

2023 Update on Thrips and INSV

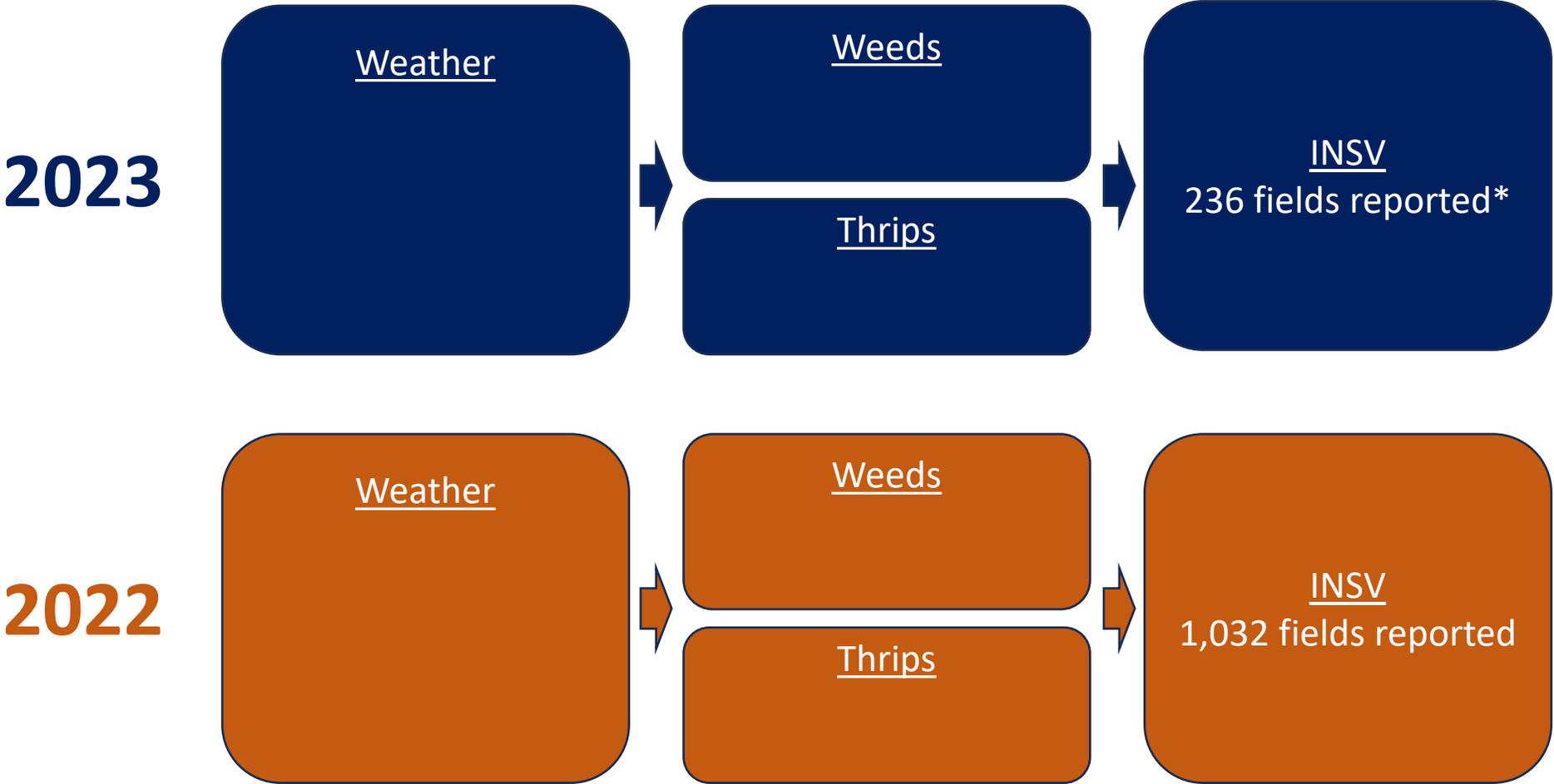
Daniel K. Hasegawa
Research Entomologist
USDA-ARS, Salinas CA

Pest Management Meeting
12/5/2023

2023 Update on Thrips and INSV

1. **2023 observations: weather, weeds, thrips, INSV**
2. **Thrips nursery sampling**
3. **New tools for detecting INSV and Pythium**
4. **Peptide technologies for managing thrips and diamondback moth**
5. **Improved methods for trapping and monitoring thrips**

2023 observations: weather, weeds, thrips, INSV



Mary Zischke, Chris Valadez
INSV/PW Task Force



2023 observations: weather, weeds, thrips, INSV

2023

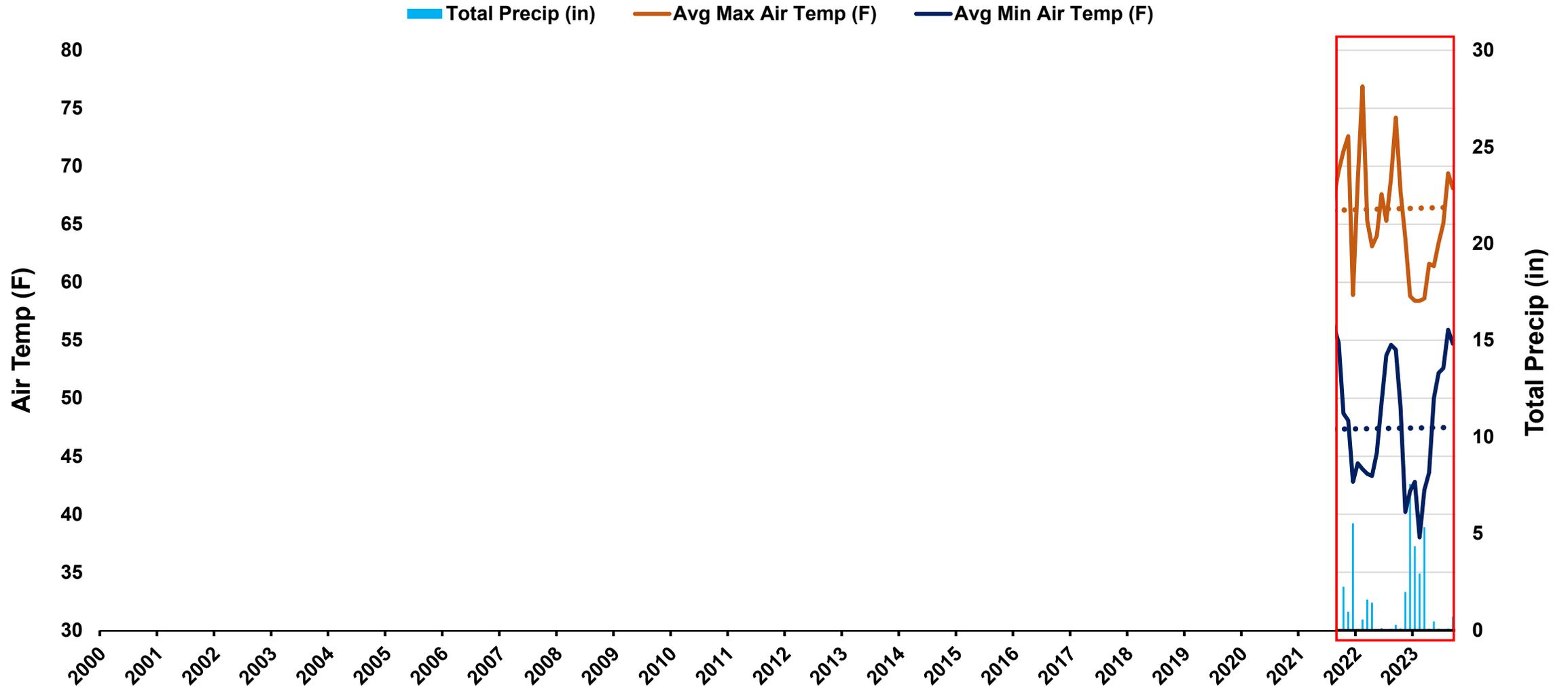


2022



Temperature and precipitation: 2000-2023

CIMIS Station 116: Salinas North

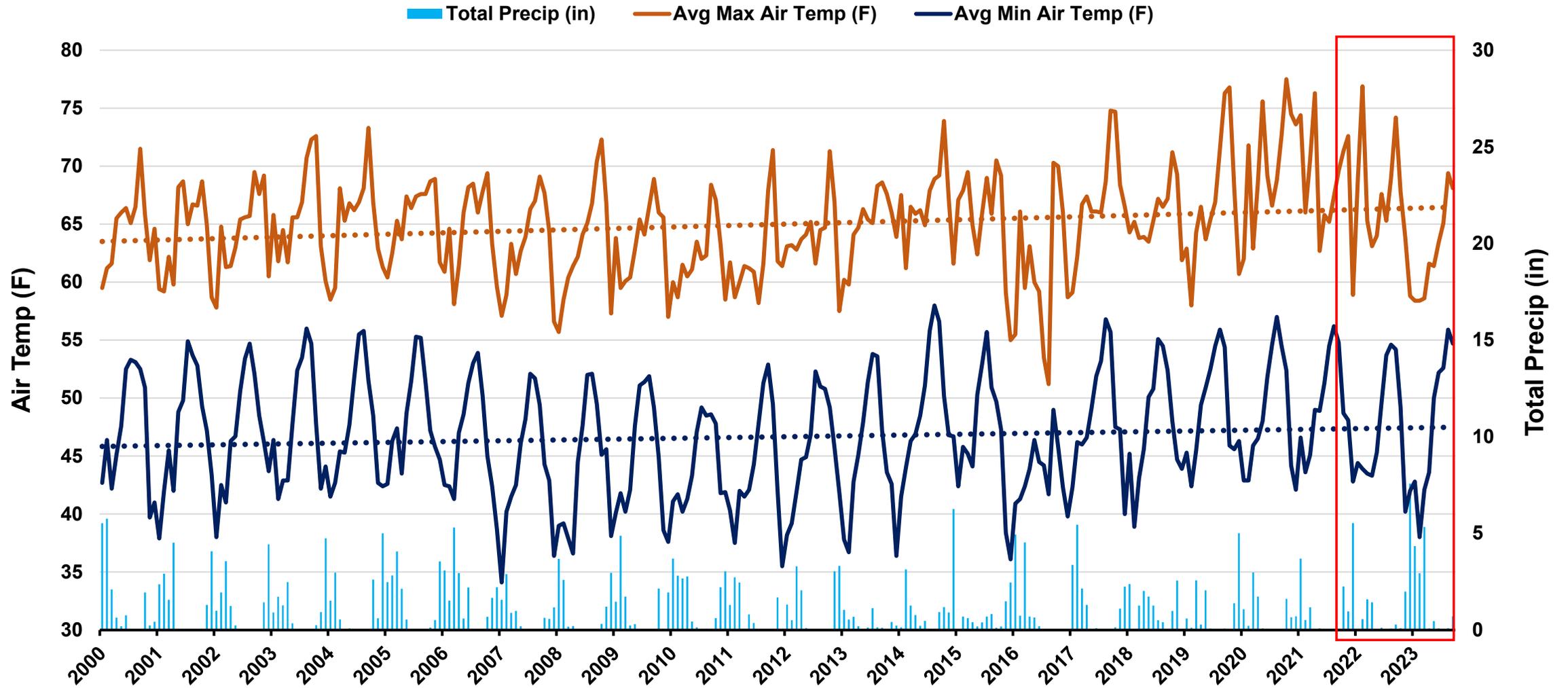


INSV first documented in coastal lettuce

Severe INSV outbreaks started to occur

Temperature and precipitation: 2000-2023

CIMIS Station 116: Salinas North



INSV first documented in coastal lettuce

Severe INSV outbreaks started to occur

2023 observations: weather, weeds, thrips, INSV

2023



2022



2023 observations: weather, weeds, thrips, INSV

2023



2022



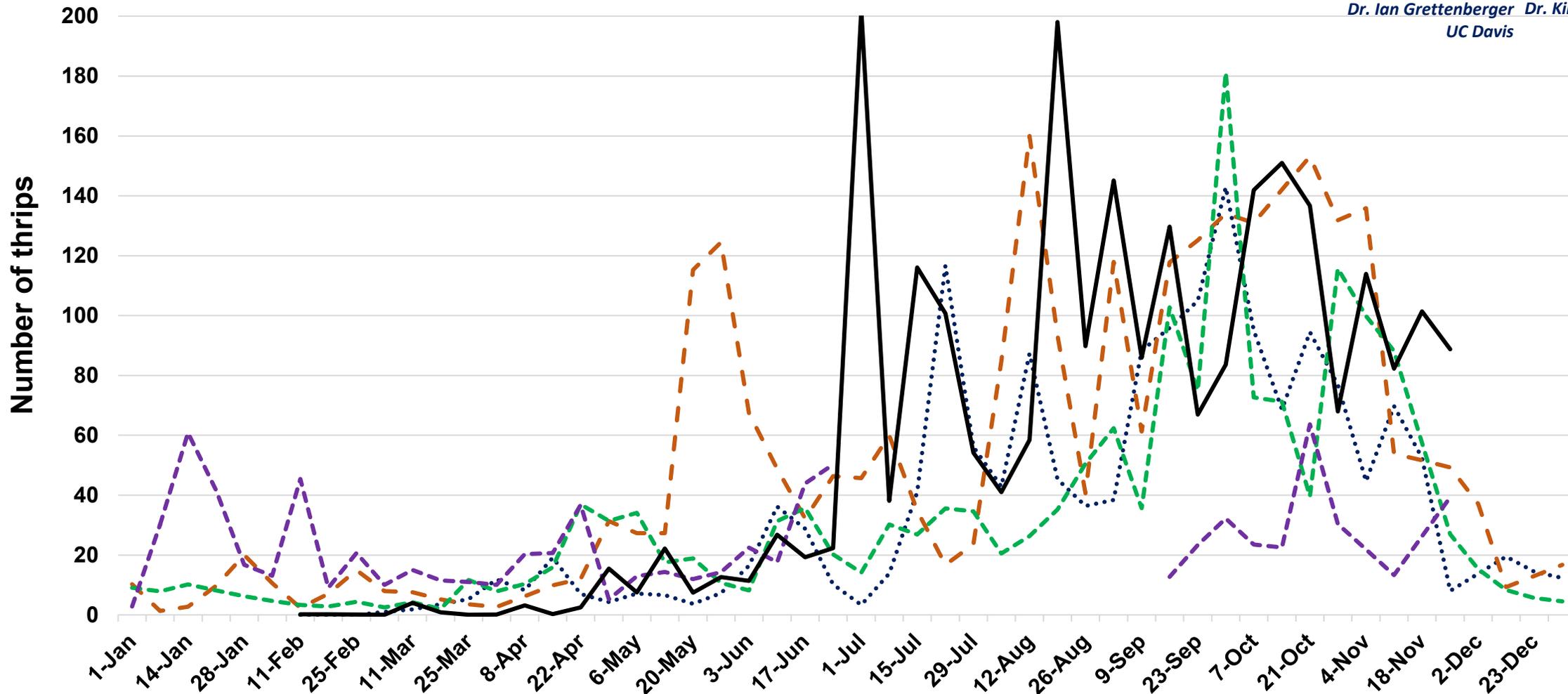
Thrips monitoring: 2019 – 2023



Dr. Ian Grettenberger UC Davis Dr. Kirsten Pearsons UCCE

Thrips/Sticky Card/Week (Salinas Valley Averages)

..... 2019 - - - 2020 - - - 2021 - - - 2022 — 2023



2023 observations: weather, weeds, thrips, INSV

2023



2022



2023 observations: weather, weeds, thrips, INSV

2023



2022



2023 observations: weather, weeds, thrips, INSV

2023



2022



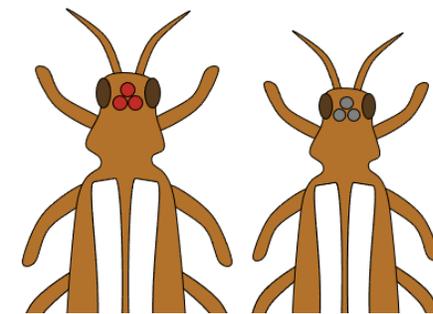
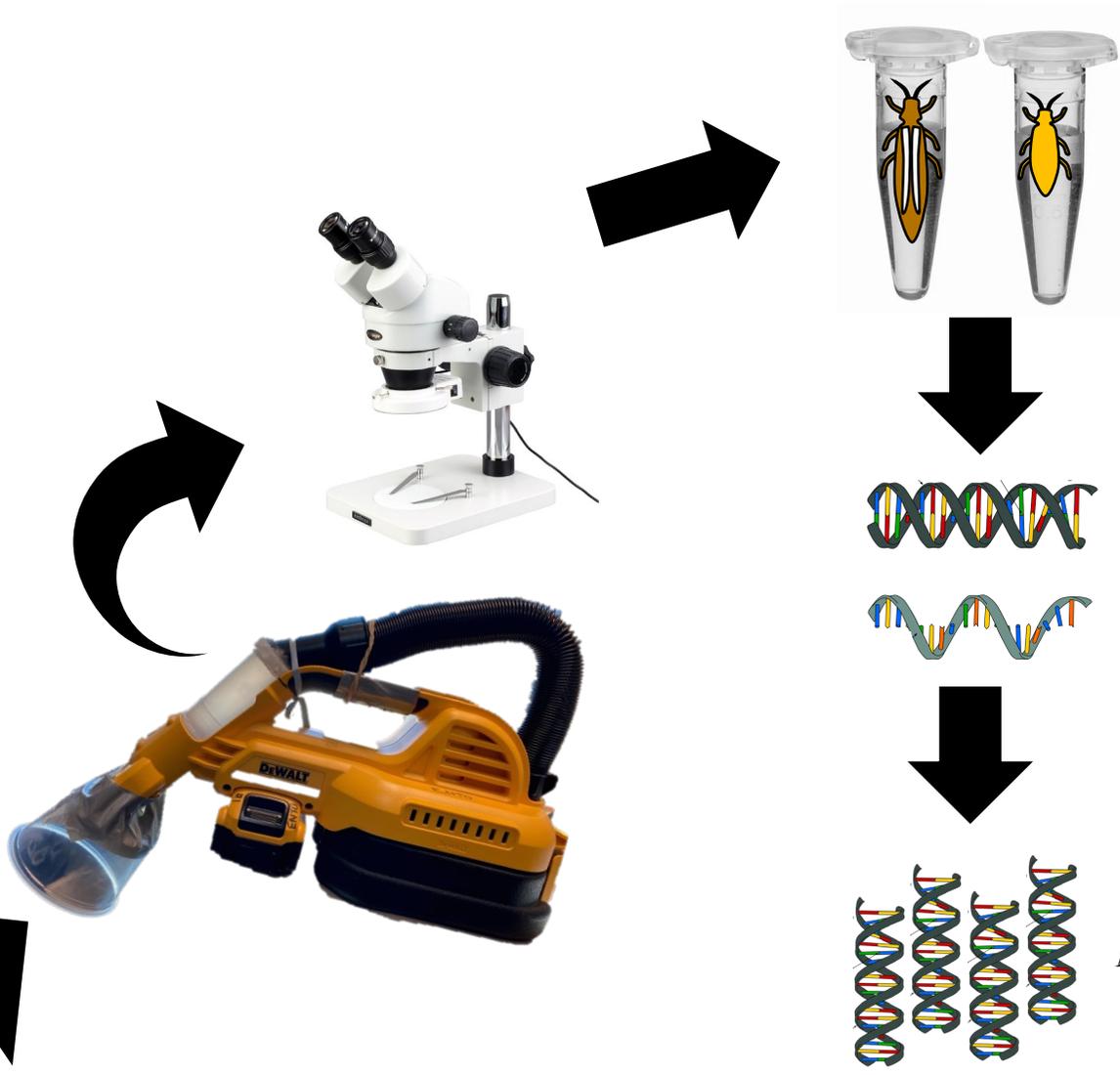
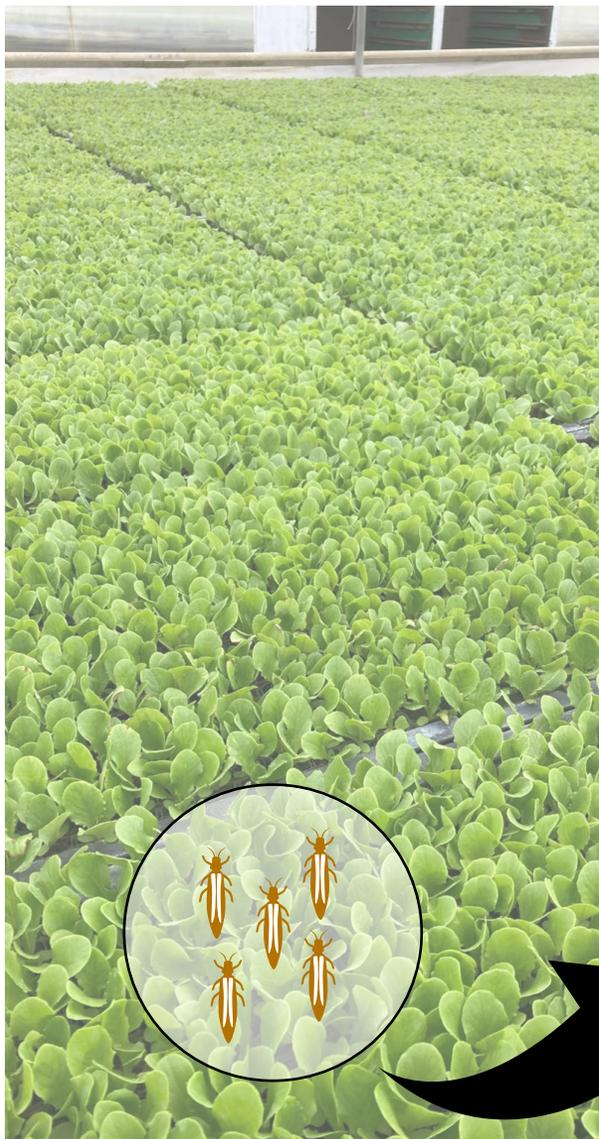
2023 Update on Thrips and INSV

1. 2023 observations: weather, weeds, thrips, INSV
2. **Thrips nursery sampling**
3. New tools for detecting INSV and Pythium
4. Peptide technologies for managing thrips and diamondback moth
5. Improved methods for trapping and monitoring thrips

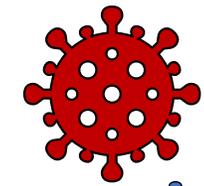
Thrips nursery sampling



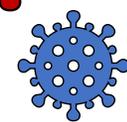
Dr. Kirsten Pearsons
UCCE



WFT? Onion thrips?



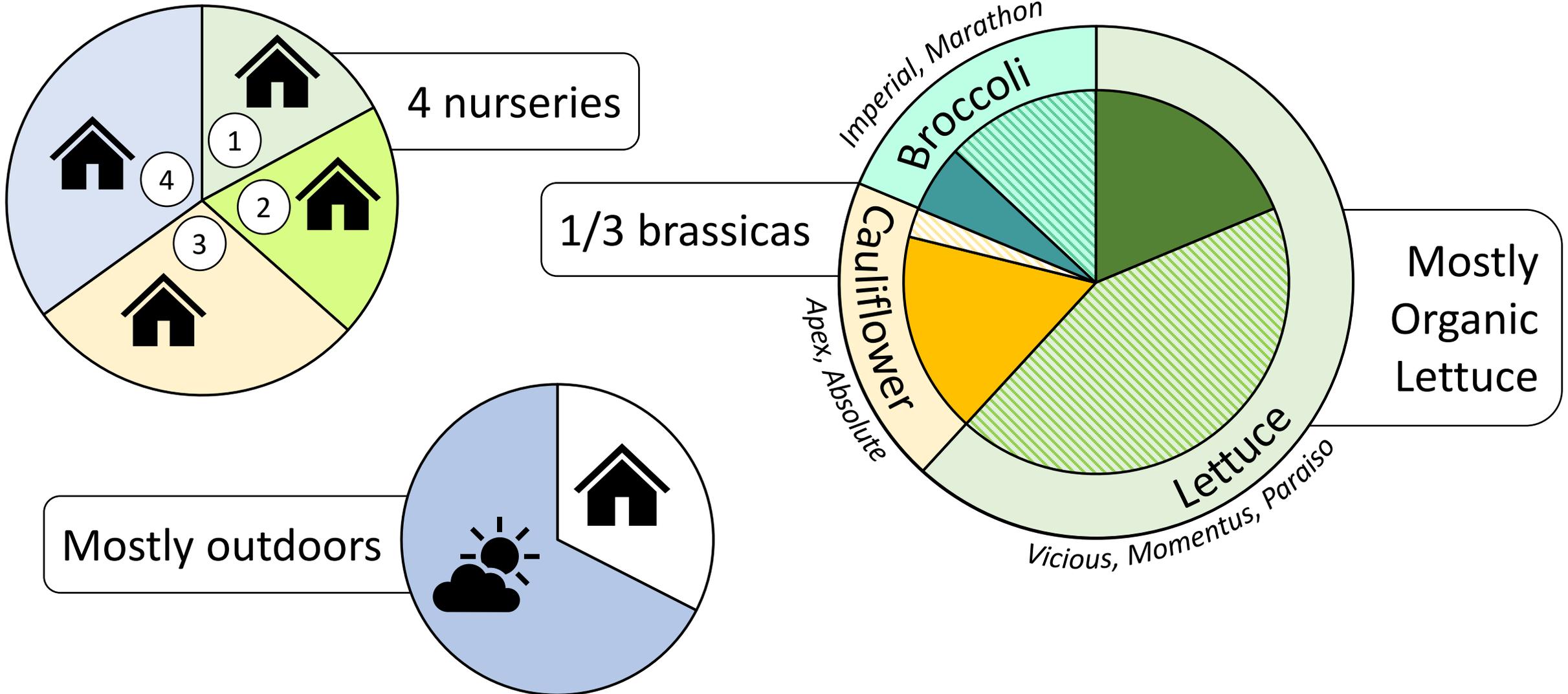
INSV?



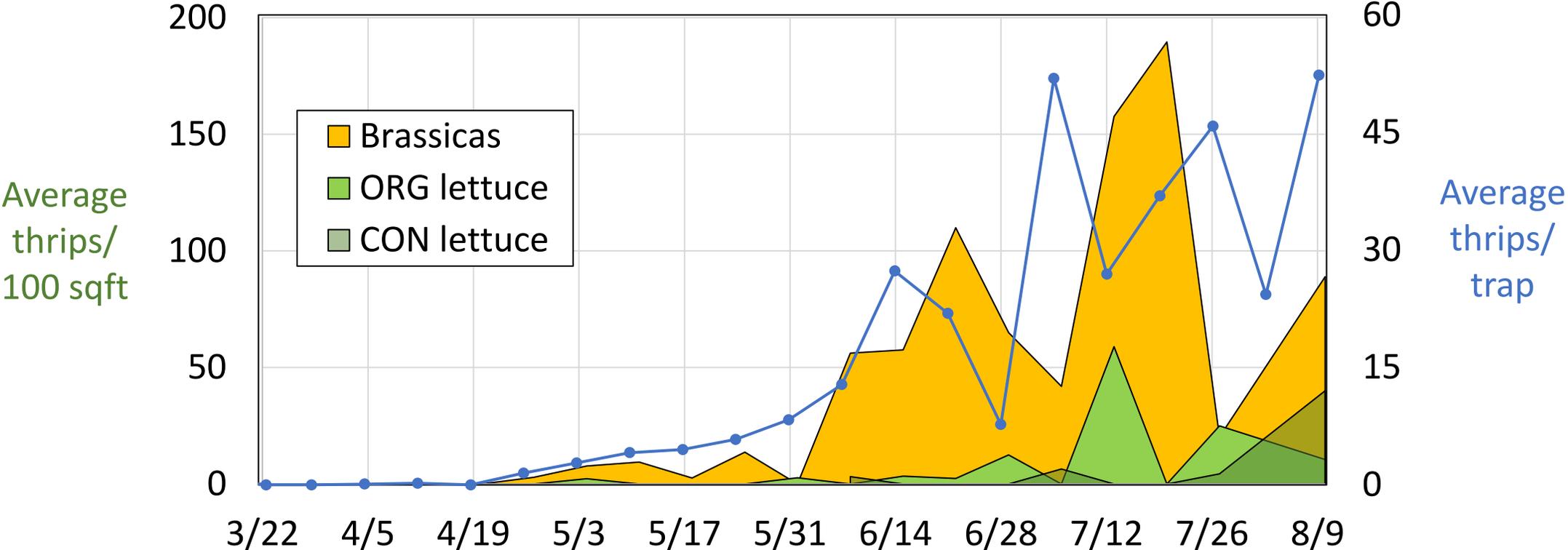
TSWV?

Thrips nursery sampling

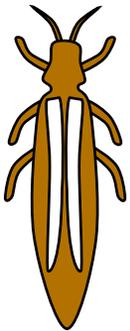
March – August 2023



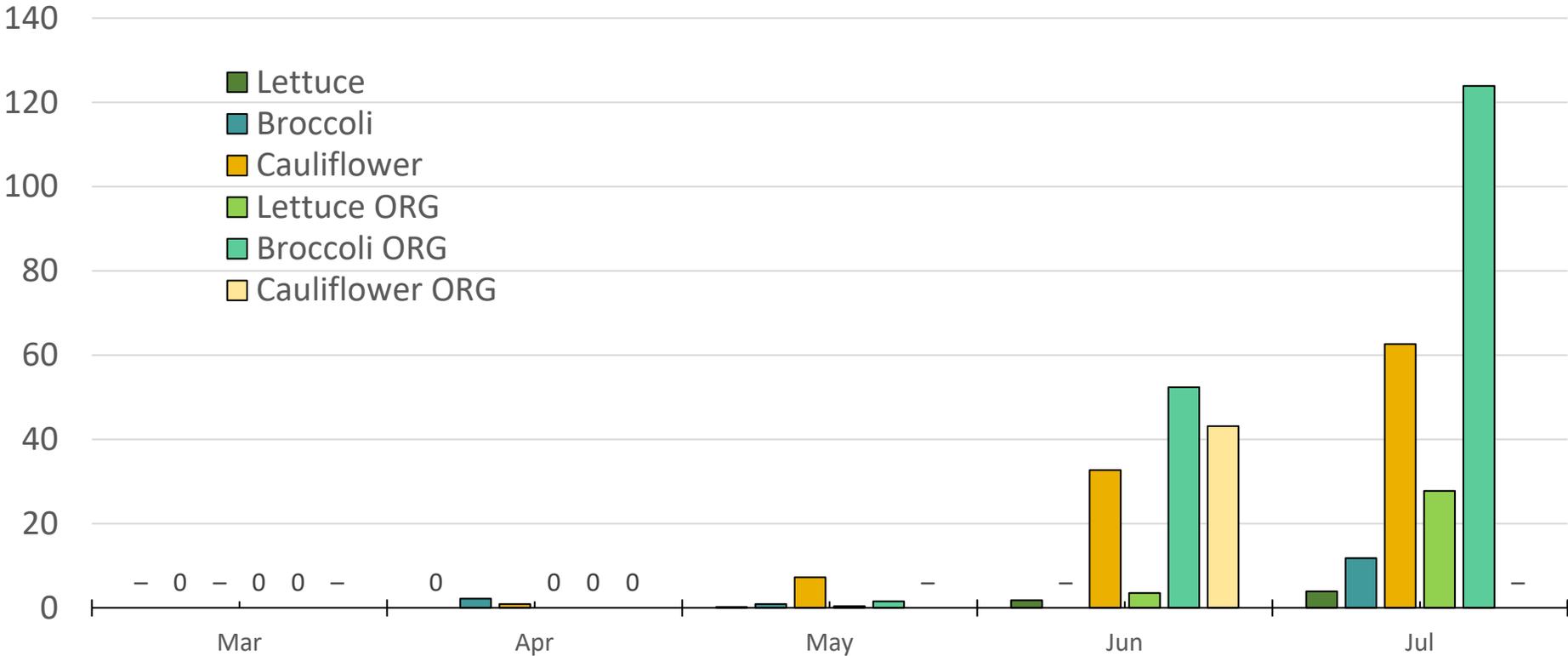
Thrips populations in nurseries followed Salinas Valley trends



Highest adult densities on conventional cauliflower and organic broccoli, sampled in July

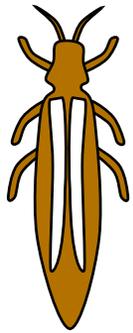


thrips / sqft

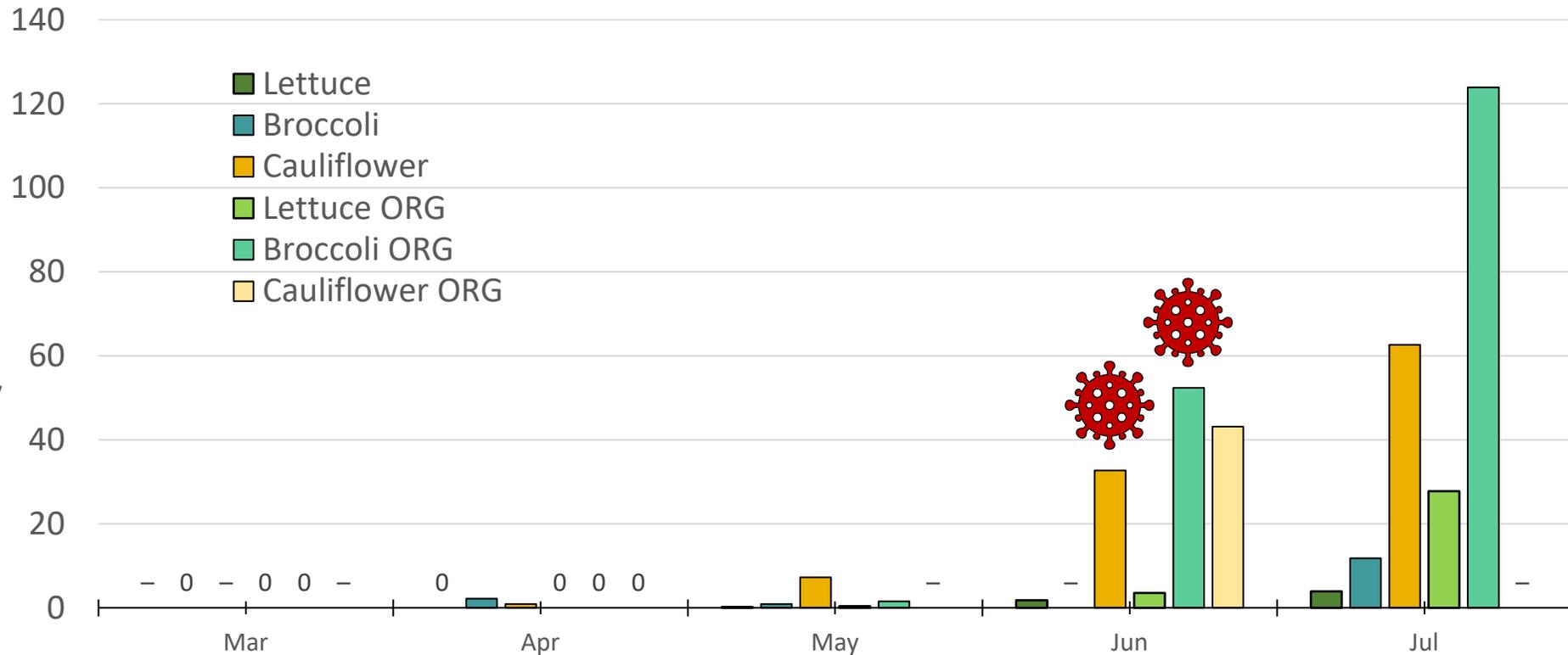


731 adult thrips tested

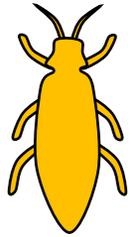
~98.7% western flower thrips
~1.64% positive for INSV (no TSWV)



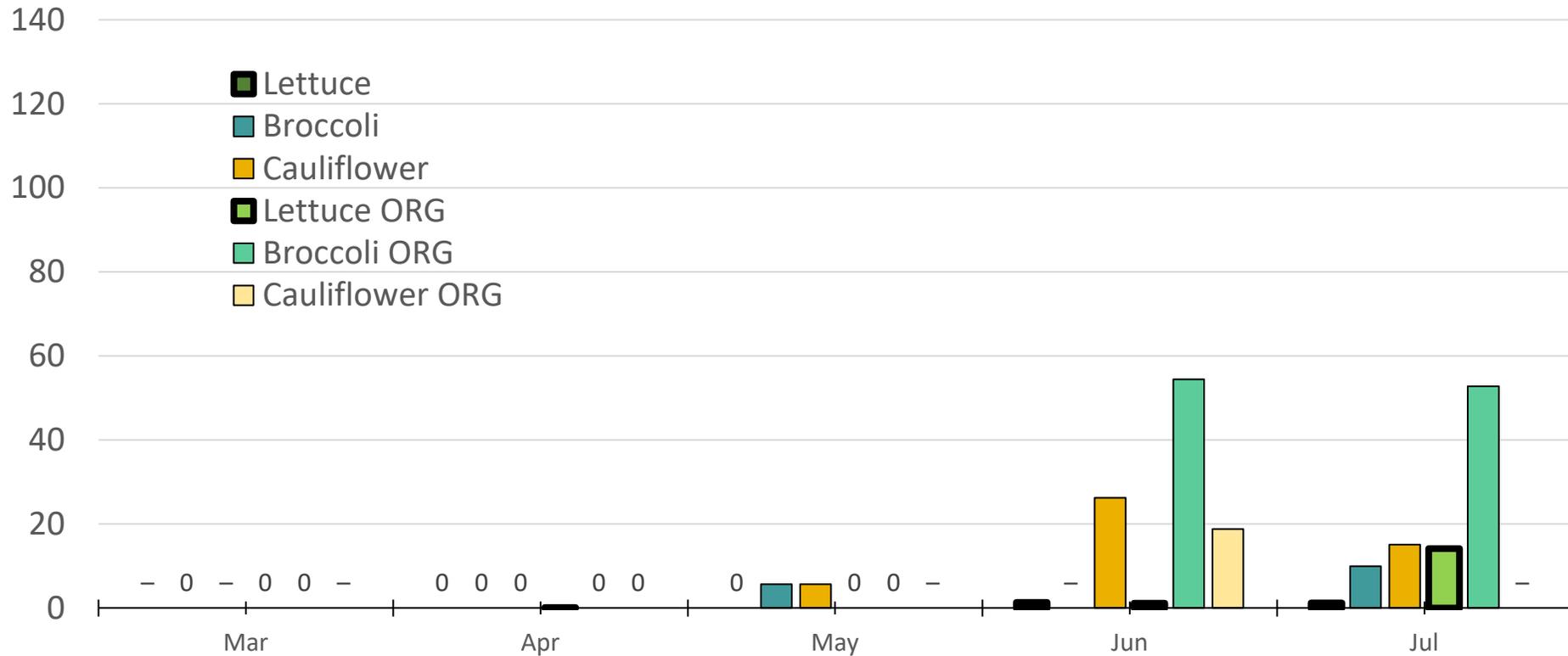
thrips /
sqft



399 larvae tested ~99.6% western flower thrips None positive for INSV (no TSWV)



thrips /
sqft



2023 Update on Thrips and INSV

1. 2023 observations: weather, weeds, thrips, INSV
2. Thrips nursery sampling
3. **New tools for detecting INSV and Pythium**
4. Peptide technologies for managing thrips and diamondback moth
5. Improved methods for trapping and monitoring thrips

INSV + Pythium infections



*Dr. JP Dondore-Arias, Karla Jasso, M.S. student
California State University Monterey Bay*

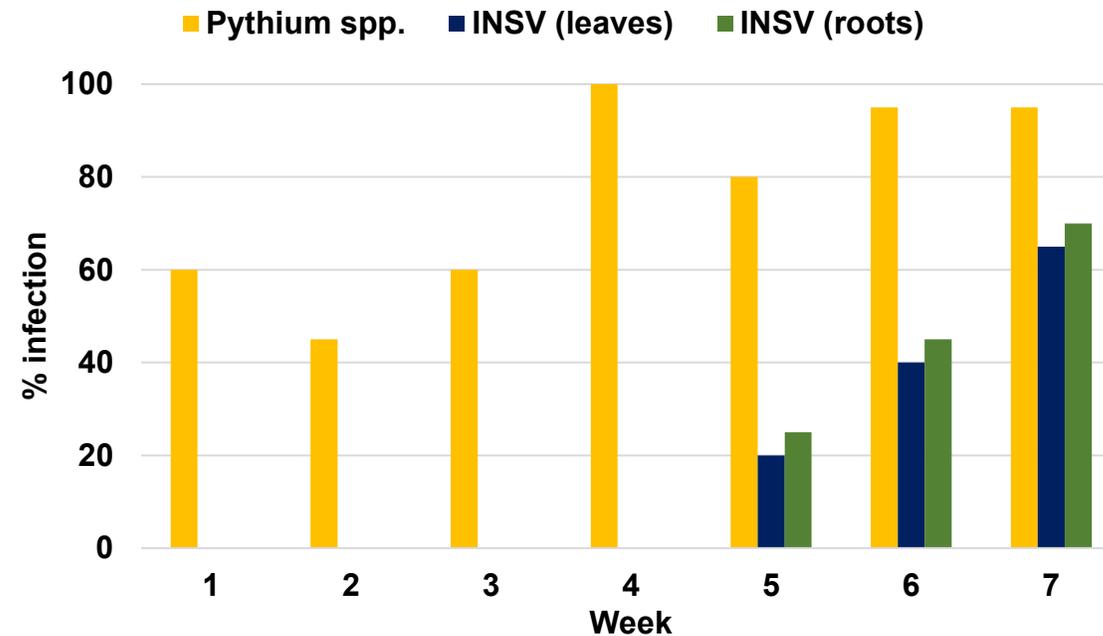
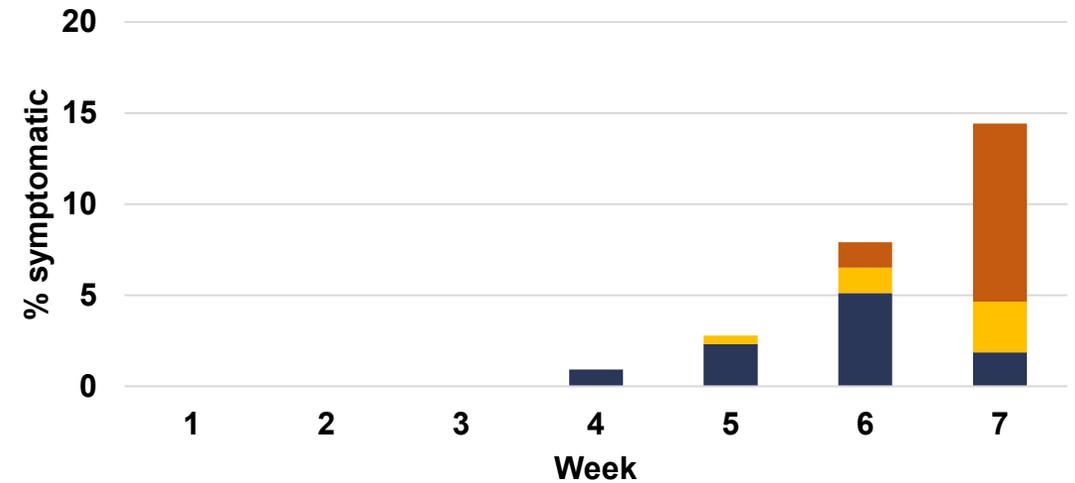
Field trials

- 6 fields in 2022
- 7 fields in 2023

Weekly evaluations

- Foliar and root symptoms
 - INSV: leaf necrosis
 - Pythium Wilt: wilting of leaves
- Diagnostics
 - INSV: TAS-ELISA (leaves + roots)
 - Pythium spp.: Culturing (roots)
 - N=20 plants

■ INSV ■ Wilt ■ INSV + Wilt 2022 field



New tools for quantifying INSV and *P. uncinulatum*

Multiplex qPCR



Viviana Camelo
Postdoc, USDA-ARS



Frank Martin
USDA-ARS

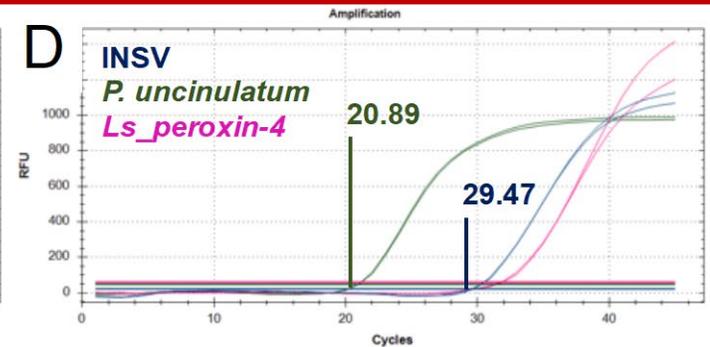
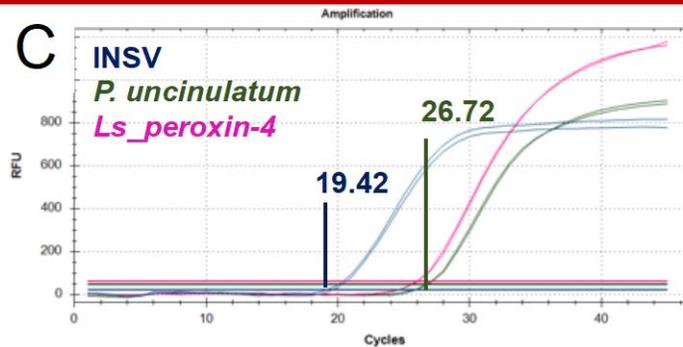


Austin McCoy
Timothy Miles
Martin Chilvers
Michigan State University



B

	1	2	3	4	5	6
INSV	↑ 19.42	24.11	23.44	22.94	24.72	29.57 ↓
<i>P. uncinulatum</i>	↓ 26.72	25.95	22.65	20.90	21.76	20.89 ↑



2023 Update on Thrips and INSV

1. 2023 observations: weather, weeds, thrips, INSV
2. Thrips nursery sampling
3. New tools for detecting INSV and Pythium
4. Peptide technologies for managing thrips and diamondback moth
5. Improved methods for trapping and monitoring thrips

Novel peptides for managing western flower thrips and diamondback moth

2.5 years: (2022 – 2025)

- **Phase 1 (Discovery)**: Identification and expression of receptors that are specific to western flower thrips (WFT) and diamondback moth (DBM),
- **Phase 2 (Synthesis)**: Screen, design, and synthesize bioactive peptides that selectively bind to and disrupt WFT and DBM GPCRs, and
- **Phase 3 (Efficacy)**: Evaluate the efficacy of bioactive peptides on WFT and DBM survival.



*Dr. Manny Choi
Research Entomologist,
USDA-ARS Corvallis, OR*



*Laura Hladky
Lab Tech, USDA-ARS*



*Juan Vargas
USDA-ARS, Salinas
CSUMB undergrad*



PEST MANAGEMENT RESEARCH TECHNOLOGY

PEST MANAGEMENT ...

New technology for environmentally safe pest control discovered

"Receptor interference" technology disrupts the vital processes needed for fire ants to survive

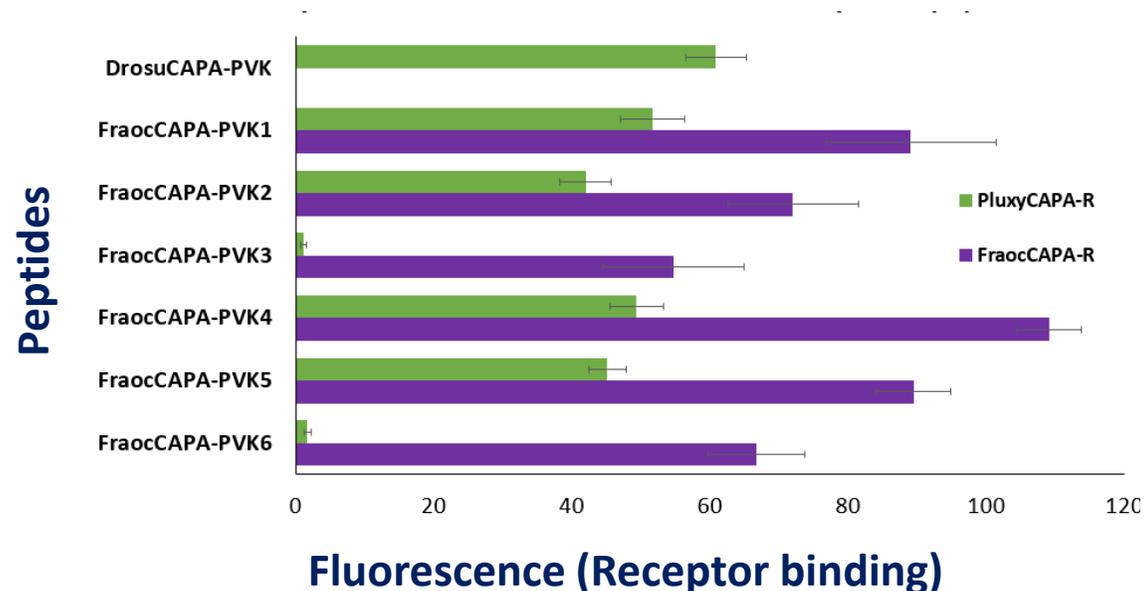
PUBLISHED ON AUGUST 29, 2021

Novel peptides for managing western flower thrips and diamondback moth

2.5 years: (2022 – 2025)

- **Phase 1 (Discovery):** Identification and expression of receptors that are specific to western flower thrips (WFT) and diamondback moth (DBM),
- **Phase 2 (Synthesis):** Screen, design, and synthesize bioactive peptides that selectively bind to and disrupt WFT and DBM GPCRs, and
- **Phase 3 (Efficacy):** Evaluate the efficacy of bioactive peptides on WFT and DBM survival.

 Western flower thrips
 Diamondback moth



Dr. Manny Choi
Research Entomologist,
USDA-ARS Corvallis, OR



Laura Hladky
Lab Tech, USDA-ARS



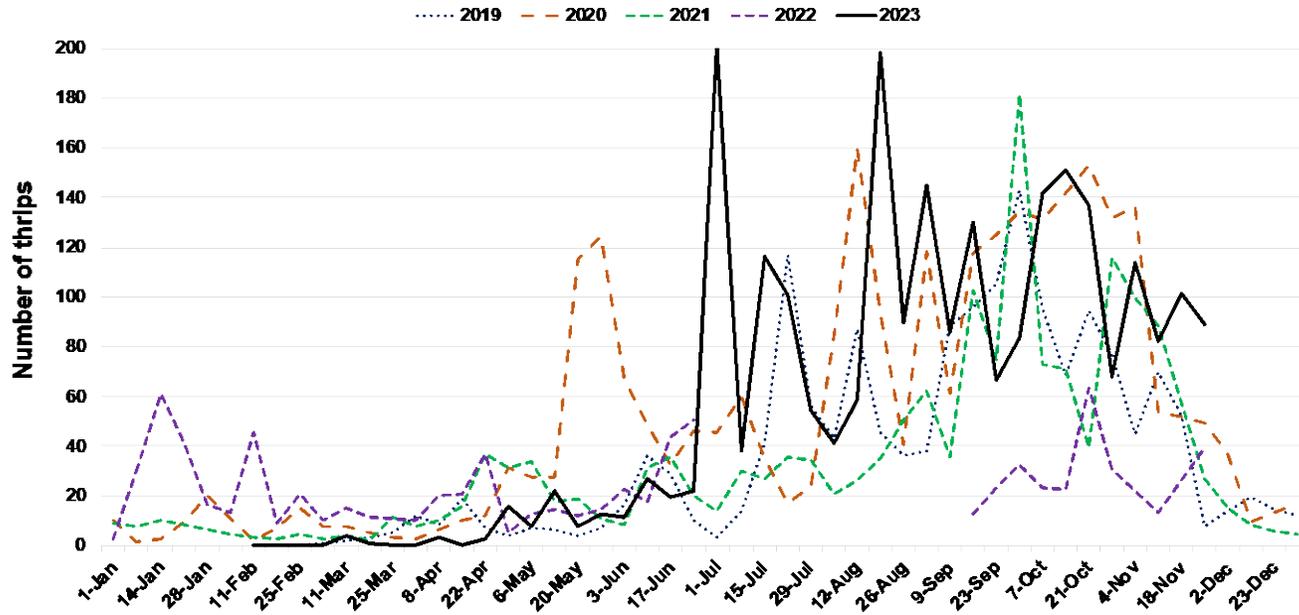
Juan Vargas
USDA-ARS, Salinas
CSUMB undergrad

2023 Update on Thrips and INSV

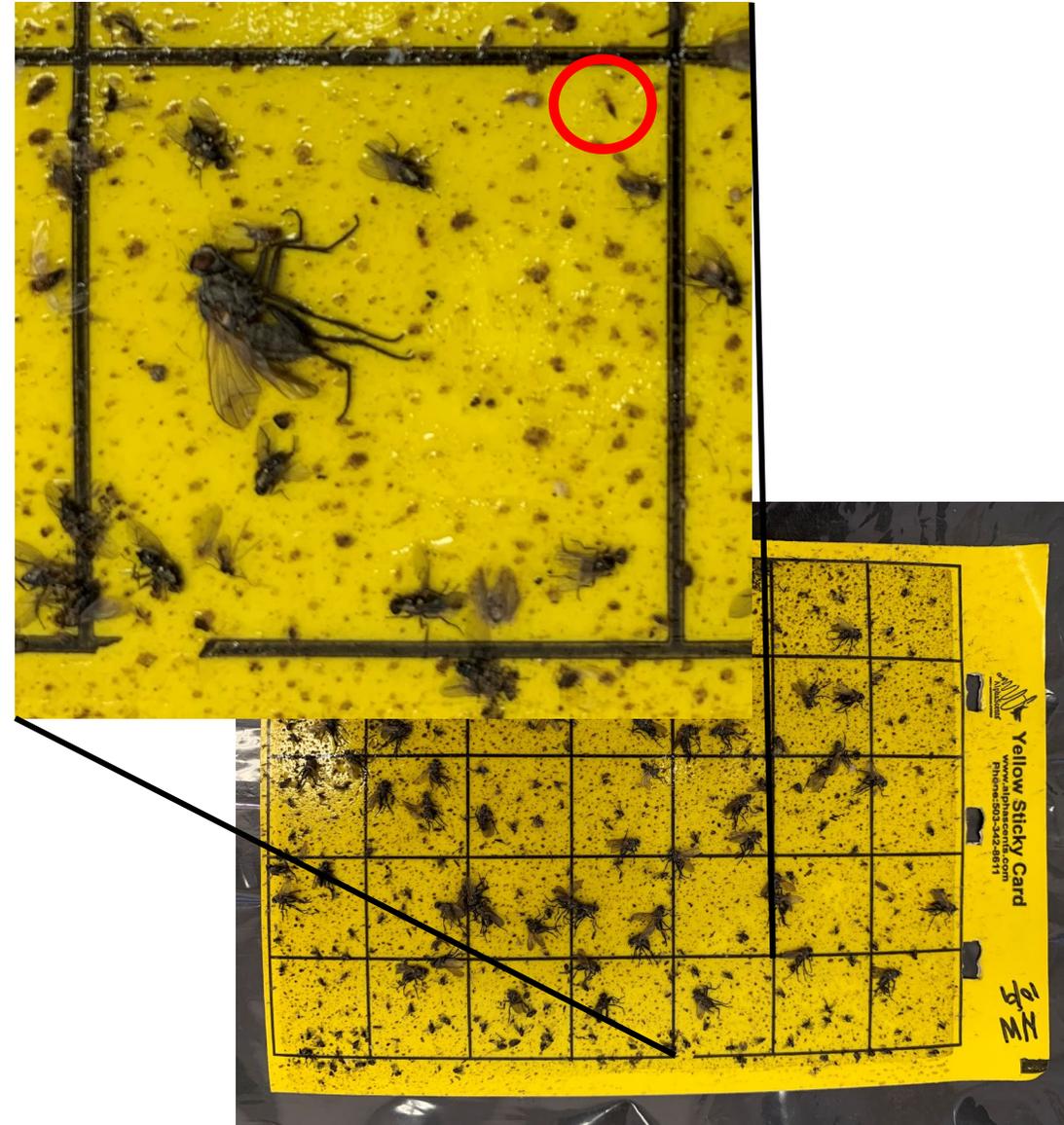
1. 2023 observations: weather, weeds, thrips, INSV
2. Thrips nursery sampling
3. New tools for detecting INSV and Pythium
4. Peptide technologies for managing thrips and diamondback moth
5. Improved methods for trapping and monitoring thrips

Improved methods for trapping and monitoring thrips

Thrips/Sticky Card/Week (Salinas Valley Averages)



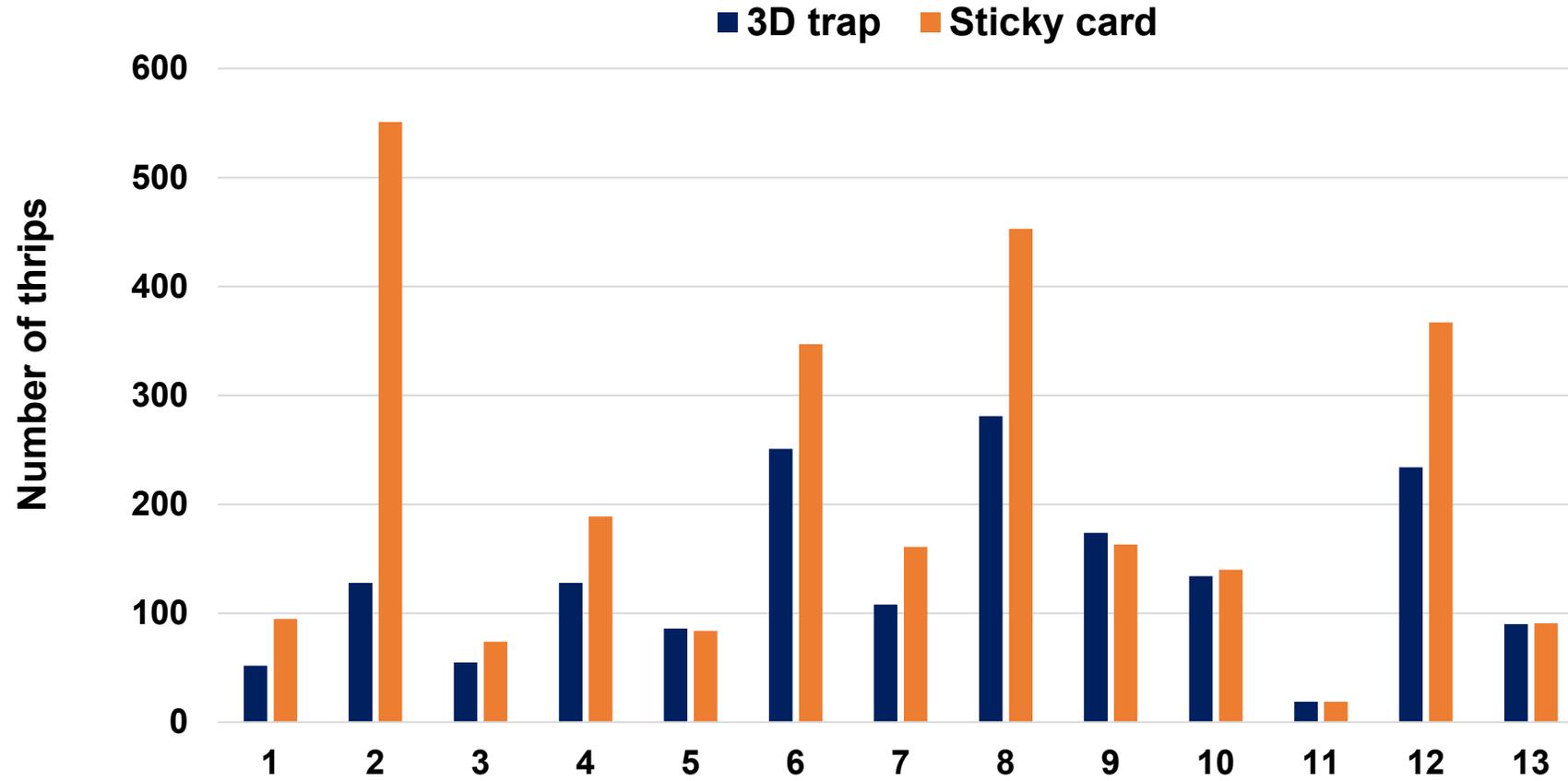
Which thrips have INSV?





Deena Husein
Postdoc, USDA-ARS

Field testing 3D-printed thrips traps



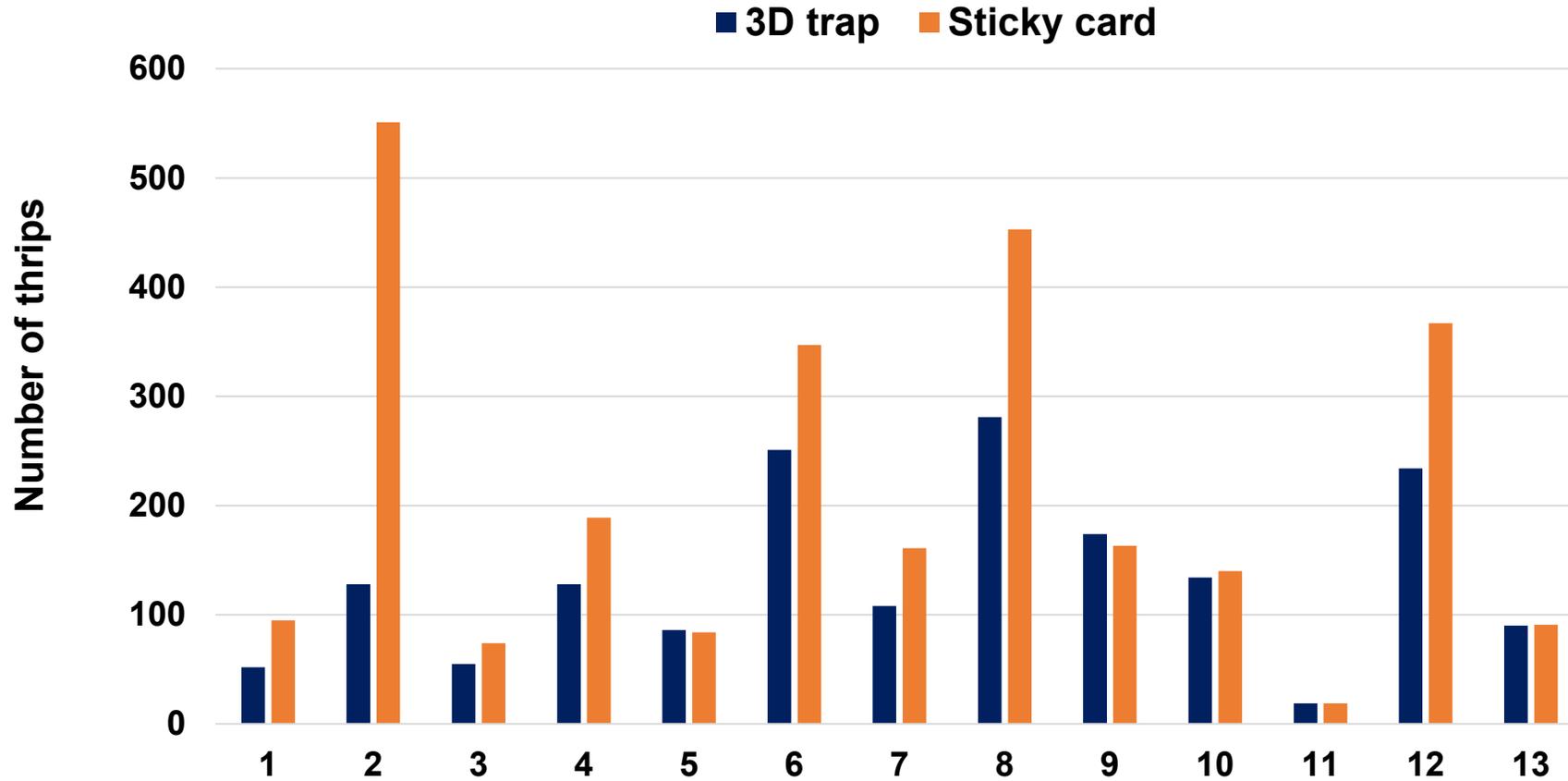


Deena Husein
Postdoc, USDA-ARS



Laura Hladky
Lab Tech, USDA-ARS

Field testing 3D-printed thrips traps



	1	2	3	4	5	6	7	8	9	10	11	12	13
Western flower thrips	+	+	+	+	+	+	+	+	+	+	+	+	+
Onion thrips	-	+	+	+	+	+	+	+	+	+	+	+	+
INSV	-	+	+	+	-	-	-	-	-	-	-	-	-
TSWV	-	-	-	-	-	-	-	-	-	-	-	-	-



Field testing 3D-printed thrips traps



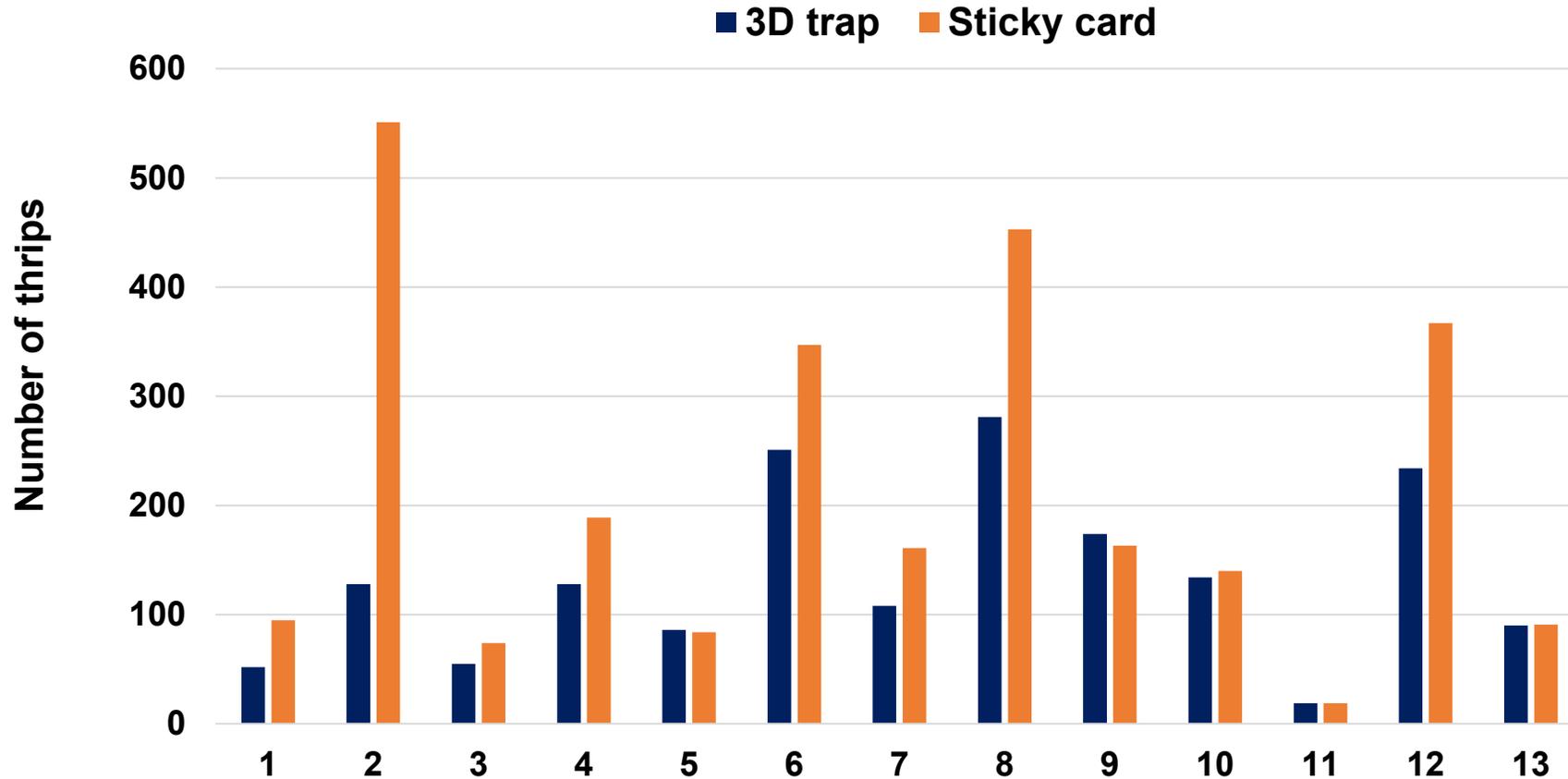
Deena Husein
Postdoc, USDA-ARS



Laura Hladky
Lab Tech, USDA-ARS



Shulu Zhang
Postdoc, USDA-ARS



Improving thrips traps:
Design
Color
Pheromones*

Faster thrips testing:
\$2.28/sample (RT-qPCR)
~2 hr/sample
Current method

\$1.66/sample (RPA)
~30 min/sample
*In progress**

	1	2	3	4	5	6	7	8	9	10	11	12	13
Western flower thrips	+	+	+	+	+	+	+	+	+	+	+	+	+
Onion thrips	-	+	+	+	+	+	+	+	+	+	+	+	+
INSV	-	+	+	+	-	-	-	-	-	-	-	-	-
TSWV	-	-	-	-	-	-	-	-	-	-	-	-	-



2023 Update on Thrips and INSV

1. **2023 observations: weather, weeds, thrips, INSV**
2. **Thrips nursery sampling**
3. **New tools for detecting INSV and Pythium**
4. **Peptide technologies for managing thrips and diamondback moth**
5. **Improved methods for trapping and monitoring thrips**

Thank you!



daniel.hasegawa@usda.gov

Hasegawa Lab, USDA-ARS, Salinas, CA

- Lab Technician: Laura Hladky
- Postdocs: Viviana Camelo, Shulu Zhang, Deena Husein
- Biological Science Aids (CSUMB undergrads): Kiara Gable, Kai Larrieu, Jasmin Azad-Khan, Chaela Hicks, Juan Vargas, Grace Hardy, Lisette Godinez-Rivera, Suzette Segoviano-Quiroz, Ulisses Peralta-Diaz

USDA-ARS, Salinas, CA

Bill Wintermantel, Aaron Rocha, Frank Martin

University of California Cooperative Extension, Monterey County

Richard Smith, Kirsten Pearsons, Alejandro Del-Pozo (Virginia Tech)

California State University Monterey Bay (CSUMB)

JP Dundore-Arias, Karla Jasso, Cecilia Diaz

University of California Davis

Ian Grettenberger

Growers, PCAs, CCAs,
other industry members
and stakeholders

Grower-Shipper Association of Central CA

Chris Valadez, GSA President

Mary Zischke, INSV/PW Task Force leader

