2025 Update on Thrips and INSV

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

Pest Management Meeting
12/02/2025

USDA Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE

2025 Update on Thrips and INSV

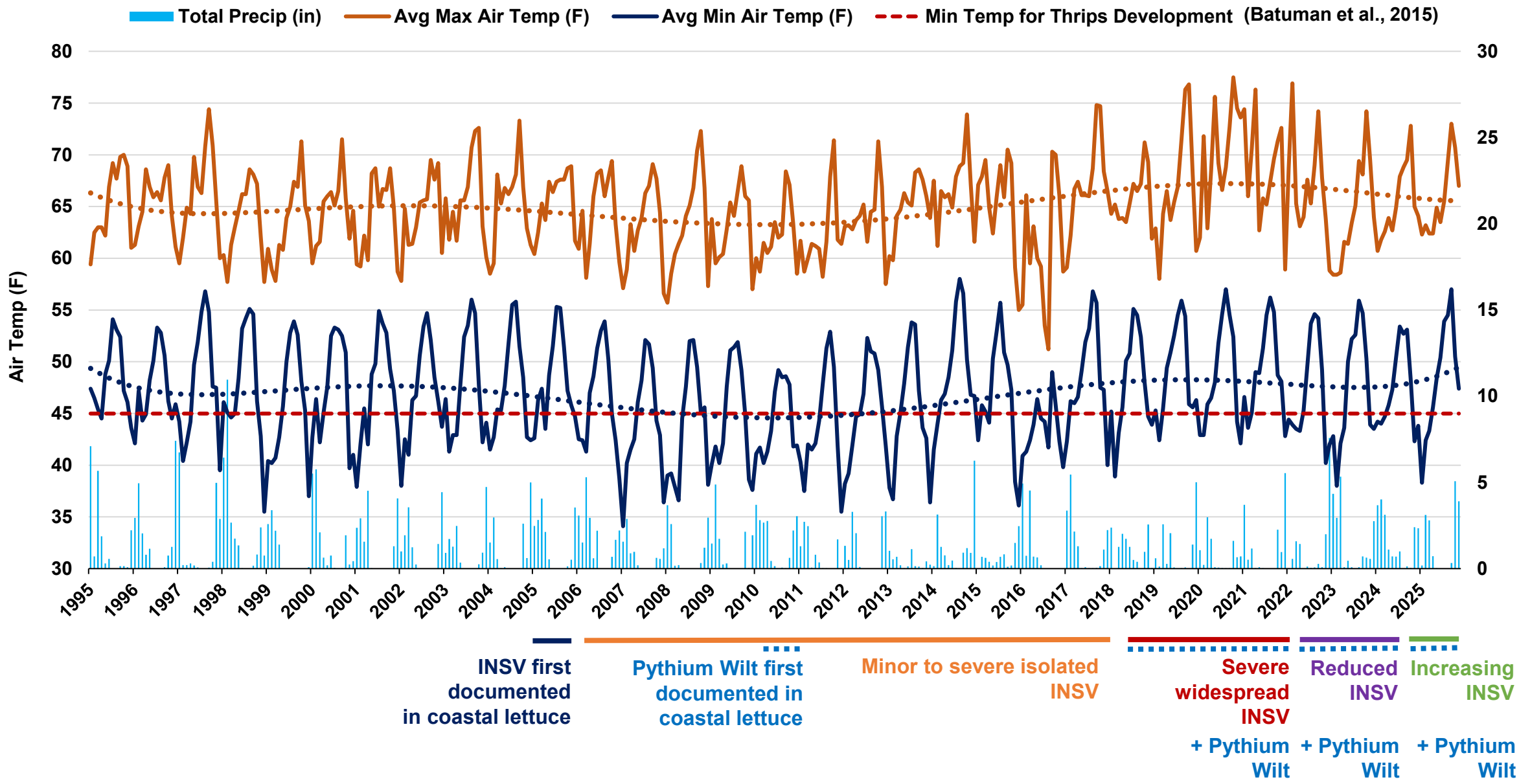
1. Weather, thrips, INSV, weeds
2. *Recap:* INSV and Pythium Wilt interactions
3. New thrips surveillance strategies
4. Use of hedgerows and native plants as insectaries

2025 Update on Thrips and INSV

1. **Weather, thrips, INSV, weeds**
2. ***Recap:*** **INSV and Pythium Wilt interactions**
3. **New thrips surveillance strategies**
4. **Use of hedgerows and native plants as insectaries**

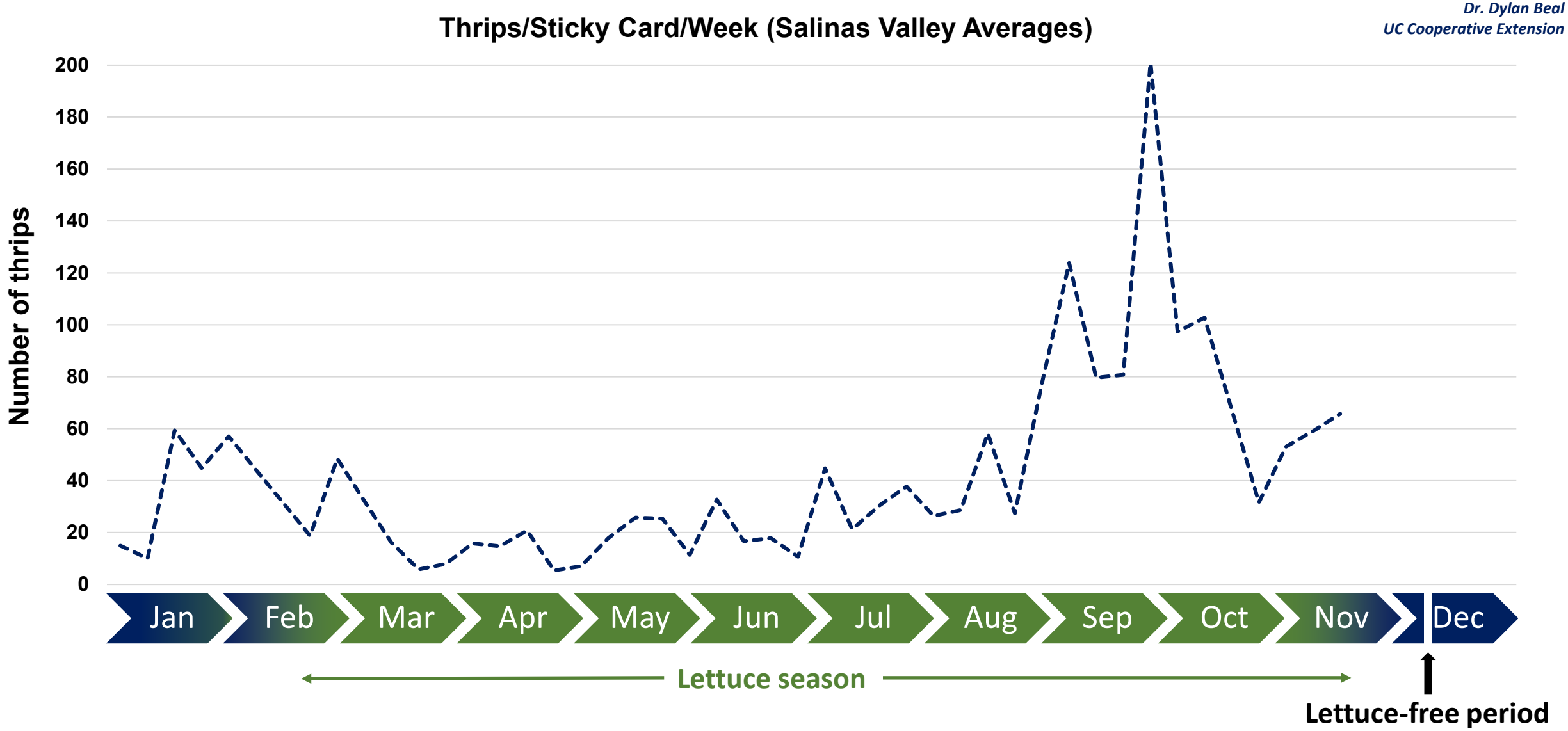
30 years of climate data

CIMIS Station 116: Salinas North



2025 Thrips and INSV observations

Dr. Dylan Beal
UC Cooperative Extension



2025 Thrips and INSV observations

Dr. Dylan Beal
UC Cooperative Extension

Thrips/Sticky Card/Week (Salinas Valley Averages)

Number of thrips

200
180
160
140
120
100
80
60
40
20
0

Mar-May

Localized minor to severe outbreaks of INSV (5-80% incidence)

Most fields were adjacent to old unmanaged weeds

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Lettuce season

Lettuce-free period

2025 Thrips and INSV observations

Dr. Dylan Beal
UC Cooperative Extension

Thrips/Sticky Card/Week (Salinas Valley Averages)

Number of thrips

200
180
160
140
120
100
80
60
40
20
0

Mar-May

Localized minor to severe outbreaks of INSV (5-80% incidence)

Most fields were adjacent to old unmanaged weeds

Jun-Oct

Increasing severe outbreaks of INSV (up to 100% incidence)

Aug (case study)

Multiple blocks of lettuce: up to 100% loss due to INSV

Adjacent weedy lot
Annual sowthistle = 83% INSV infection
Prickly lettuce = 59% INSV infection

INSV infections of adjacent lettuce continued through Oct

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

Lettuce season

Lettuce-free period

Top 10 non-lettuce hosts for INSV in the Salinas Valley, CA

					Seasonal abundance			
	Common name	**Scientific name**	**Family**	**Category**	**Winter**	**Spring**	**Summer**	**Fall**
1	Little Mallow	*Malva parviflora*	Malvaceae (Mallow Family)	Broadleaf	++	++	++	++
2	Annual Sowthistle	*Sonchus oleraceus*	Asteraceae (Sunflower Family)	Broadleaf	++	++	++	++
3	Nettleleaf goosefoot	*Chenopodium murale*	Chenopodiaceae (Goosefoot Family)	Broadleaf	+	++	++	++
4	Mare's Tail	*Conyza canadensis*	Asteraceae (Sunflower Family)	Broadleaf	+	++	++	++
5	Field Bindweed	*Convolvulus arvensis*	Convolvulaceae (Morning glory Family)	Broadleaf	0	++	++	++
6	Shepherds Purse	*Capsella bursa-pastoris*	Brassicaceae (Mustard Family)	Broadleaf	++	++	++	++
7	Common Purslane	*Portulaca oleracea*	Portulacaceae (Purslane Family)	Broadleaf	0	+	++	++
8	Hairy Fleabane	*Conyza bonariensis*	Asteraceae (Sunflower Family)	Broadleaf	+	++	++	++
9	Burning Nettle	*Urtica urens*	Urticaceae (Nettle Family)	Broadleaf	++	++	++	++
10	Common Lambsquarter	*Chenopodium album*	Chenopodiaceae (Goosefoot Family)	Broadleaf	0	++	++	++



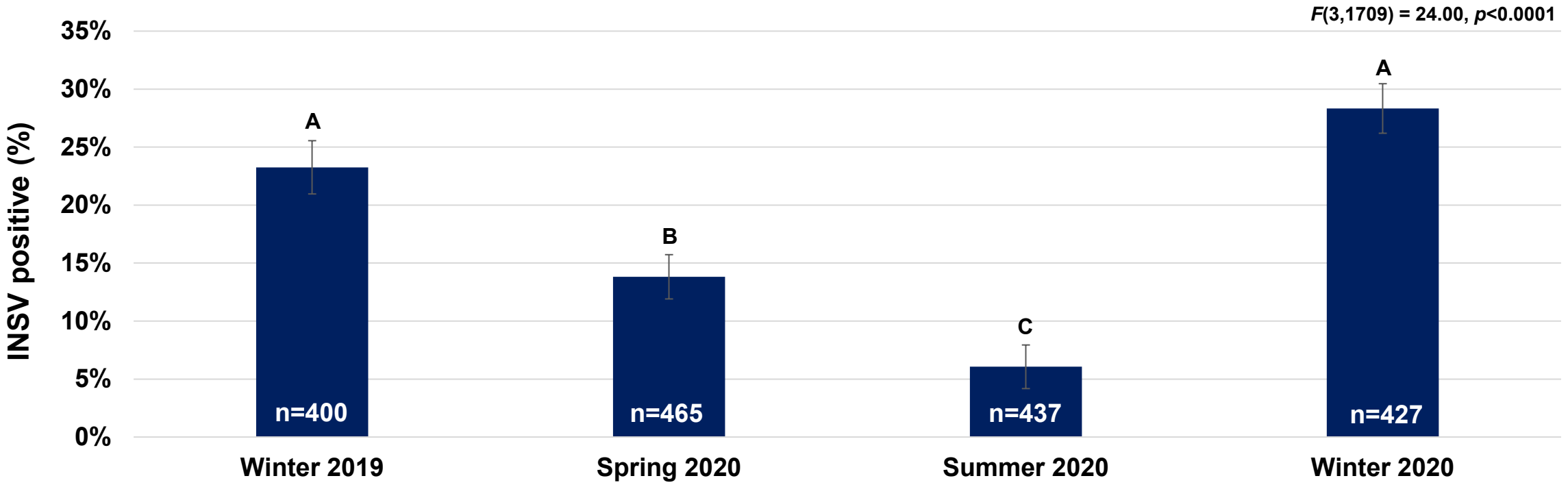


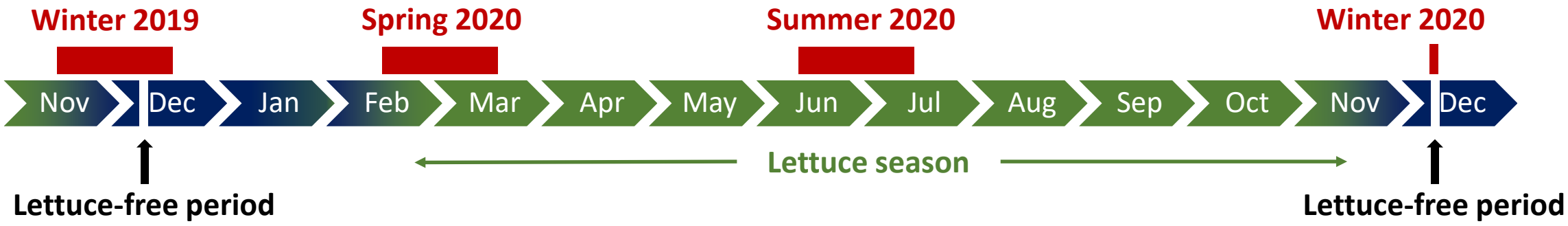





http://ipm.ucanr.edu/PMG/weeds_all.html

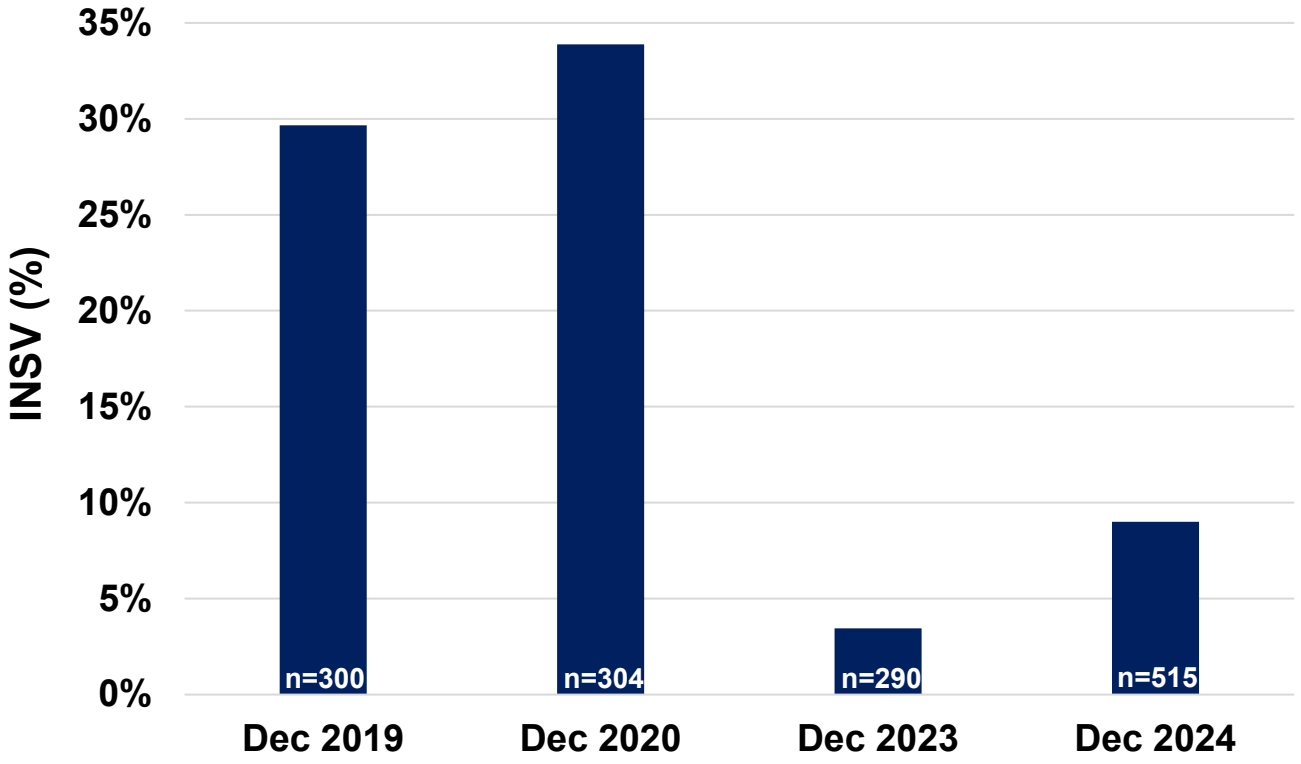
INSV infection of top 10 hosts





INSV infection of top 10 hosts

Salinas, Chualar, Gonzales



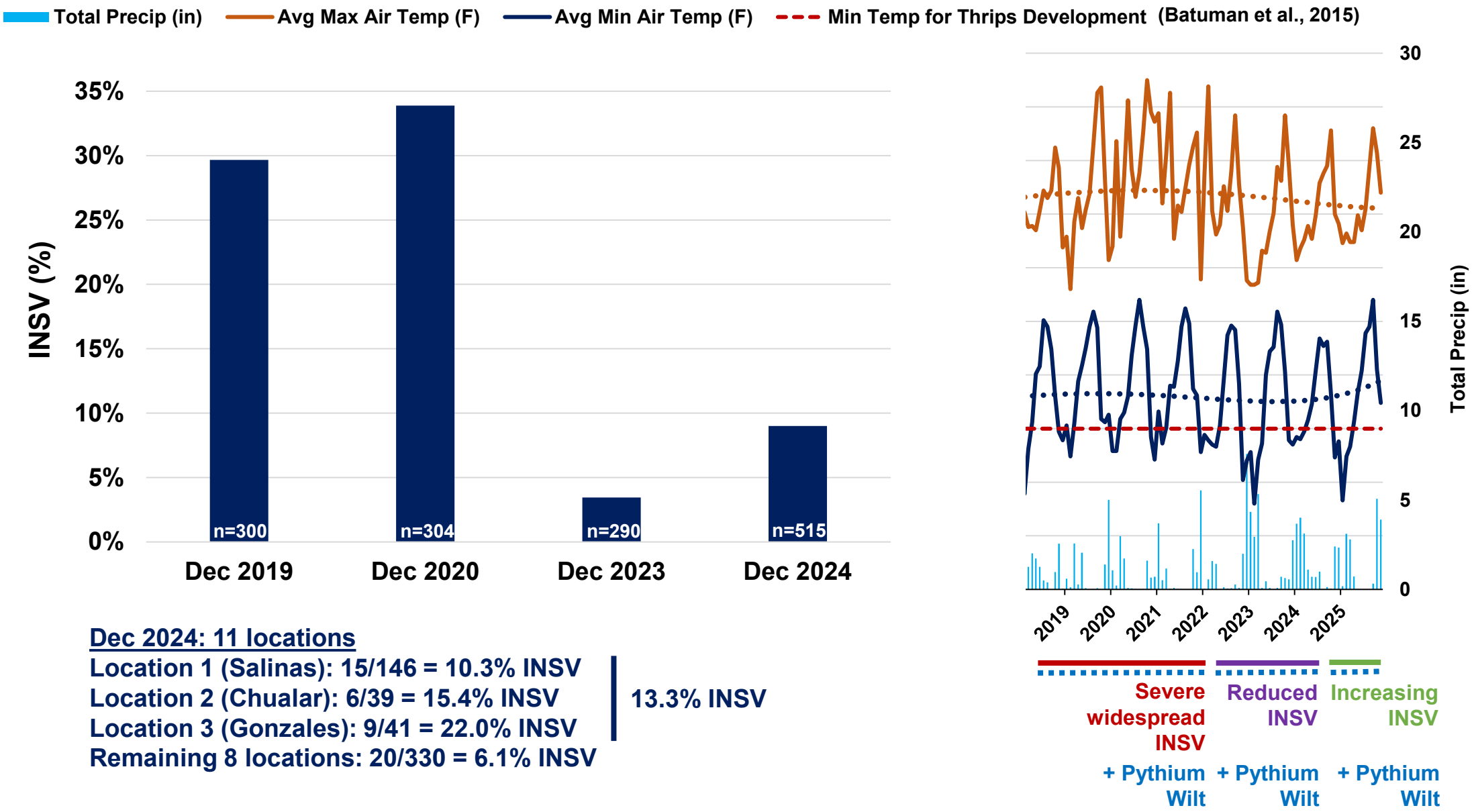
Dec 2024: 11 locations

Location 1 (Salinas): 15/146 = 10.3% INSV
Location 2 (Chualar): 6/39 = 15.4% INSV
Location 3 (Gonzales): 9/41 = 22.0% INSV
Remaining 8 locations: 20/330 = 6.1% INSV

13.3% INSV

INSV infection of top 10 hosts

Salinas, Chualar, Gonzales



Dec 2024: 11 locations

Location 1 (Salinas): 15/146 = 10.3% INSV
Location 2 (Chualar): 6/39 = 15.4% INSV
Location 3 (Gonzales): 9/41 = 22.0% INSV
Remaining 8 locations: 20/330 = 6.1% INSV

13.3% INSV

2025 Update on Thrips and INSV

1. Weather, thrips, INSV, weeds
2. *Recap:* INSV and Pythium Wilt interactions
3. New thrips surveillance strategies
4. Use of hedgerows and native plants as insectaries

Timing of INSV and Pythium Wilt

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

Timing of INSV and Pythium Wilt

Healthy

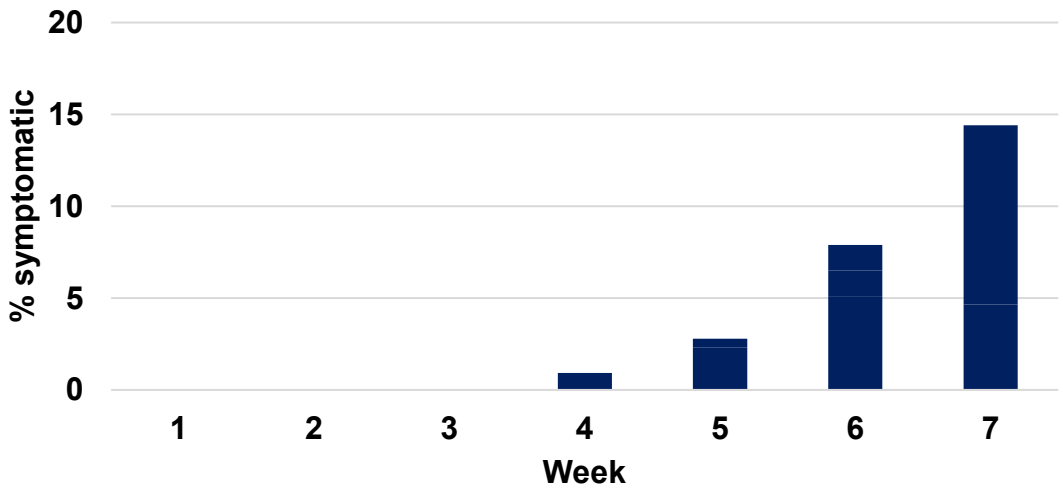
INSV

Wilt

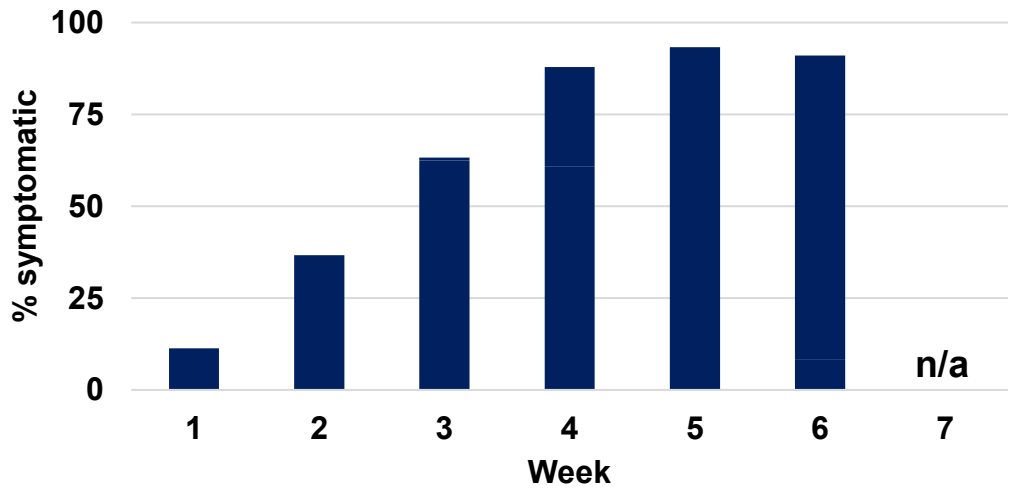
INSV + Wilt

Timing of INSV and Pythium Wilt

Field 1

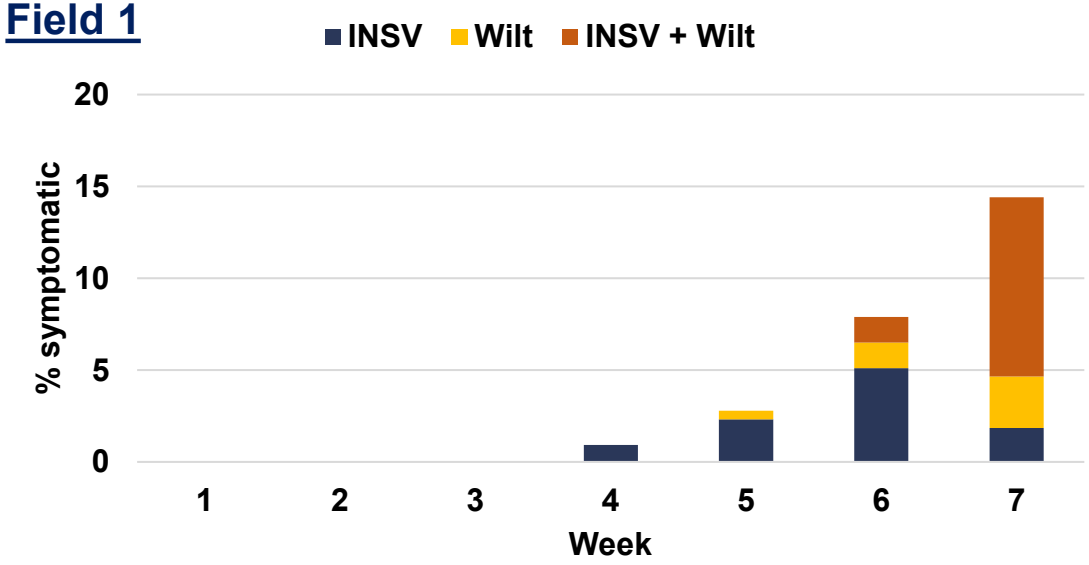


Field 2

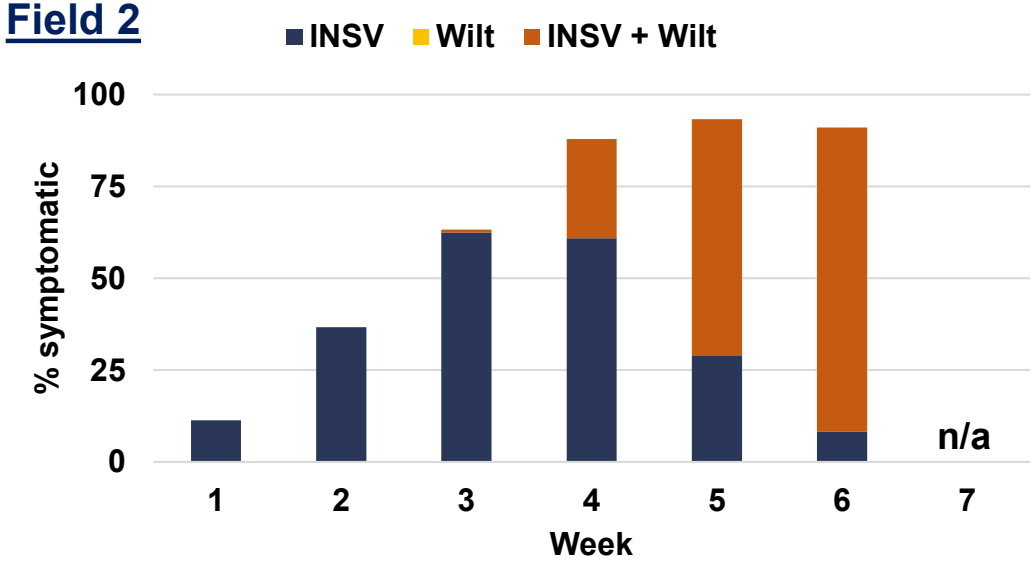


Timing of INSV and Pythium Wilt

Field 1

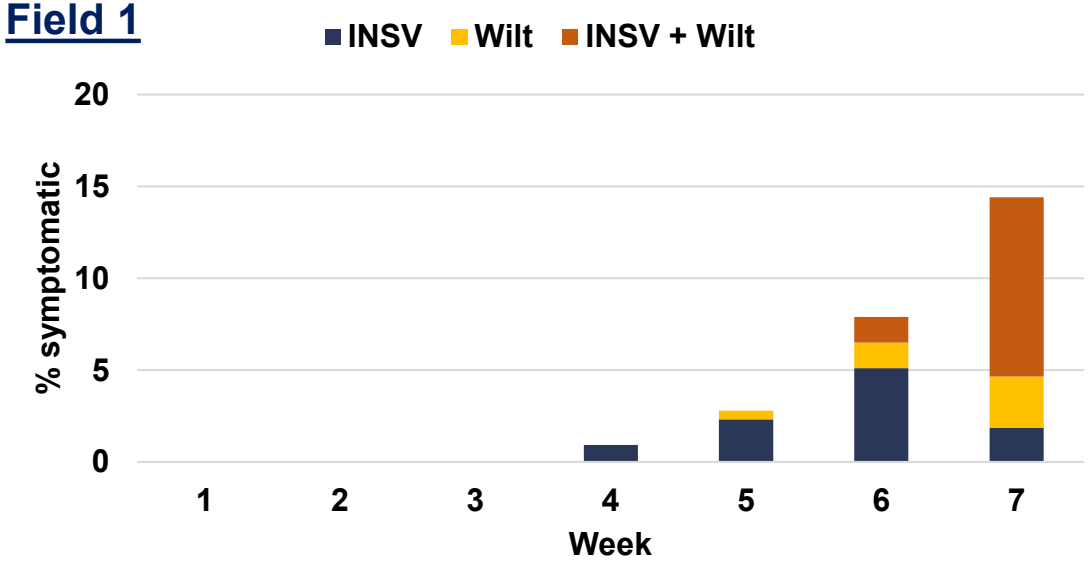


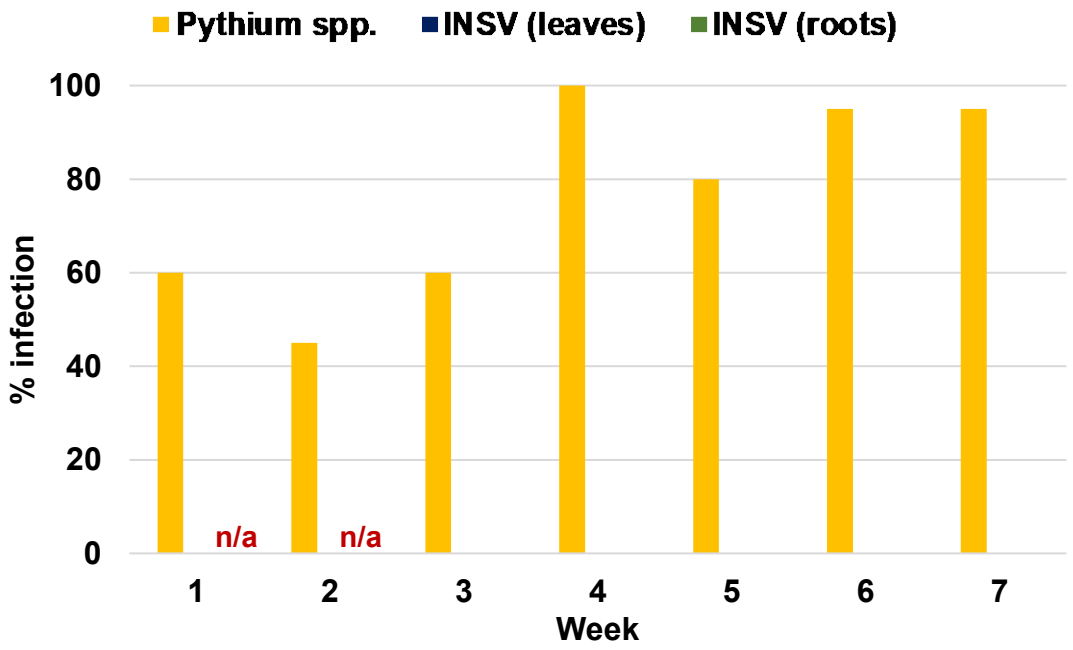
Field 2



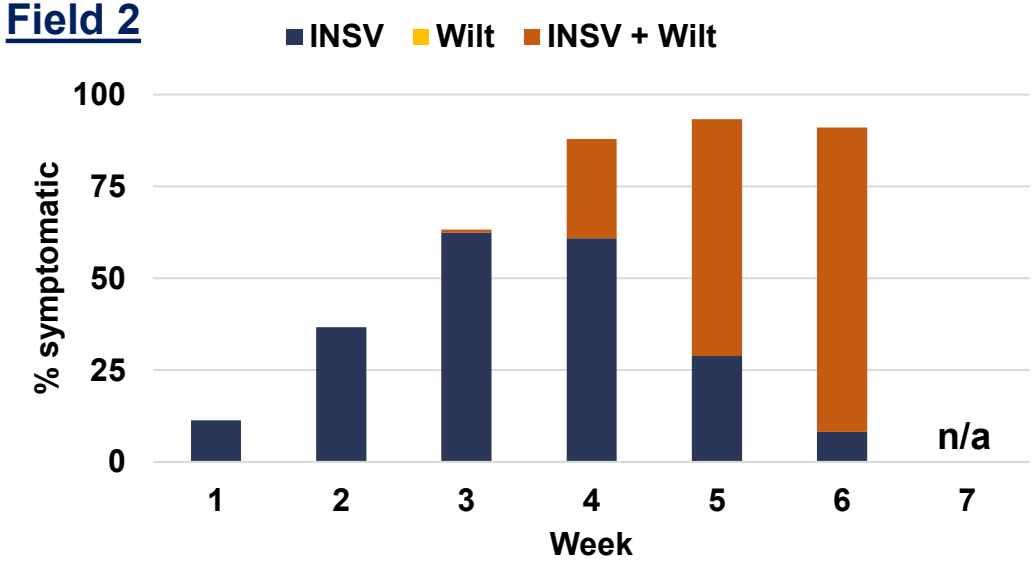
Timing of INSV and Pythium Wilt

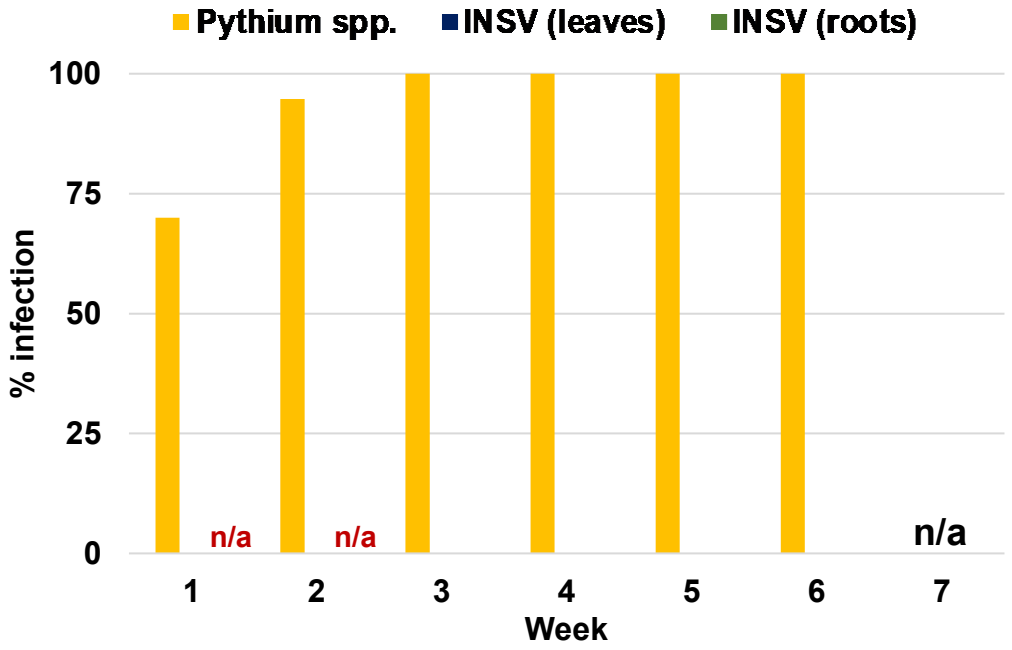
Field 1





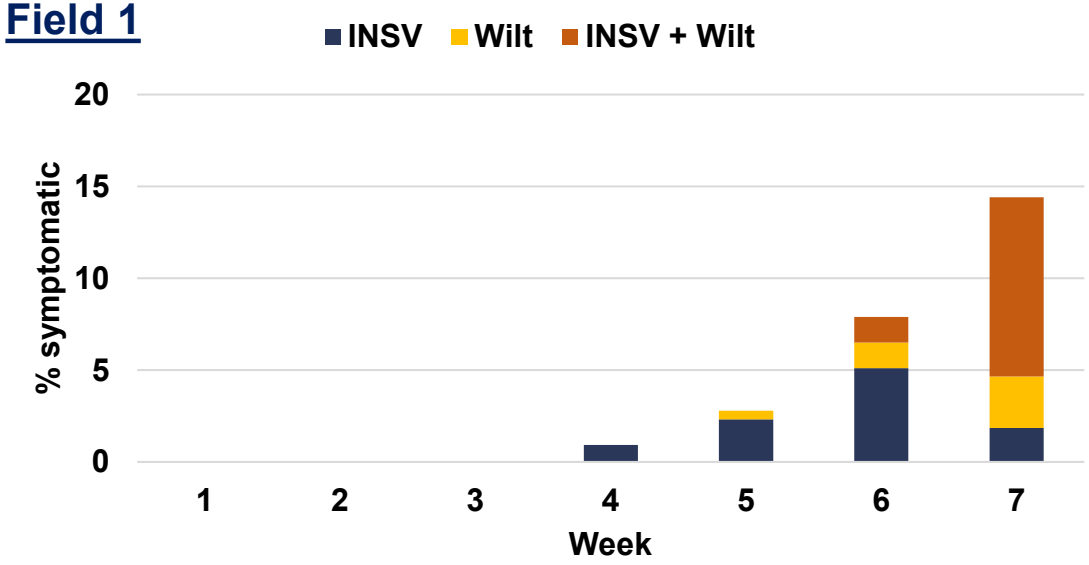
Field 2

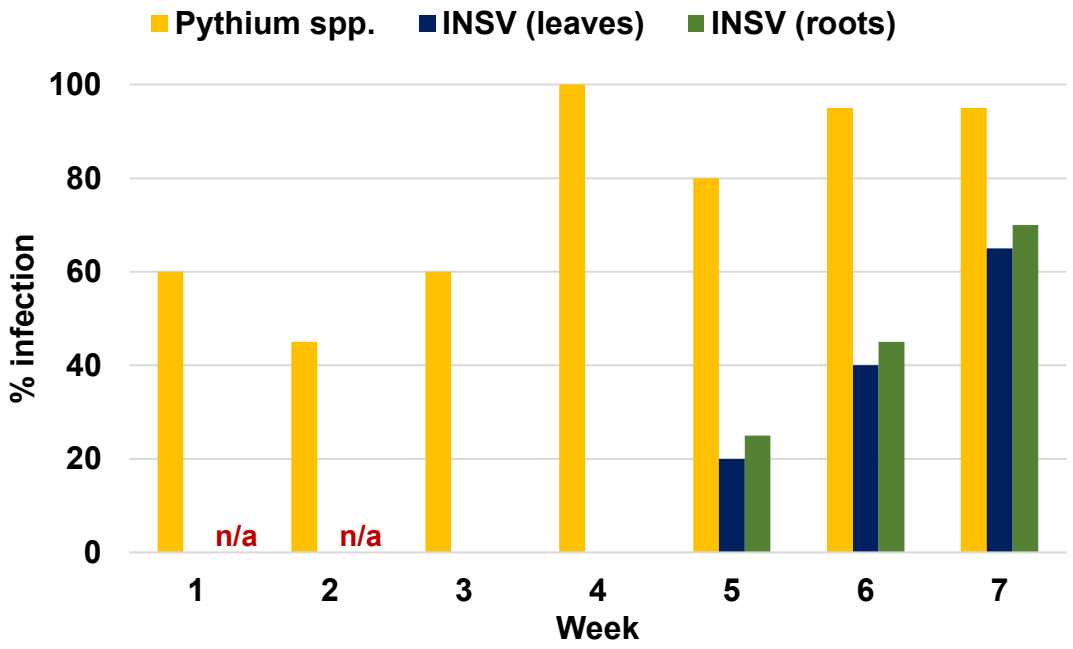




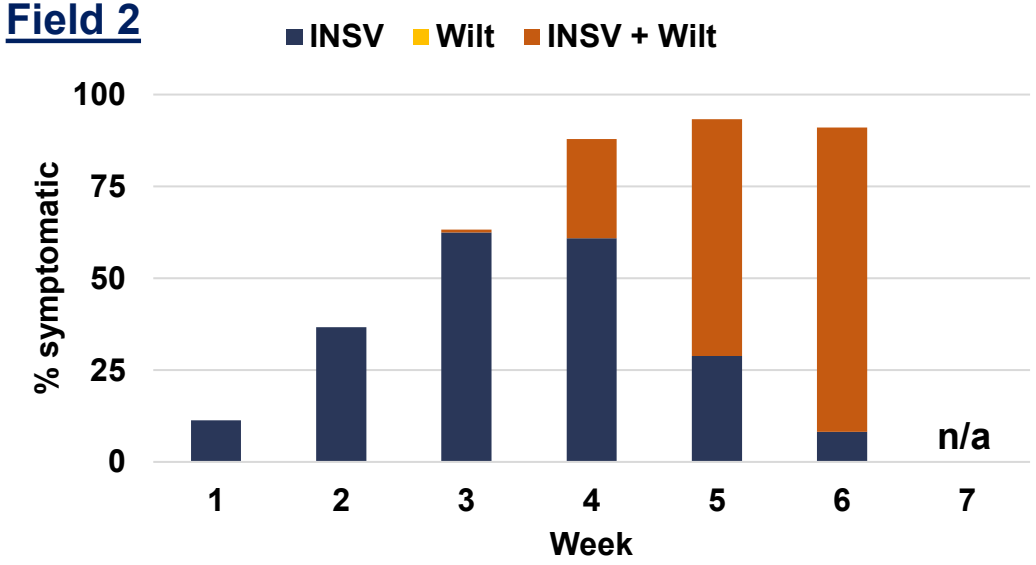
Timing of INSV and Pythium Wilt

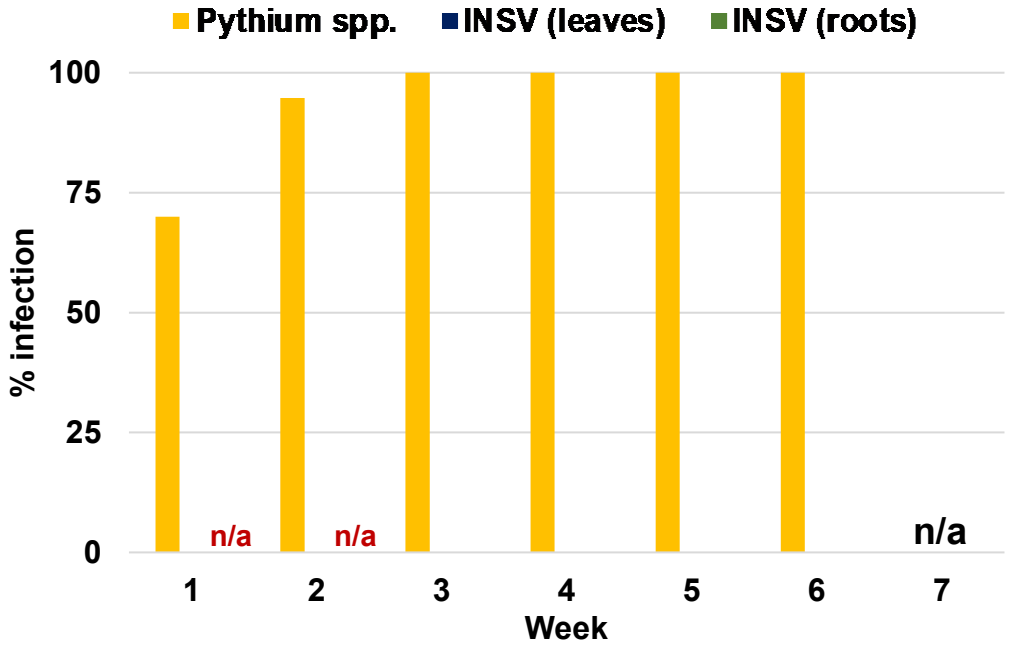
Field 1





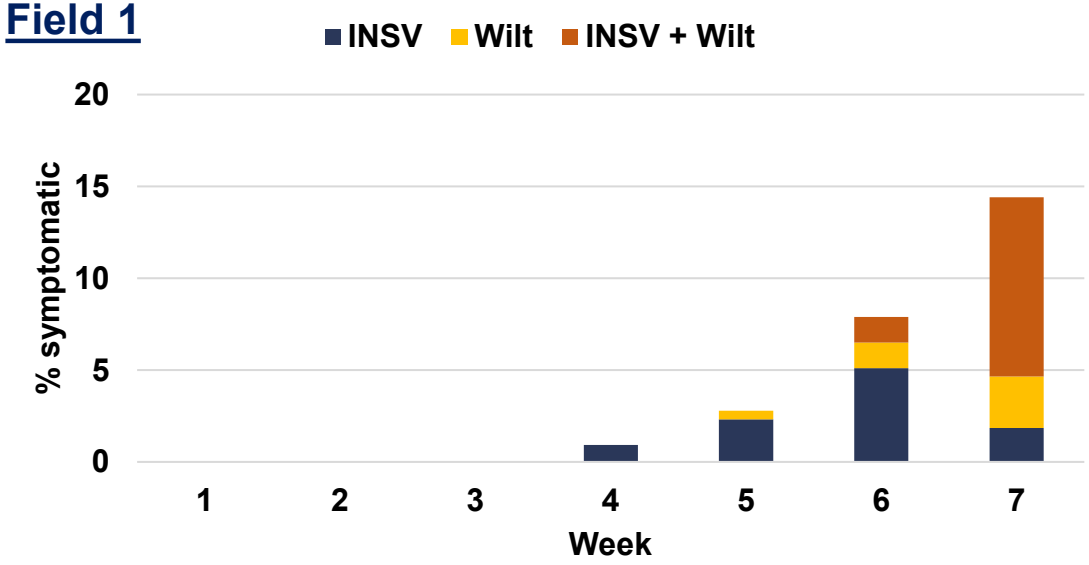
Field 2

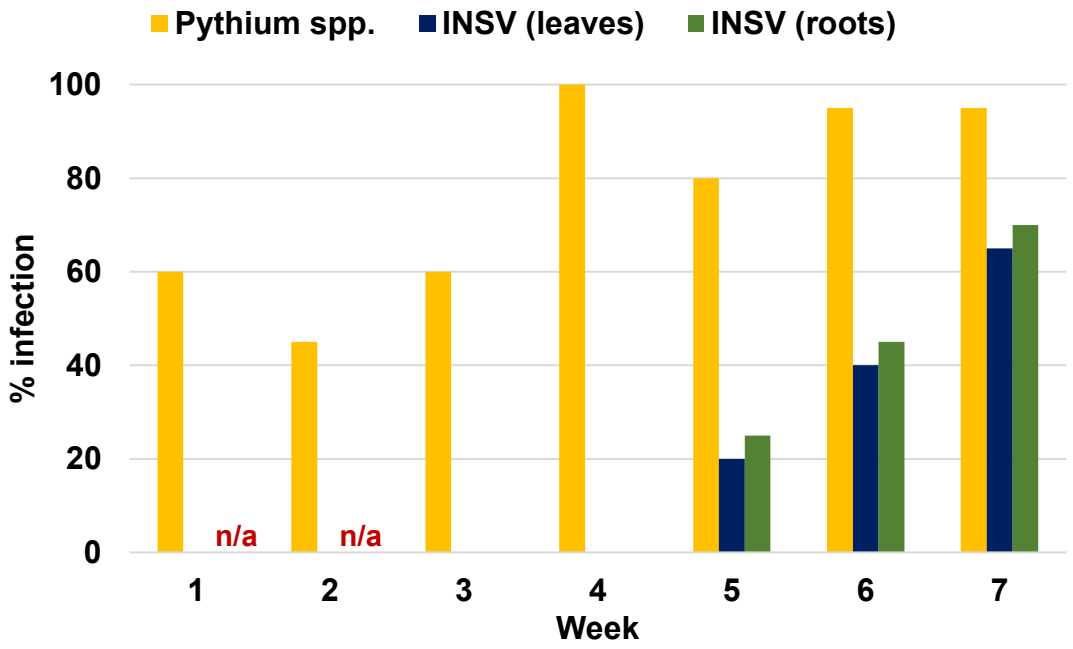




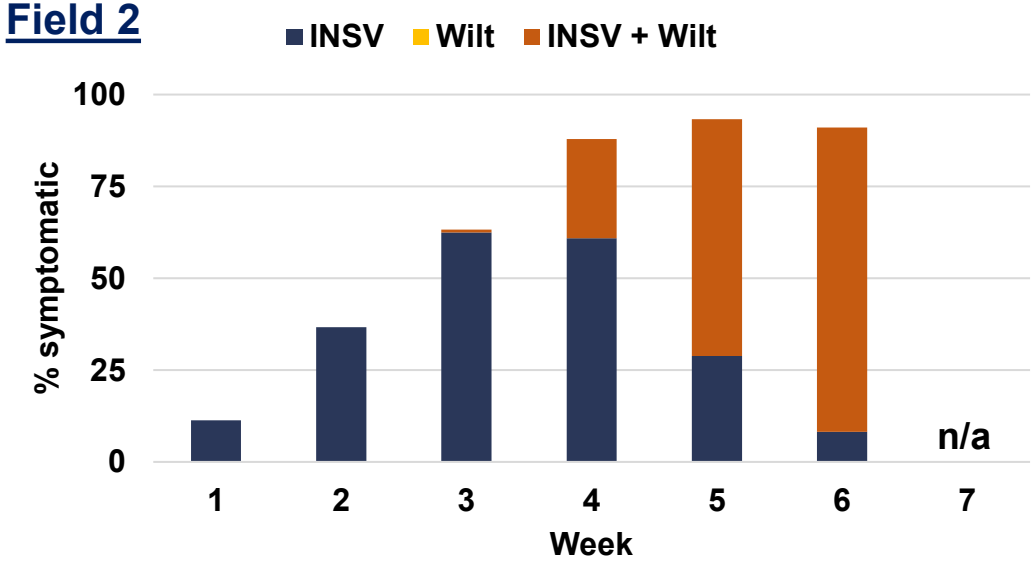
Timing of INSV and Pythium Wilt

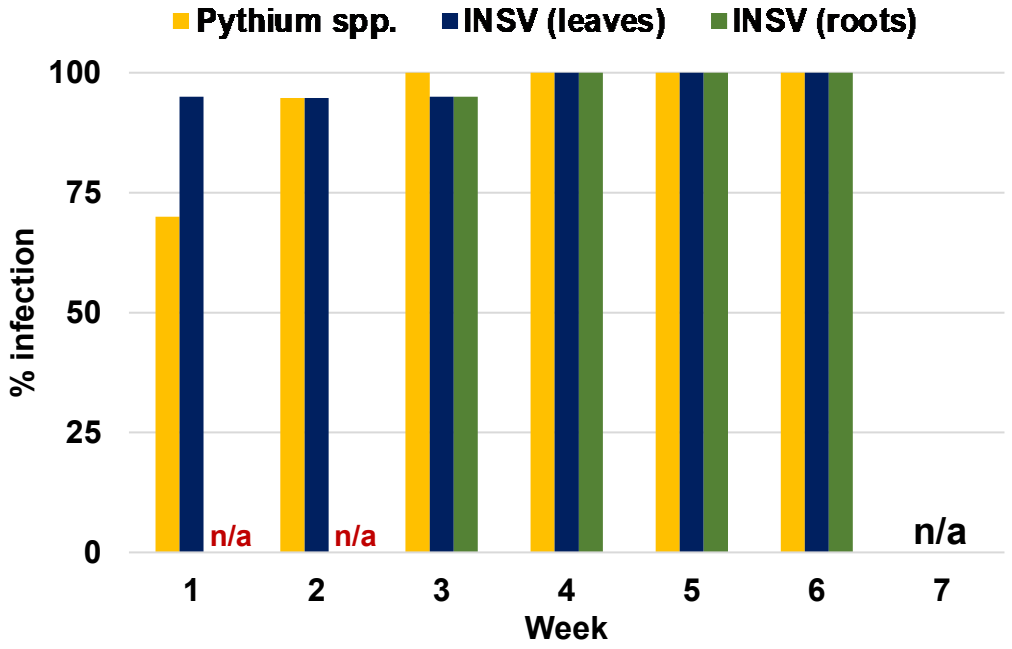
Field 1





Field 2





Viviana Camelo
Postdoc, USDA-ARS

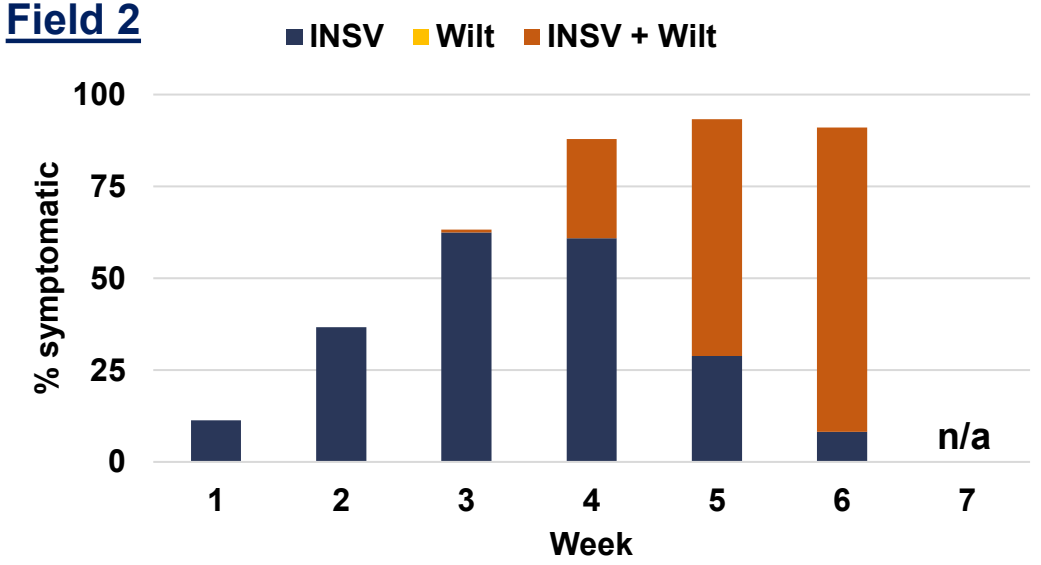
Timing of INSV and Pythium Wilt

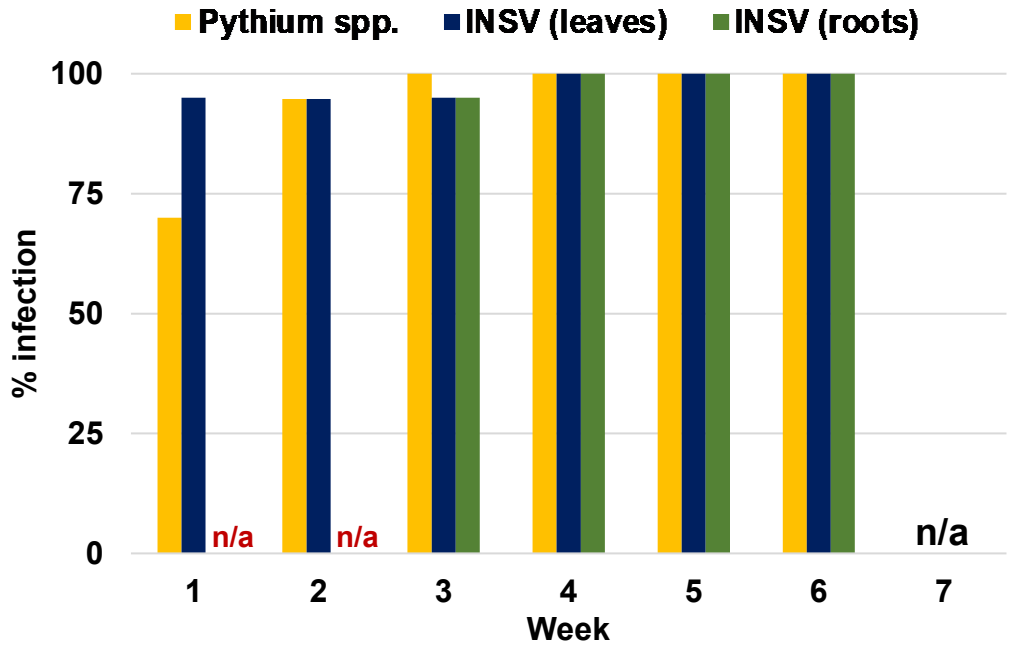
Lab

32 days post inoculation with thrips + INSV

Control	*P. uncinulatum*	INSV	INSV + *P. uncinulatum*

Field 2





Viviana Camelo
Postdoc, USDA-ARS

Timing of INSV and Pythium Wilt

Lab

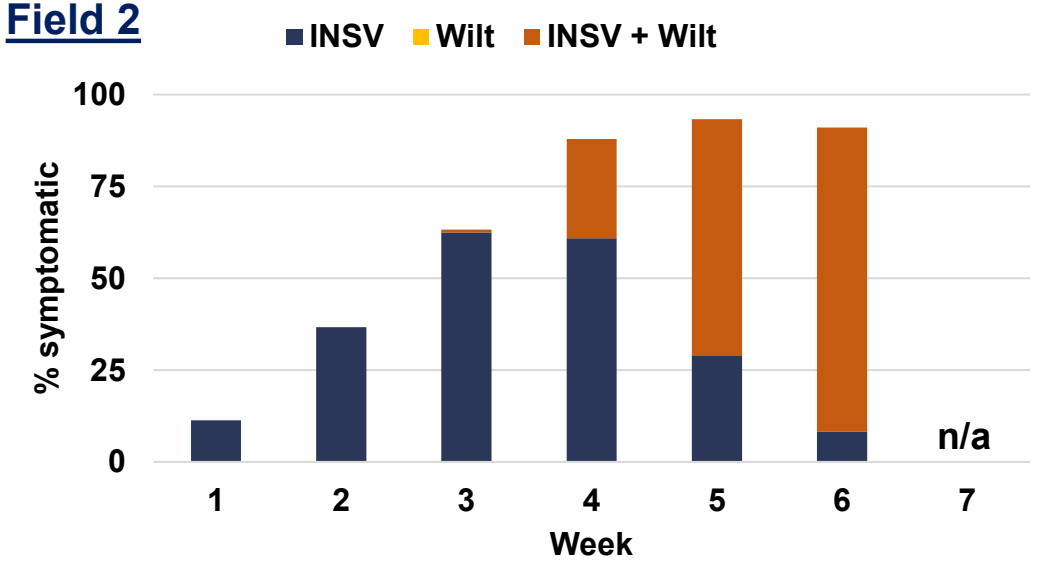
32 days post inoculation with thrips + INSV

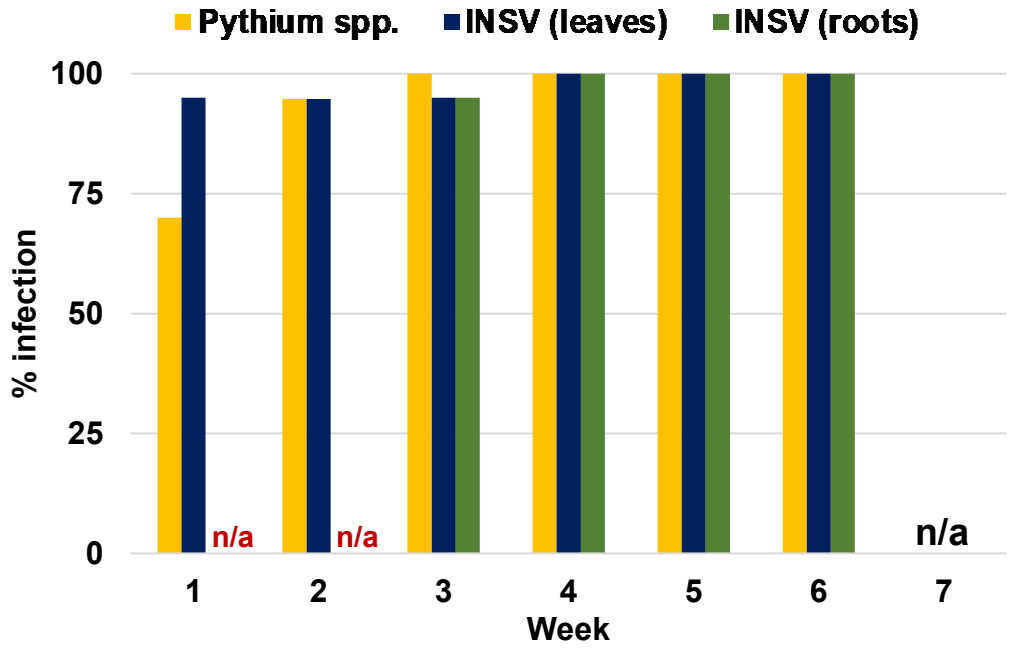
Control	*P. uncinulatum*	INSV	INSV + *P. uncinulatum*

Hypothesis

1. Pythium spp. is present in the soil *before lettuce is planted*
2. Lettuce roots and leaves are infected by INSV
3. INSV triggers the onset of Pythium Wilt*

Field 2

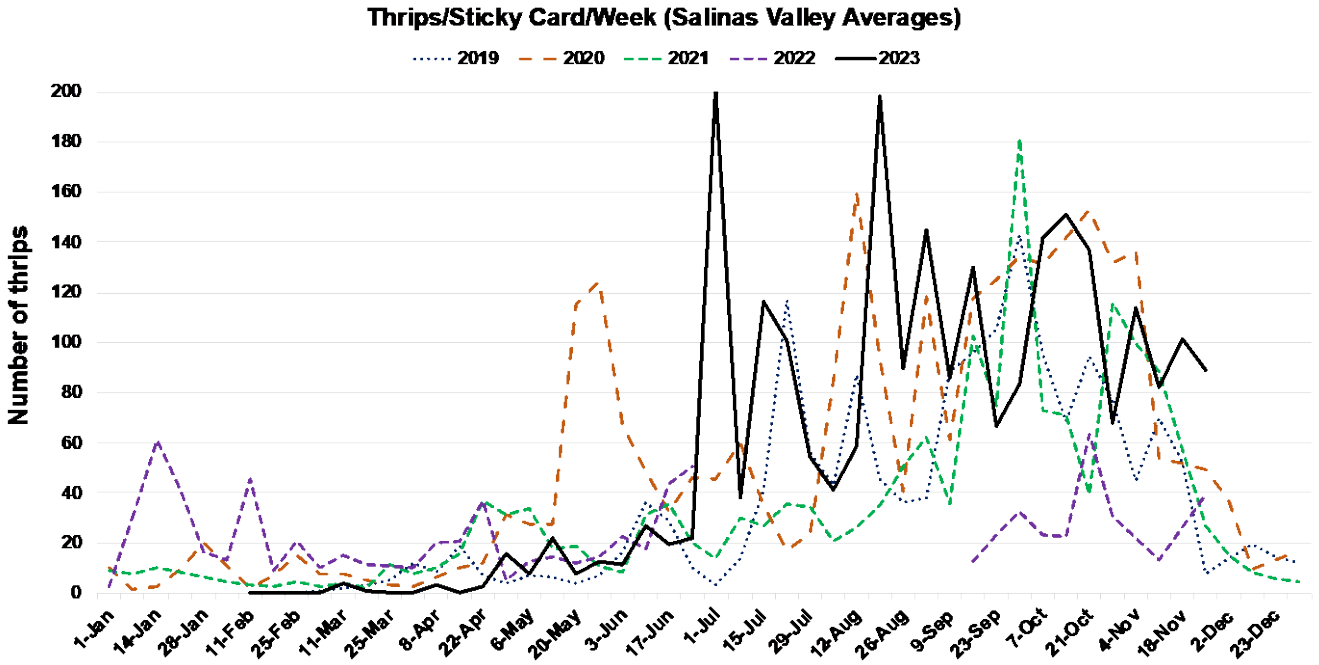


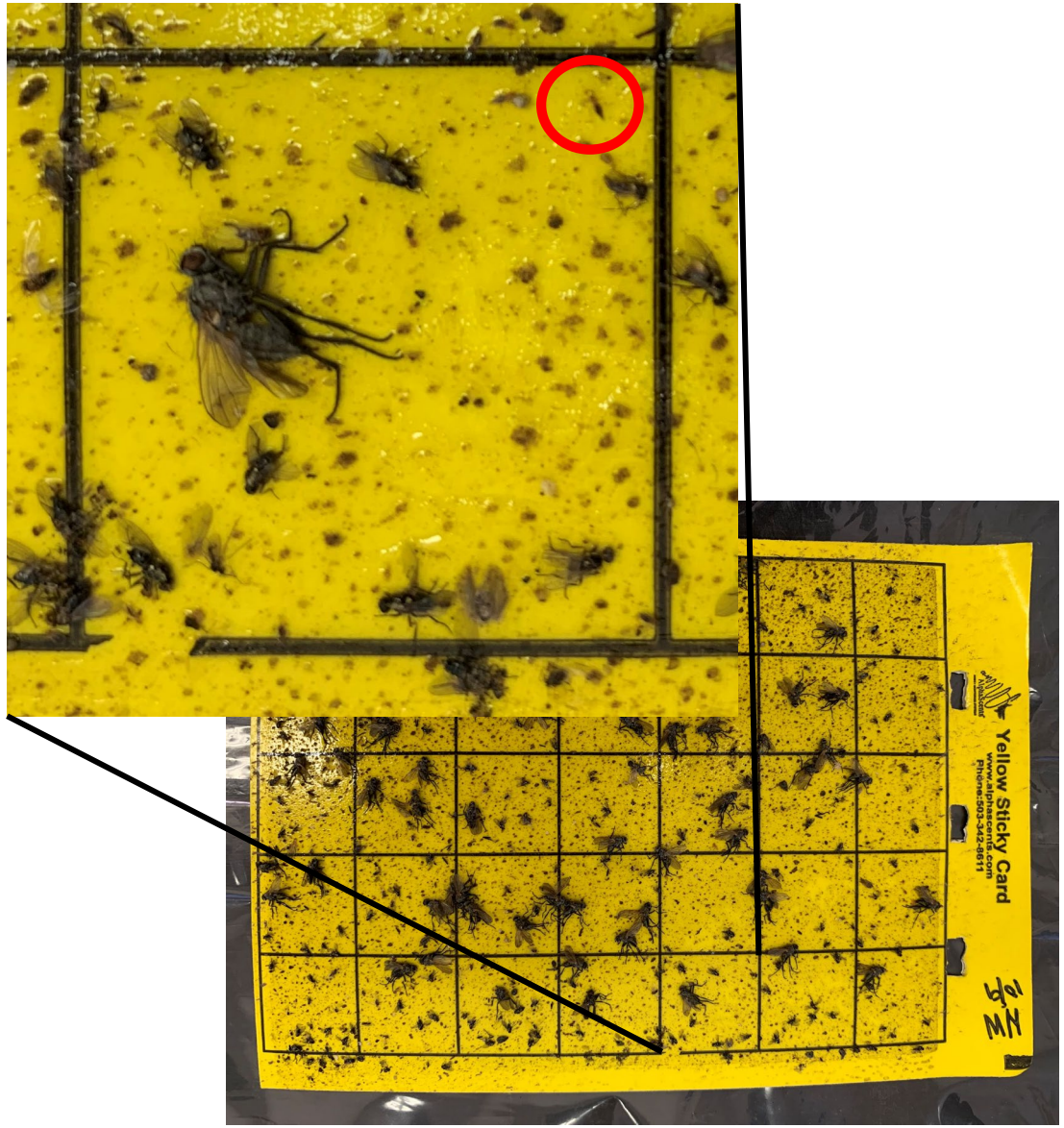


2025 Update on Thrips and INSV

1. Weather, thrips, INSV, weeds
2. *Recap:* INSV and Pythium Wilt interactions
3. New thrips surveillance strategies
4. Use of hedgerows and native plants as insectaries

New methods for trapping and monitoring thrips

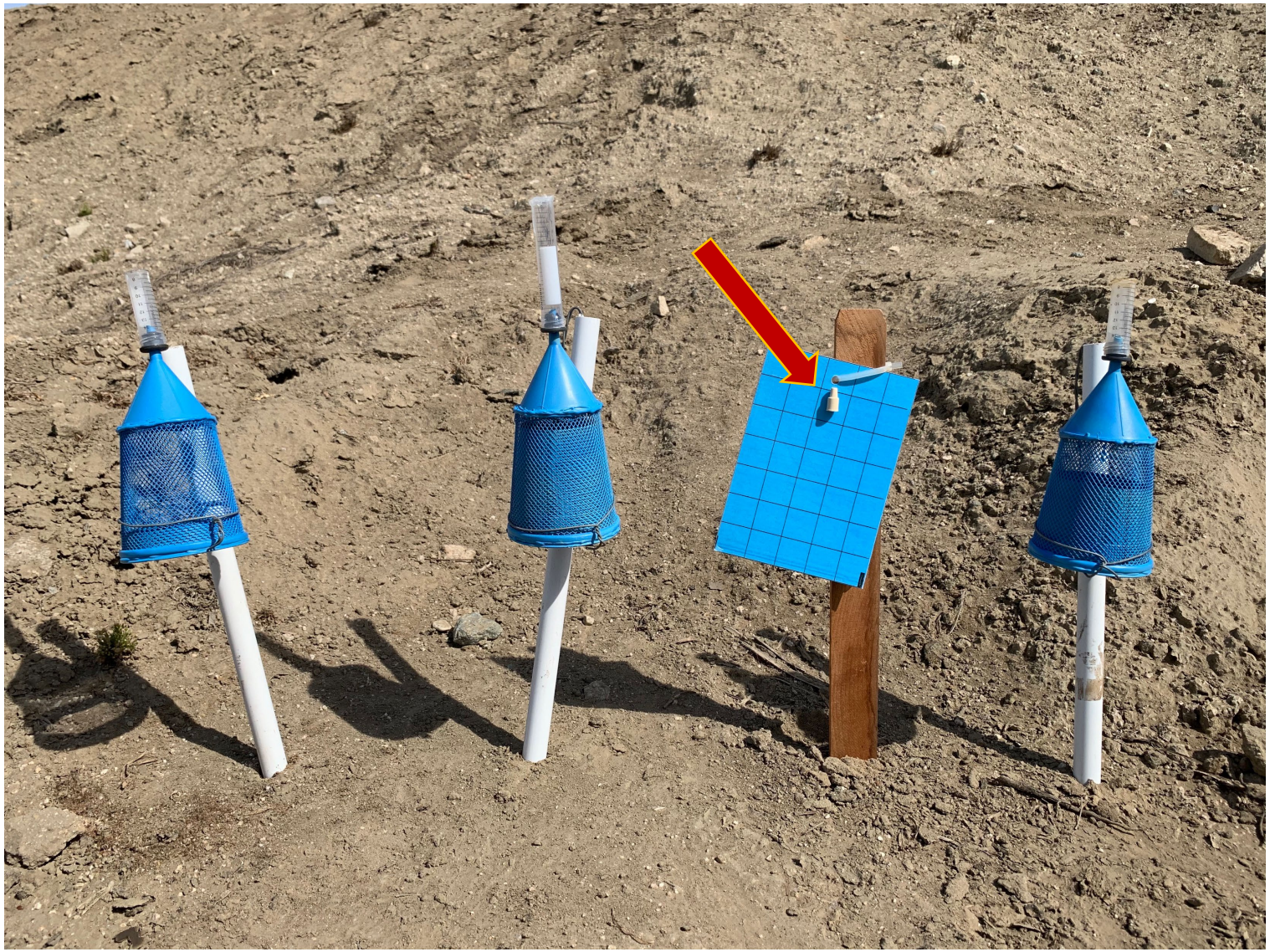




Which thrips have INSV?

New methods for trapping and monitoring thrips

2019



Building a better thrips trap

2023 – current

Dr. Ian Grettenberger
UC Davis

Building a better thrips trap

2023 – current

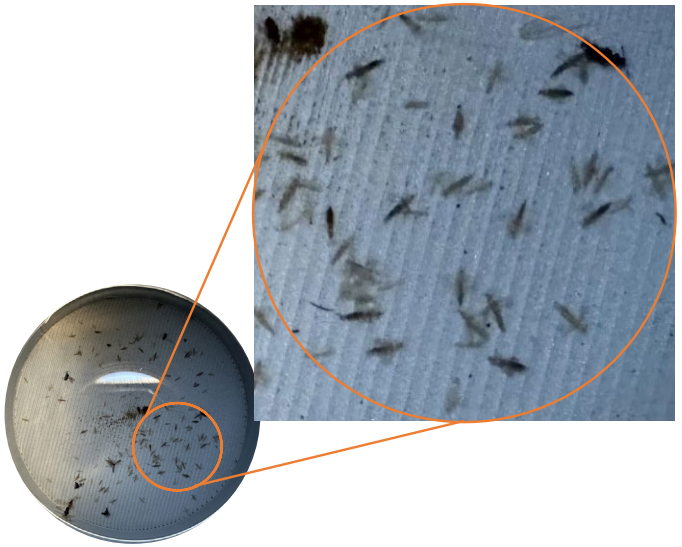
Dr. Ian Grettenberger
UC Davis

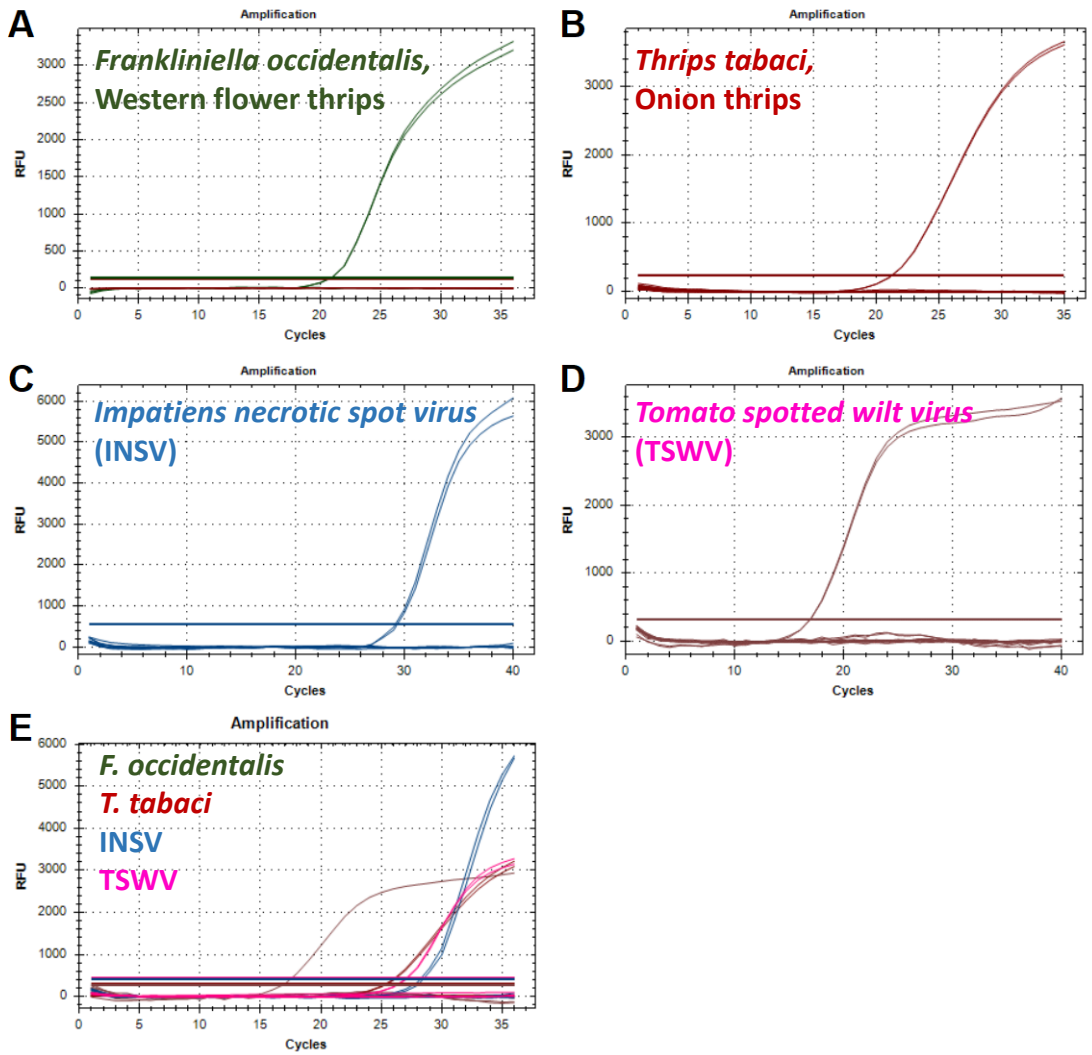
Building a better thrips trap

Detecting INSV/TSWV and thrips species from a single insect

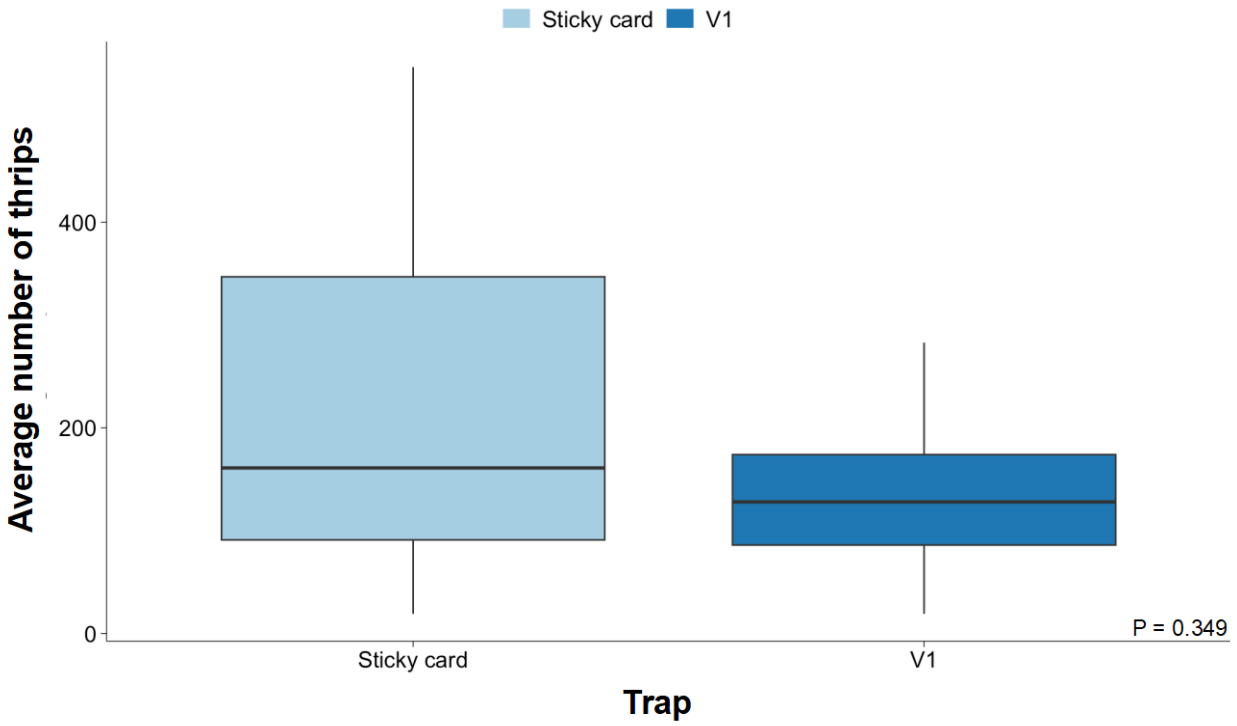
Reverse transcription - quantitative PCR (RT-qPCR)

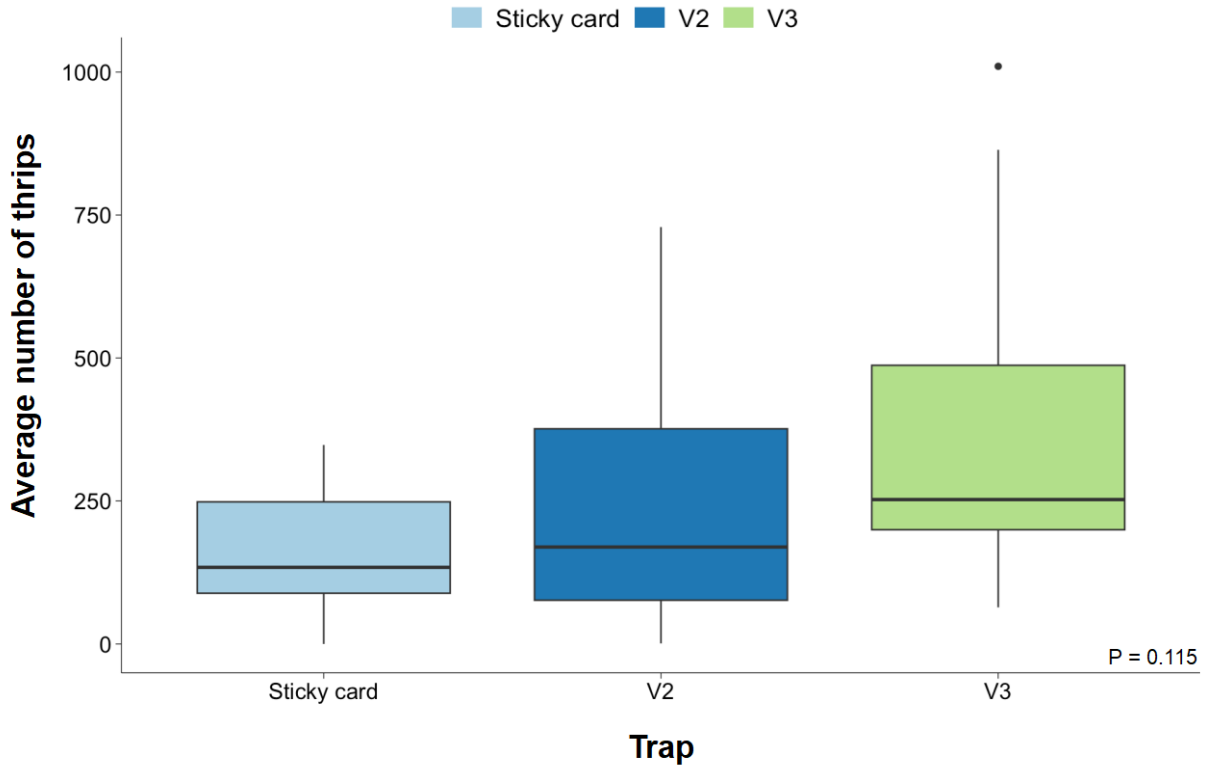
- Crude extraction
- RT-qPCR multiplex:
  - Thrips vectors
    - *Frankliniella occidentalis*
    - *Thrips tabaci*
  - Viruses
    - INSV
    - TSWV





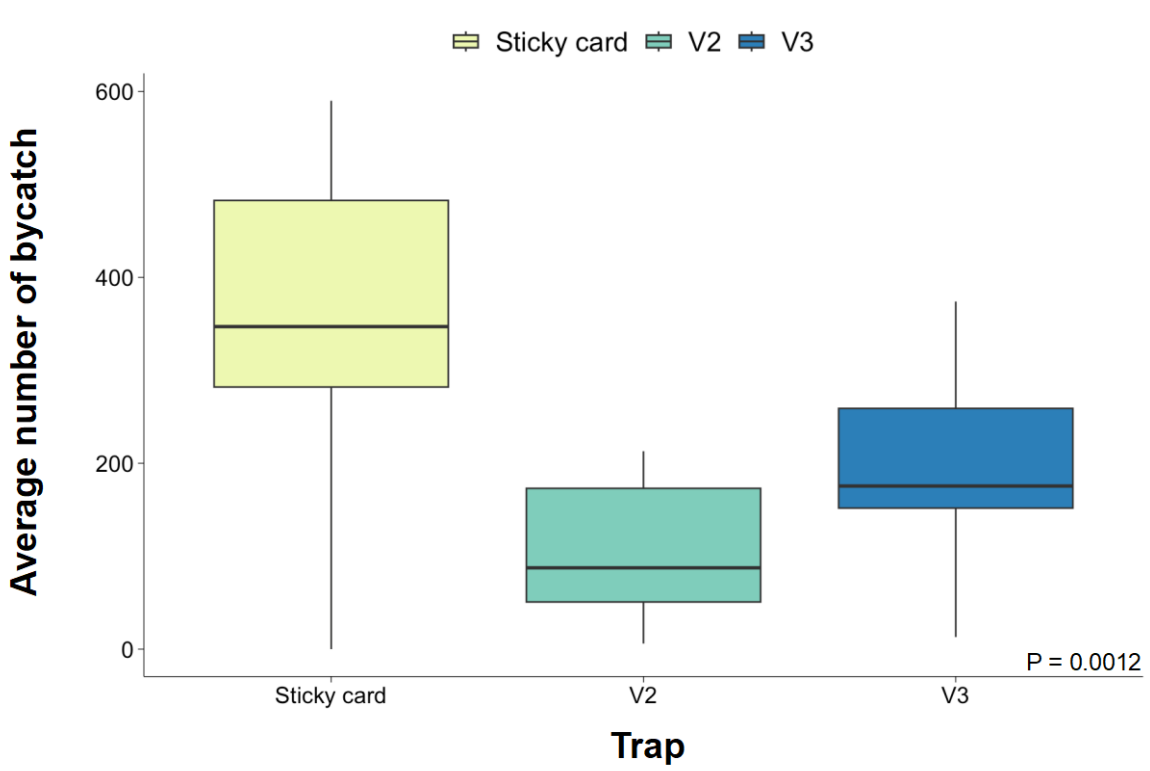
New traps improve thrips captures



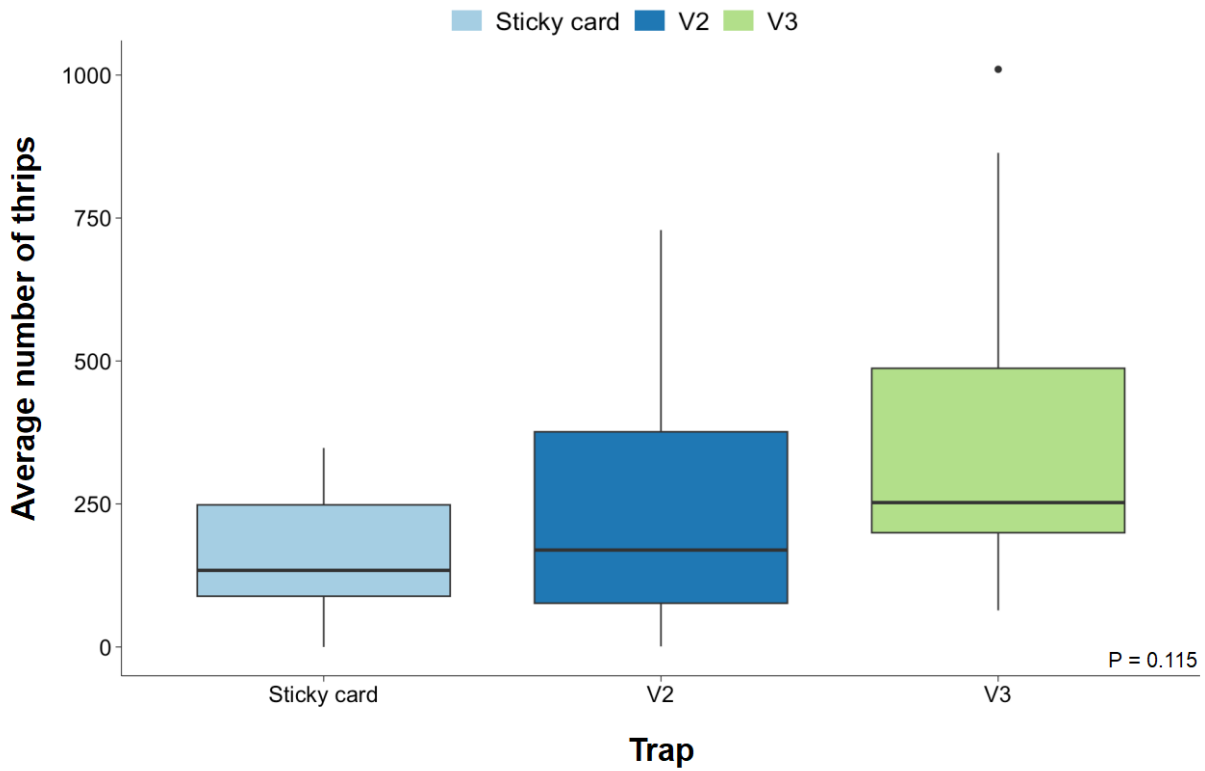


New traps improve thrips captures and reduce bycatch

Bycatch*



Thrips



*Diptera (includes hoverflies)
Hemiptera
Hymenoptera (includes parasitoid wasps)

New traps improve thrips captures and reduce bycatch

Trap design

1. Active capture methods (i.e., attraction)
   - Color
   - Pheromones, semiochemicals
2. Passive capture methods (i.e., interception)
   - Wind vane
   - Fans/suction

Other considerations

1. Thrips preservation
2. Bycatch of other insects
3. Size and ease of maintenance

Chemical attractants for thrips

Deena Husein
Postdoc, USDA-ARS

Plant kairomones

- Trade name = Alpha Scents, Chemtica
  - A.I. = *P*-anisaldehyde, derived from fennel and anise
  - Mimics plant volatiles to attract insects

- Trade name = Verbenone
  - A.I. = Vebernone (-)-, derived from pine pollen
  - Reported to attracts thrips

Thrips pheromone

- Trade name = Thripline
  - A.I. = neryl (S)-2-methylbutanoate
  - Male aggregation pheromone from western flower thrips

Chemtica

Alpha Scents

Verbenone

Thripline

Chemical attractants for thrips

Plant kairomones

- Trade name = Alpha Scents, Chemtica
  - A.I. = *P*-anisaldehyde, derived from fennel and anise
  - Mimics plant volatiles to attract insects
- Trade name = Verbenone
  - A.I. = Vebernone (-)-, derived from pine pollen
  - Reported to attracts thrips

Thrips pheromone

- Trade name = Thripline
  - A.I. = neryl (S)-2-methylbutanoate
  - Male aggregation pheromone from western flower thrips

Chemtica

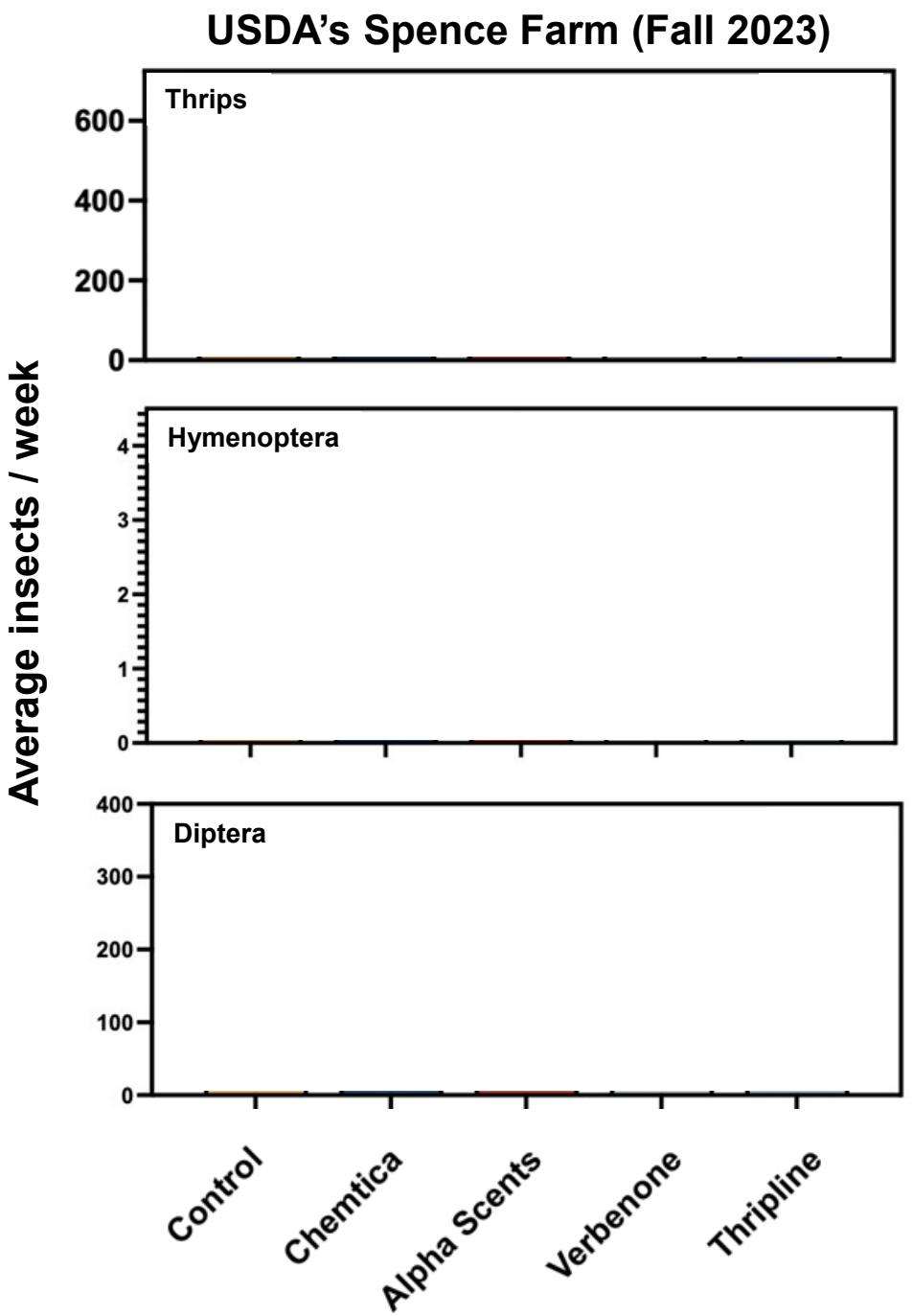
Polymeric membrane sachet

Alpha Scents

Coastal lure packet

Verbenone

Thripline



Chemical attractants for thrips

Plant kairomones

- Trade name = Alpha Scents, Chemtica
  - A.I. = *P*-anisaldehyde, derived from fennel and anise
  - Mimics plant volatiles to attract insects

- Trade name = Verbenone
  - A.I. = Vebernone (-)-, derived from pine pollen
  - Reported to attracts thrips

Thrips pheromone

- Trade name = Thripline
  - A.I. = neryl (S)-2-methylbutanoate
  - Male aggregation pheromone from western flower thrips

Chemtica

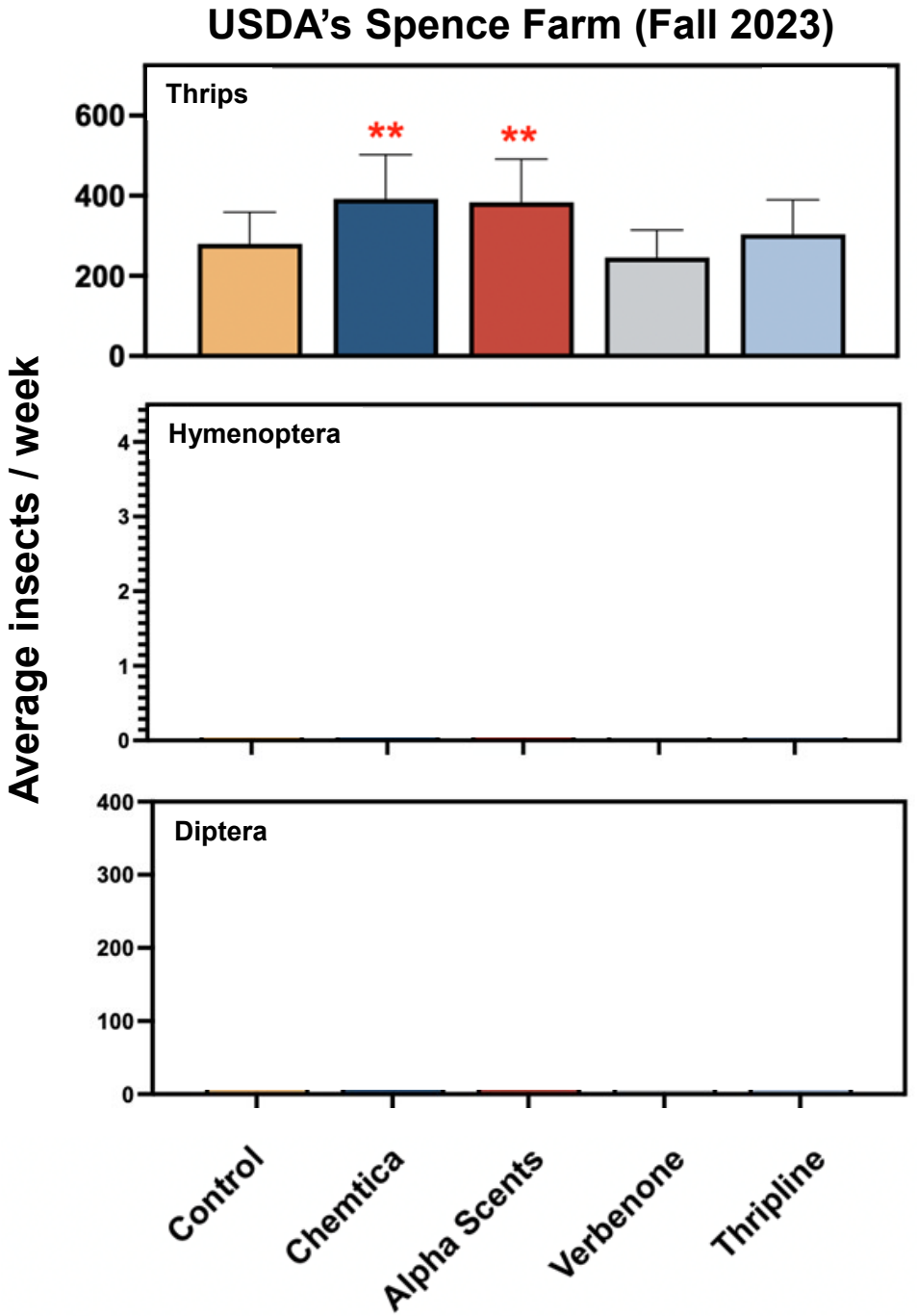
Polymeric membrane sachet

Alpha Scents

Coastal lure packet

Verbenone

Thripline



Chemical attractants for thrips

Plant kairomones

- Trade name = Alpha Scents, Chemtica
  - A.I. = *P*-anisaldehyde, derived from fennel and anise
  - Mimics plant volatiles to attract insects

- Trade name = Verbenone
  - A.I. = Vebernone (-)-, derived from pine pollen
  - Reported to attracts thrips

Thrips pheromone

- Trade name = Thripline
  - A.I. = neryl (S)-2-methylbutanoate
  - Male aggregation pheromone from western flower thrips

Chemtica

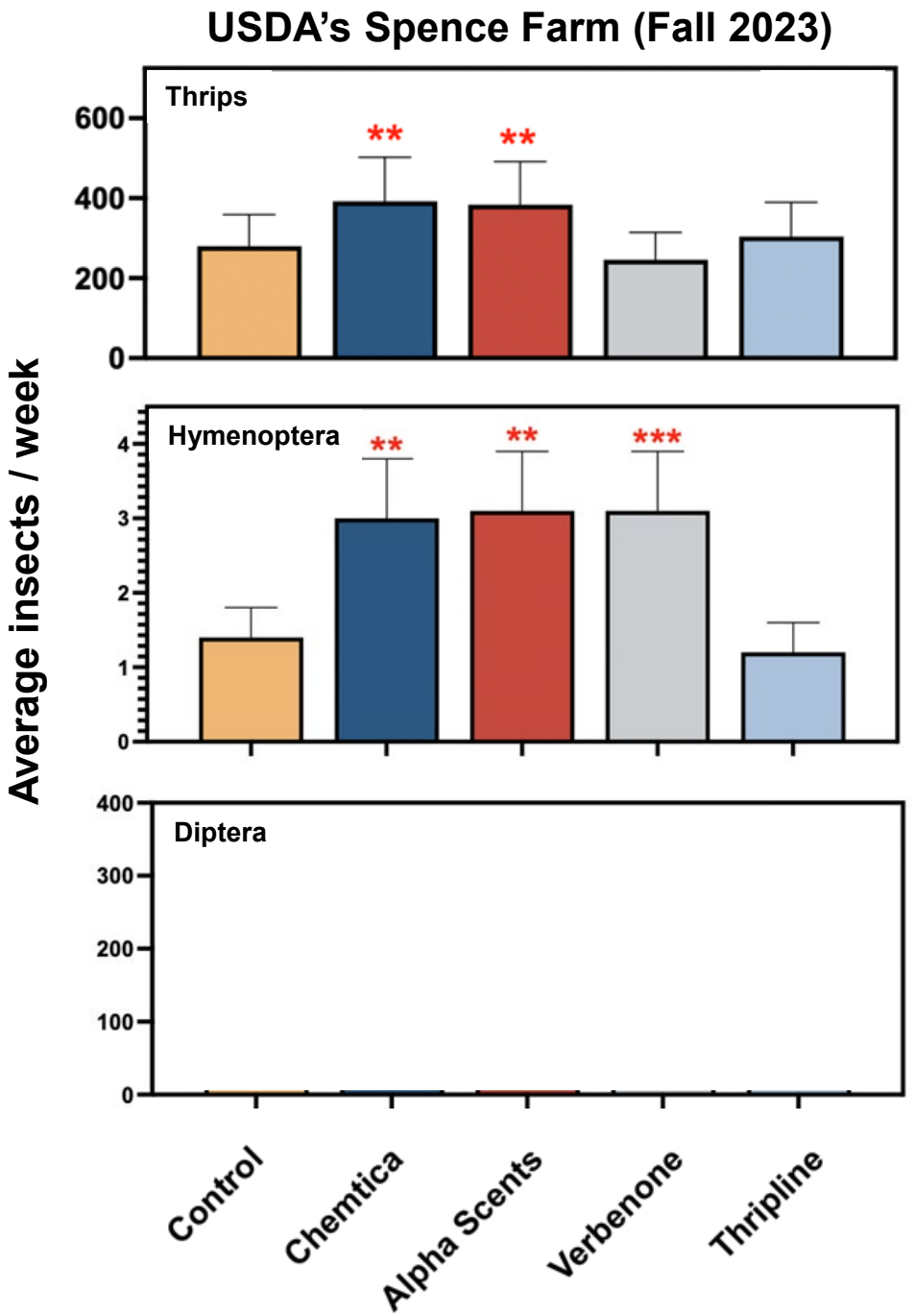
Polymeric membrane sachet

Alpha Scents

Coastal lure packet

Verbenone

Thripline



Chemical attractants for thrips

Plant kairomones

- Trade name = Alpha Scents, Chemtica
  - A.I. = *P*-anisaldehyde, derived from fennel and anise
  - Mimics plant volatiles to attract insects

- Trade name = Verbenone
  - A.I. = Vebernone (-)-, derived from pine pollen
  - Reported to attracts thrips

Thrips pheromone

- Trade name = Thripline
  - A.I. = neryl (S)-2-methylbutanoate
  - Male aggregation pheromone from western flower thrips

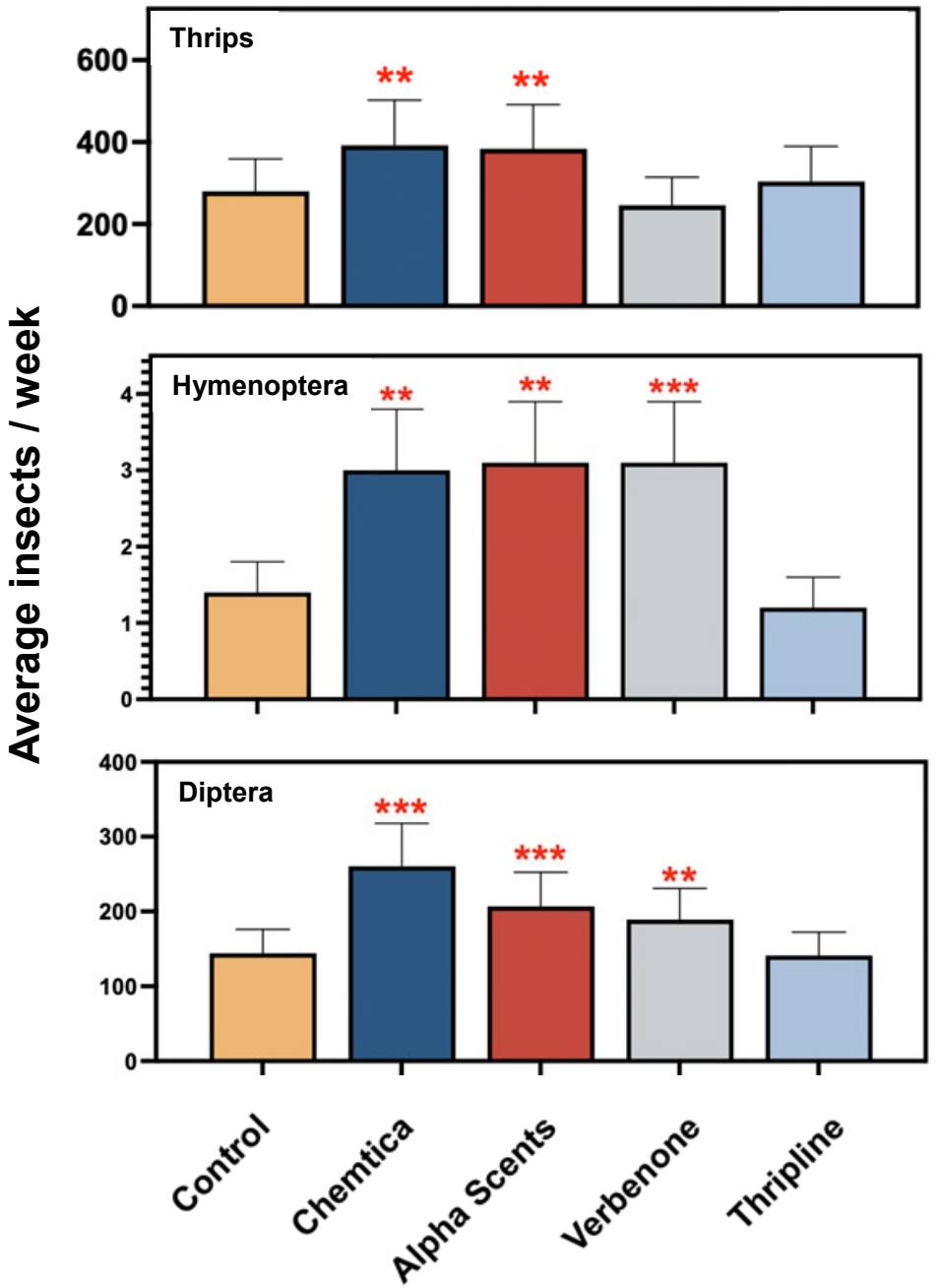
Chemtica

Alpha Scents

Verbenone

Thripline

USDA's Spence Farm (Fall 2023)



New traps to understand thrips dispersal

Sep 28 – Nov 11, 2025

4 traps deployed: 9/28 – 11/11/25

- **Proximity to INSV infected romaine field**
- **Collected every 2 days until 10/16, then every 4 days**
- **Recorded farming activities for field, ranch, and adjacent areas**
    - **Lettuce harvest, drip tape removal, discing, etc.**

Goal: understand how farming activities influence thrips dispersal

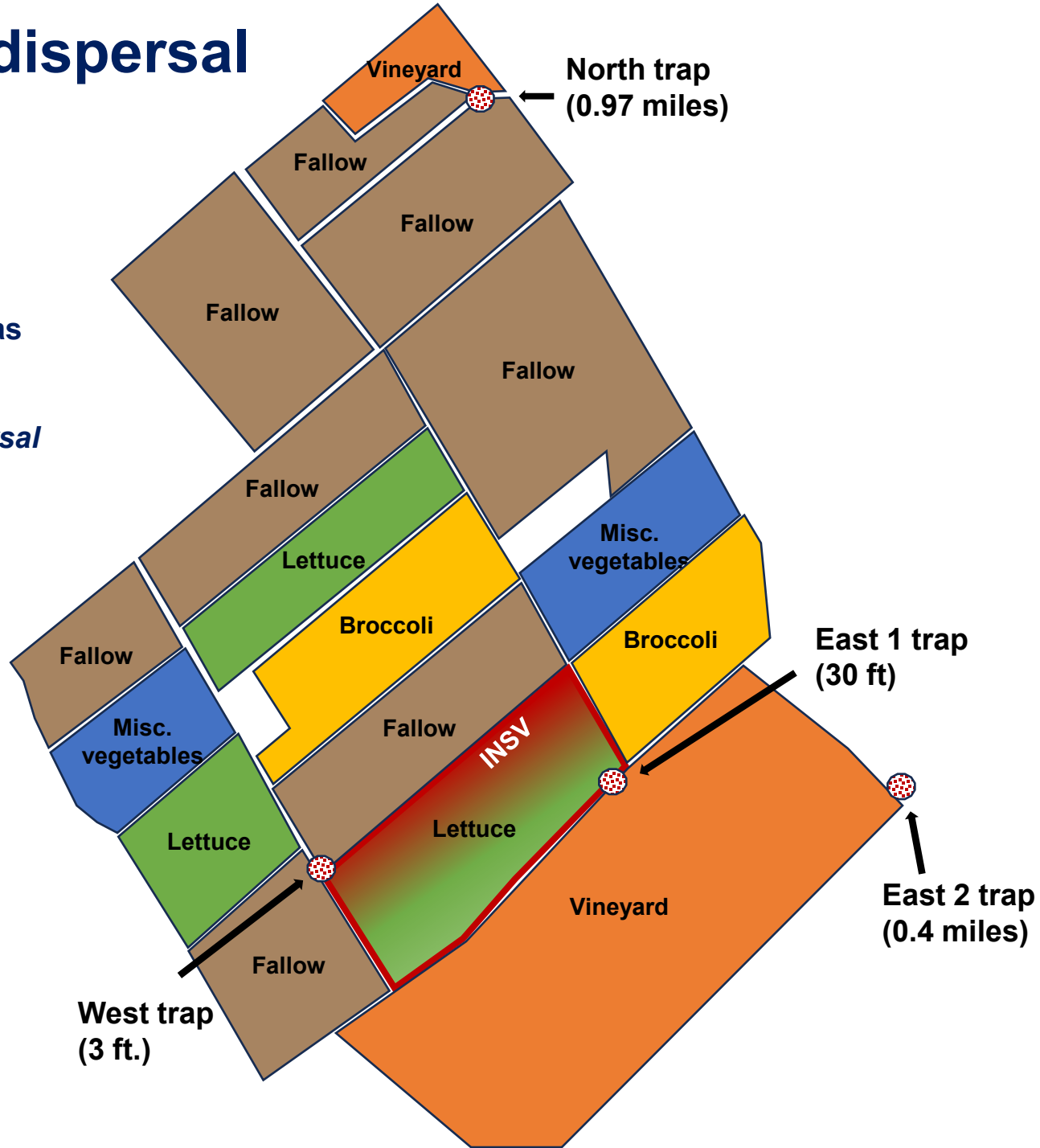
New traps to understand thrips dispersal

Sep 28 – Nov 11, 2025

4 traps deployed: 9/28 – 11/11/25

- Proximity to INSV infected romaine field
- Collected every 2 days until 10/16, then every 4 days
- Recorded farming activities for field, ranch, and adjacent areas
    - Lettuce harvest, drip tape removal, discing, etc.

Goal: understand how farming activities influence thrips dispersal



New traps to understand thrips dispersal

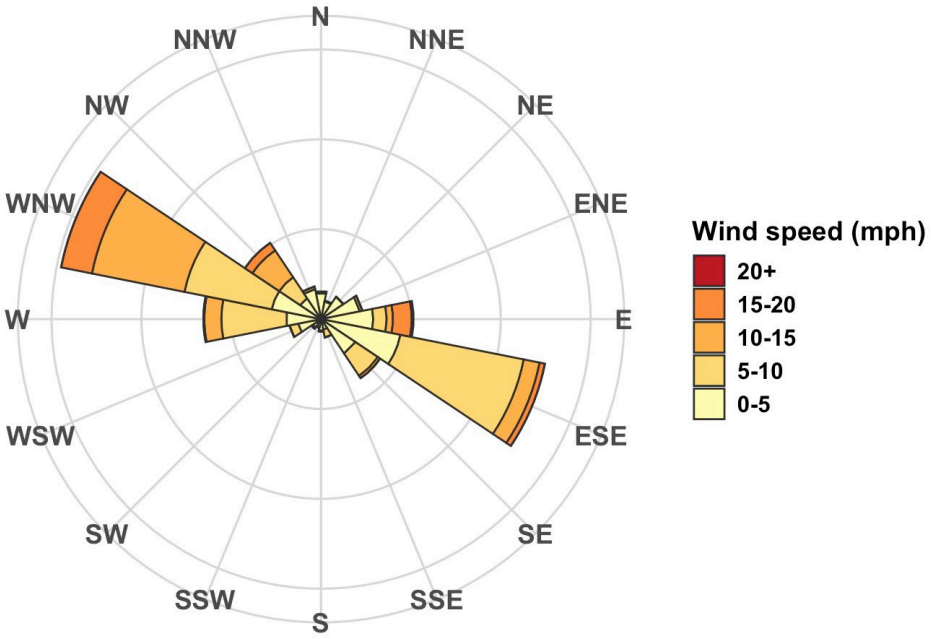
Sep 28 – Nov 11, 2025

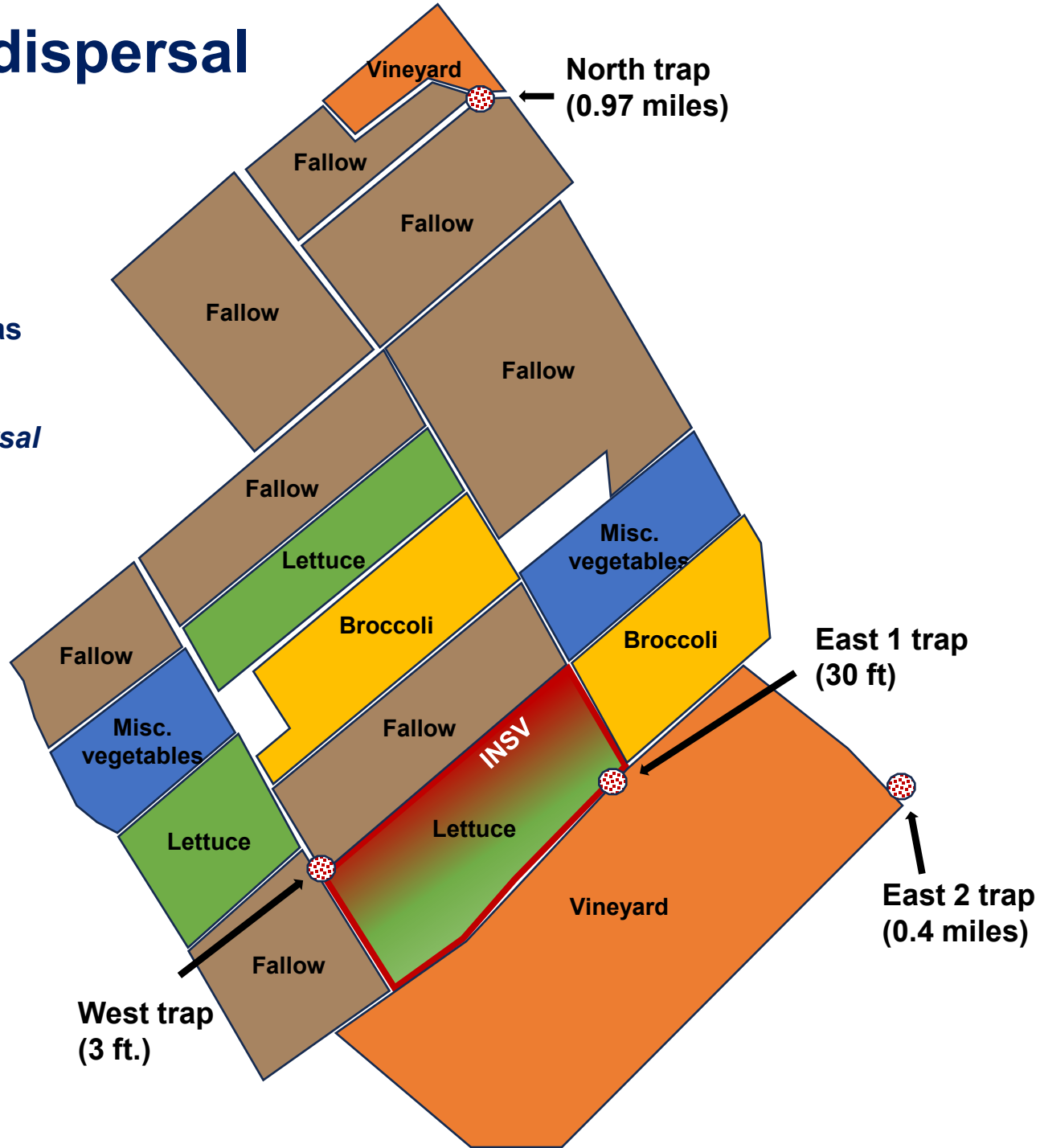
4 traps deployed: 9/28 – 11/11/25

- Proximity to INSV infected romaine field
- Collected every 2 days until 10/16, then every 4 days
- Recorded farming activities for field, ranch, and adjacent areas
    - Lettuce harvest, drip tape removal, discing, etc.

Goal: understand how farming activities influence thrips dispersal

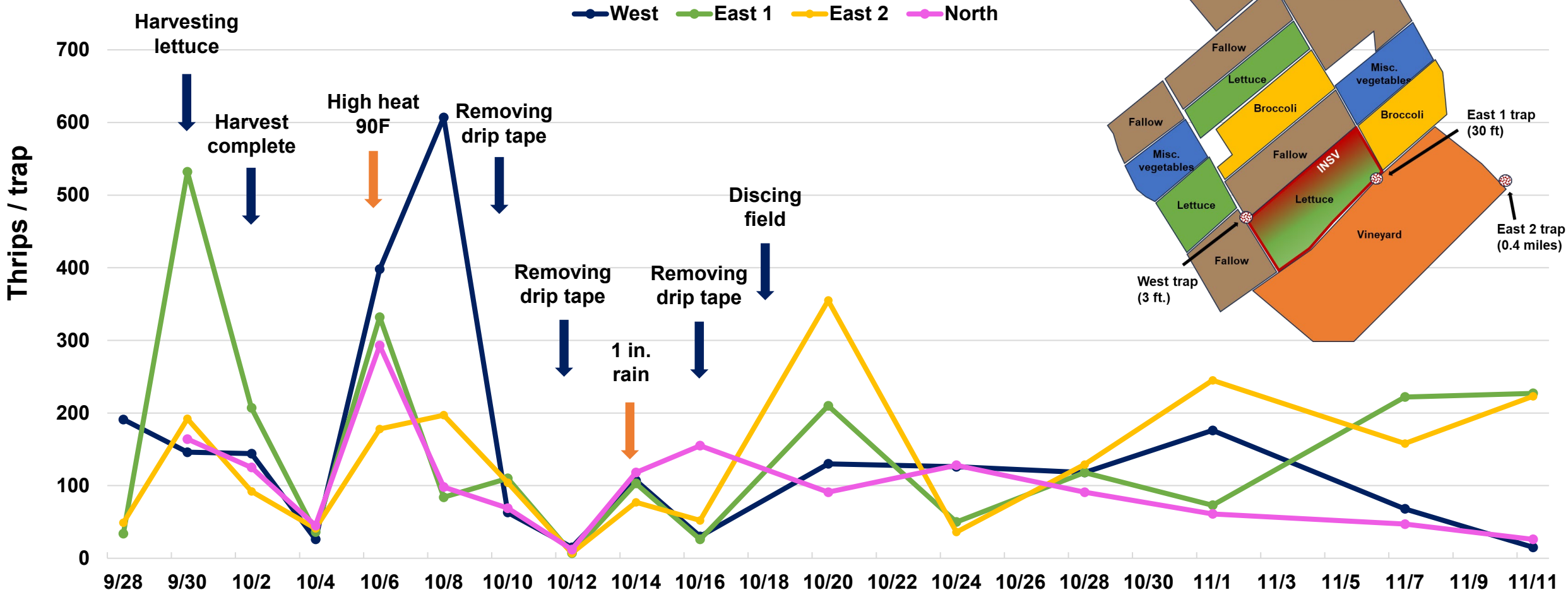
Wind speed and direction





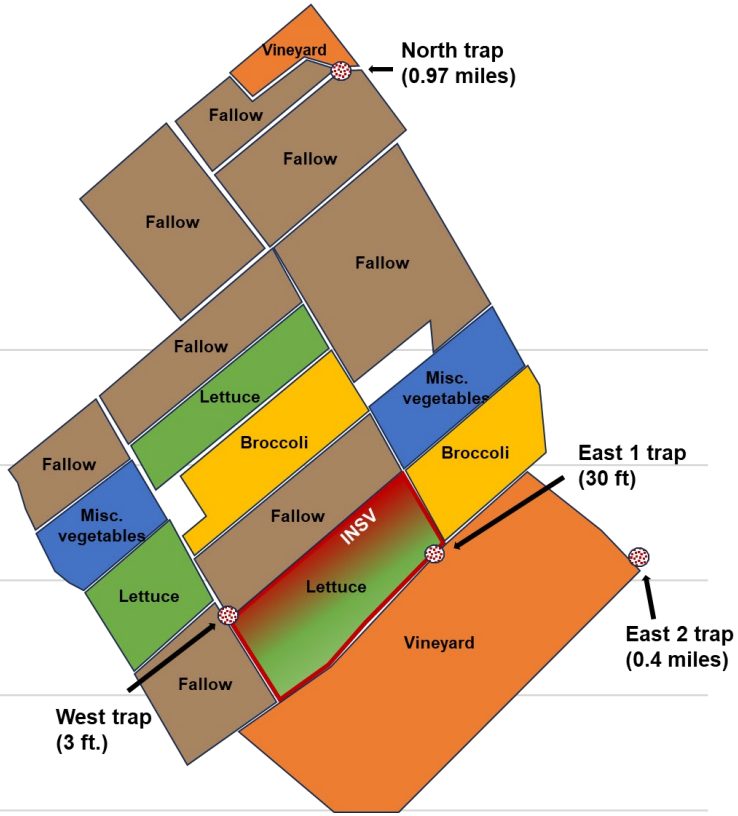
New traps to understand thrips dispersal

Sep 28 – Nov 11, 2025



New traps to understand thrips dispersal

Sep 28 – Nov 11, 2025



Thrips INSV test	9/28	9/30	10/2	10/4	10/6	10/8	10/10	10/12	10/14	10/16	10/18	10/20	10/22	10/24	10/26	10/28	10/30	11/1	11/3	11/5	11/7	11/9	11/11
West	+	+	+	+	+	+	+	-	+	+		+		+		N/A		N/A			N/A		
East 1	+	+	+	+	+	+	+	+	+	+		+		+									
East 2	-	+	+	+	+	+	+	-	+	-		+		+									
North		+	+	+	+	-	-	-	+	+		-		+									

2025 Update on Thrips and INSV

1. Weather, thrips, INSV, weeds
2. *Recap:* INSV and Pythium Wilt interactions
3. New thrips surveillance strategies
4. Use of hedgerows and native plants as insectaries

CDFA's Biologically Integrated Farming Systems (BIFS) program

2024 – 2028

UC Davis: Ian Grettenberger, Danny Karp
USDA-ARS: Daniel Hasegawa, Eric Brennan

3rd Objective: Gain knowledge on the contributions *and potential risks* that hedgerows and native plants can provide in Salinas Valley ag

- **CA Native plants: small (0.25 - 5 ft. tall); medium (1 - 8 ft. tall); large (6-30 ft. tall), various ecosystem services**
  - **Year-round insect surveys: 2026-2028**
  - **Single plant species (USDA) vs. Mixed, diverse plant species (Cooperator sites)**

USDA Spence Research Farm
Pre-planting

CDFA's Biologically Integrated Farming Systems (BIFS) program

2024 – 2028

USDA-ARS: Daniel Hasegawa, Eric Brennan

Longer-term Objectives: Impact of CA Native plants on soil health, pest management (lettuce, brassicas, strawberries), pollination, etc.

USDA Spence Research Farm
Post-planting

CDFA's Biologically Integrated Farming Systems (BIFS) program

2024 – 2028

USDA-ARS: Daniel Hasegawa, Eric Brennan

Longer-term Objectives: Impact of CA Native plants on soil health, pest management (lettuce, brassicas, strawberries), pollination, etc.


Erigeron glaucus


Salvia Allen chickering


Achillea millefolium

USDA Spence Research Farm
Post-planting

Thank you

Hasegawa Lab, USDA-ARS, Salinas, CA (current and former members)
Laura Hladky, Viviana Camelo, Shulu Zhang, Deena Husein, Kiara Gable, Kai Larrieu, Jasmin Azad-Khan, Chaela Hicks, Juan Vargas, Grace Hardy, Lisette Godinez-Rivera, Suzette Segoviano-Quiroz, Ulisses Peralta-Diaz, Litzy Jacuinde, Alfredo Vargas, Jasmin Viorato

USDA-ARS, Salinas, CA
Bill Wintermantel, Aaron Rocha

University of California Cooperative Extension, Monterey County
Richard Smith, Dylan Beal, Yu-Chen Wang

California State University Monterey Bay (CSUMB)
JP Dundore-Arias, Karla Jasso, Cecilia Diaz

University of California Davis
Ian Grettenberger

Grower-Shipper Association of Central CA
Chris Valadez, Mary Zischke

Growers, PCAs, CCAs, many other industry members

USDA Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE

CALIFORNIA LEAFY GREENS RESEARCH PROGRAM

cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

California Environmental Protection Agency dpr Department of Pesticide Regulation

GROWER-SHIPPER ASSOCIATION of Central California Since 1950