



# Development of IPM Programs for Peppers and Celery

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# Pepper IPM Research



# Foliar Application



# Screening Trial Treatments

<u>Treatment</u>	<u>Manufacturer</u>	<u>Rate/Ac</u>	<u>#Applied</u>
1-Untreated	-	-	-
*2-Intrepid + Sequoia 2 SC Radiant SC Dyne-amic	Corteva	10 oz 4.5 oz 7.0 oz 0.25%	6 foliar
*3-Organic IPM Pyganic 1.4EC Trilogy EC Entrust SC	MGK Certis Corteva	32 oz 64 oz 8.0 oz	6 foliar
4-Sivanto Prime Soil application	Bayer	28 oz	1 soil
5-Sivanto Prime Foliar application	Bayer	14 oz	1 foliar

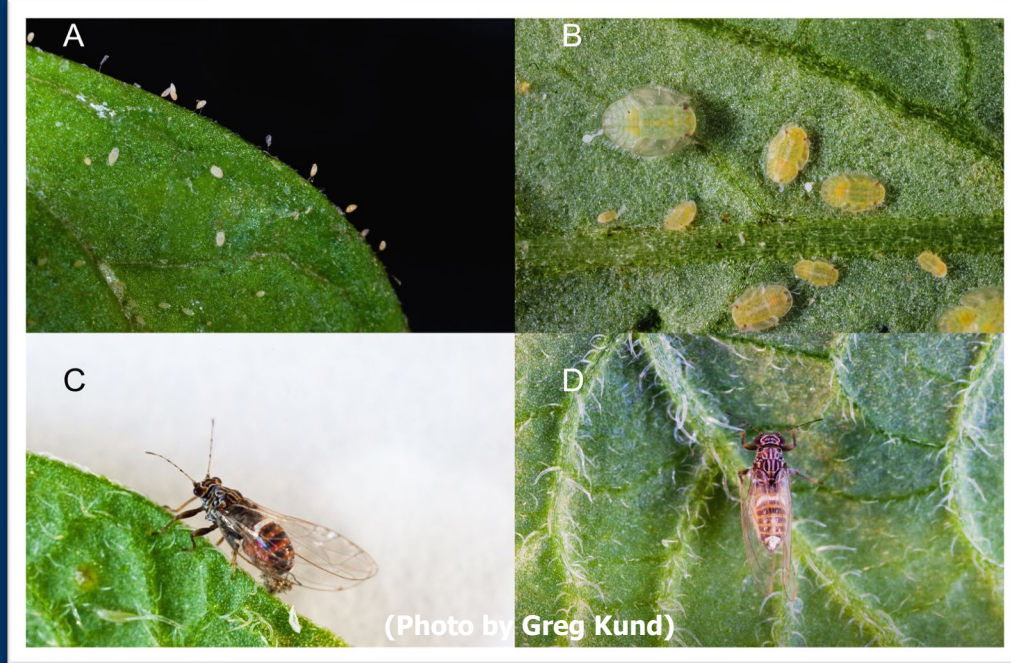
\*IPM rotations

# Screening Trial Treatments

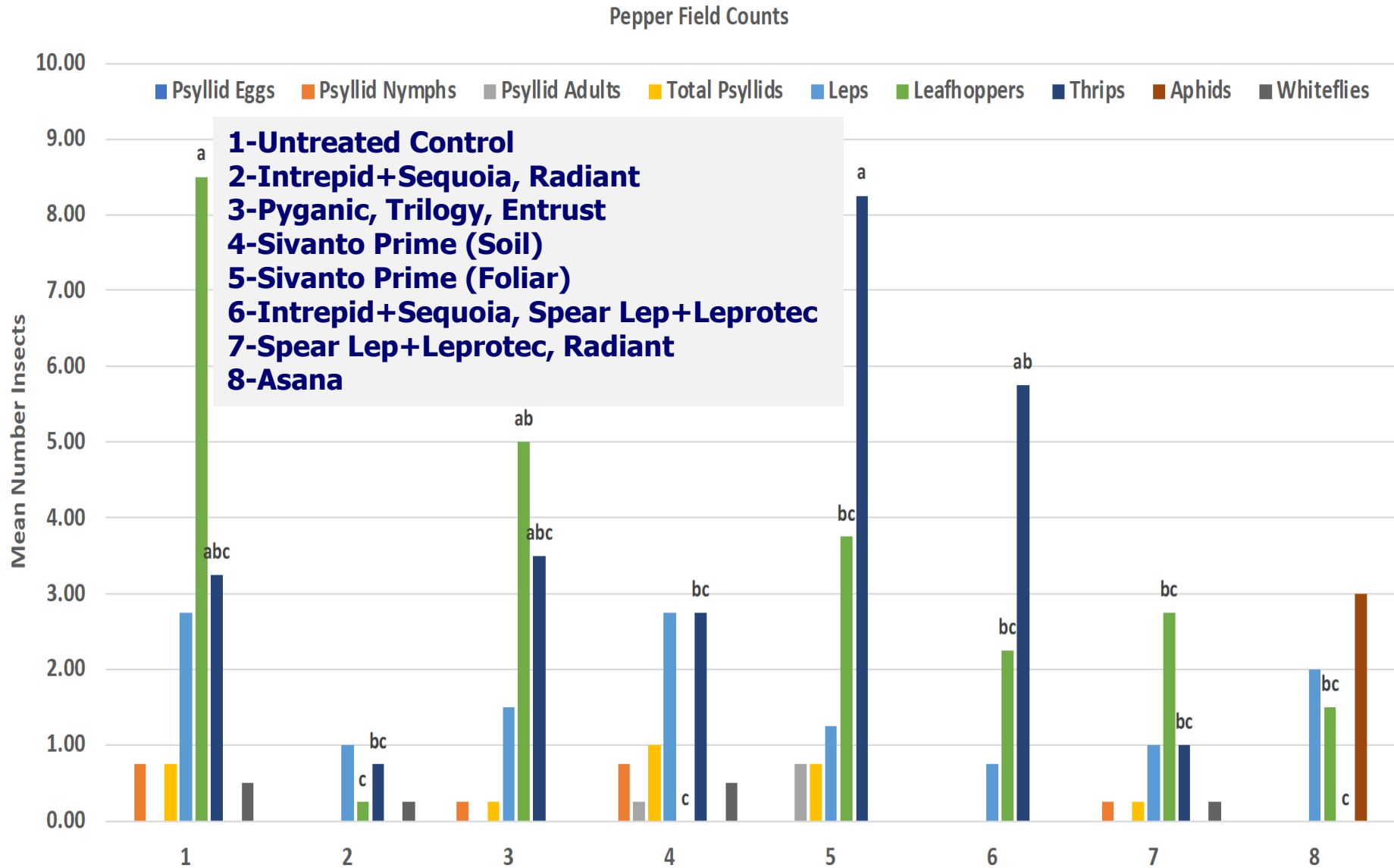
<u>Treatment</u>	<u>Manufacturer</u>	<u>Rate/Ac</u>	<u>#Applied</u>
*6-Intrepid + Sequoia 2SC	Corteva	10 oz	3 foliar
Spear-Lep + Leprotect	Vestaron	4.5 oz	3 foliar
Dyne-amic		2 pt	3 foliar
		1 pt	3 foliar
		0.25%	
*7-Spear-Lep + Leprotect	Vestaron	2 pt	3 foliar
Radiant SC		1 pt	3 foliar
Dyne-amic	Corteva	7 oz	3 foliar
		0.25%	
8- Asana	Dupont	9 oz	6 foliar

\*IPM rotations

# Common Pests



# Pepper Field Insect Counts



# Worm Damage

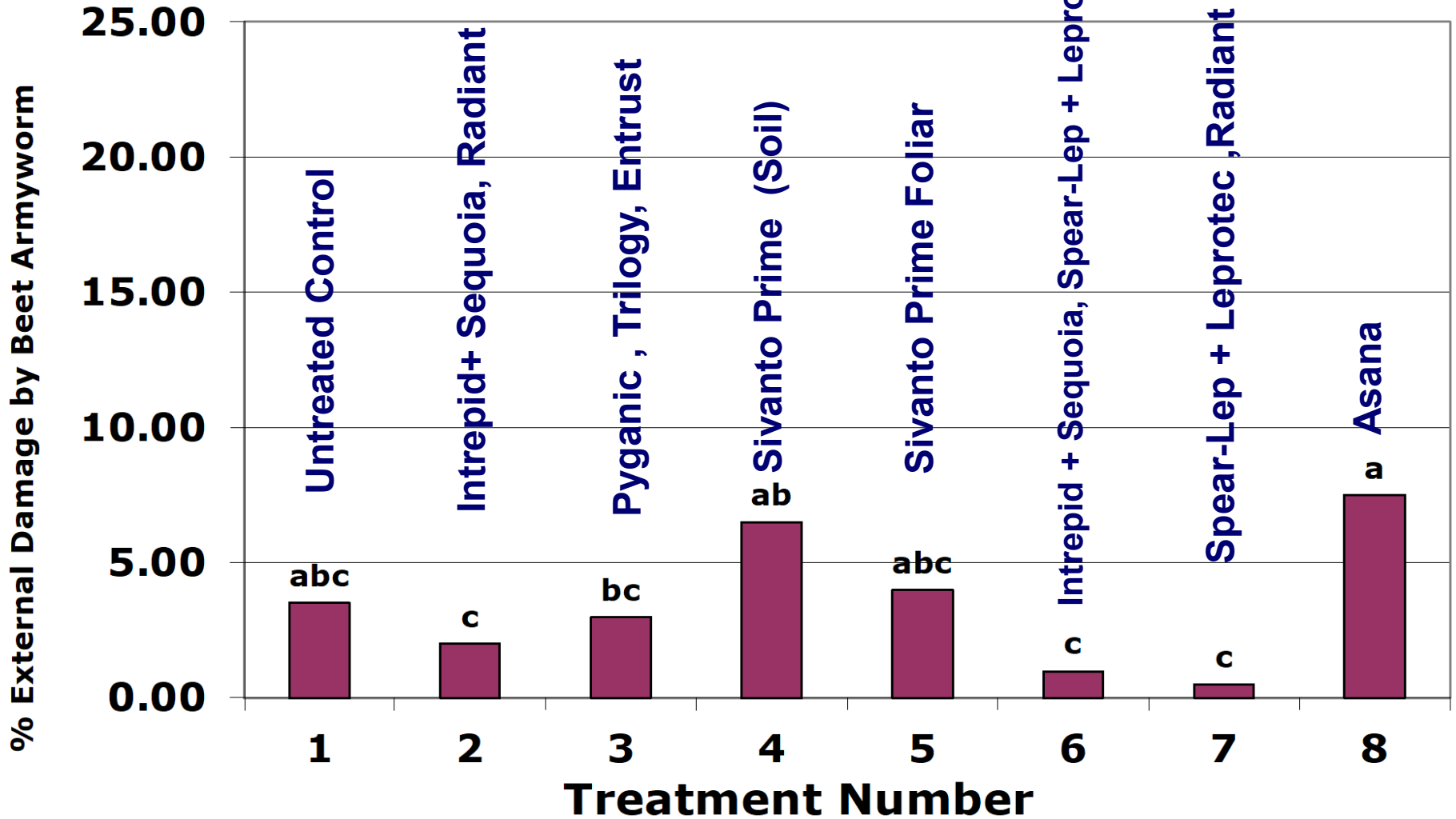


(Photos by Greg Kund)



# Beet Armyworm Damage

Pepper Chemical Trial 2021

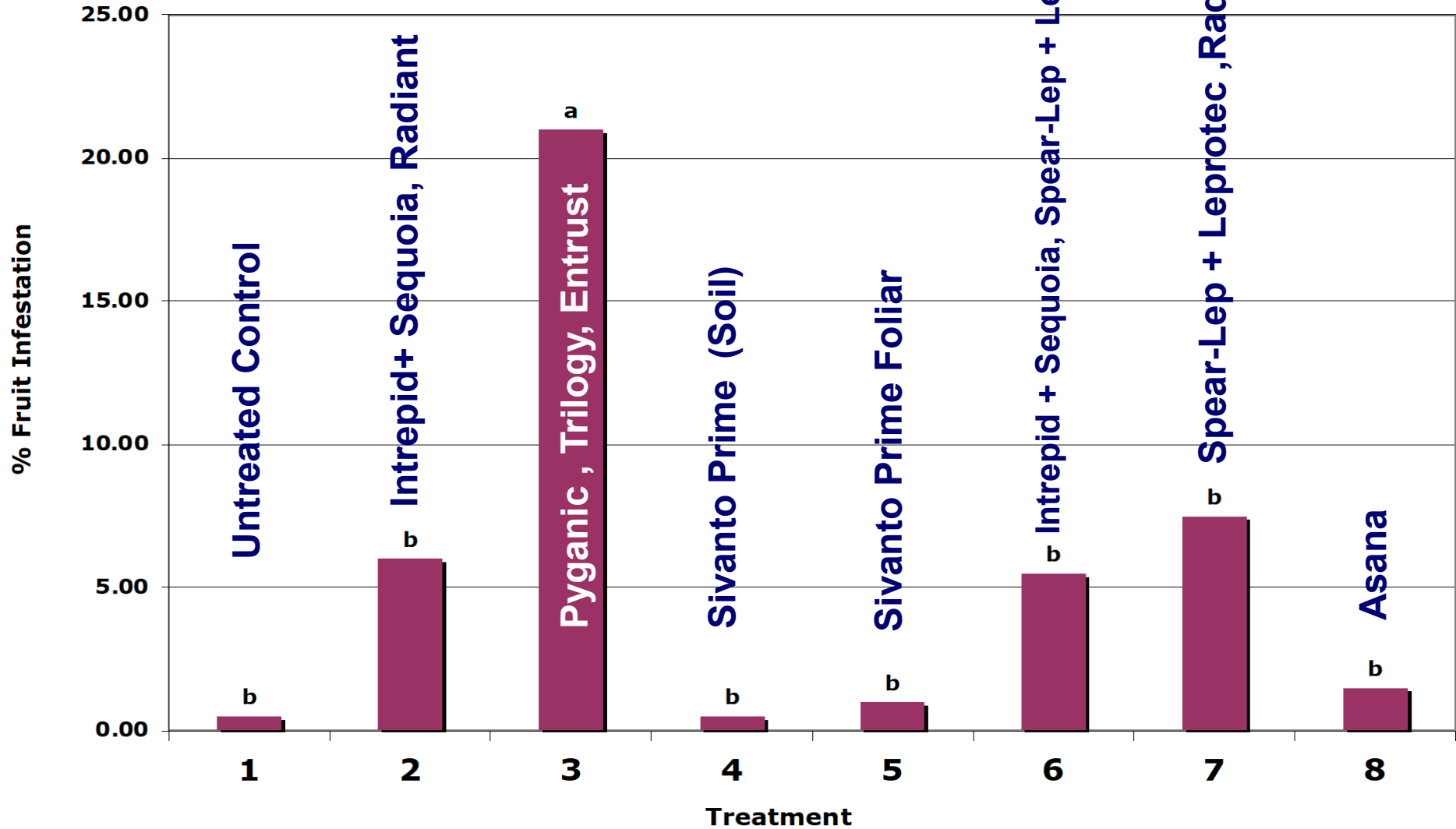


# Spider Mites



# Spider Mite Damage

Pepper Chemical Trial 2021 -Mites



# Bagrada Bug



(Photo by Greg Kund)



(Photo by Greg Kund)

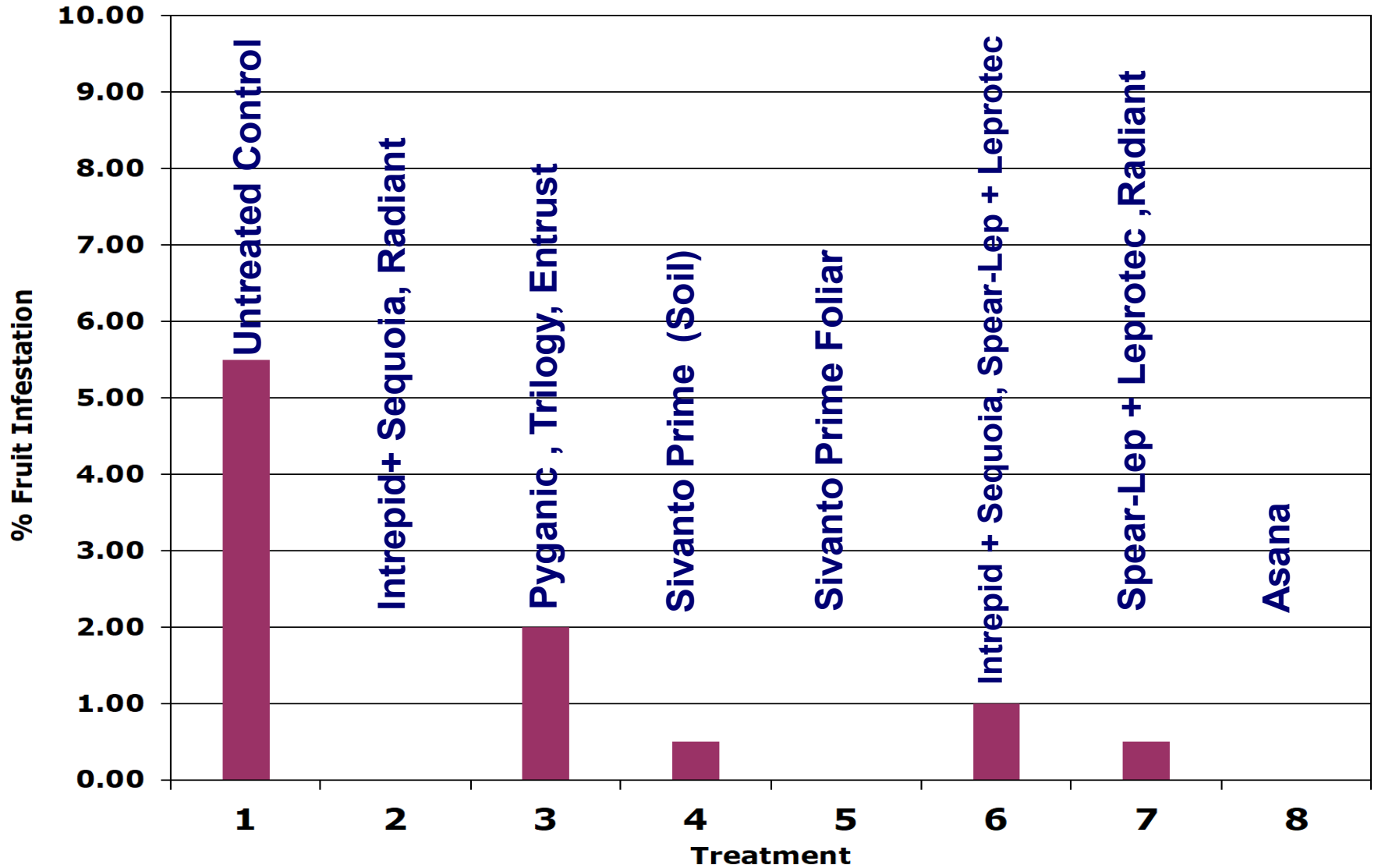


(Eggs and the last instar photos by Eric Natwick and the rest by Surendra Dara)

Adult size 1/4"

# Bagrada Bug Damage

Pepper Chemical Trial 2021 -Bagrada Bug



# Psyllid Baseline Resistance Studies

**Exirel (cyantraniliprole)**

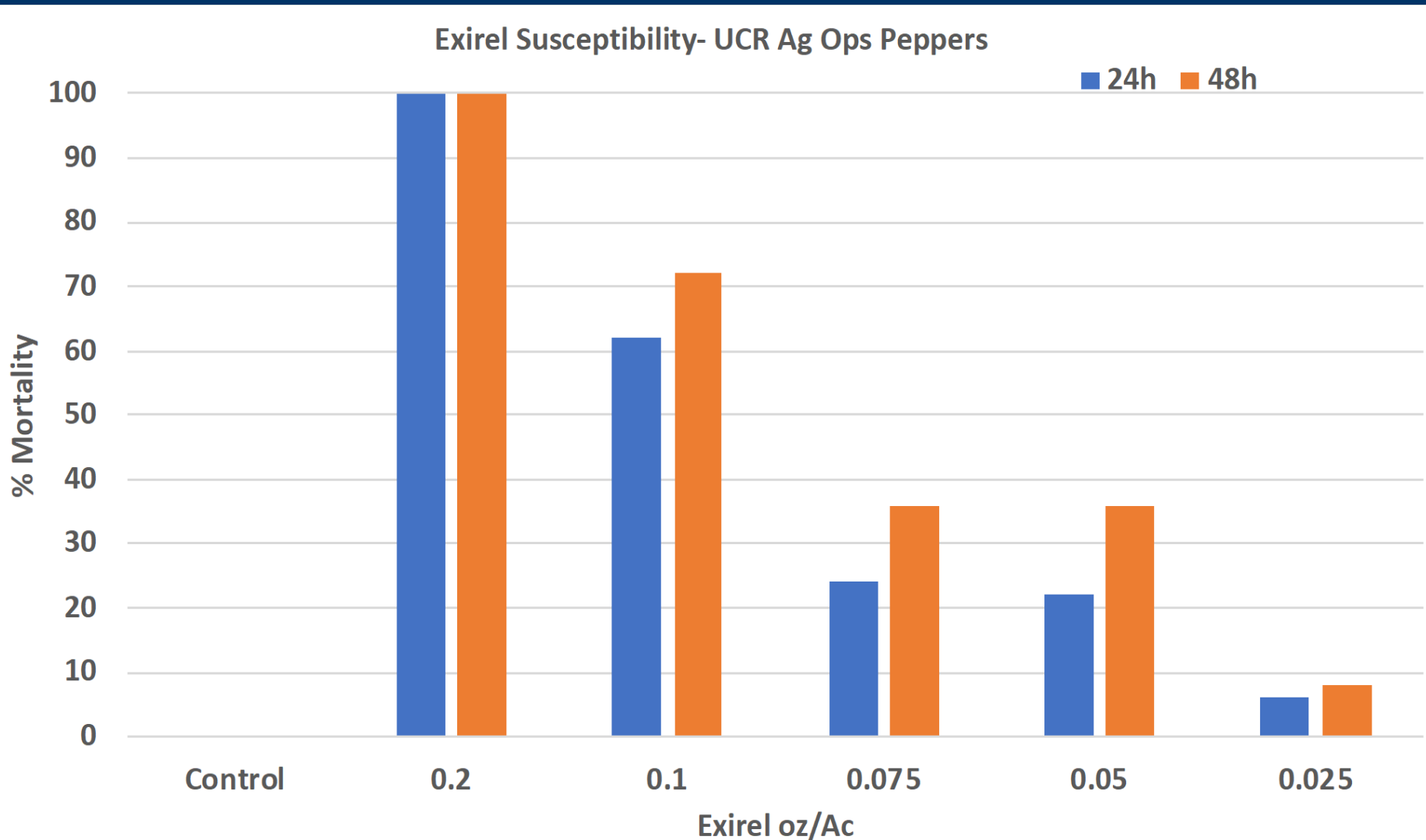
**Populations**

**1-UC Riverside - Agricultural Operations**

**2-Temecula, CA**



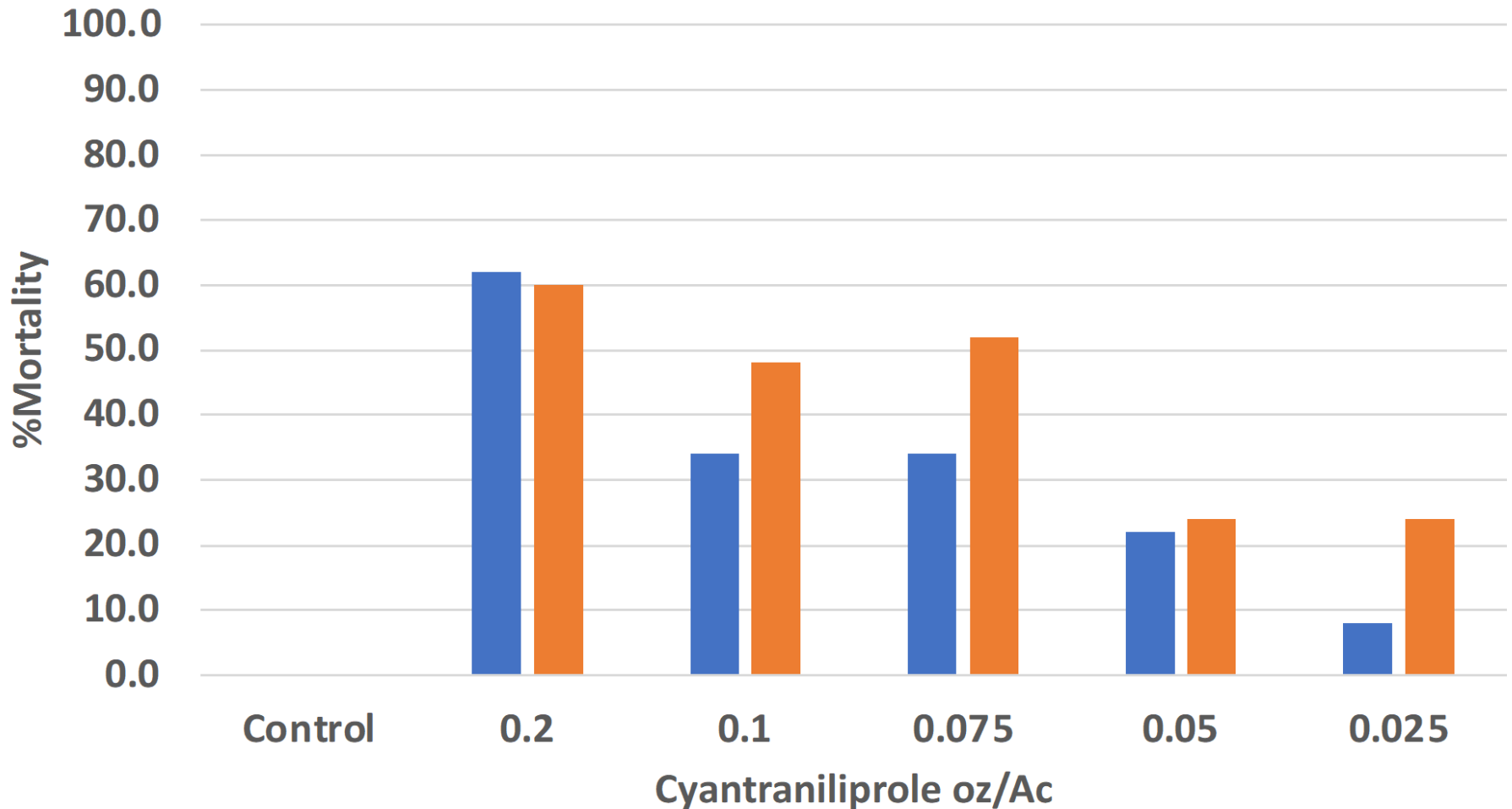
# Exirel – Pepper Psyllids



# Exirel – Pepper Psyllids

Cyantraniliprole Resistance - Temecula, CA

■ 24h ■ 48h





# Future studies

**New materials to test:**

- **Proprietary Insecticides—(Plinazolin-Syngenta)**

- **Replacement of neonicotinoids**

- **OMRI organic treatments**

**Develop and evaluate IPM programs**

# Newer Registered Materials

- **Sequoia (sulfoxaflor) Corteva**
- **Sefina (afidopyropen) BASF**
- **Spear-T and Spear-Lep (Vestaron)**
- **Minecto Pro (Syngenta)**

# Celery IPM Research



# Celery Field Trial

## Goals and Objectives

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1. Screen new chemicals for use in an IPM program
2. Develop IPM rotations that:
  - a) Reduce costs
  - b) Manage insecticide resistance
  - c) Economically viable

# 2021 Screening Trial

<b>Material</b>	<b>Manufacturer</b>	<b>#</b>	<b>Rates</b>
<b>Exirel</b>	<b>Dupont/FMC</b>	<b>1</b>	
<b>Radiant</b>	<b>Dow/Corteva</b>	<b>1</b>	
<b>Dipel</b>	<b>Valent</b>	<b>1</b>	
<b>Asana</b>	<b>Dupont/FMC</b>	<b>1</b>	
<b>Spear-Lep</b>	<b>Vestaron</b>	<b>1</b>	
<b>* Leprotec</b>	<b>Vestaron</b>	<b>1</b>	
<b>Beleaf</b>	<b>FMC</b>	<b>1</b>	

**\* (Aqueous Btk to improve the efficacy of Spear-Lep)**

# 2021 Screening Trial (Contd.)

<b>Material</b>	<b>Manufacturer</b>	<b># Rates</b>
<b>Minecto Pro</b>	<b>Syngenta</b>	<b>1</b>
<b>Entrust</b>	<b>Corteva</b>	<b>1</b>
<b>Pyganic</b>	<b>MGK</b>	<b>1</b>
<b>Trilogy</b>	<b>Certis</b>	<b>1</b>
<b>Aza-diret</b>	<b>Gowan</b>	<b>1</b>
<b>Dipel</b>	<b>Valent</b>	<b>1</b>
<b>Venerate</b>	<b>Marrone-Bio</b>	<b>1</b>
<b>Grandevo</b>	<b>Marrone-Bio</b>	<b>1</b>



# Aphids

# Beet Armyworm



Carbamates and Pyrethroids  
increase aphid populations.

Photo by Greg Kund

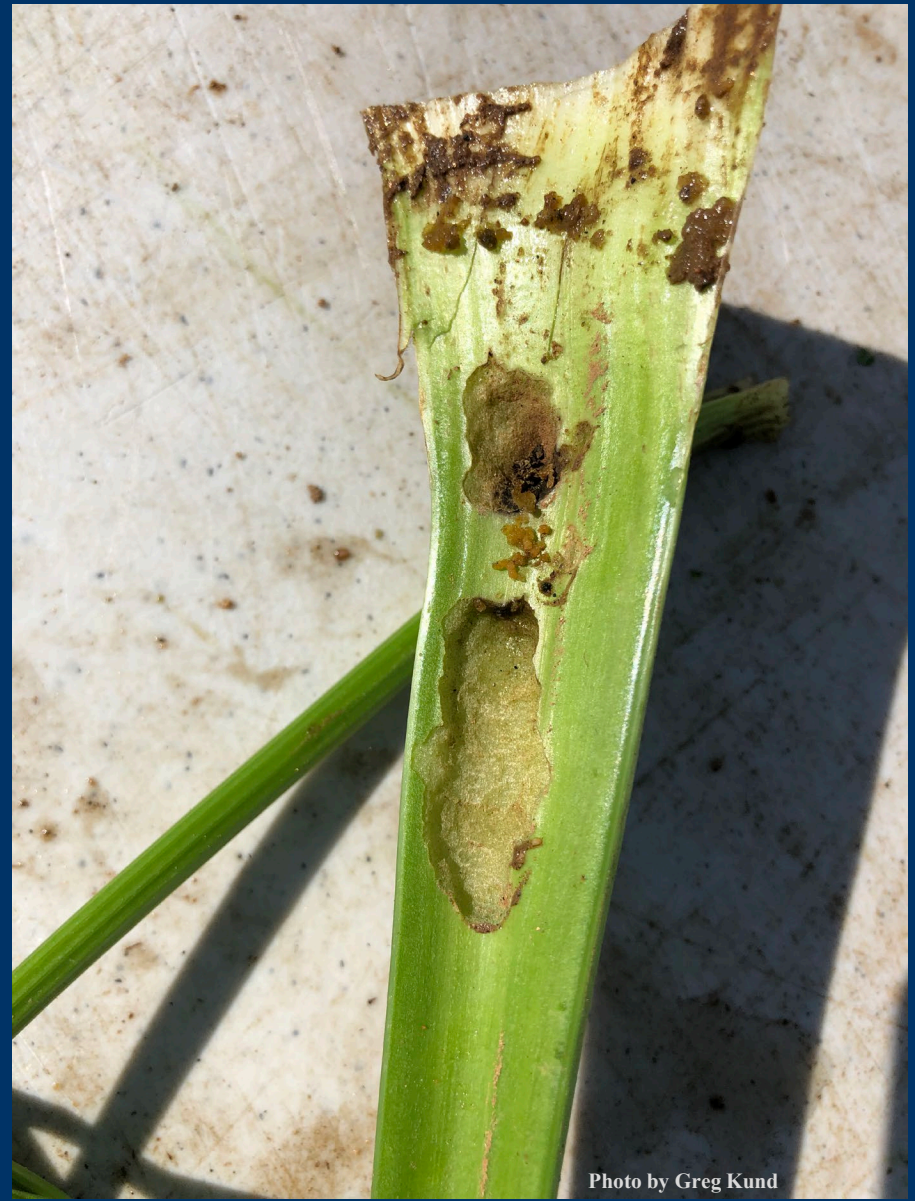


Photo by Greg Kund



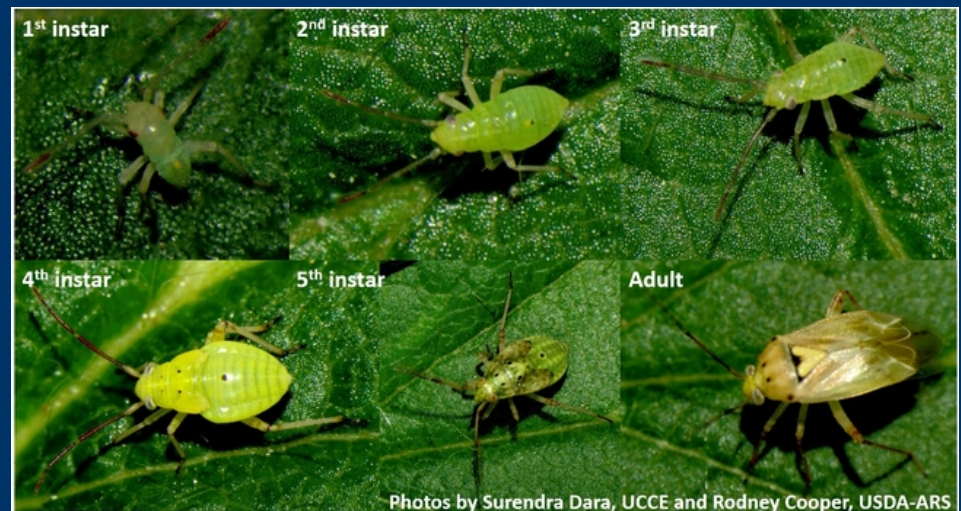
# Lygus Bug Damage



UC Statewide IPM Project  
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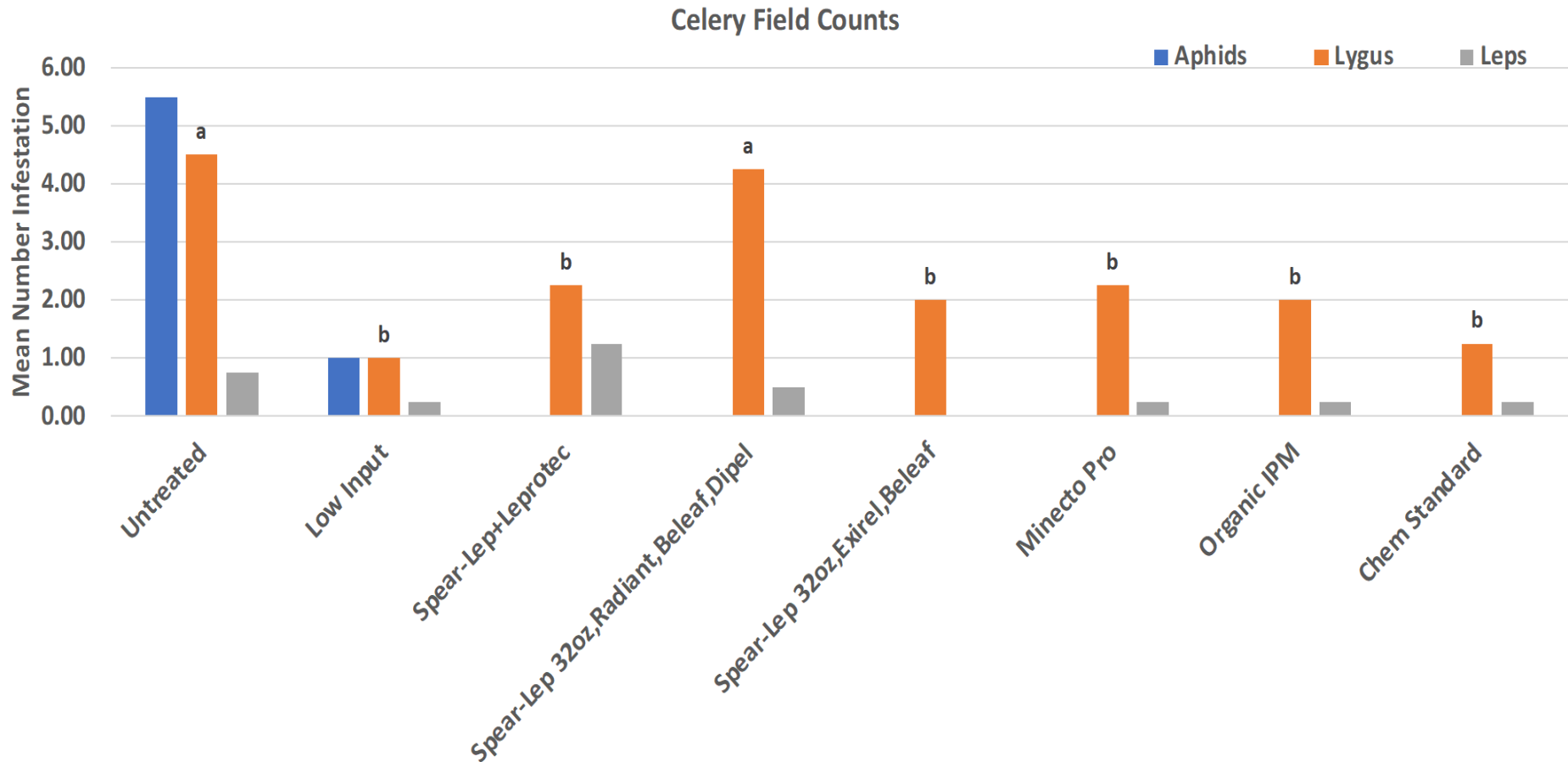


Photo by Greg Kund



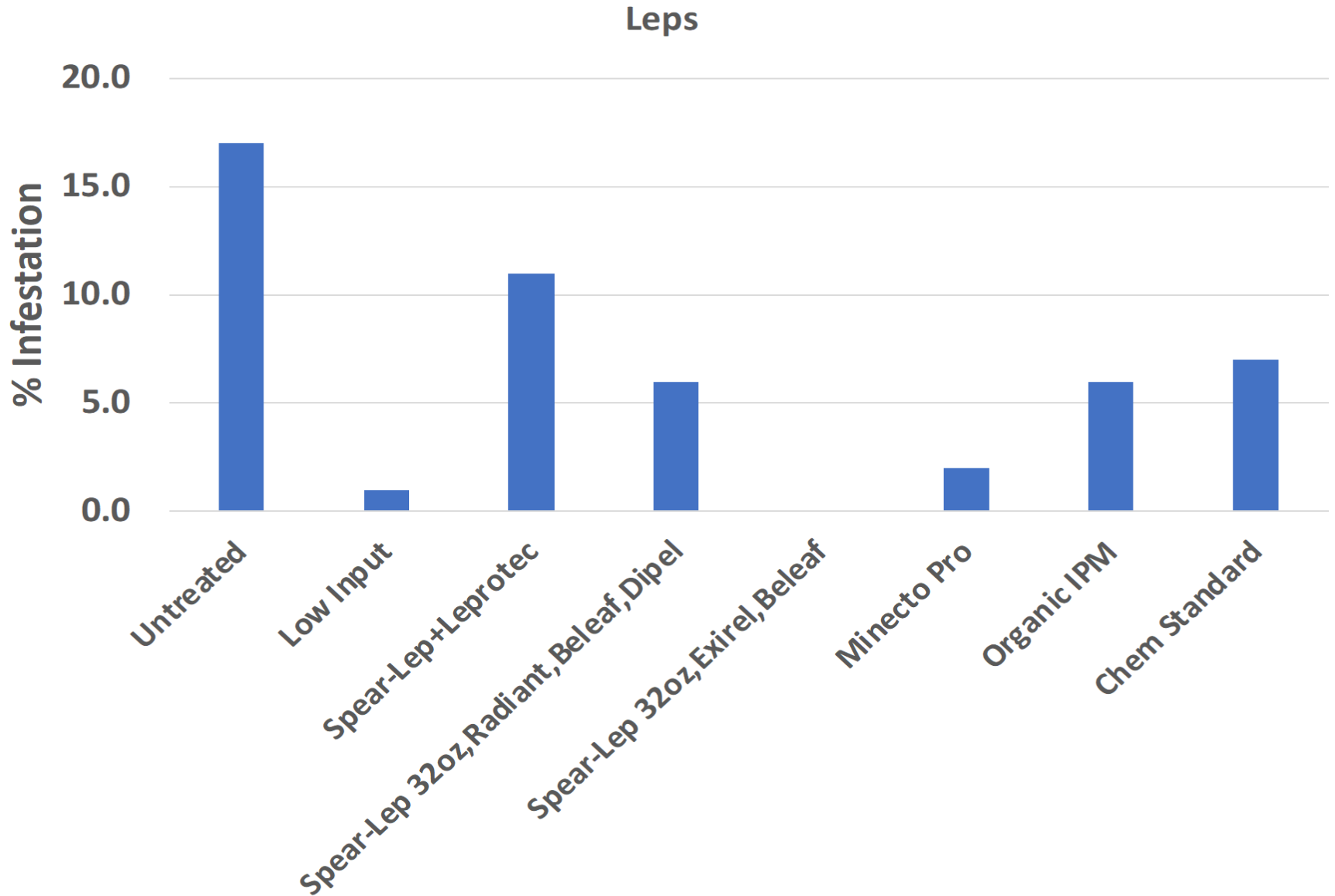
Photos by Surendra Dara, UCCE and Rodney Cooper, USDA-ARS

# Insect Field Counts

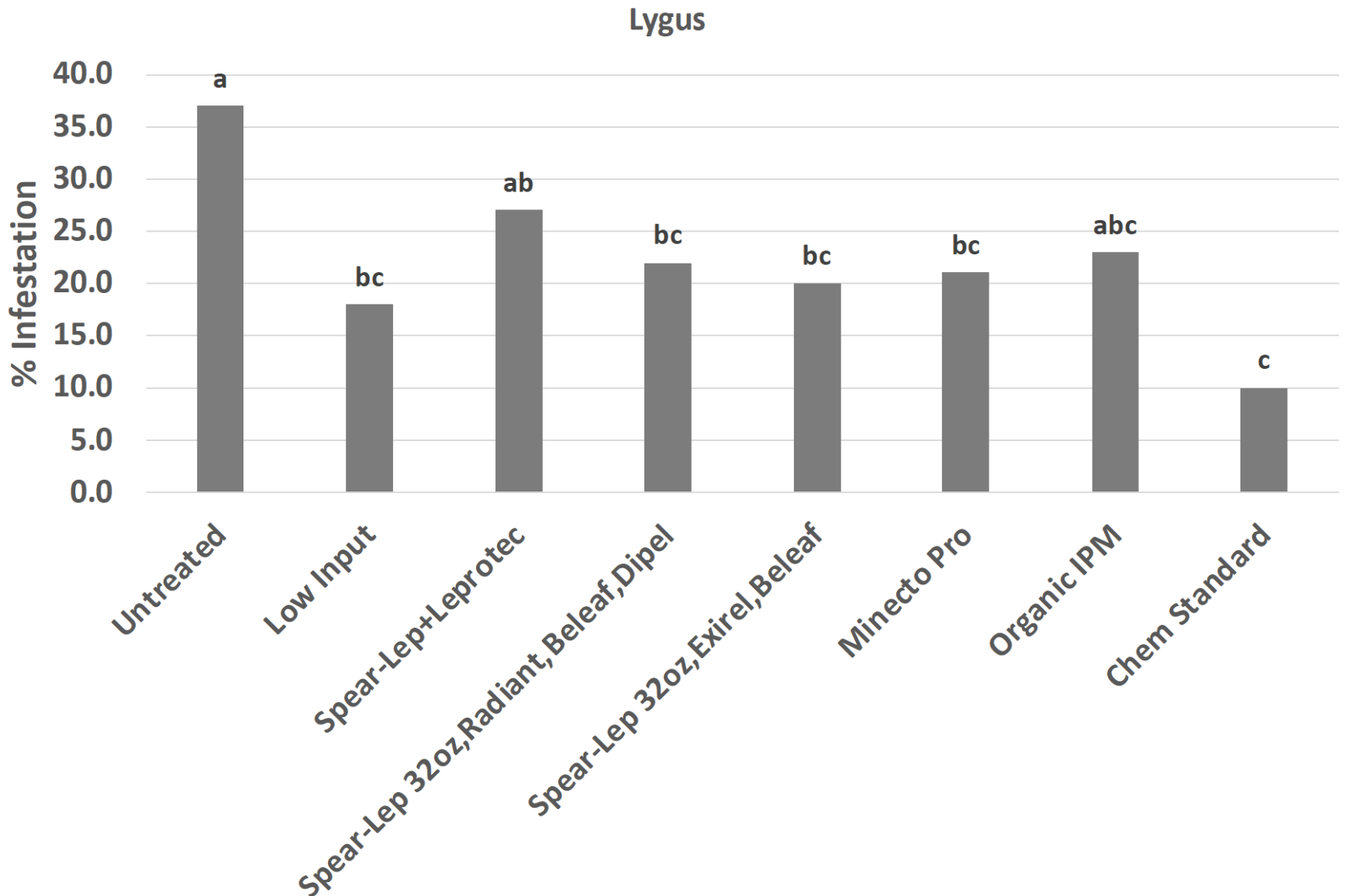




# Worm Control



# Lygus Control

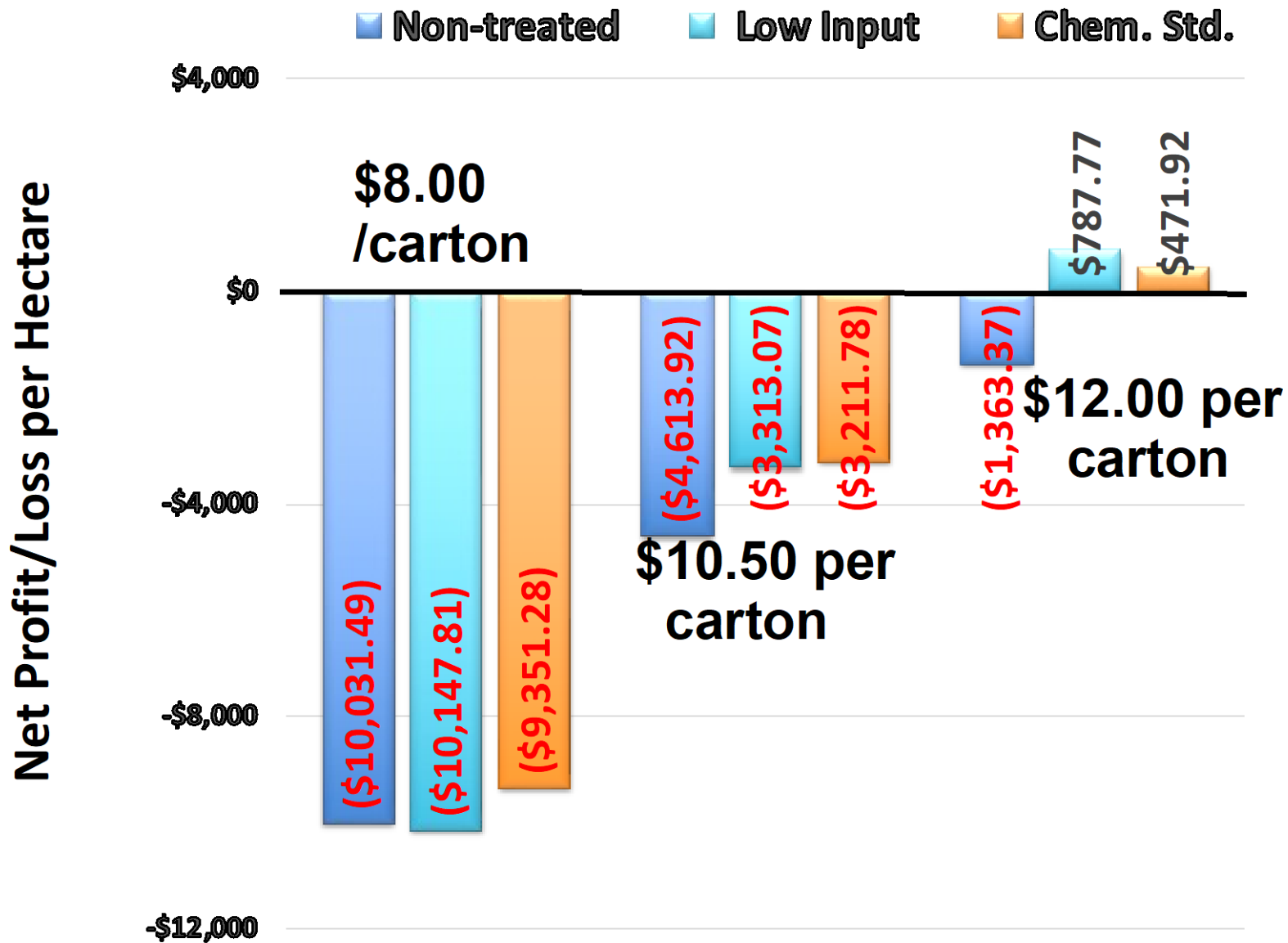


# Celery IPM Trial-2021 Rotations

<u>Low Input</u>		<u>No. App.</u>
A. Exirel SE +	13.5 oz	1
Beleaf 50SG	2.8 oz	
B. Radiant SC +	8 oz	1
Beleaf 50SG	2.8 oz	
C. Exirel SE	13.5 oz	1
D. Dipel DF	1 lb	1

<u>Chem Approach</u>		<u>No. App.</u>
A. Asana XL	9.0 oz	6

# 2021 IPM Trial Economics



# **Insecticide Resistance of Celery Pests - Lygus Bug -**

- 1. Establish susceptible and resistant populations of Lygus to insecticides.**
  - Sarah Zukoff – Cal Poly Strawberry Center**
  - Flonicamid (Beleaf), Thiamethoxam (Platinum), Flupyradifuron (Sivanto), Malathion, Novaluron (Diamond), Bifenthrin, Dibrom**
- 2. Develop biochemical assays to identify resistance mechanisms.**
- 3. Develop PCR tests to detect resistant genes.**
- 4. Develop rapid field diagnostic test.**



# Acknowledgements

California Celery Research Advisory Board



California Pepper Commission



John Fujii – Gardena Nursery

Andy White – White Seed Company

Dave Wetovick – UCR Agricultural Operations