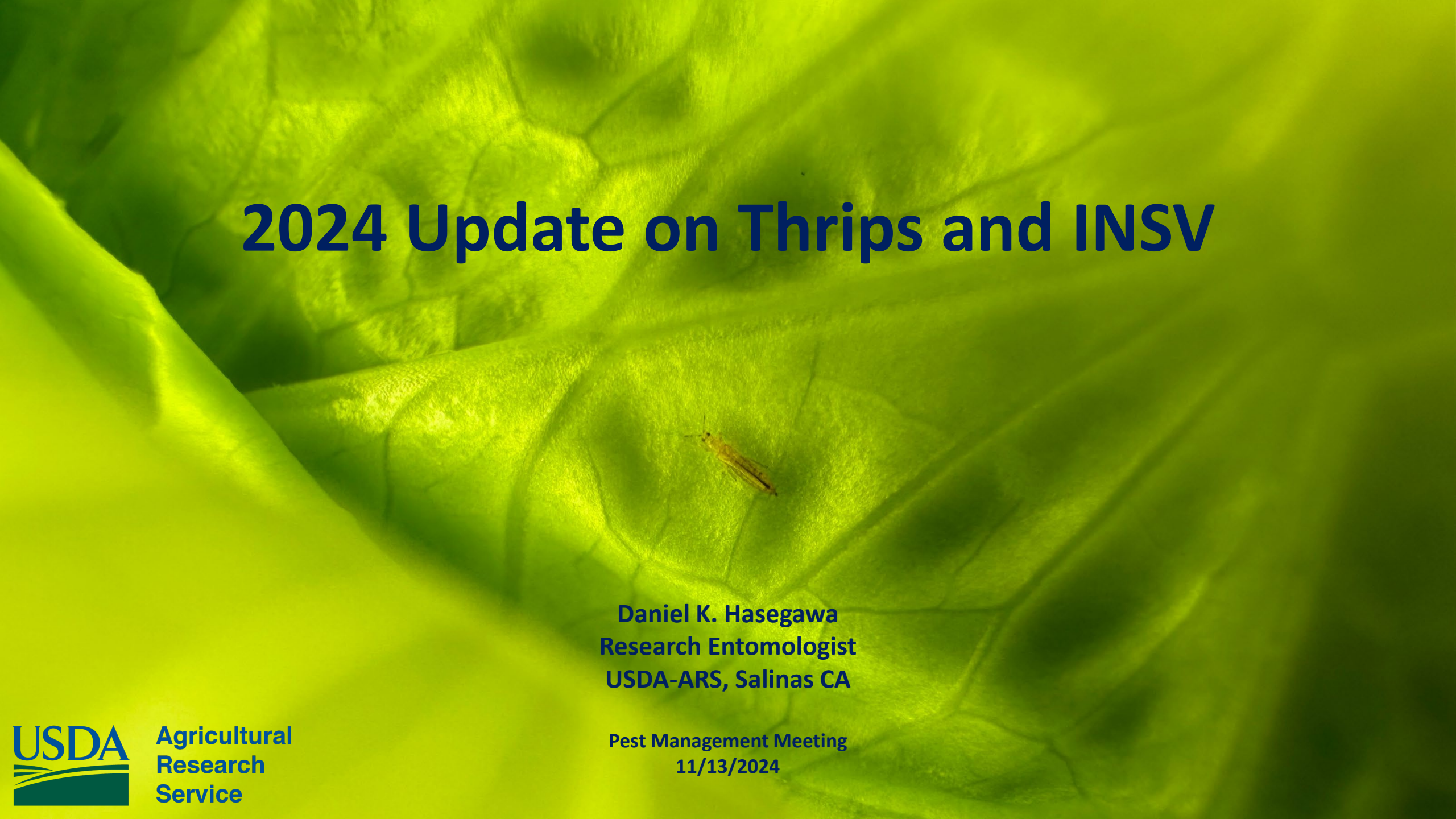
2024 Update on Thrips and INSV



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

Pest Management Meeting
11/13/2024

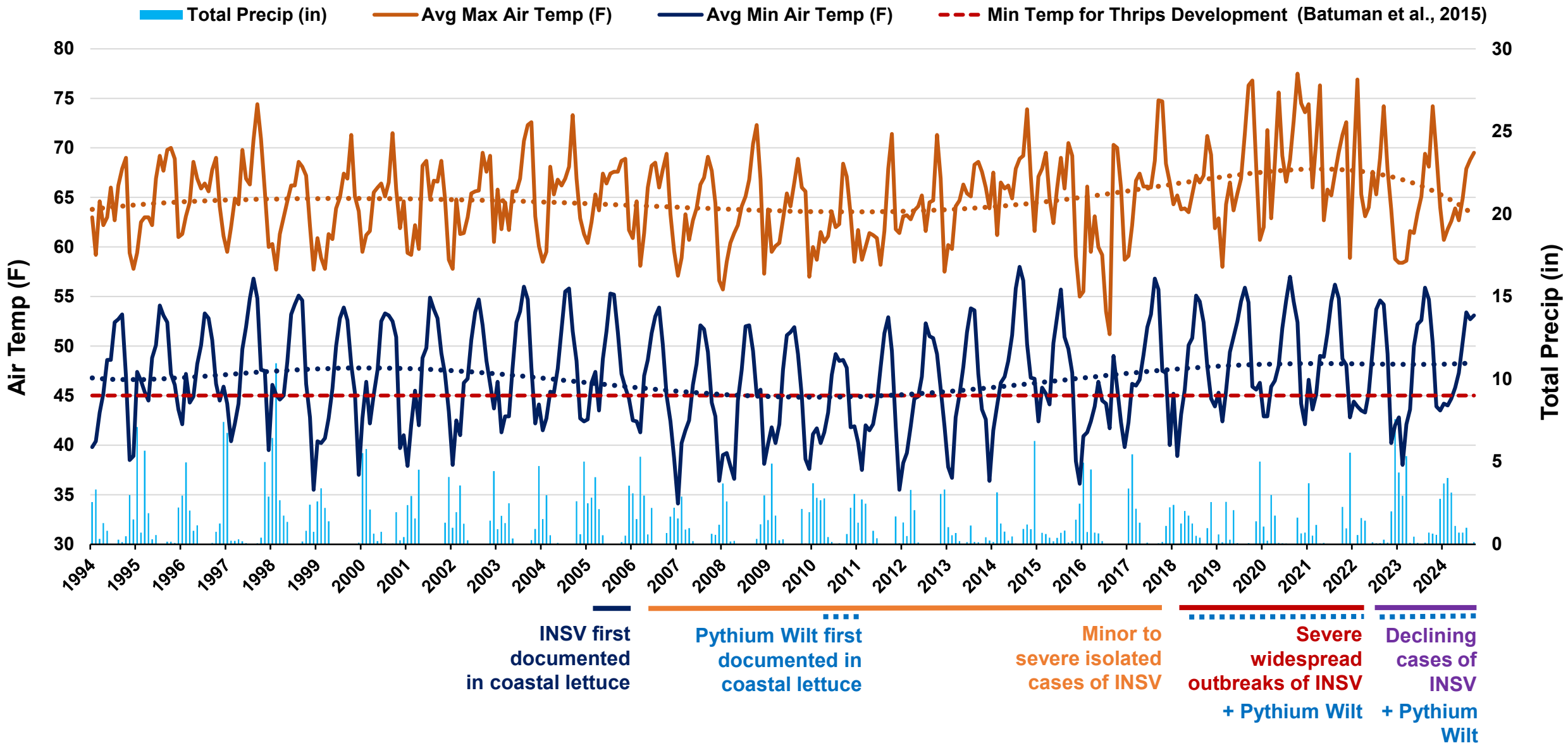
USDA Agricultural Research Service

2024 Update on Thrips and INSV

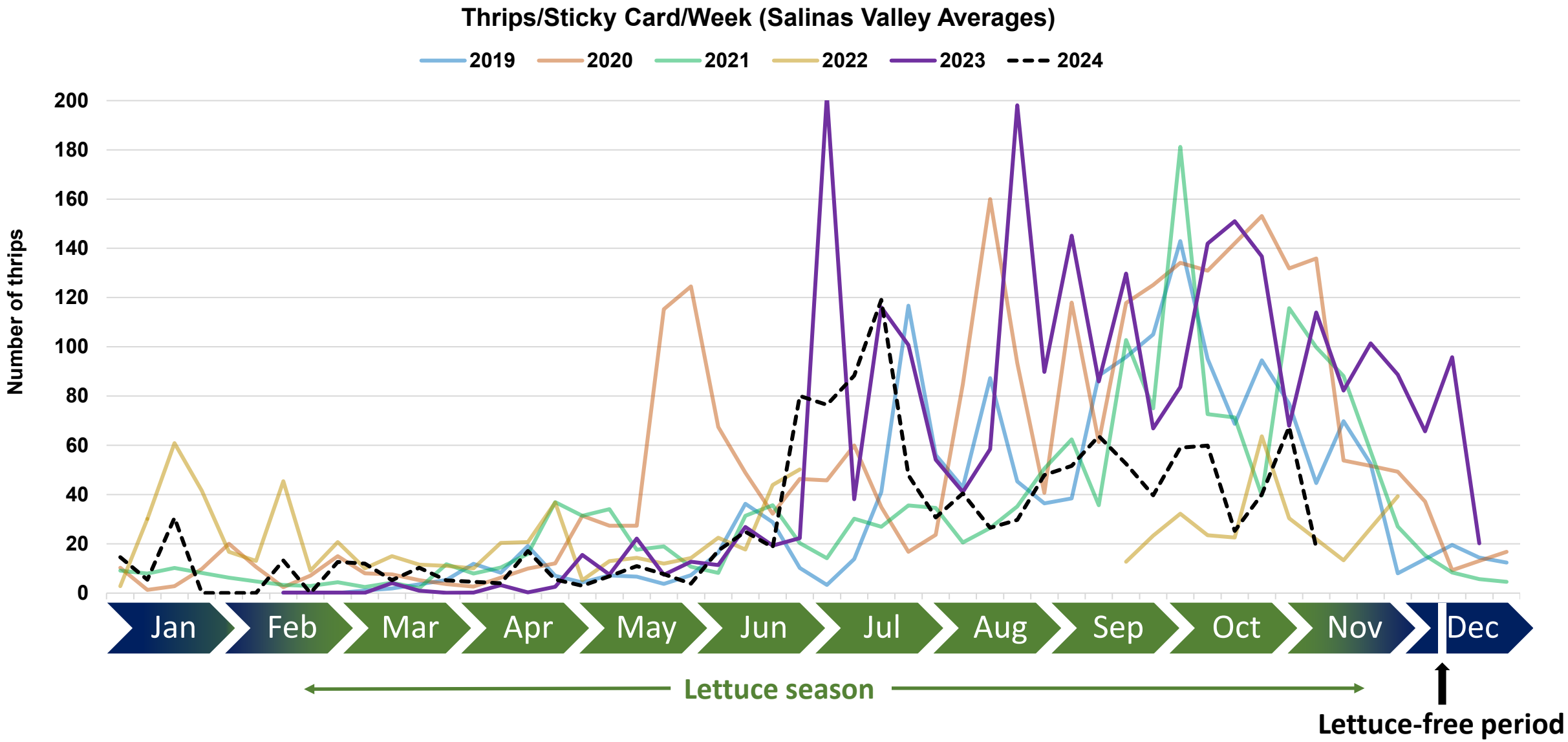
1. 2024 observations: weather, thrips, INSV, weeds
2. INSV and Pythium Wilt interactions
3. Peptide technologies for managing thrips and diamondback moth
4. INSV susceptibility tests

30 years of climate data

CIMIS Station 116: Salinas North



Thrips monitoring: 2019 - 2024



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	++	++	++



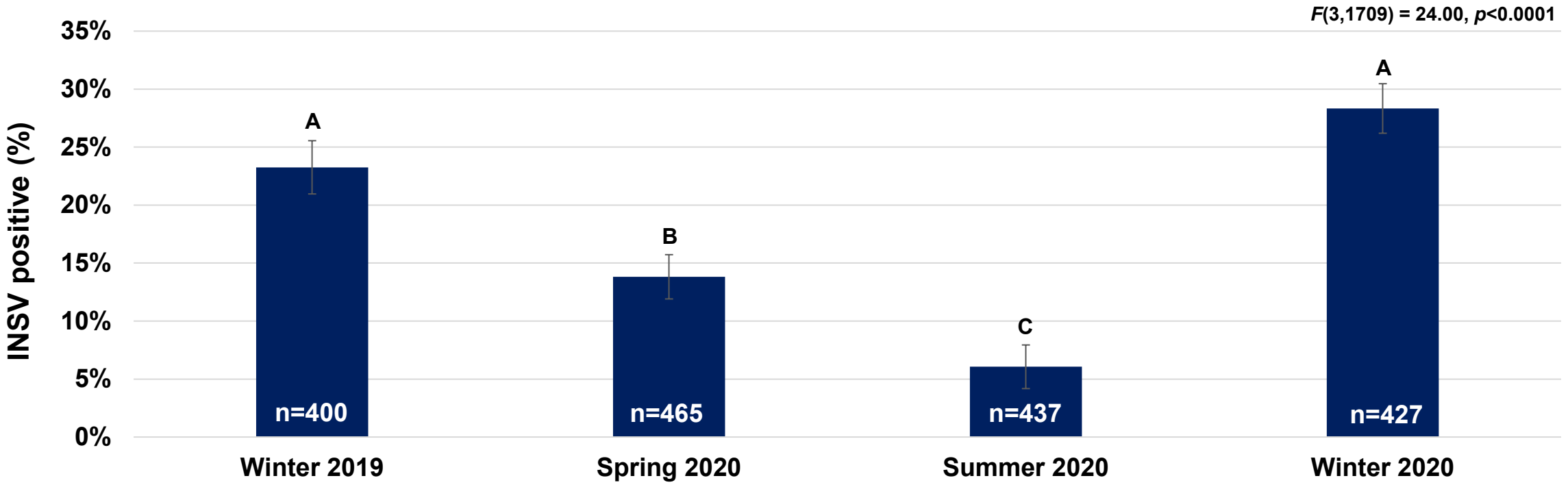


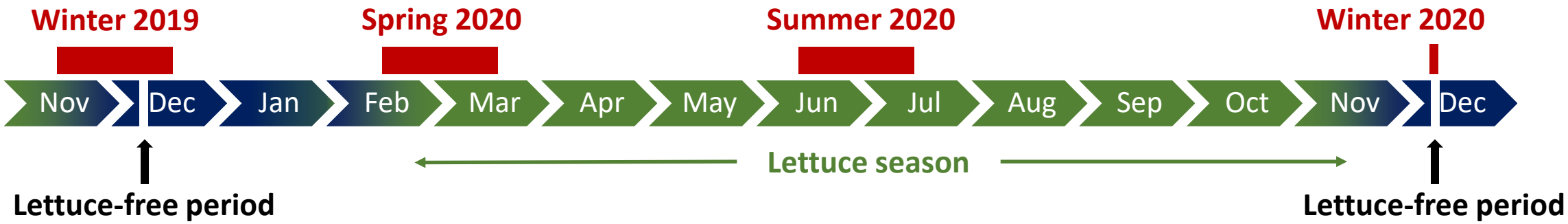





http://ipm.ucanr.edu/PMG/weeds_all.html

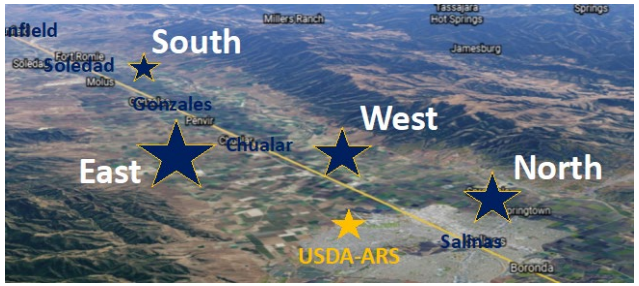
Top 10 hosts: Season

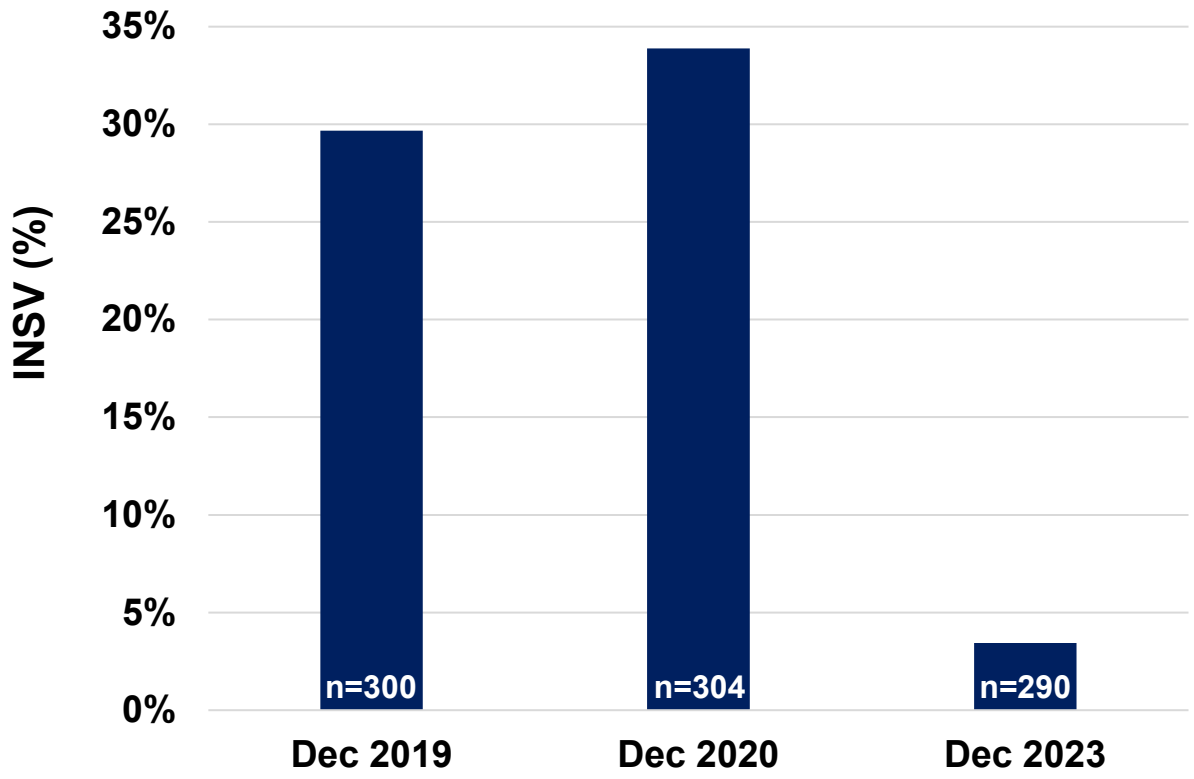




2023 field surveys: top 10 hosts for INSV

8 locations: East and West





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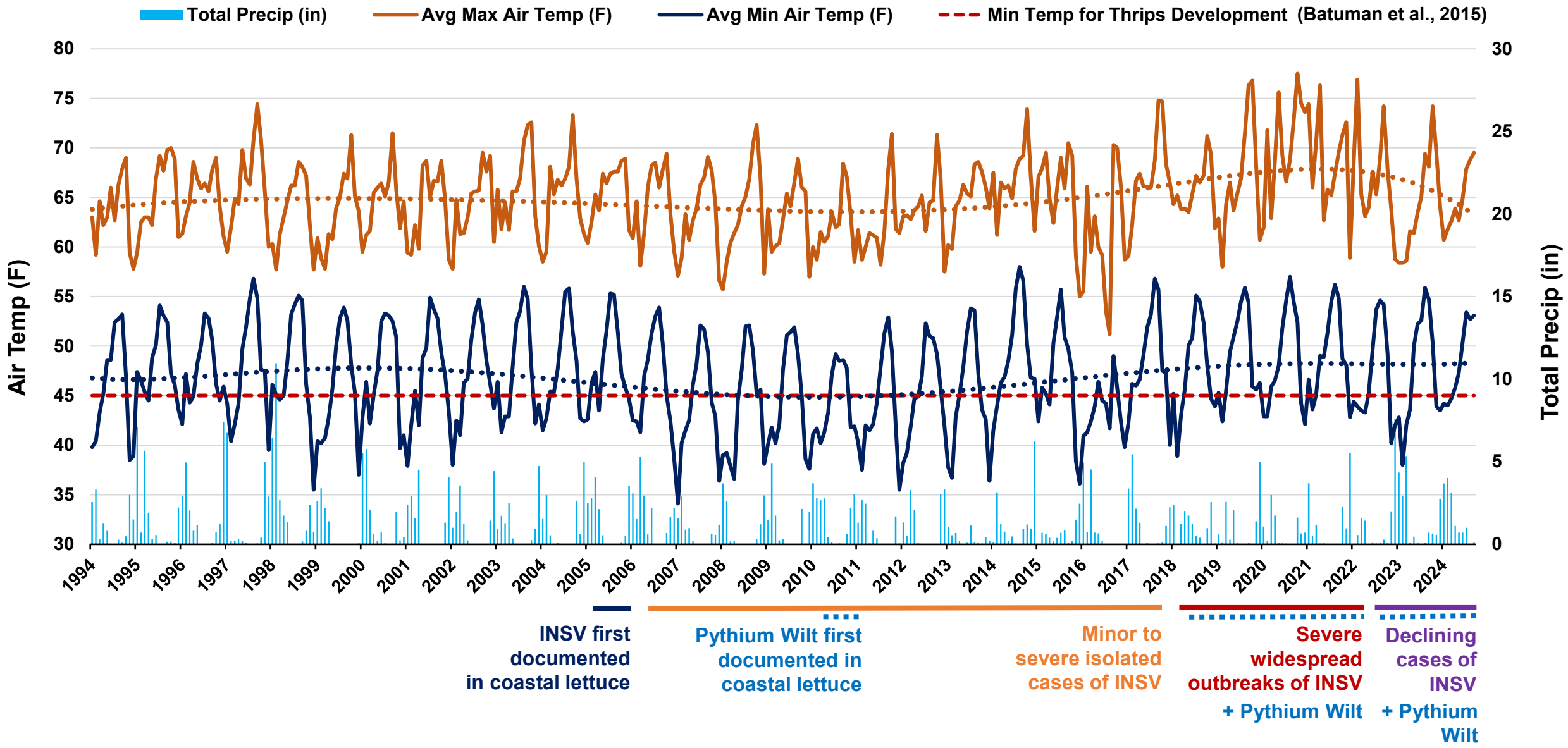

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Timing of INSV and Pythium Wilt

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

Timing of INSV and Pythium Wilt

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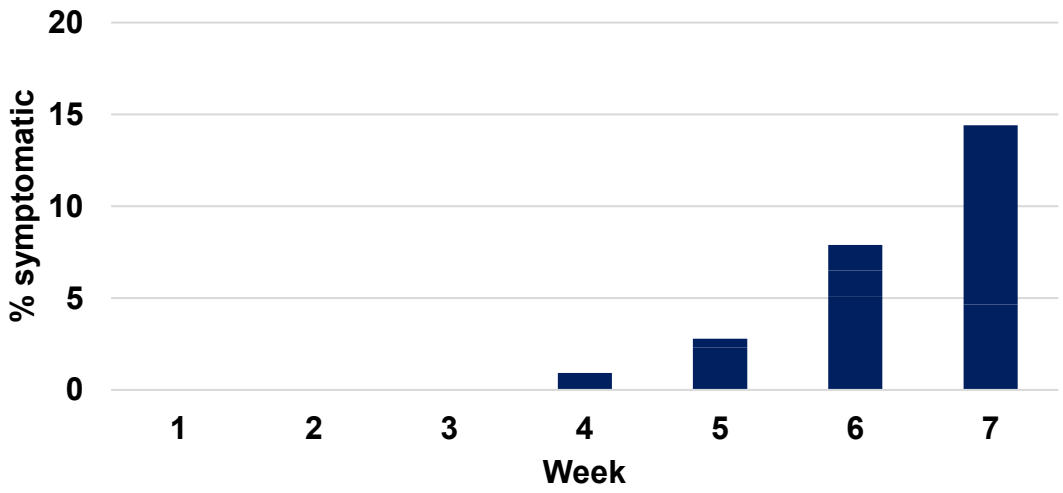

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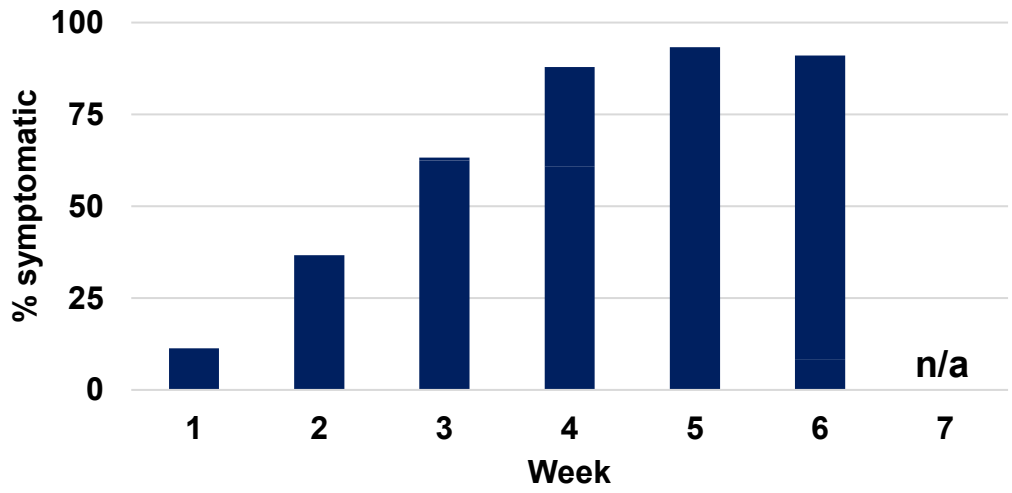

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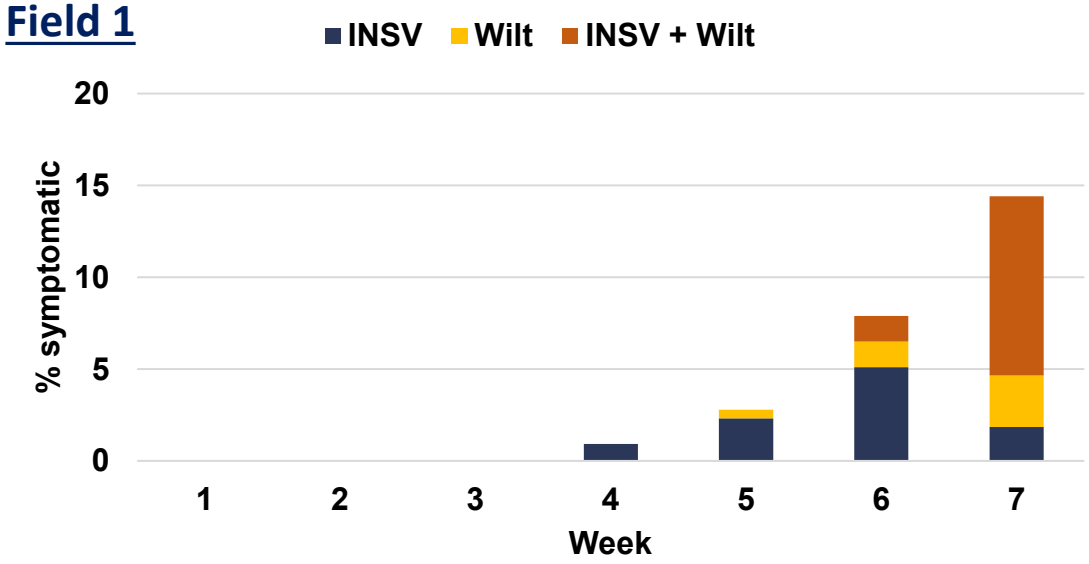

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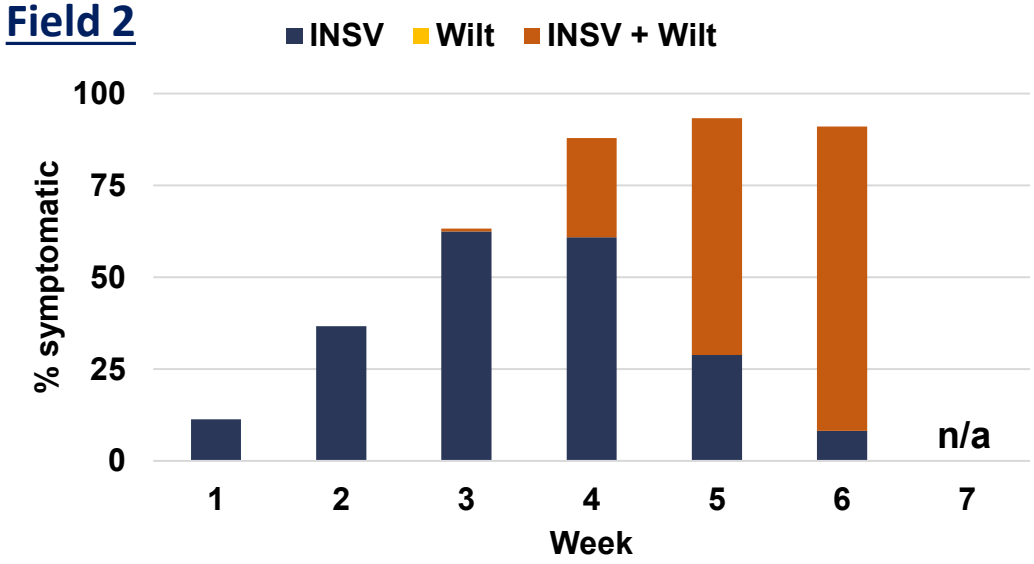

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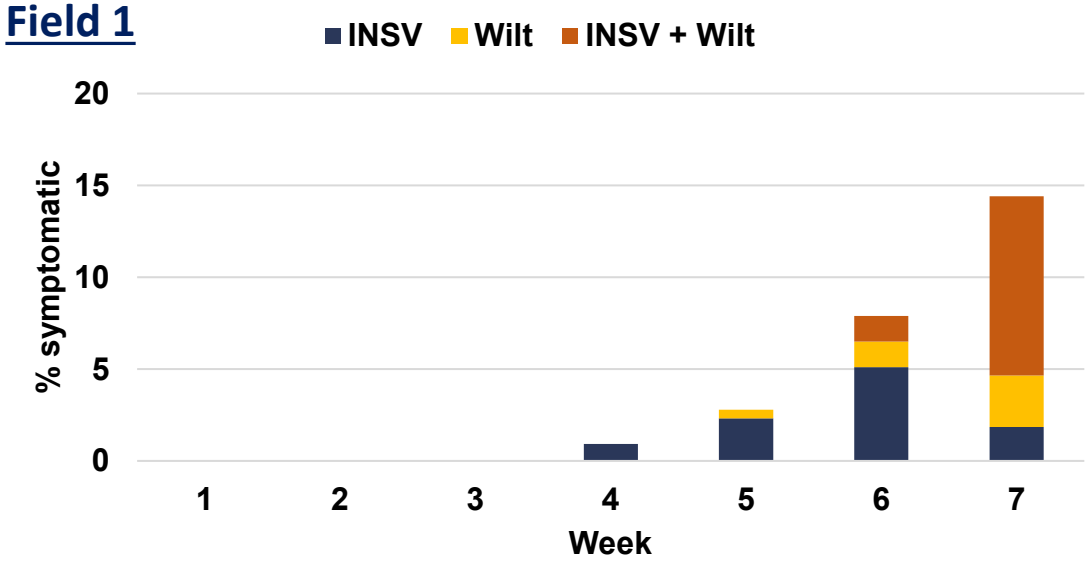

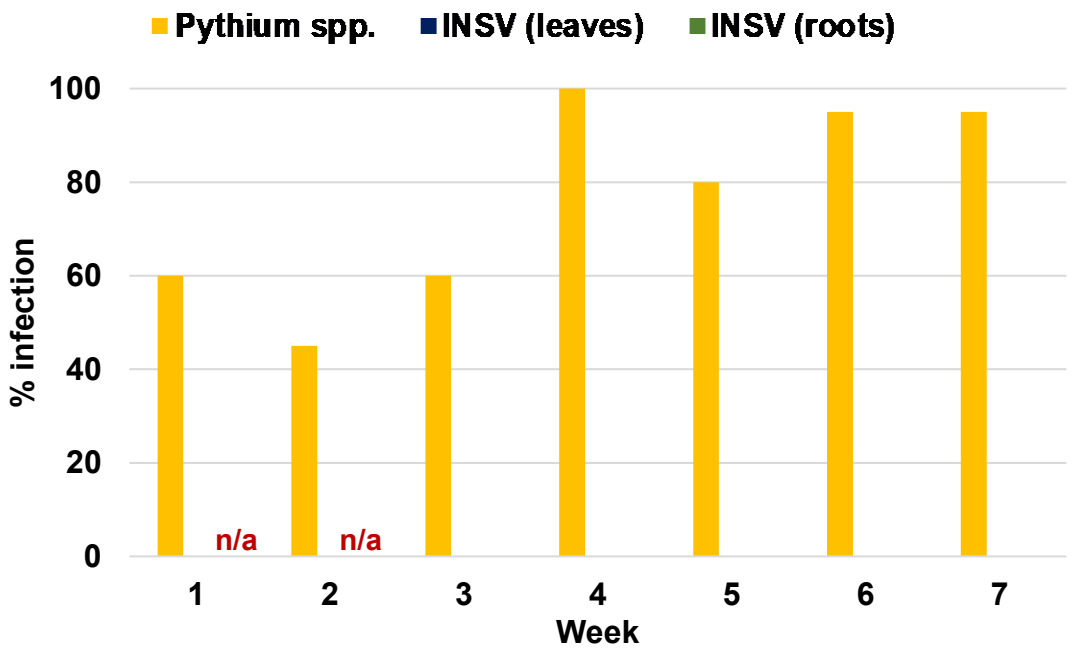

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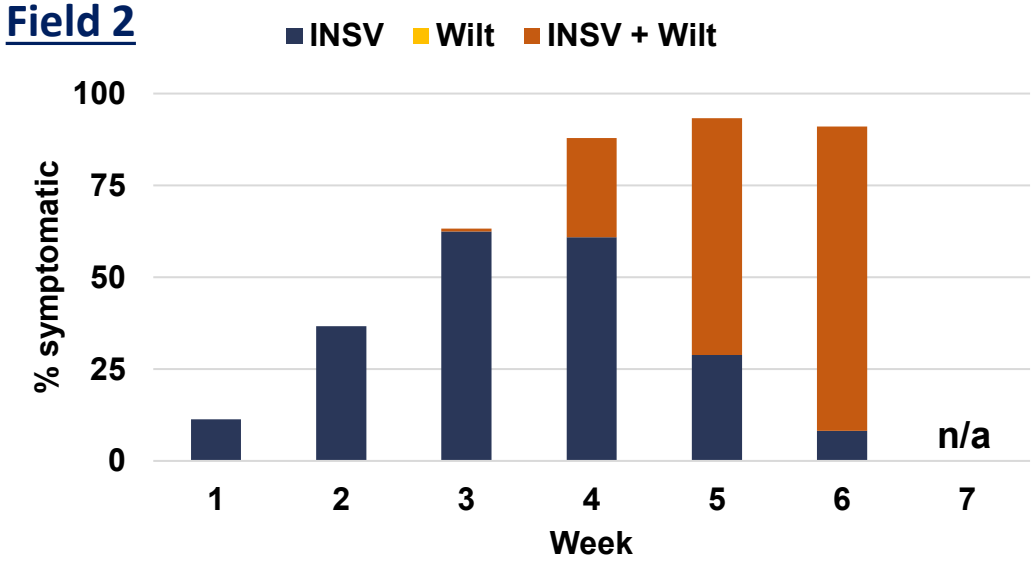

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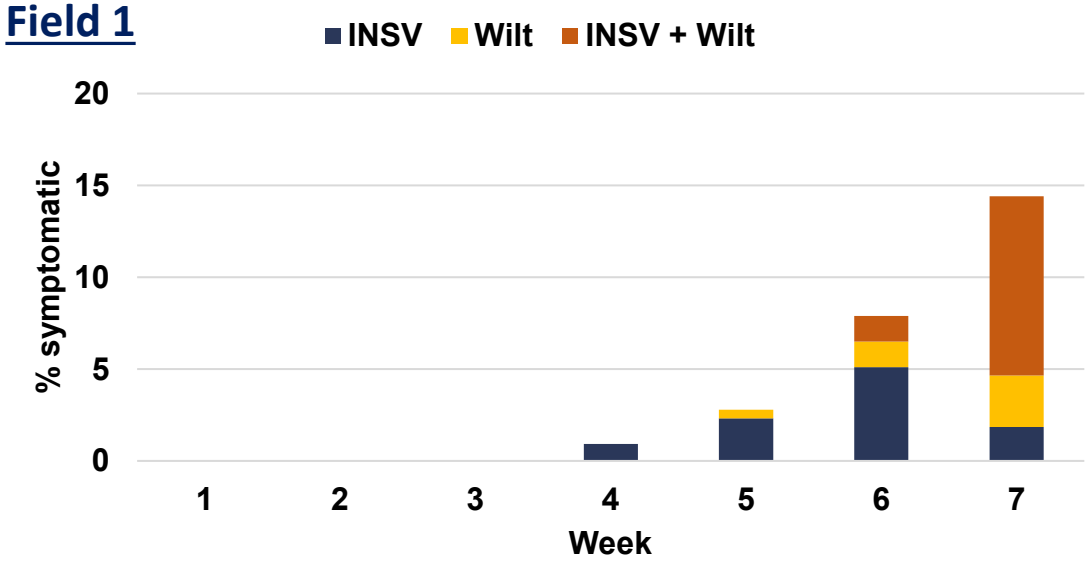

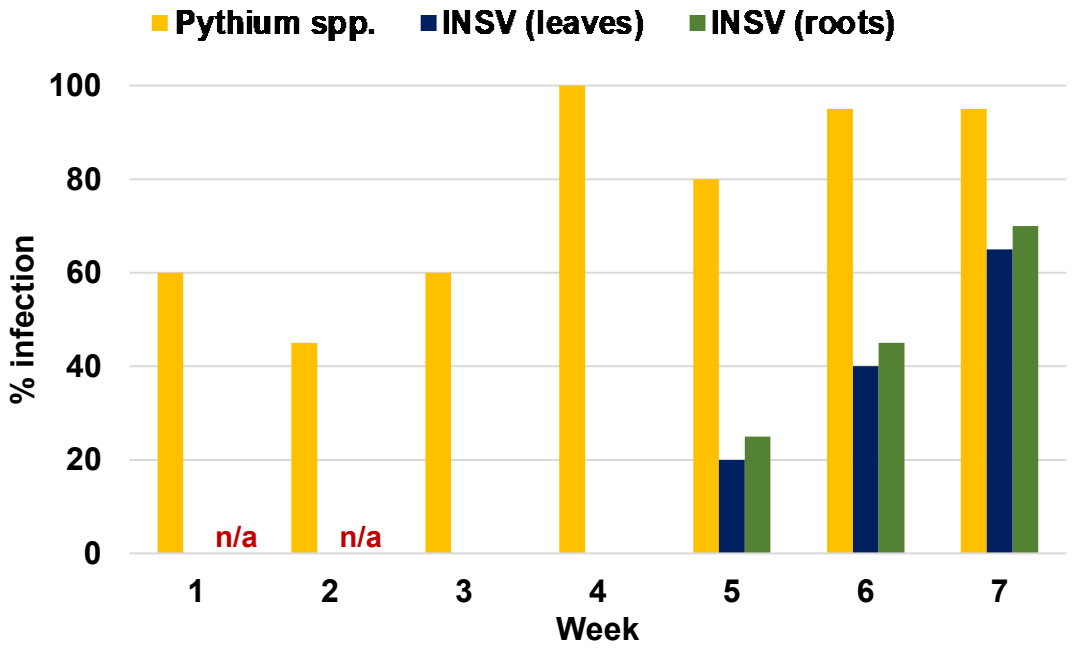

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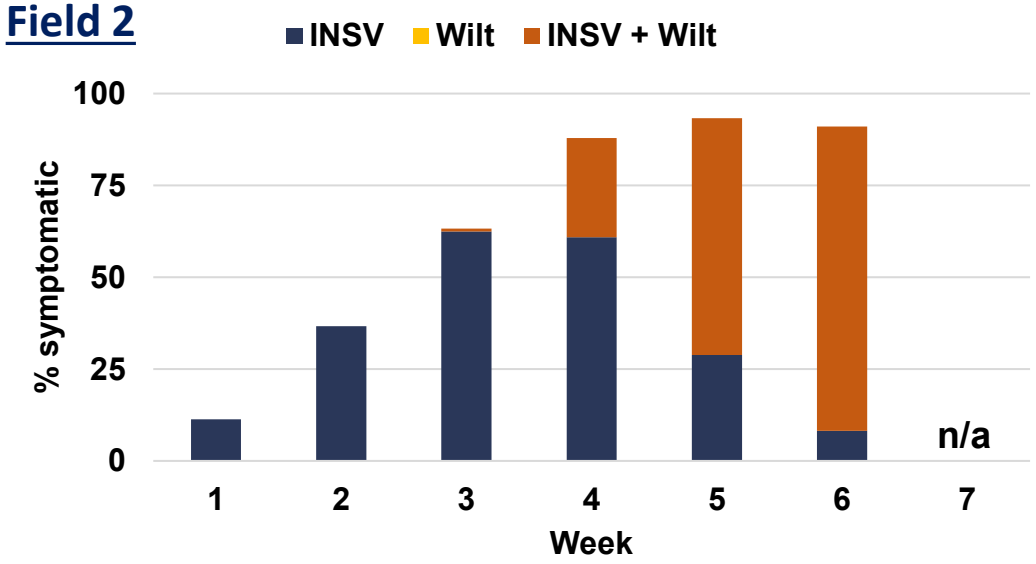

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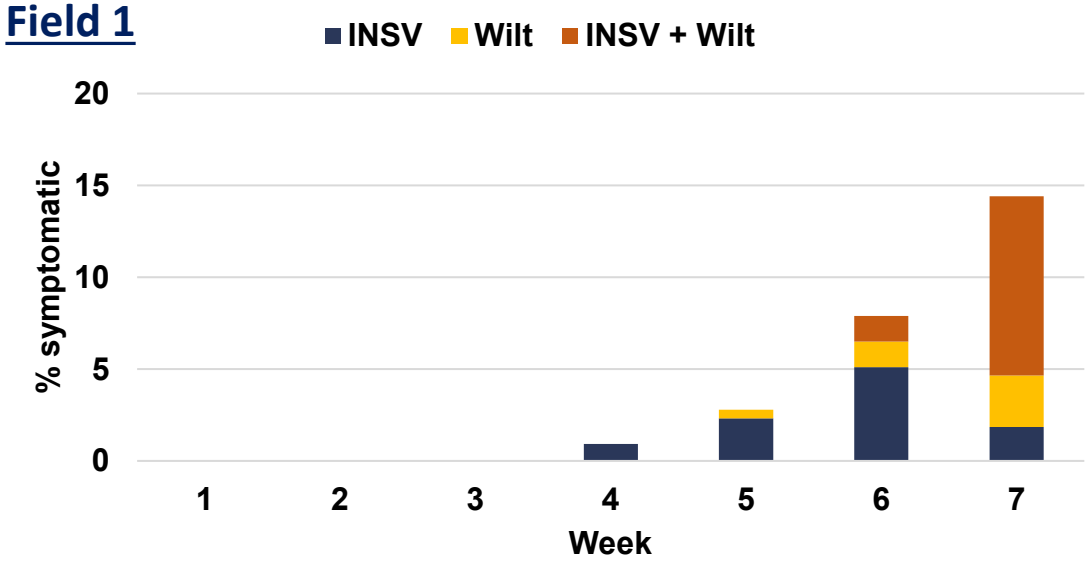

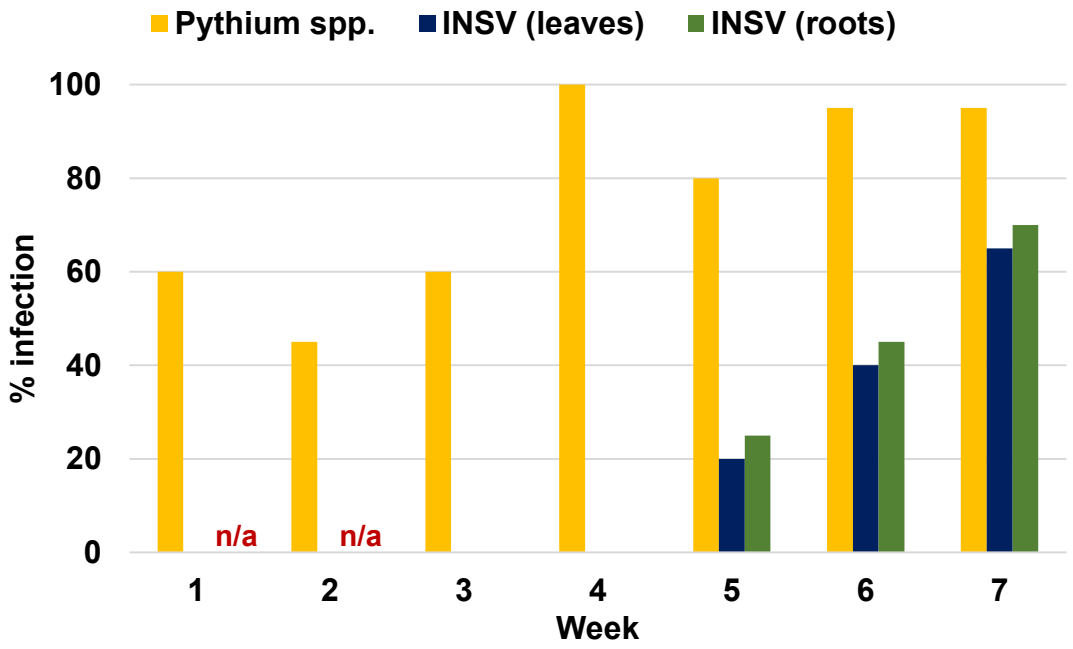

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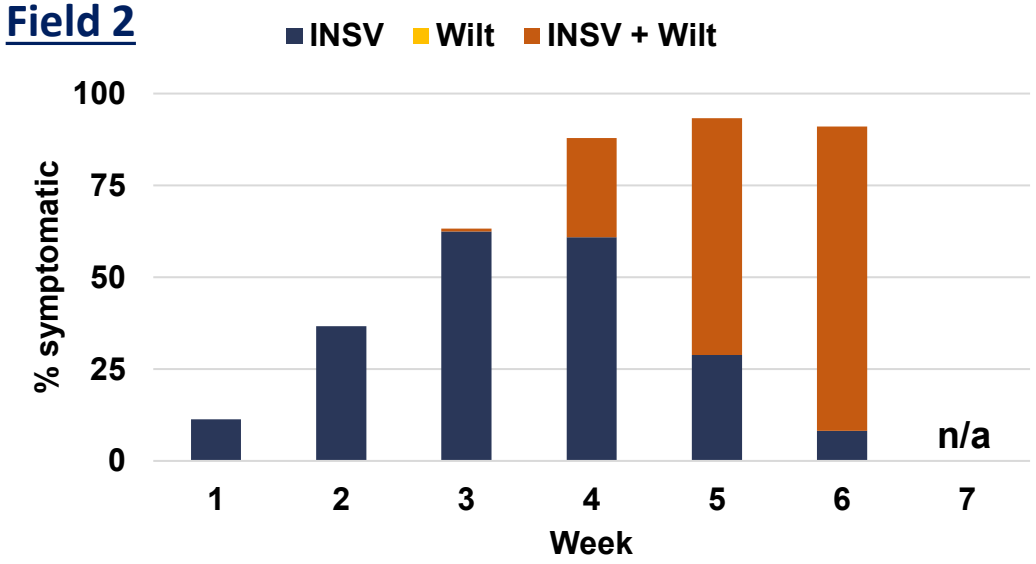

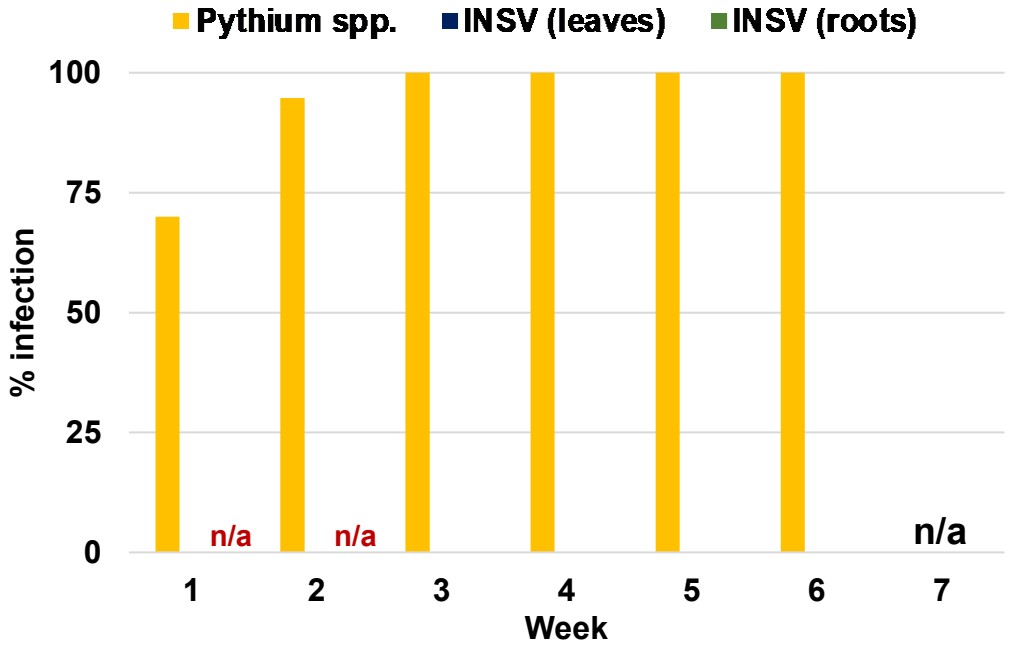

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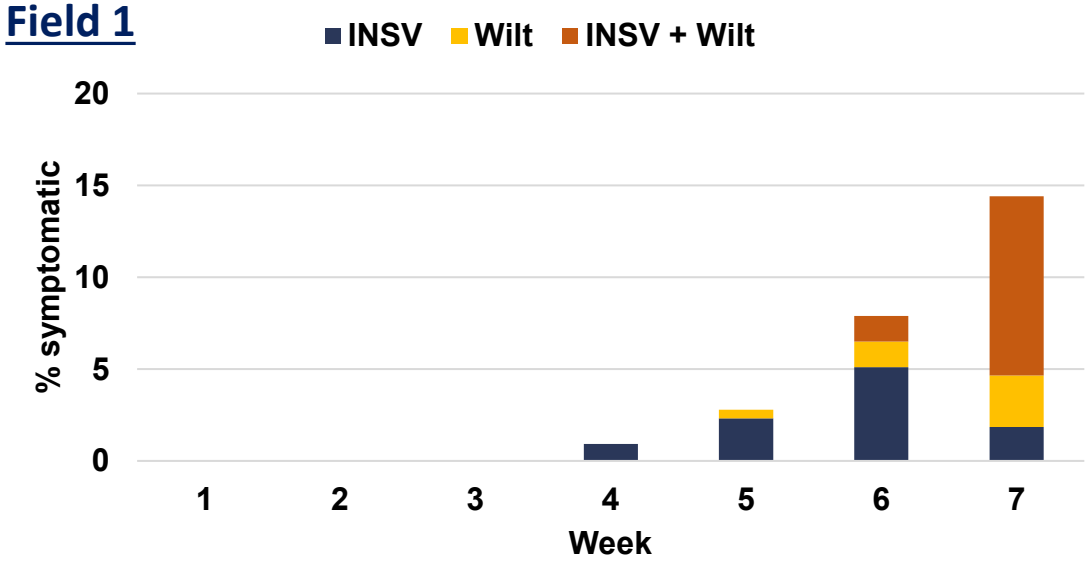

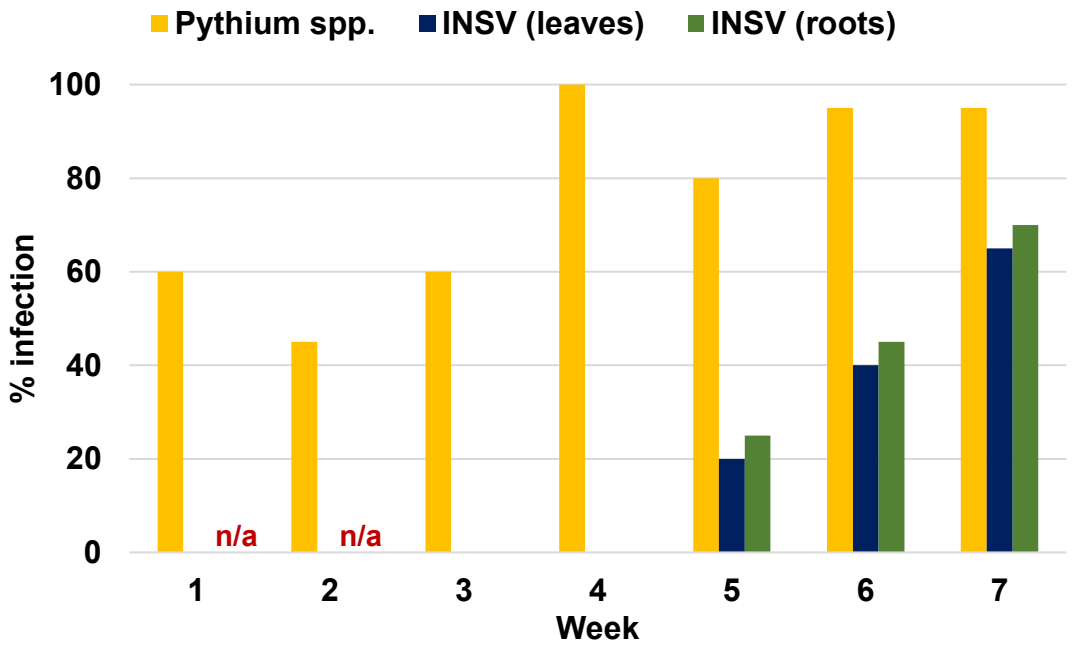

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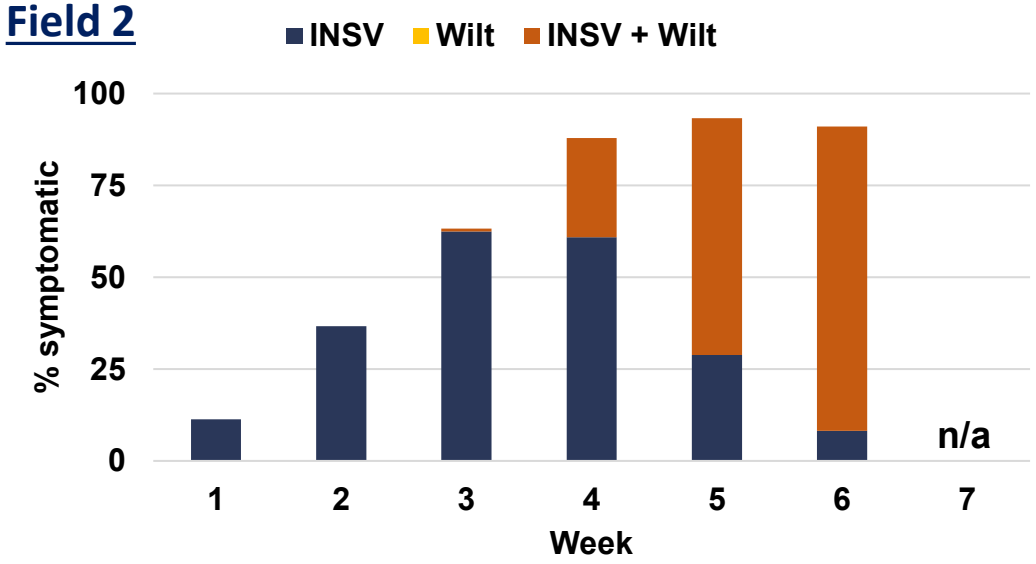

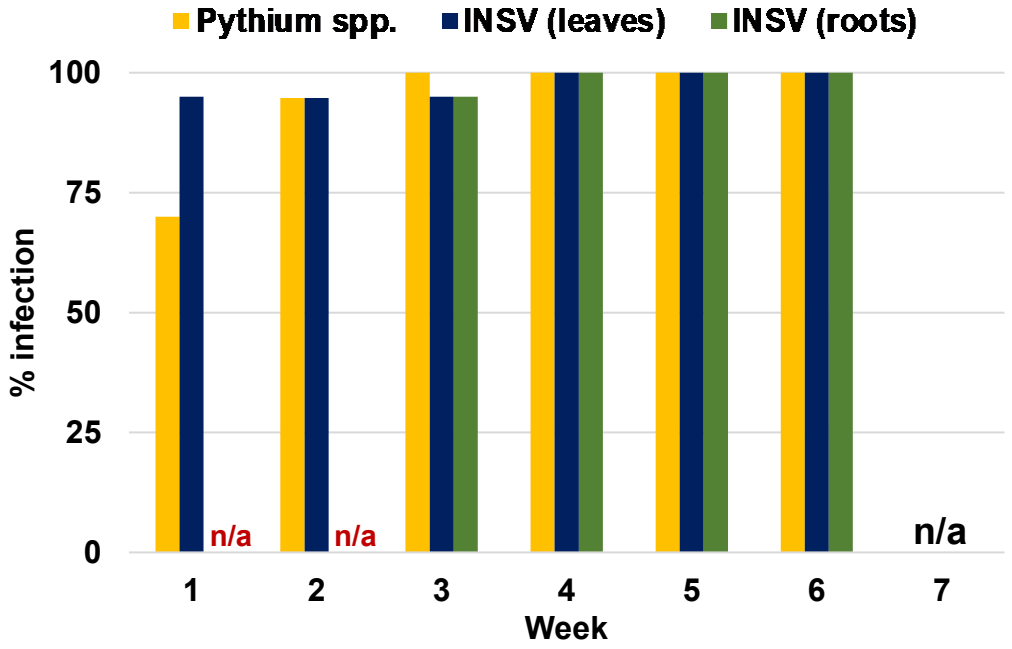

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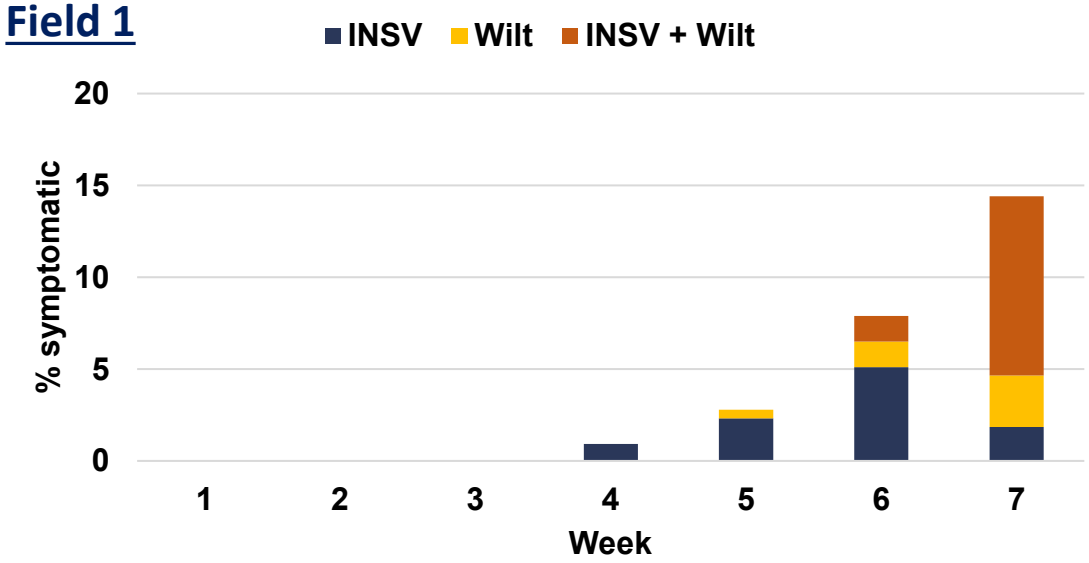

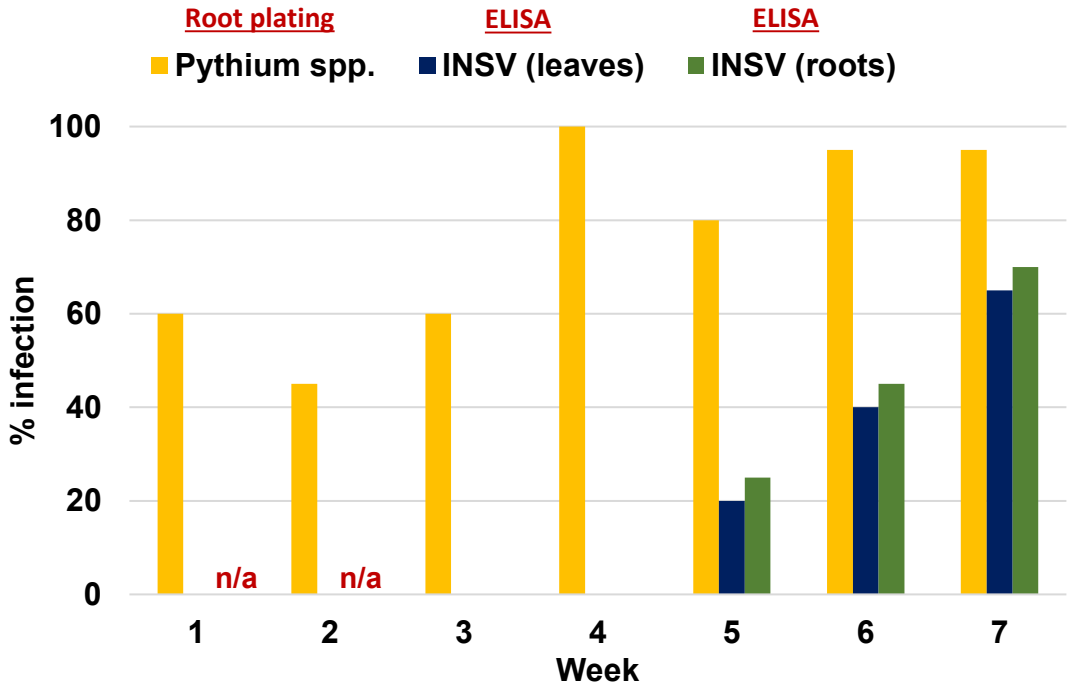

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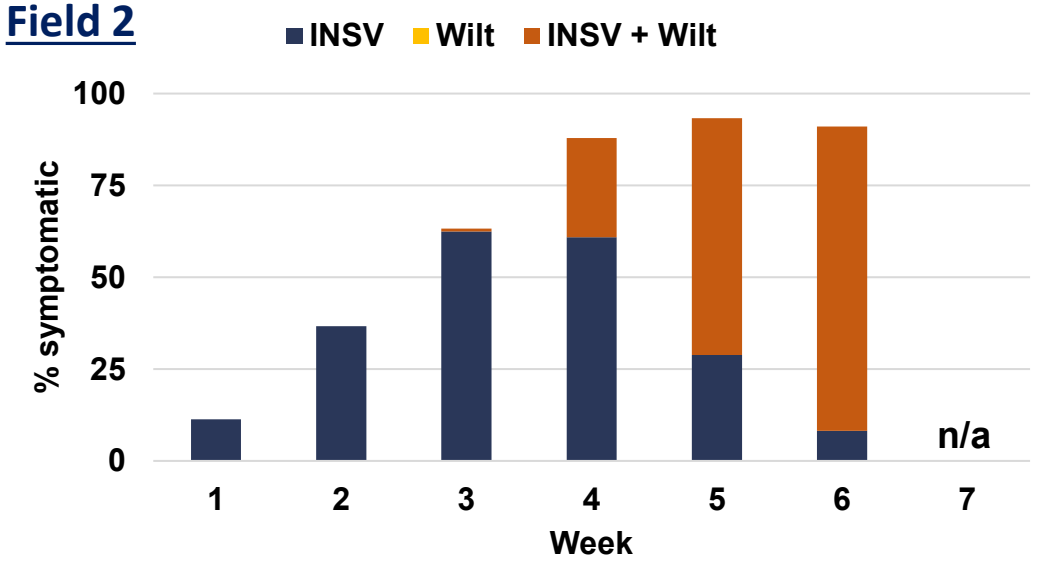
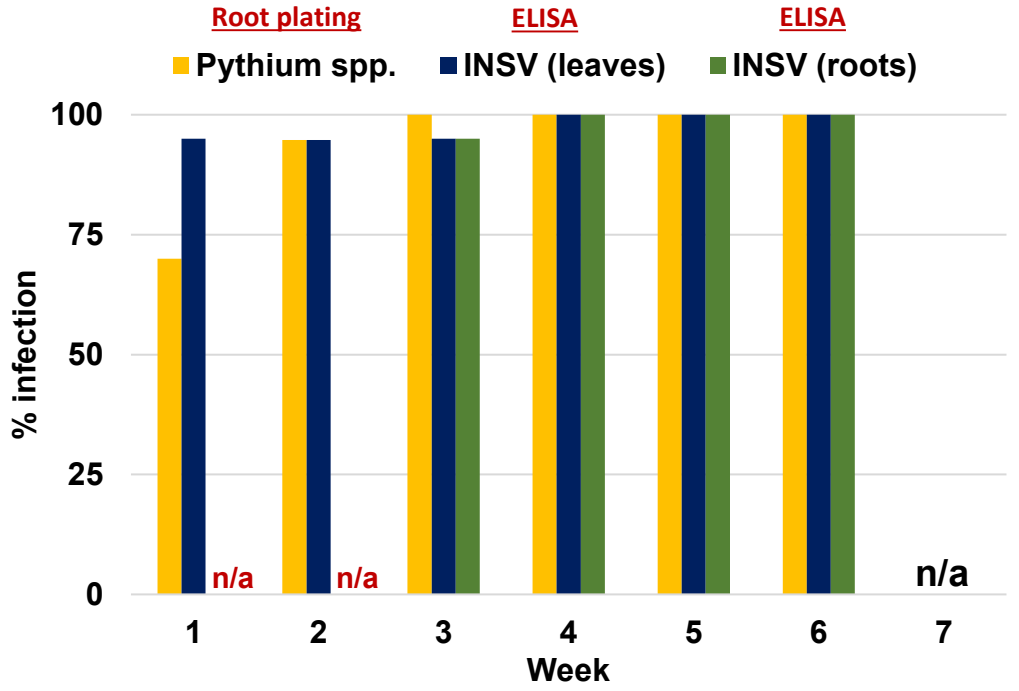




Multiplex detection assay for INSV and *P. uncinulatum*

qPCR

Lyse and homogenize root tissue

Bind, wash, elute nucleic acids

DNA (*P. uncinulatum*)

RNA (INSV)

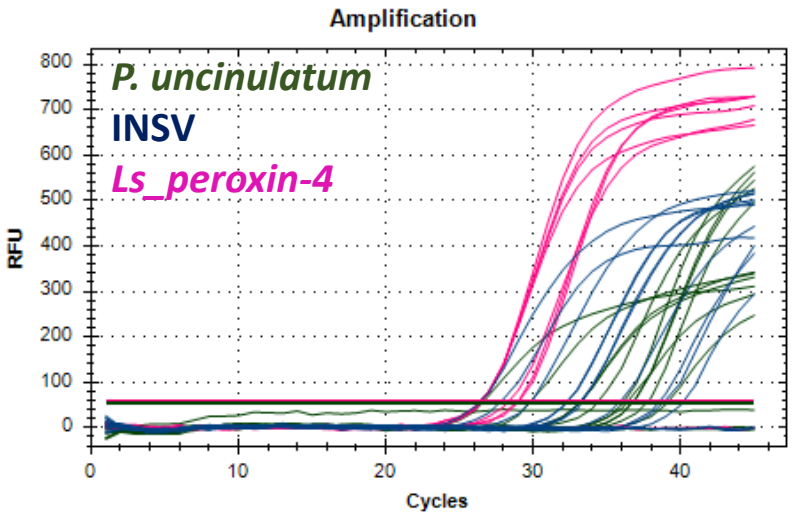
Reverse transcription

Multiplex qPCR
INSV + *P. uncinulatum*

Viviana Camelo
USDA-ARS, Salinas
Postdoc

Frank Martin
USDA-ARS Salinas

Austin McCoy
Timothy Miles
Martin Chilvers
Michigan State University

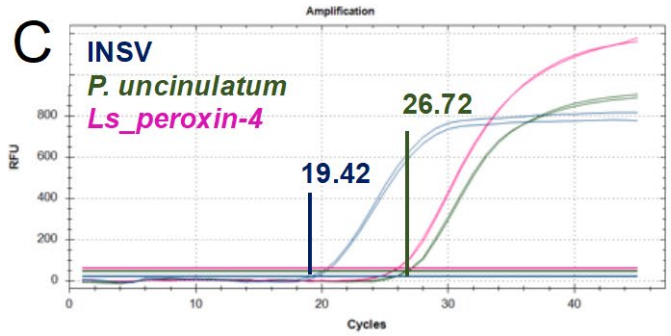


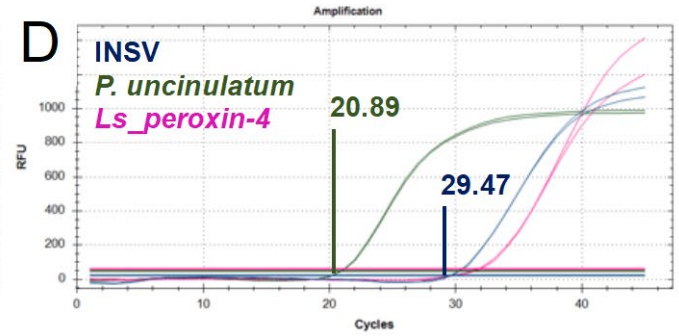
Field validation

Creation of a new tool to detect INSV and Pythium uncinulatum from a single root sample

B

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





INSV + *P. uncinulatum* co-inoculation studies


P. uncinulatum inoculations

Millet inoculated with *P. uncinulaum* media plugs

~3 weeks

1:7 millet:soil substrate (autoclaved)

Transplant lettuce into soil substrate

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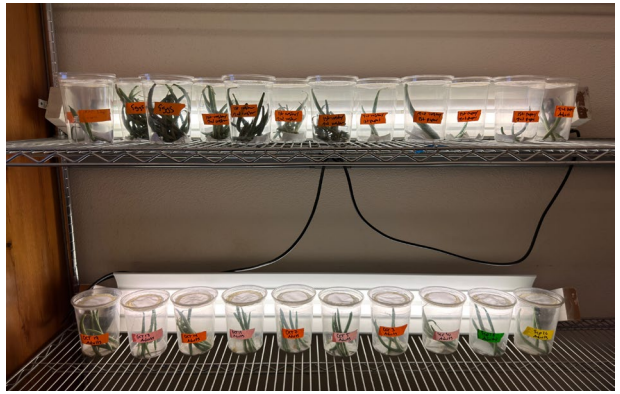
F. occidentalis colony



INSV acquisitions using L1s

10 viruliferous adults (5 male + 5 female)

INSV + *P. uncinulatum* co-inoculation studies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5-day inoculation access period

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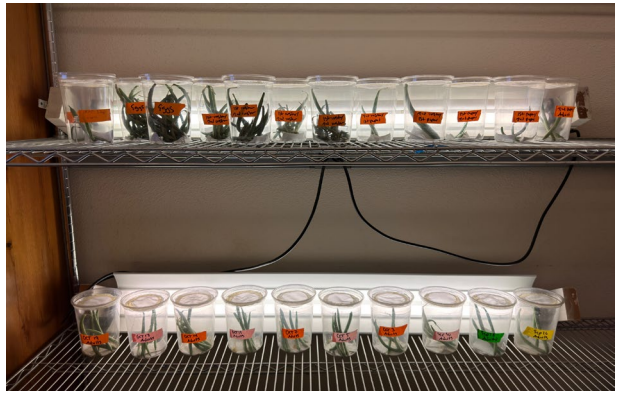

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Kill off thrips

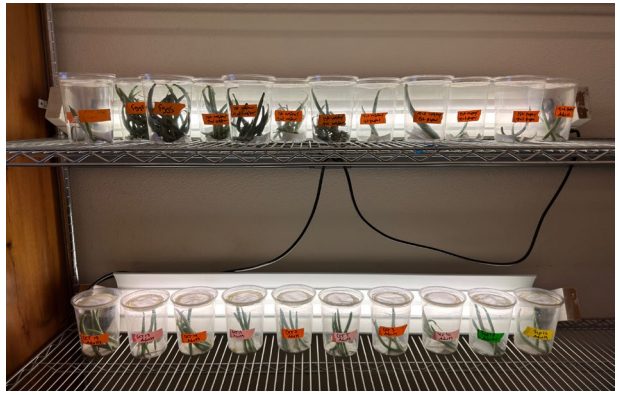
Treatments

1. Control
2. *P. uncinulatum*
3. INSV
4. INSV + *P. uncinulatum*

Grow plants for 32-37 days

INSV inoculations

F. occidentalis colony



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Evaluations

- Symptom severity
- Abundance of INSV and *Pythium uncinulatum*

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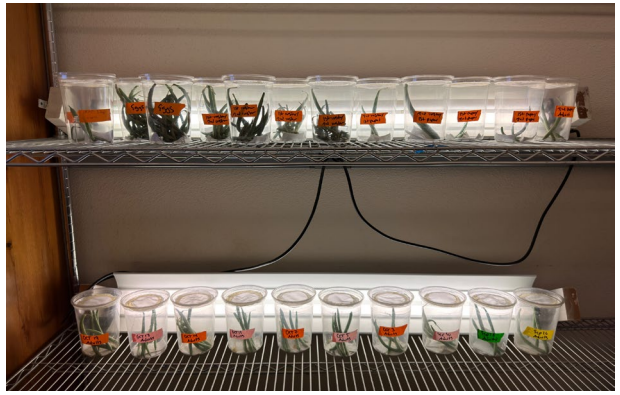

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INSV + *P. uncinulatum* co-inoculation studies

32 days post inoculation INSV

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

INSV + *P. uncinulatum* co-inoculation studies

32 days post inoculation INSV

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

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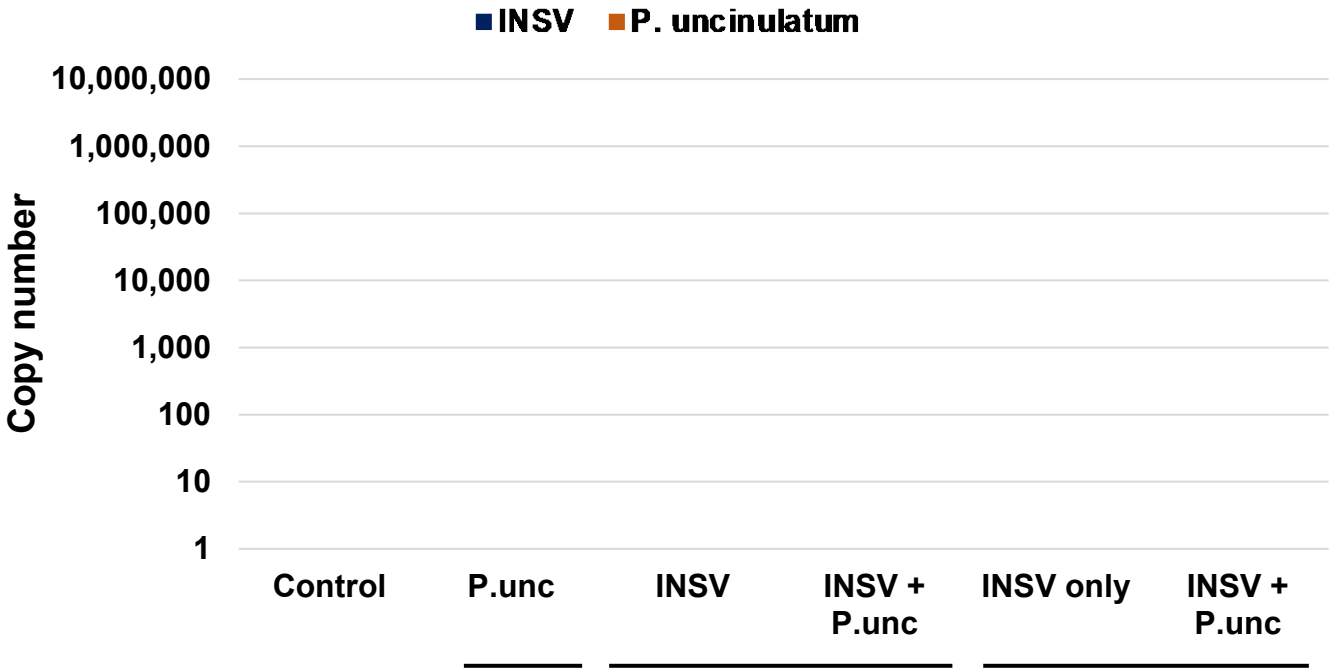
32 days post inoculation INSV

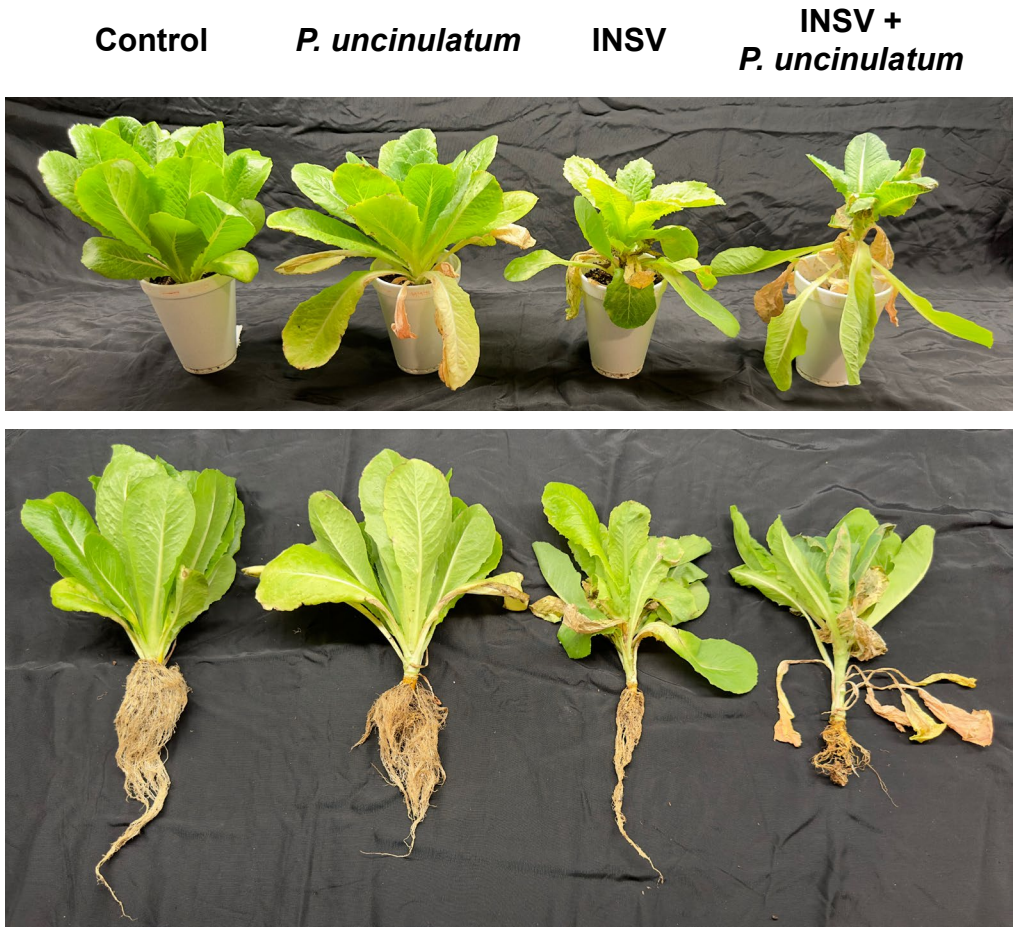
Control | *P. uncinulatum* | INSV | INSV + *P. uncinulatum*

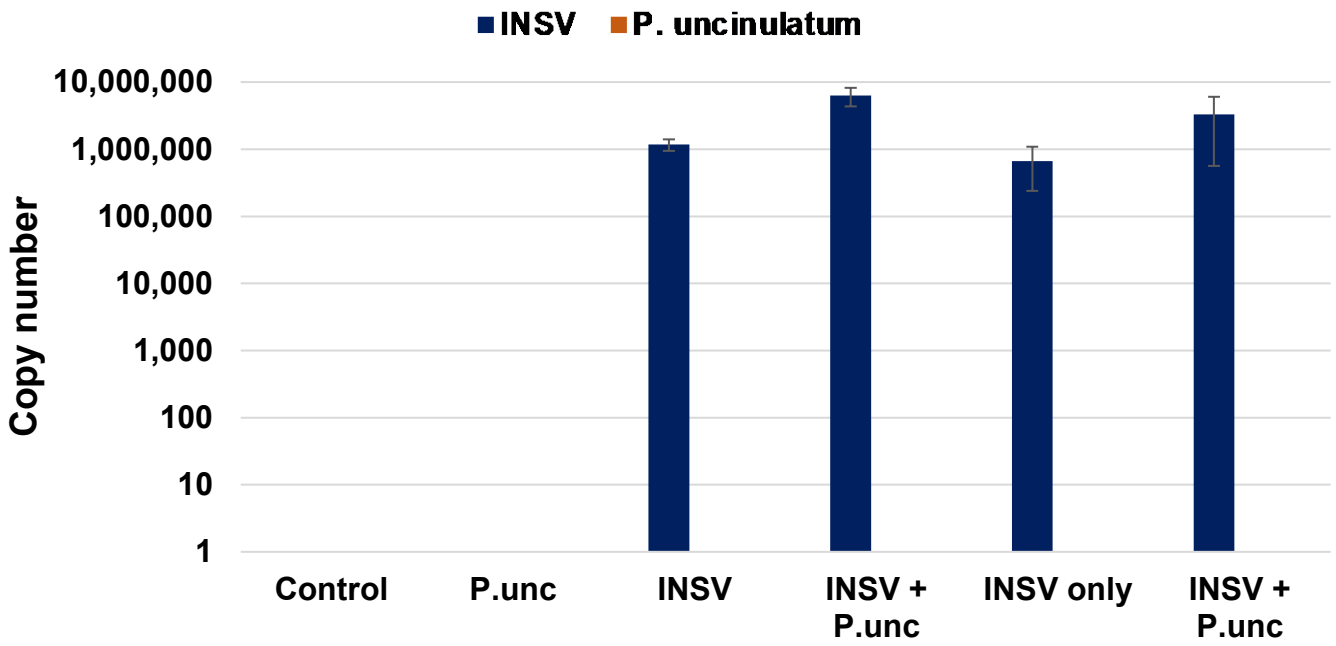


# days since *P. unc* inoculation	60	n/a	49	n/a	56
# days since INSV transmission	n/a	37	37	38	38

INSV + *P. uncinulatum* co-inoculation studies

32 days post inoculation INSV





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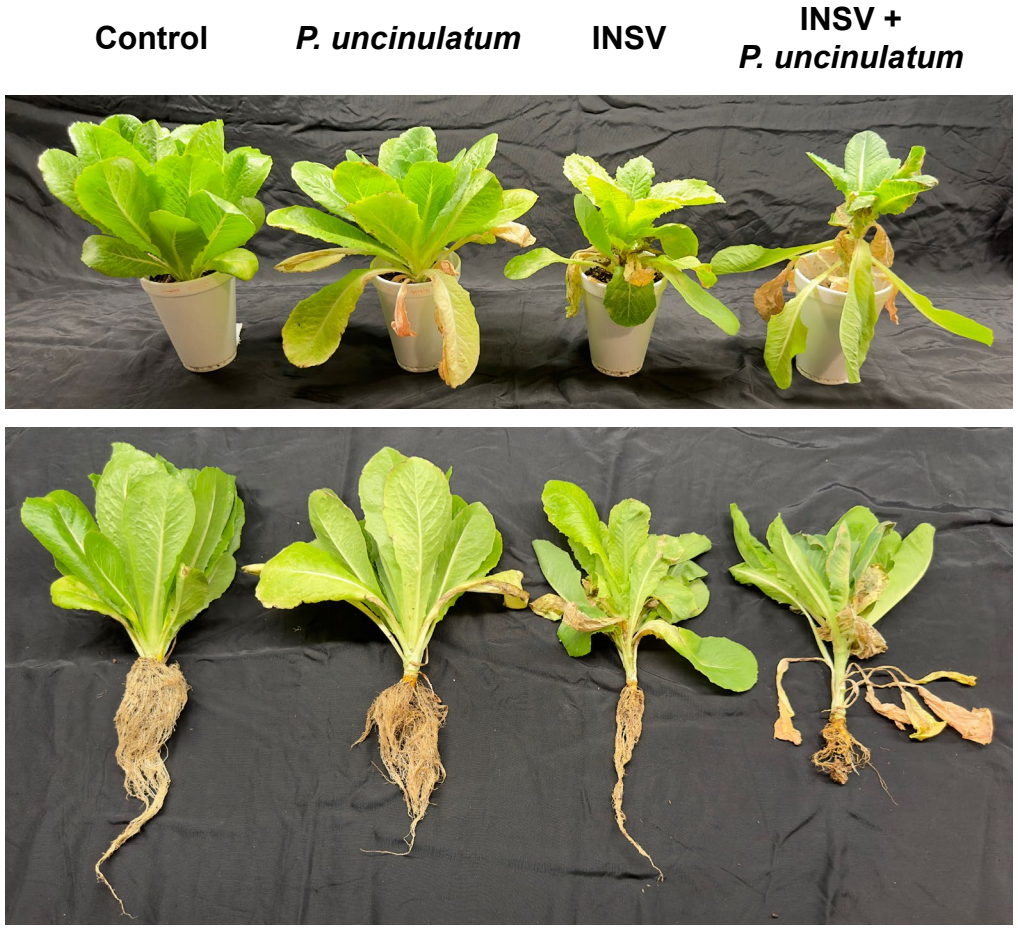

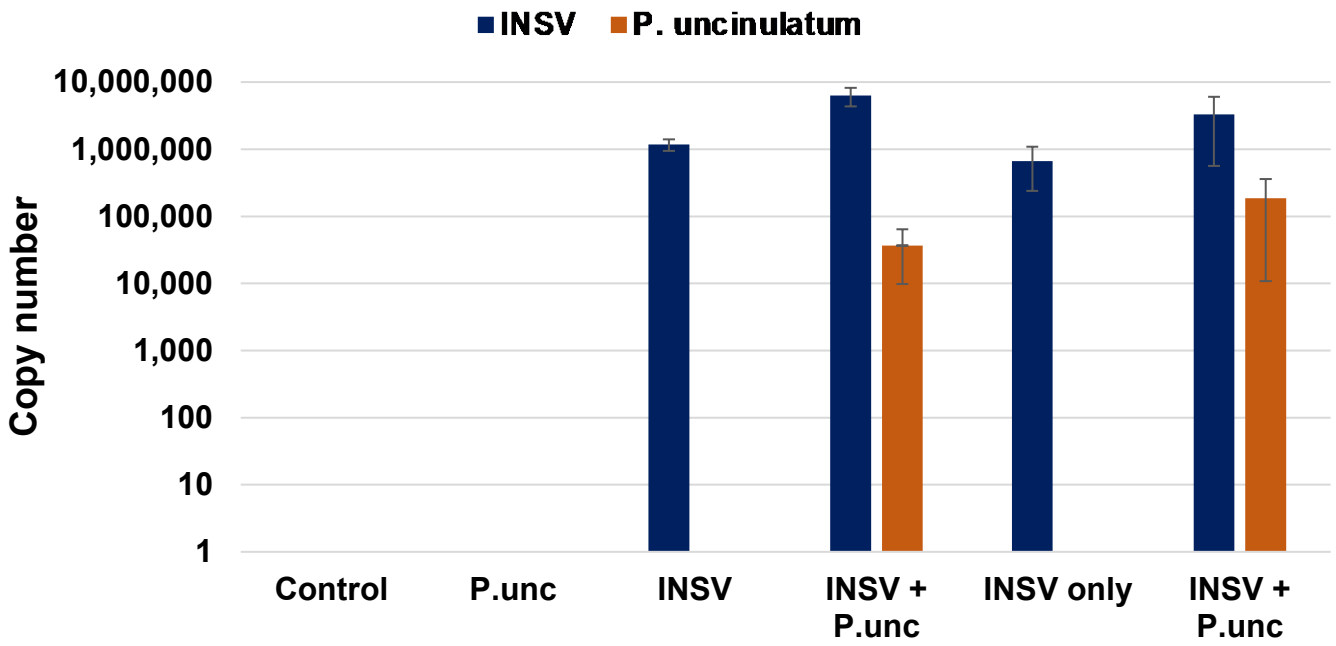

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Novel peptides for managing western flower thrips and diamondback moth

2.5 years: (2022 – 2025)

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

- **Phase 1 (Discovery): Identified gut receptors that are specific to western flower thrips (WFT) and diamondback moth (DBM).**
- **Phase 2 (Synthesis): Identified peptides that selectively bind to and disrupt WFT and DBM receptor function.**
- **Phase 3 (Efficacy): Evaluating the efficacy of peptides on WFT and DBM survival.**

PEST MANAGEMENT · RESEARCH · TECHNOLOGY

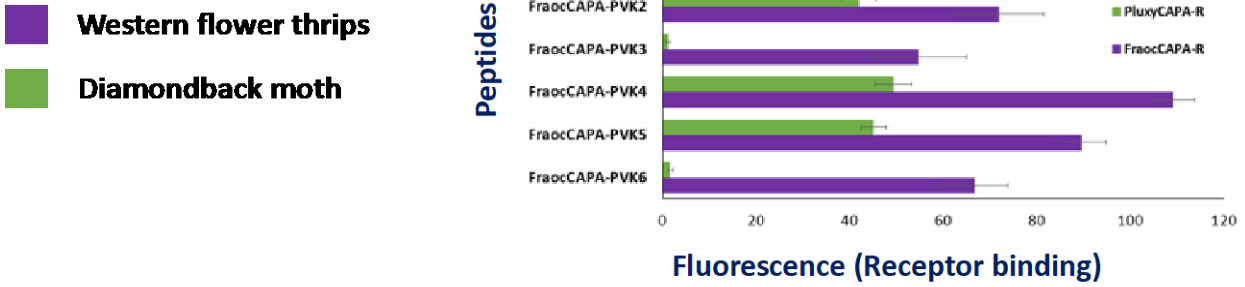
Morning AgClips America's #1 Daily Ag News Source

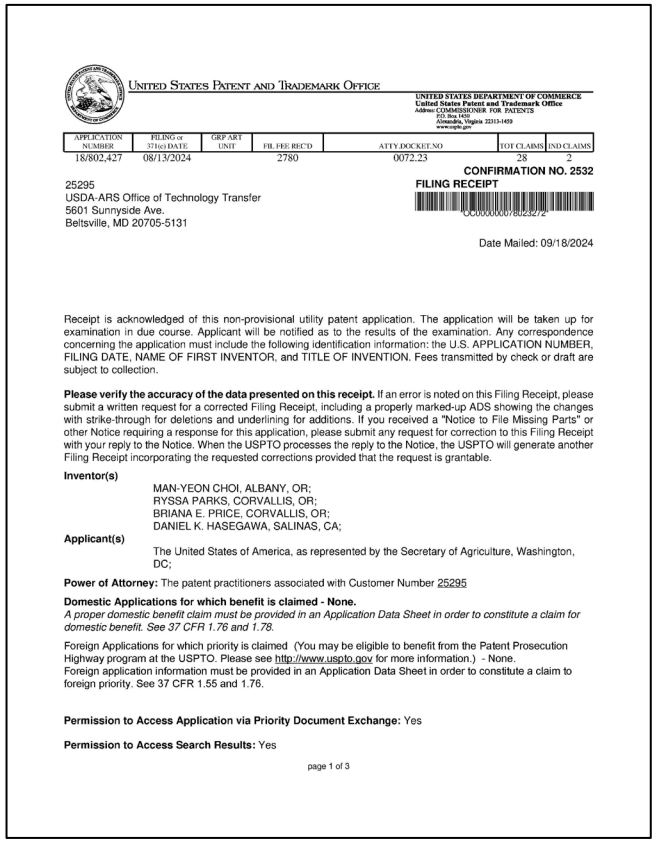
PEST MANAGEMENT ...

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**





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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
18/802,427	08/13/2024		2780	0072.23	28	2

CONFIRMATION NO. 2532

25295
USDA-ARS Office of Technology Transfer
5601 Sunnyside Ave.
Beltsville, MD 20705-5131

FILING RECEIPT

Date Mailed: 09/18/2024

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

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Applicant(s)
The United States of America, as represented by the Secretary of Agriculture, Washington, DC;

Power of Attorney: The patent practitioners associated with Customer Number 25295

Domestic Applications for which benefit is claimed - None.
A proper domestic benefit claim must be provided in an Application Data Sheet in order to constitute a claim for domestic benefit. See 37 CFR 1.76 and 1.78.

Foreign Applications for which priority is claimed (You may be eligible to benefit from the Patent Prosecution Highway program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

page 1 of 3

California Environmental Protection Agency
dpr Department of Pesticide Regulation

2024 Update on Thrips and INSV

1. 2024 observations: weather, thrips, INSV, weeds
2. INSV and Pythium Wilt interactions
3. Peptide technologies for managing thrips and diamondback moth
4. INSV susceptibility tests

INSV susceptibility tests

Experimental design

Clean plant nursery (3 weeks)

Cover crops (10)

- Cereals
  - Barley
  - Cayuse oats
  - Merced rye
  - Pacheco triticale
  - Sudangrass
- Mustards
  - *Brassica juncea*
  - *Sinapsis alba*
- Legumes
  - Faba bean
  - Lana vetch
- Broadleaf
  - Buckwheat

Susceptible control (1)

- Lettuce

1 replicate = 3 plants per species

33 plants total

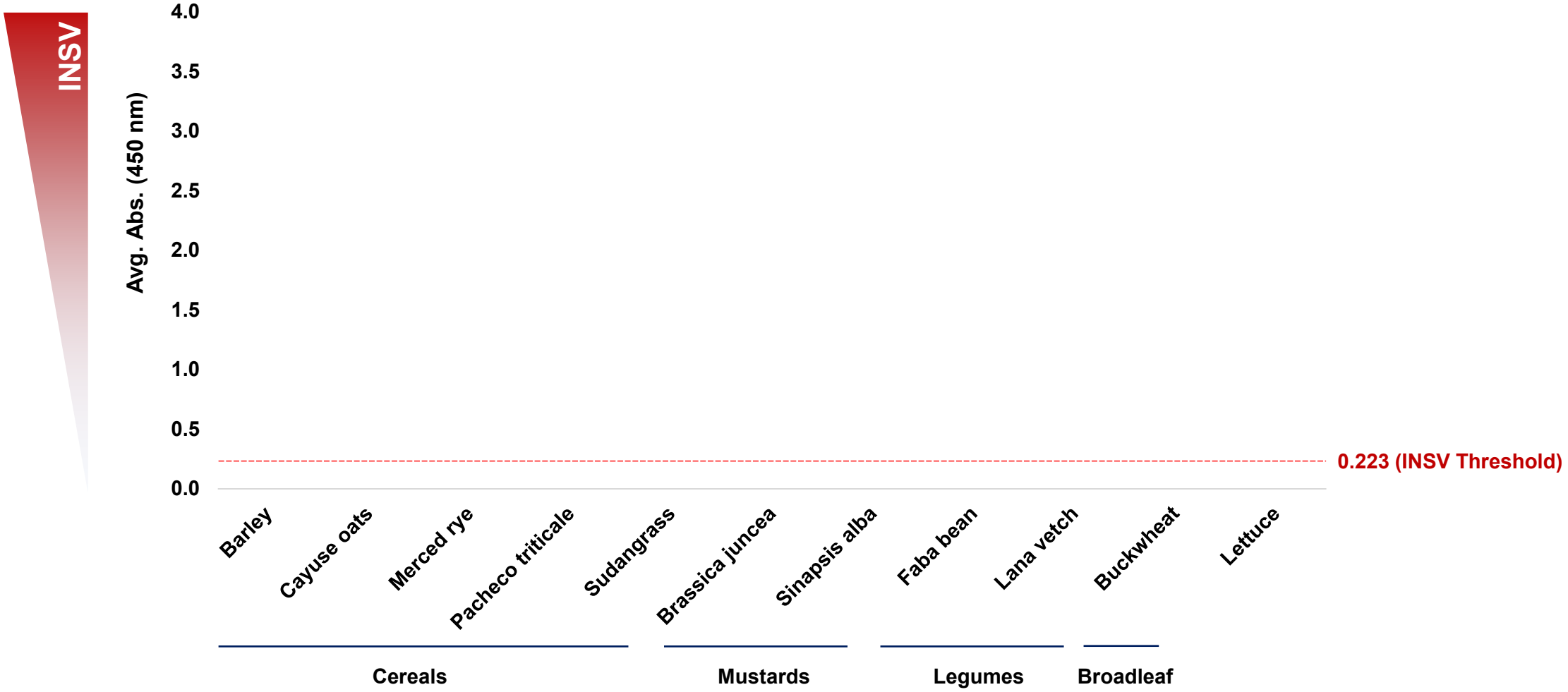
Randomized complete block design

Thrips and INSV greenhouse (3 weeks)

Plants tested for INSV using DAS-ELISA

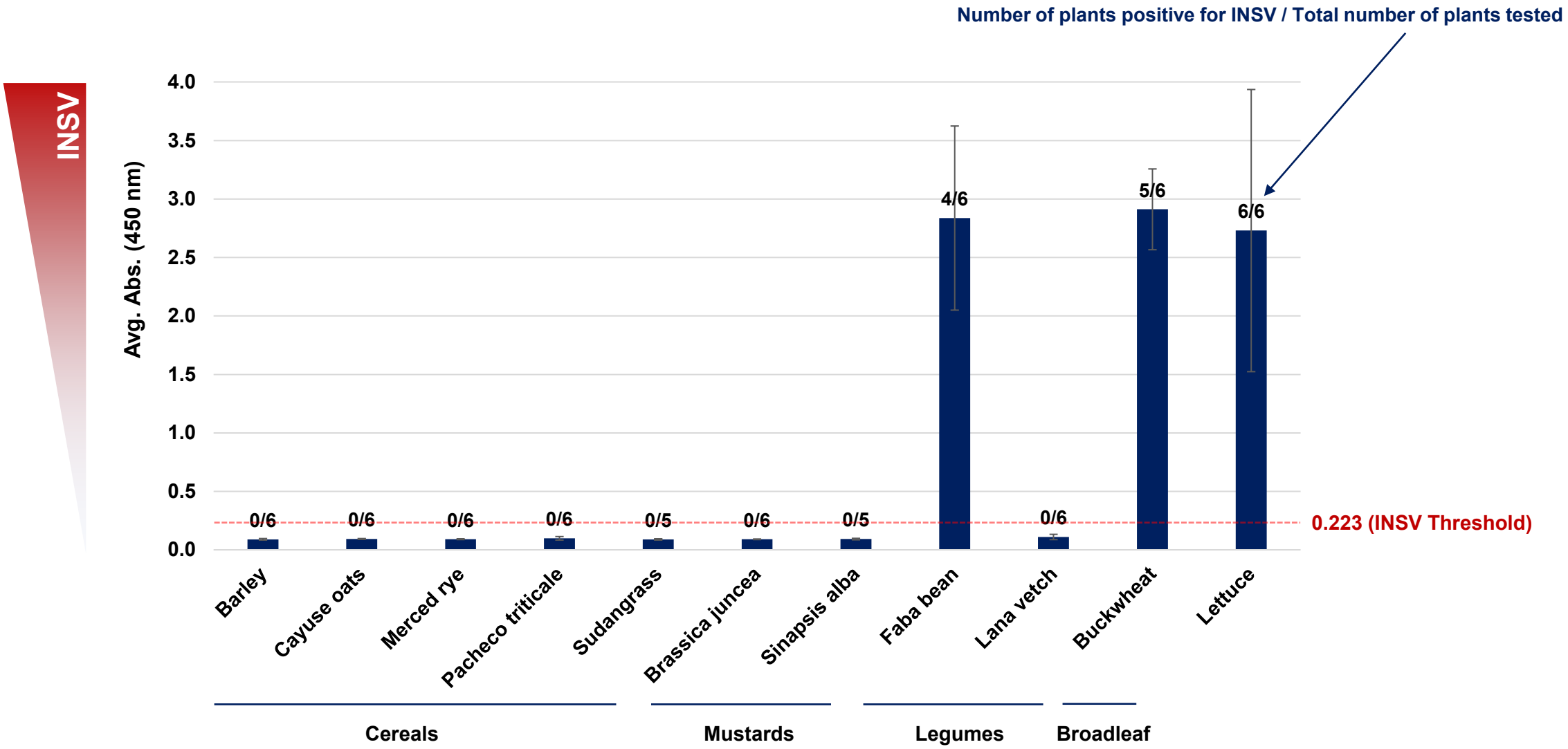
INSV susceptibility tests: cover crops

2 replicates



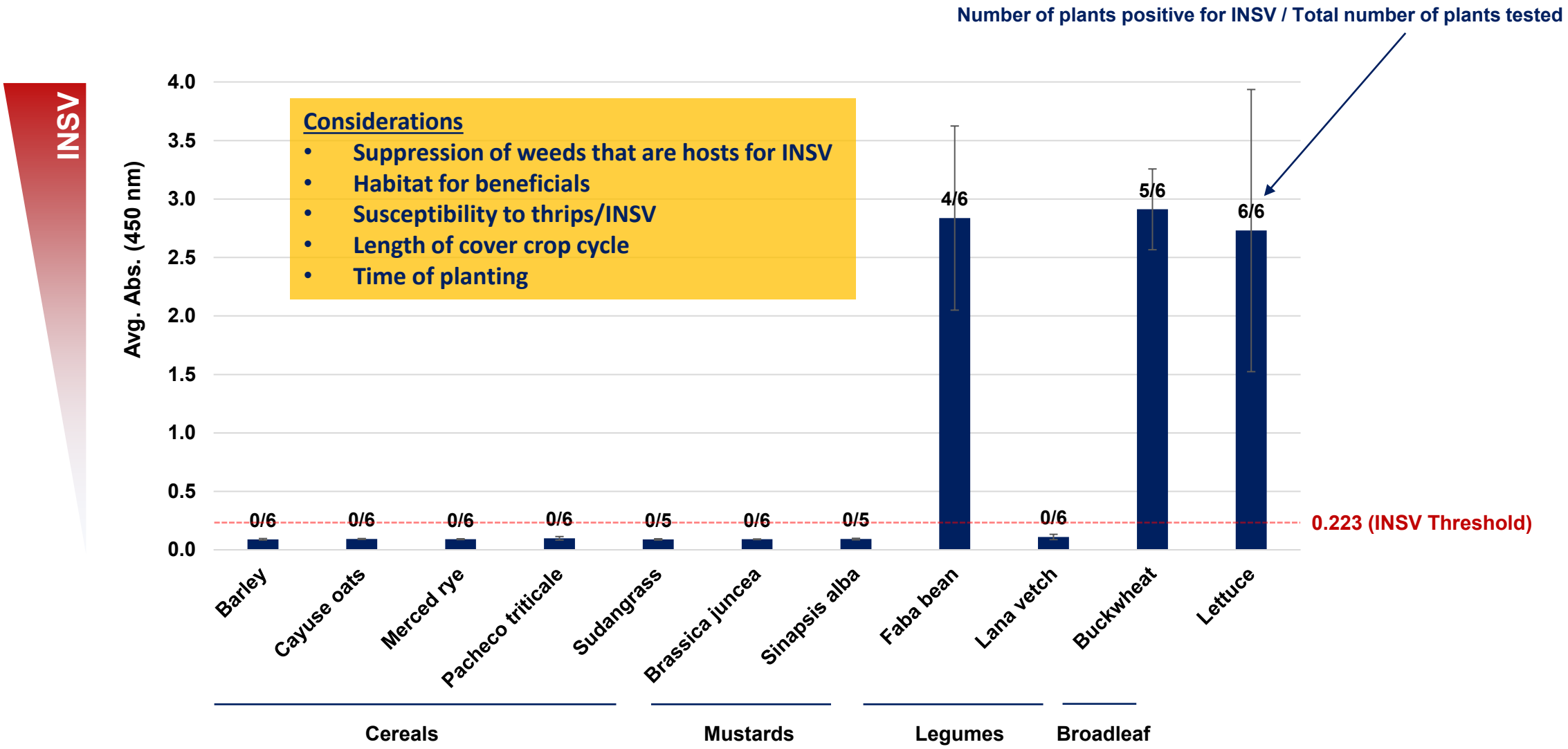
INSV susceptibility tests: cover crops

2 replicates



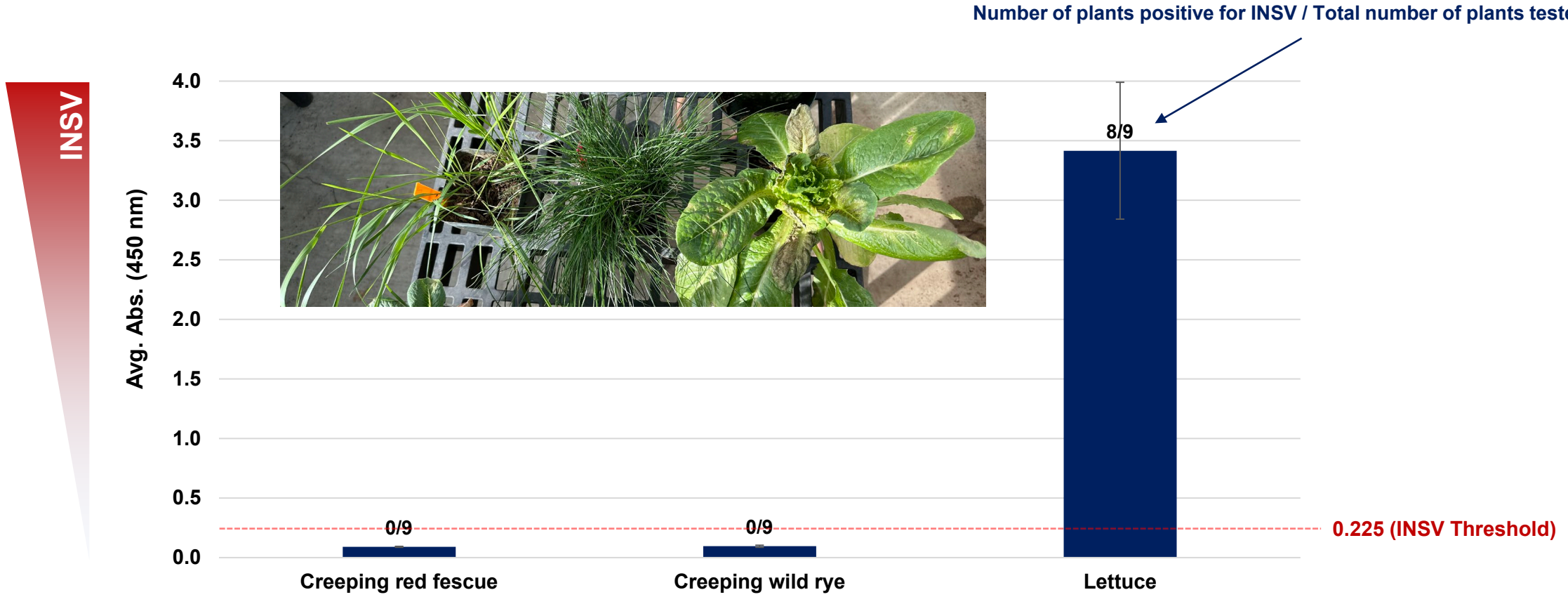
INSV susceptibility tests: cover crops

2 replicates



INSV susceptibility tests: vegetative ditch species

3 replicates



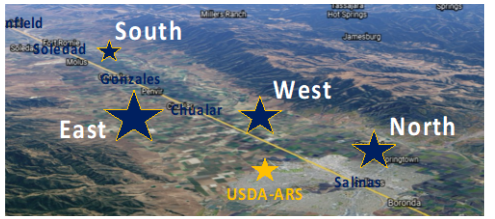
Ag. Commissioner's Office
Farm Bureau
UC Cooperative Extension
Central Coast Wetlands Group

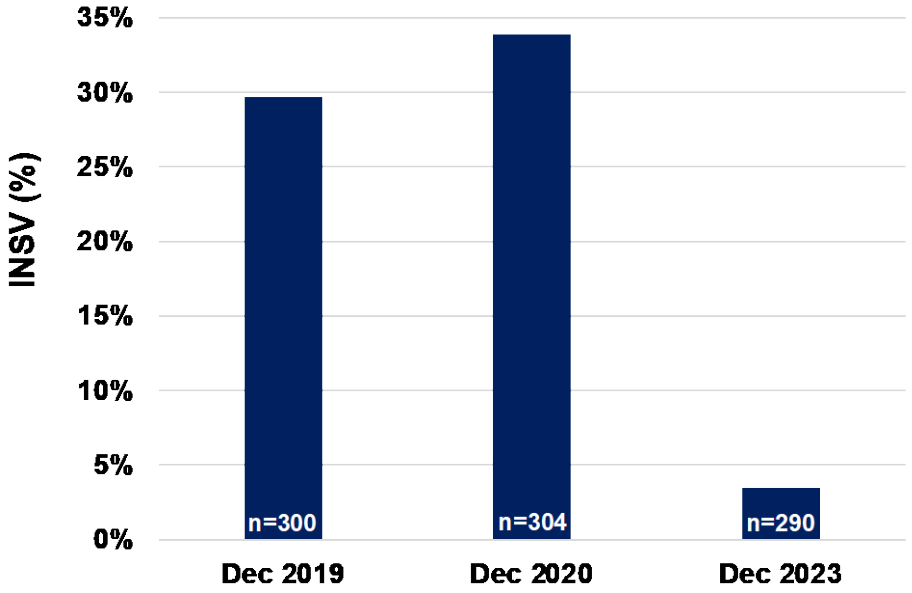
New project: weed surveys and INSV susceptibility testing

2024 – 2027, CDFA SCBGP

1. Continue weed surveys during host-free period (Dec 2024, Dec 2025, Dec 2026)
   - Old locations
   - New locations based on reports of INSV in lettuce

2. Broaden INSV susceptibility tests to identify beneficial plants that are 'INSV safe'
   - Cover crops
   - Insectary habitat
   - Vegetative ditches
   - Erosion management
   - Weed suppression
   - Hedgerows
   - Native plants





cdfa
CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

Thank you!

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Mary Zischke, INSV/PW Task Force leader

Growers, PCAs, CCAs, other industry members and stakeholders

USDA Agricultural Research Service

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 1930