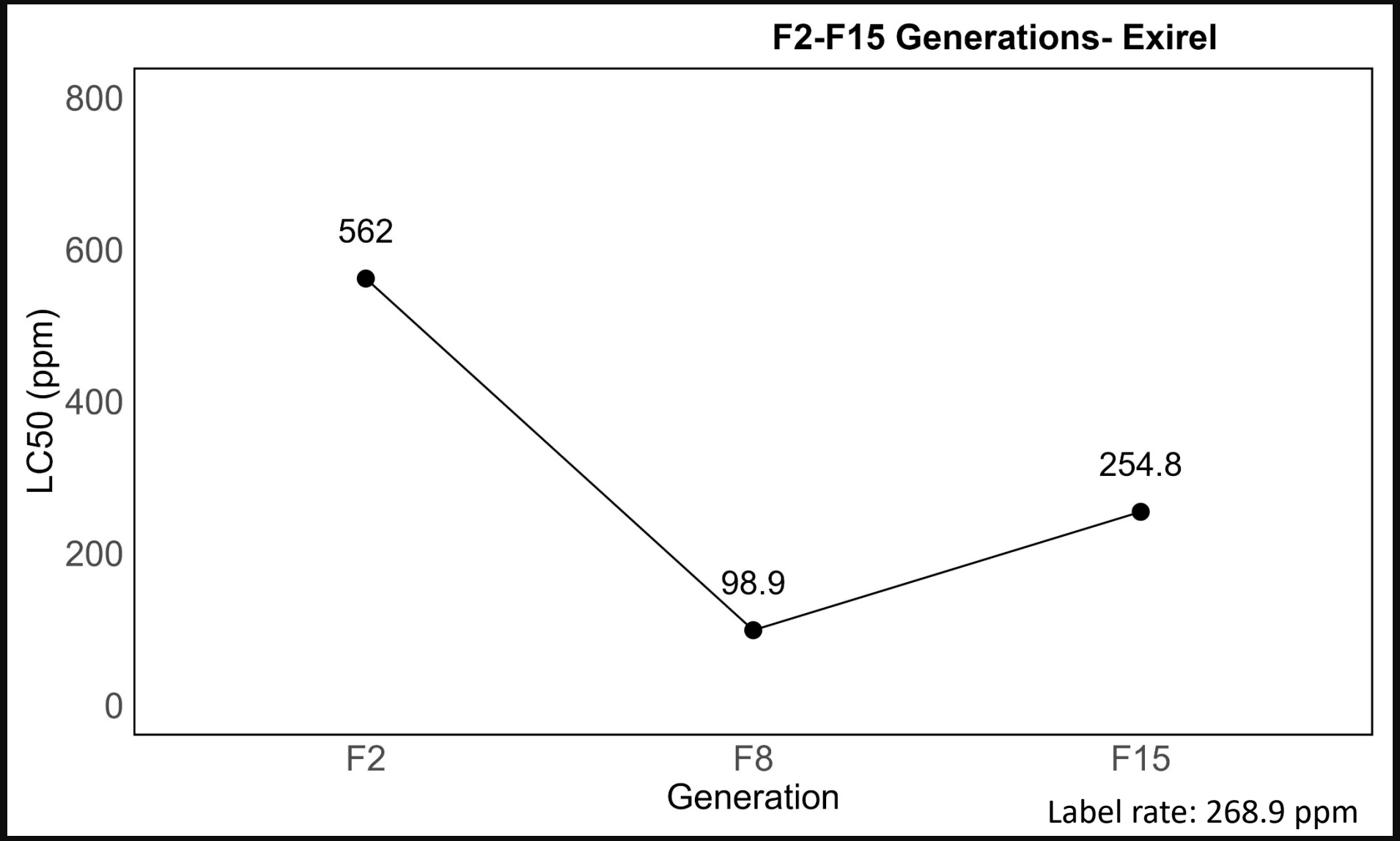
But this is only one example, what about DBM populations in CA?



Resistance to Coragen after 13 generations in a Salinas Valley population



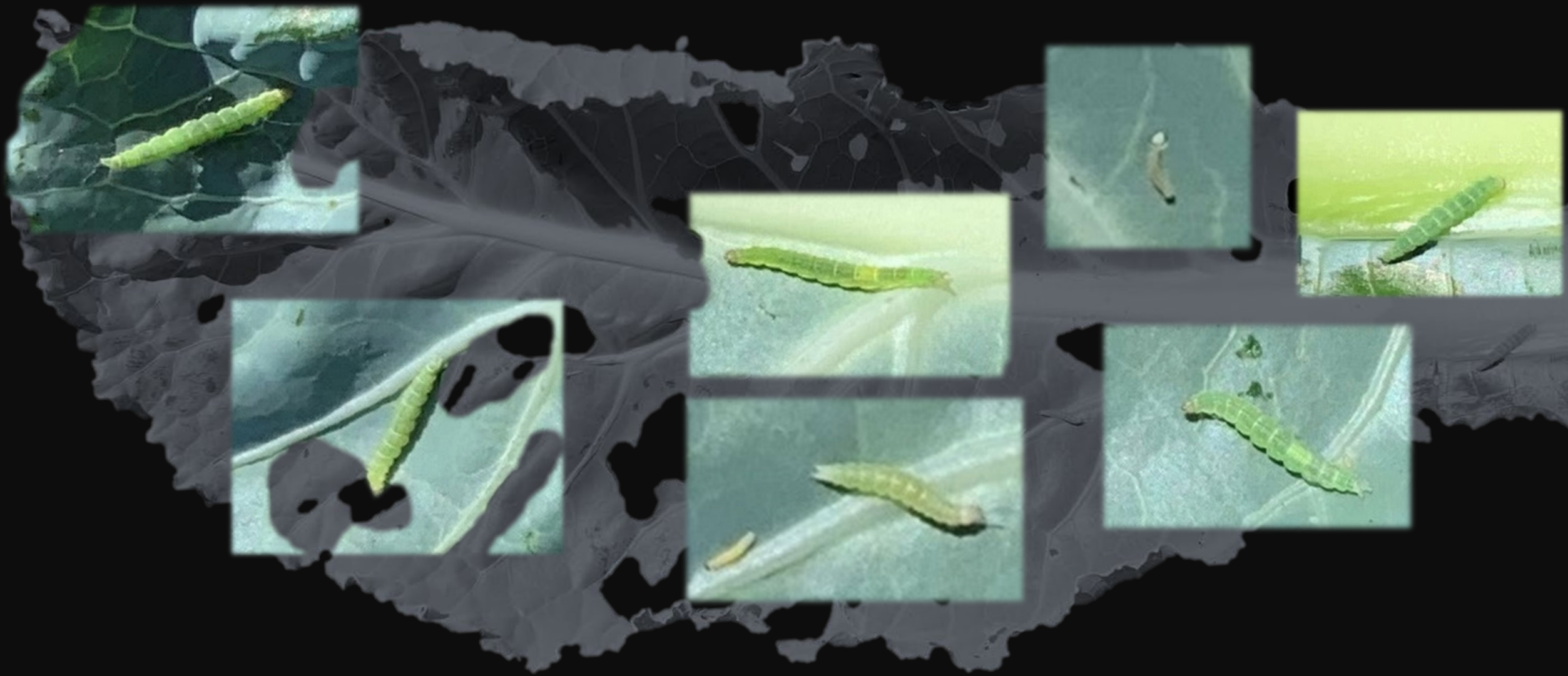
Resistance to Exirel after 13 generations in a Salinas Valley population



Take-home message

- Diamide resistance in this population does not disappear quickly
- Like resistance, stability may also vary by location and population
  - Other populations may exhibit different trends
- More data is needed to confirm whether resistance to diamides is stable for this population and others!

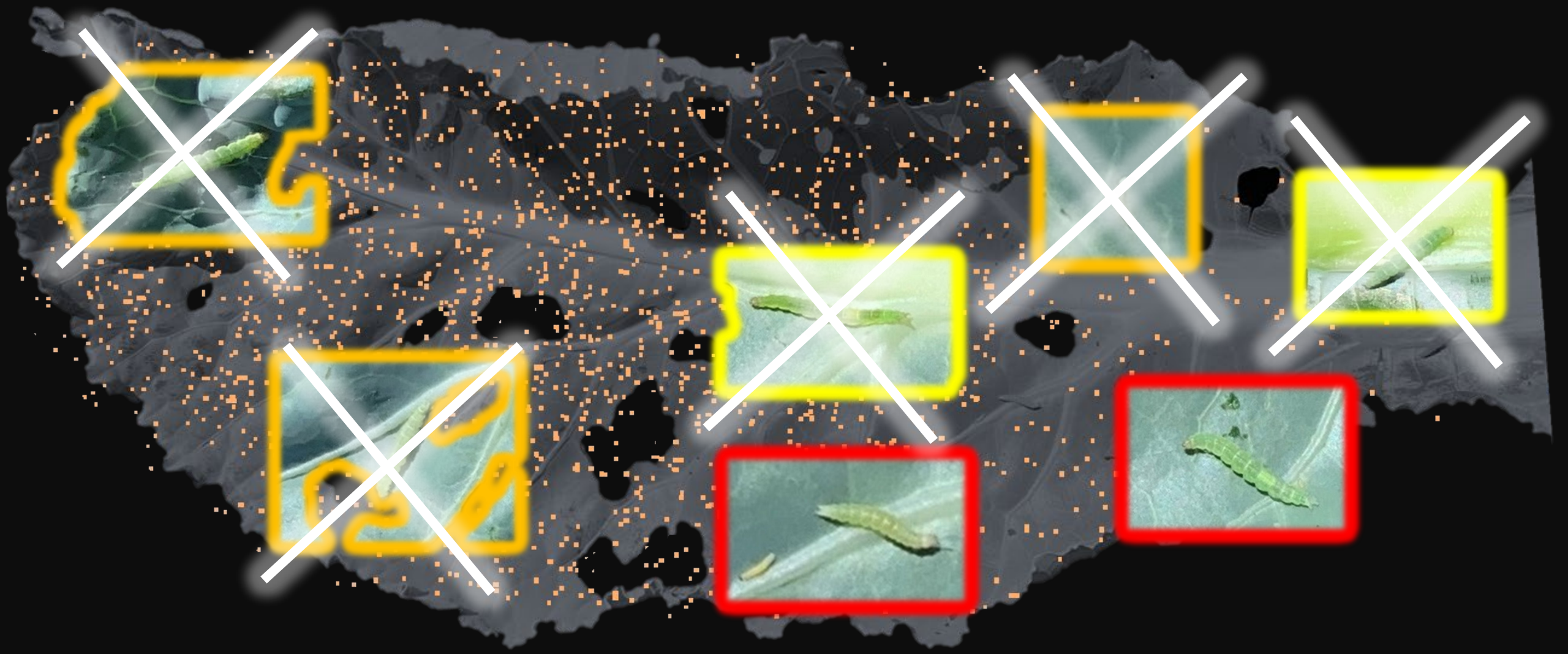
NYPD
INSECTICIDE RESISTANCE
SPRAY COVERAGE



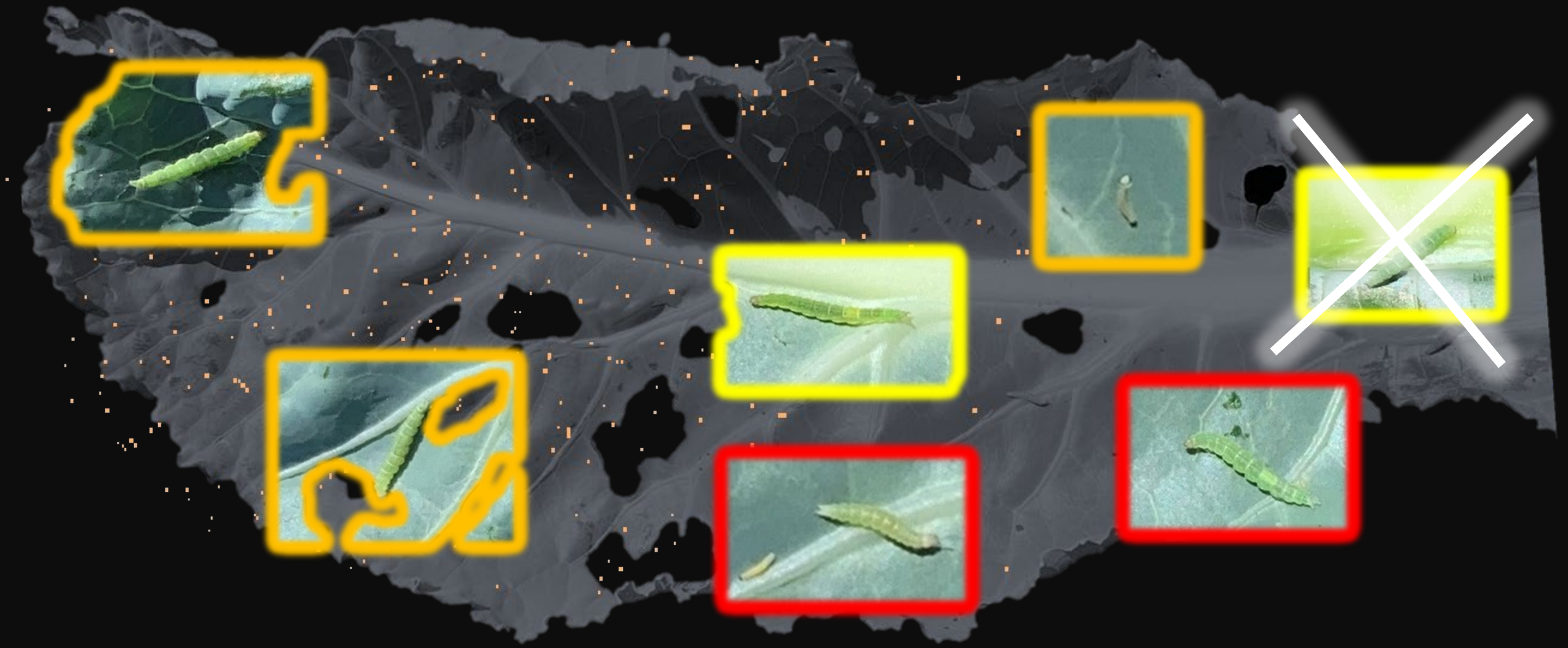
Susceptible

Susceptible

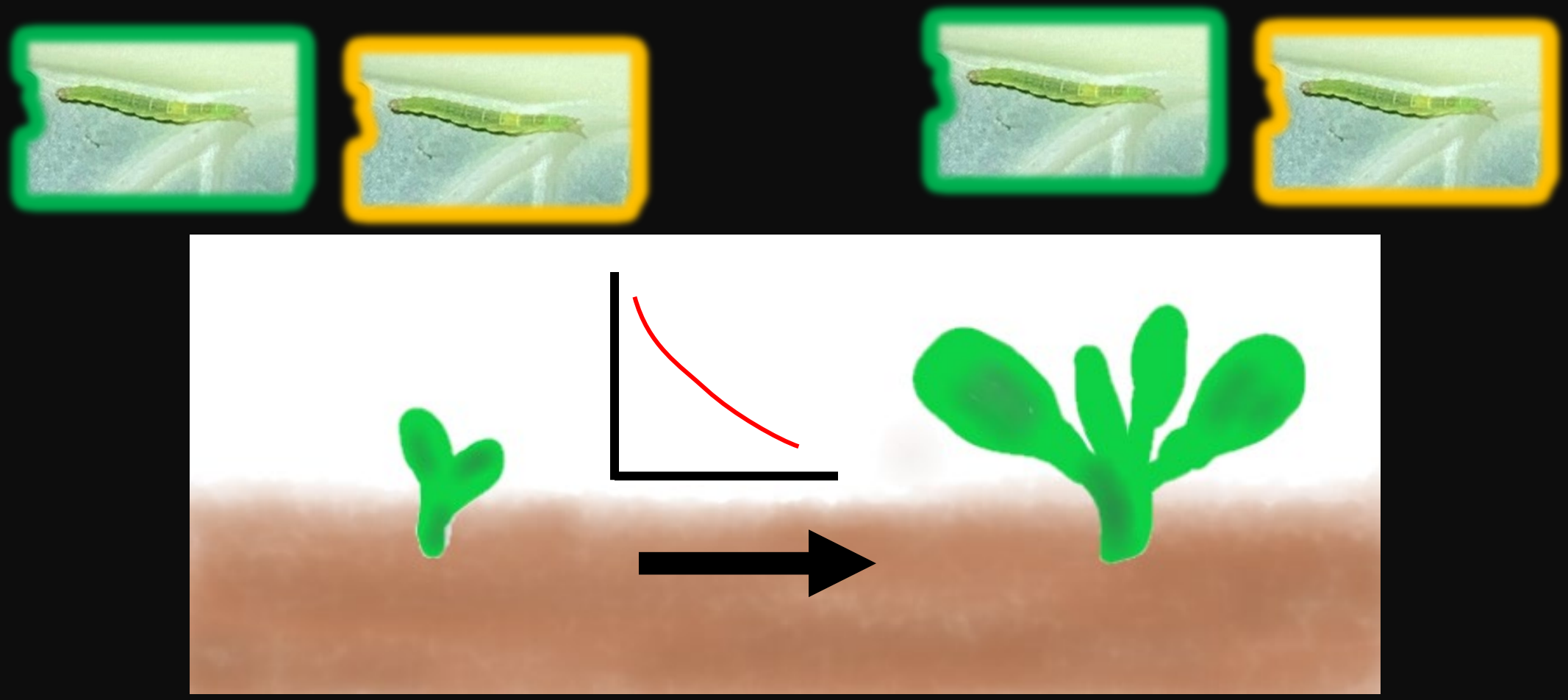
Resistant



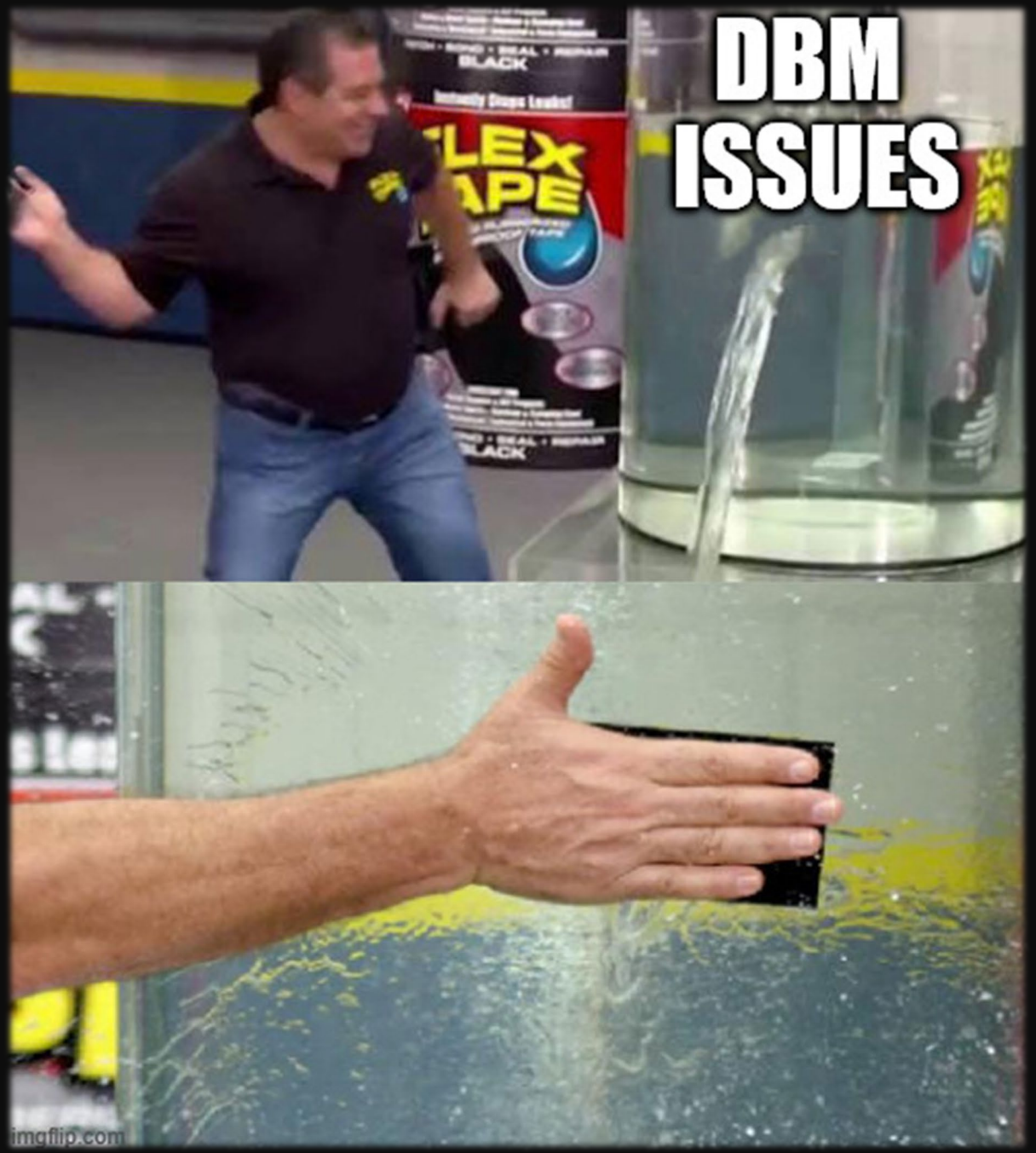
Resistant

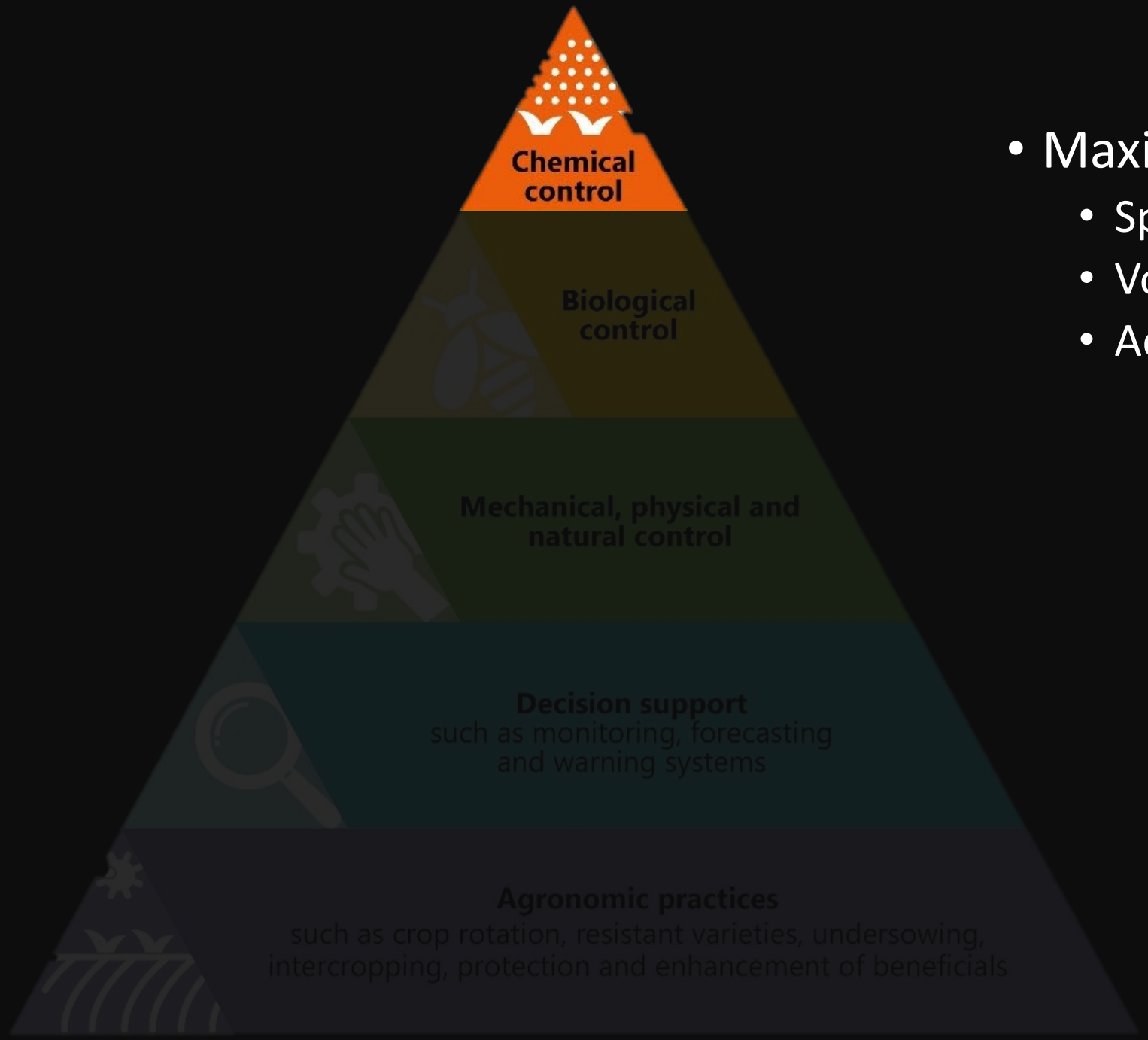


Transplants and tray drenches



What can we do?

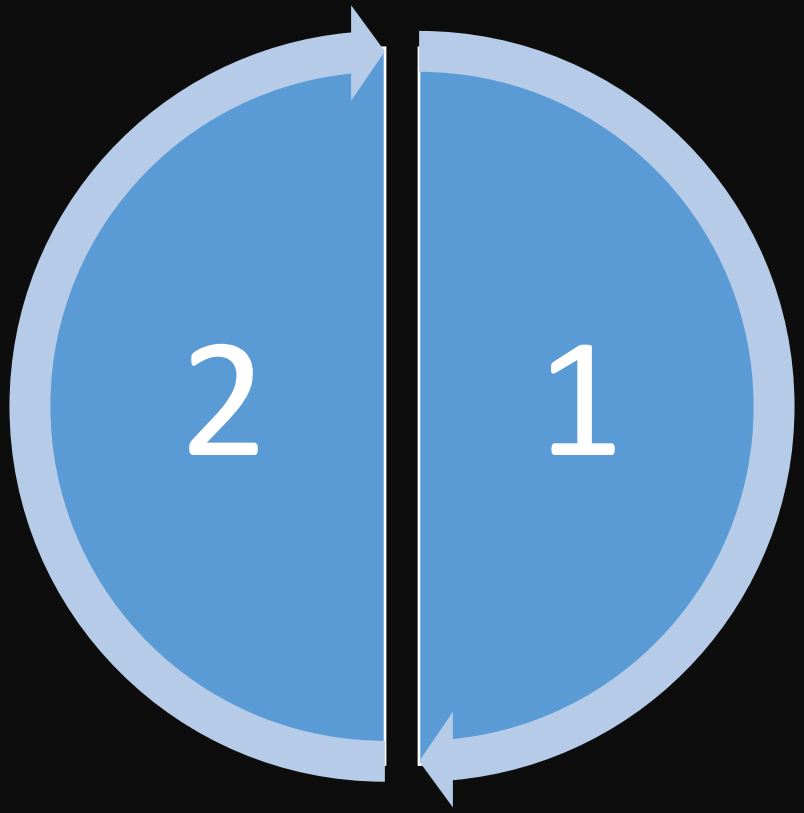

DBM
ISSUES
imgflip.com



- Maximize applications
  - Sprayer setup/method
  - Volume
  - Adjuvant

Rotation is necessary

Rotation is necessary



Index Open

Can we avoid the icebergs?

Ian Grettenberger
UC Davis

Daniel Hasegawa
USDA-ARS

Ricky Lara
CDFA

Matt Greishop
Cal Poly SLO

Oleg Daugovish
UCCE Ventura

Hamutahl Cohen
UCCE Ventura

Caroline Donohew
UC Davis

Erika Bueno
UC Davis

Dylan Beal
UCCE Monterey/Sa
Cruz/San Benito

Mating disruption

PC: Oxitec

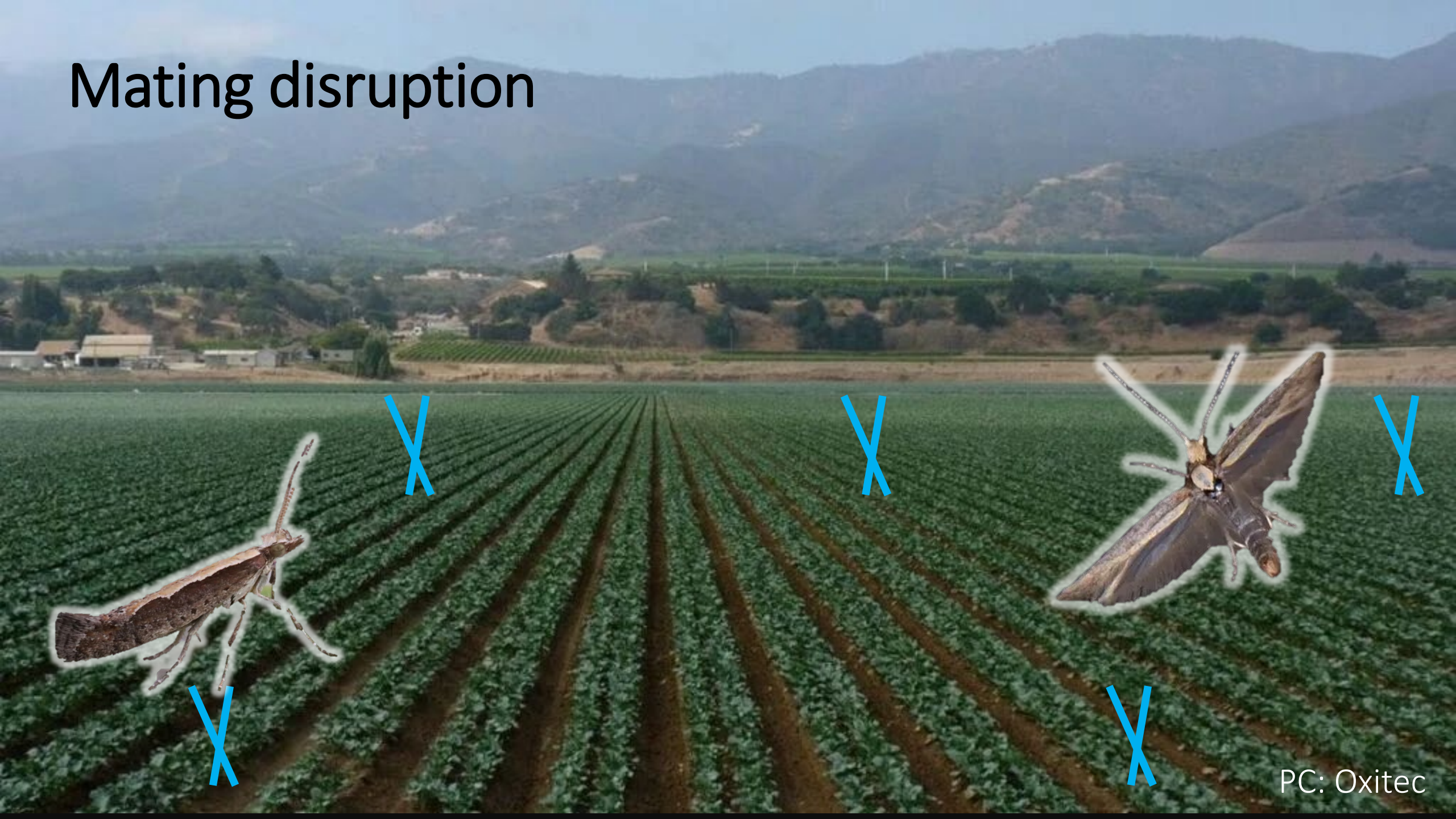
Mating disruption

PC: Oxitec

Mating disruption

PC: Oxitec

Mating disruption



PC: Oxitec

Mating disruption

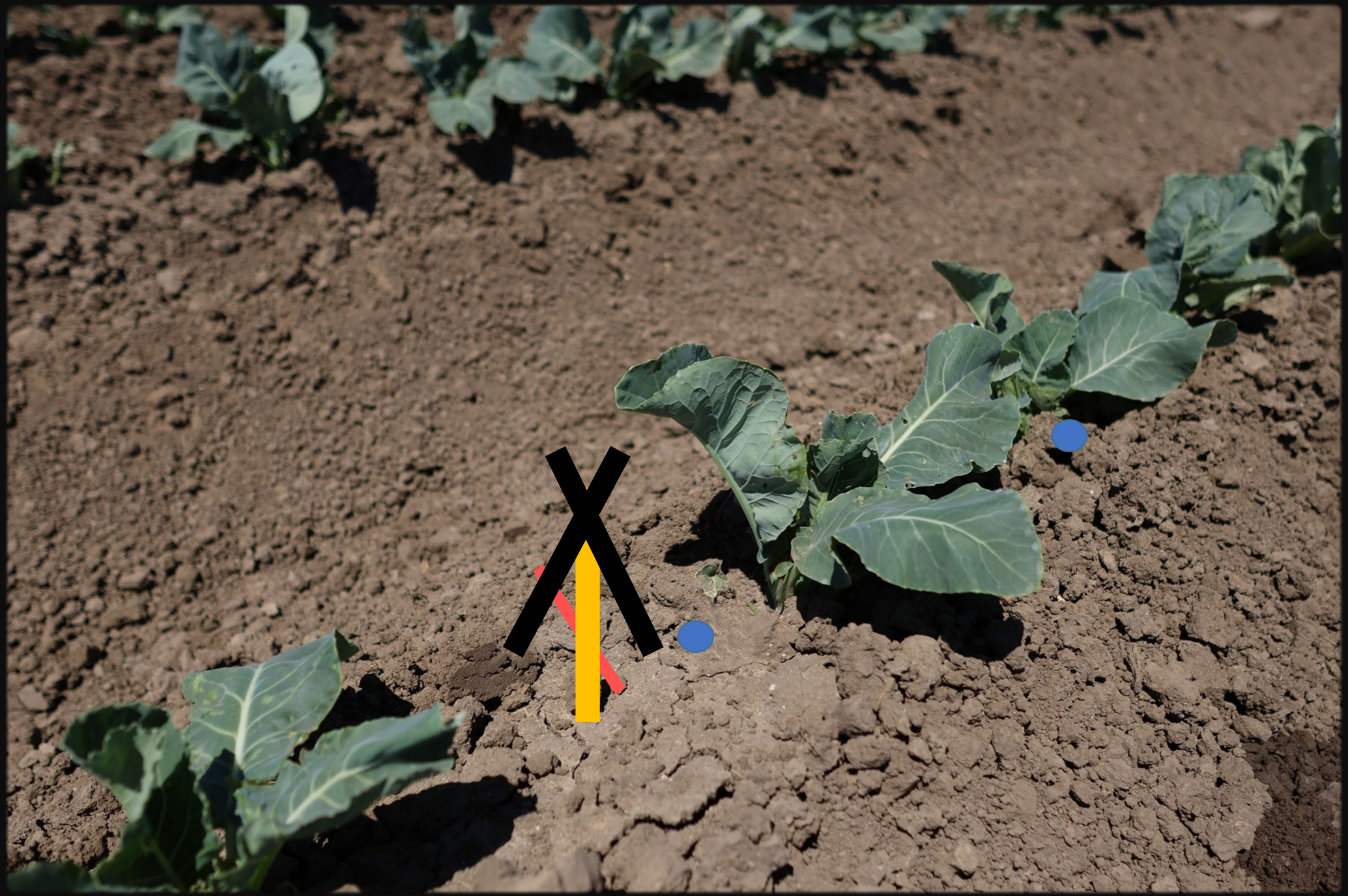
PC: Oxitec

Mating disruption

PC: Oxitec

Mating disruption

PC: Oxitec



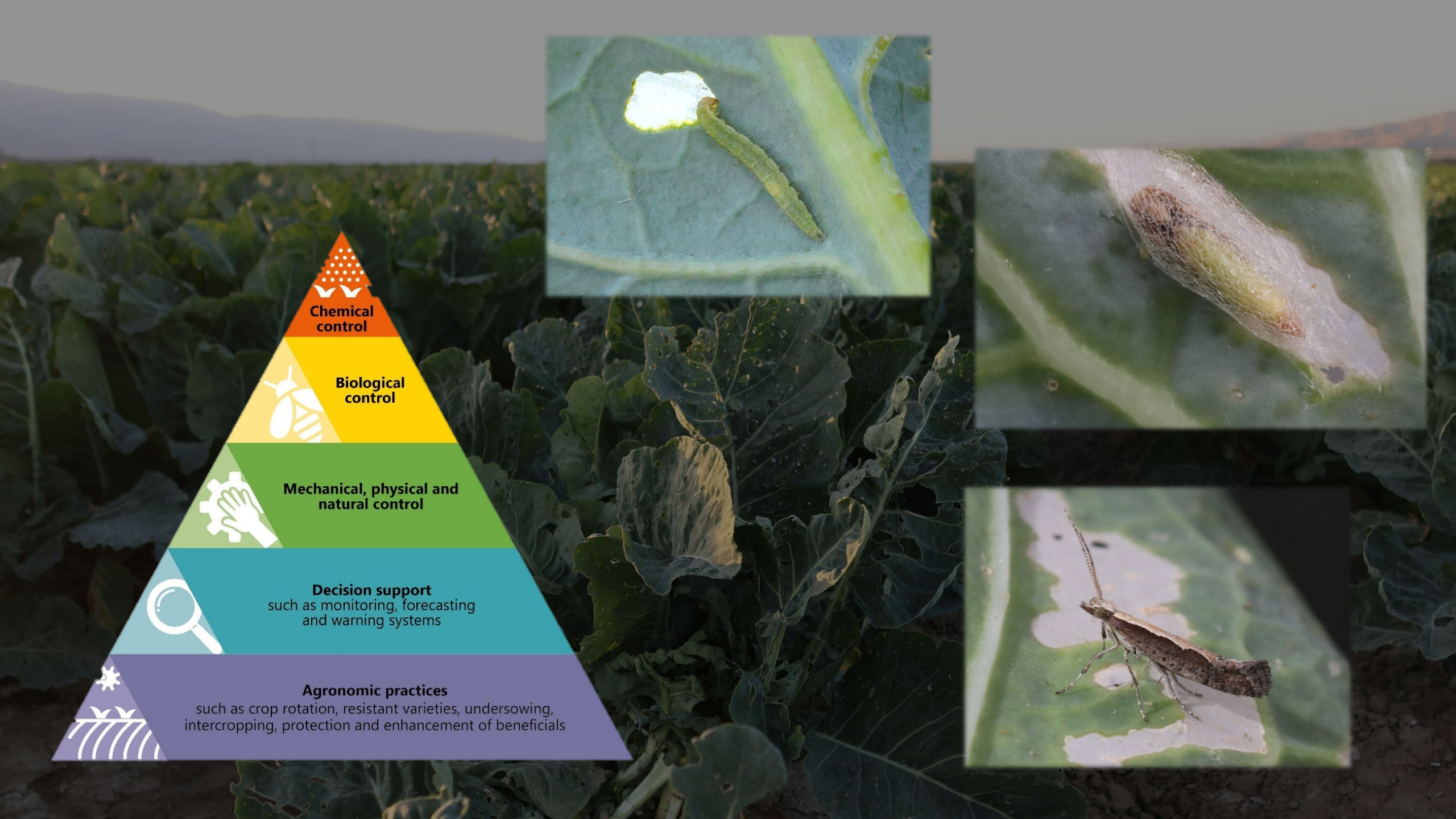
Mating disruption

Salinas River
UT
T2
T1

SCENTRY
WING TRAP

Biological control – resident parasitoids

Diadegma insulare


Chemical control
Biological control
Mechanical, physical and natural control
Decision support
such as monitoring, forecasting and warning systems
Agronomic practices
such as crop rotation, resistant varieties, undersowing, intercropping, protection and enhancement of beneficials

Acknowledgements

- Kevin Goding, Sophie Allen
- Field-Vegetable IPM lab undergraduates
- Nursery cooperators
- Industry cooperators/FMC
- Mark Mason+Martin Alfaro + Huntington Farms
- Rafael Alfaro + Merrill Farms
- Reed Worthy
- Kim Horton + Taylor Farms
- Joe Padilla + Lakeside farms
- Jaylen Calabro + Braga Fresh Family Farms
- Other PCA/grower cooperators

Questions?

imgrettenberger@ucdavis.edu