



COLLEGE OF AGRICULTURE & LIFE SCIENCES  
Arizona  
Experiment Station  
Yuma Agricultural Center

# New Products for Insect Management On Produce and Melons



# Early Synthetic Chemical Era

## Organochlorines

*DDT, Toxaphene*

1945

## Organophosphates

*Parathion, Lorsban*

1946

## Carbamates

*Sevin, Methomyl*

1956

## Pyrethroids

*Ambush, Pounce*

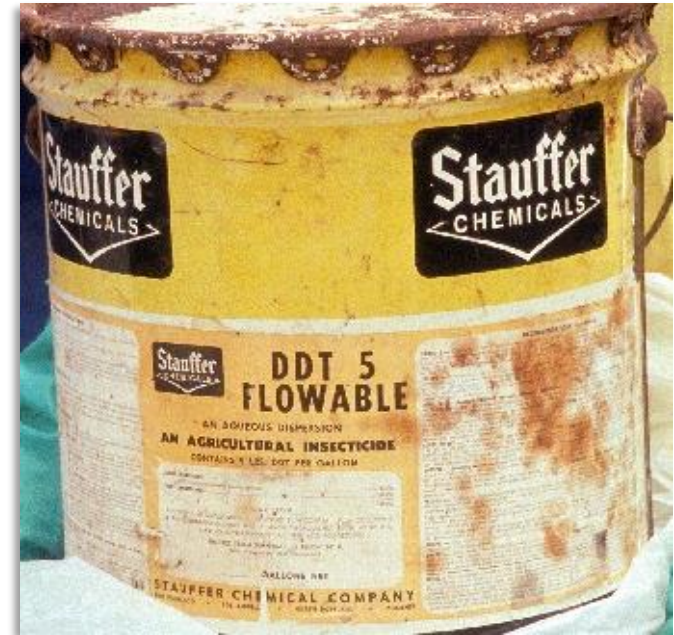
1972

### Selective Products

*B. thuringiensis* (1965)

*Formamidines* (1979)

*Avermectins* (1986)



### Broadly Toxic Insecticides

- Neurotoxins
- Contact / Stomach poisons
- Broad spectrum
- Effective at high rates (LAA)
- Persistent in environment

# Modern Chemical Era: (1993-present)

## Neonicotinoids

*Admire, Venom*

## Spinosyns

*Success, Radiant*

## Thiadiazines

*Courier*

## Phenoxyphenols

*Knack*

## Carboxamides

*Beleaf, Carbine*

## Sulfoxamines

*Sequoia*

## Semicarbazone

*Alverde*

## Diacylhydrazines

*Intrepid*

## Diamides

*Coragen, Belt*

## Ketoenols

*Movento*

## Pyrazols

*Torac*

## Carboxylates

*Acramite*

## Pyridines

*Fulfill*

## Benzoylureas

*Rimon*

## Pyridalyl

*Tesoro*

## Oxadiazines

*Avaunt*

## Chlorphenypyr

*Alert*

## Ketoenols

*Movento*

## Butenolides

*Sivanto*

## Phenylpyrazoles

*Regent*



## Reduced-risk Insecticides

- 20 New Chemical Classes
- Unique Modes of Action
- Selective Activity
- Lower toxicity to Beneficials
- Multiple Routes of Activity
- Low Impact on Human Health
- Environmentally Friendly
- Compatible with IPM

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# Minecto Pro

cyazapyr + abamectin



***Suspension concentrate***

## Chemistry

- Antranillic Diamide + Avermectin
- IRAC group – 28 + 6

## Mode of Action

- Rynaodine receptor modulator
- Chloride channel activator

## Route of Activity

- Translaminar / ingestion
- *(neither has much contact activity)*

## Effective Spectrum

- Worms, Whiteflies, Leafminers

## X Rate:

- 10 oz

## Key Crops:

- ***Leafy Vegetables and Melons***

MAY 15 01 322



### DuPont™ Exirel™

INSECT CONTROL  
WITH THE ACTIVE INGREDIENT CYAZYPYR®

GROUP 28 INSECTICIDE

For foliar applications to brassica, bulb, cucurbit, fruiting, and leafy vegetables; commercially grown greenhouse eggplant, pepper and tomato; bushberries; citrus, pome, and stone fruits; and tree nuts for pest management of sucking and chewing insects, suppression of certain insect vectored diseases and optimization of the crop's potential.

Active Ingredient	By Weight
Cyazynilprole	
cyano-1-(3-chloro-2-pyridinyl)-N-[4-cyano-2-methyl-6-[(methylamino)isobutyl]phenyl]-1H-pyrazole-5-carboxamide	10.20%
Other Ingredients	89.80%
TOTAL	100.00%

EXIREL™ is a suspension (oil in water emulsion). SHAKE WELL BEFORE USING.  
Contains 0.83 lb. active ingredient per gallon.  
EPA Reg. No. 352-859

EPA Est. No. 352-GA-002

### KEEP OUT OF REACH OF CHILDREN CAUTION

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

**FIRST AID: IF ON SKIN:** Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice. **IF IN EYES:** Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing. Call a poison control center or doctor for treatment advice. For questions regarding emergency medical treatment, you may contact 1-800-441-3637 for information.

**PRECAUTIONARY STATEMENTS HAZARDS TO HUMANS AND DOMESTIC ANIMALS: CAUTION:** Causes moderate eye irritation. Avoid contact with eyes, skin or clothing. Prolonged or frequently repeated skin contact may cause allergic reactions in some individuals.

**PERSONAL PROTECTIVE EQUIPMENT:** Applicators and other handlers must wear:

• Long-sleeved shirt and long pants.

• Chemical resistant gloves Category A (such as butyl rubber, natural rubber, neoprene rubber, or nitrile rubber), all > 14 mils.

• Shoes plus socks.

After the product has been diluted in accordance with label directions for use, shirt, pants, socks, and shoes are sufficient Personal Protective Equipment. Follow manufacturer's instructions for cleaning/maintaining personal protective equipment (PPE). If no such instructions for washables are available, use detergent and hot water. Keep and wash PPE separately from other laundry.

#### USER SAFETY RECOMMENDATIONS

**USERS SHOULD:** Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.

**ENVIRONMENTAL HAZARDS:** This pesticide is toxic to aquatic invertebrates and oysters. Do not apply directly to water. Drift and runoff may be hazardous to aquatic organisms in water adjacent to use sites. This product is highly toxic to bees exposed to direct treatment on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are foraging the treatment area.

**Surface Water Advisory:** This product may impact surface water quality due to runoff of rain water. This is especially true for poorly draining soils and soils with shallow ground water. This product is classified as having high potential for reaching surface water via runoff for several weeks after application. A level, well-maintained vegetative buffer strip between areas to which this product is applied and surface water features, such as ponds, streams, and springs will reduce the potential loading of cyazynilprole from runoff water and sediment. Runoff of this product will be reduced by avoiding applications when rainfall is forecasted to occur within 48 hours.

**Ground Water Advisory:** This chemical has properties and characteristics associated with chemicals detected in ground water. This chemical may leach into ground water if used in areas where soils are permeable, particularly where the water table is shallow.

E. I. du Pont de Nemours and Company, 1007 Market Street, Wilmington, Delaware 19898 U.S.A.

402753007 (SL-1880-012714 01-24-14)

NET: 1 gallon Nonrefillable Container

Made in U.S.A.

PULL HERE TO OPEN

13.5 oz

PULL HERE TO OPEN

## RESTRICTED USE PESTICIDE

TOXIC TO FISH, MAMMALS, AND AQUATIC ORGANISMS

FOR RETAIL SALE TO AND USE ONLY BY CERTIFIED APPLICATORS OR PERSONS UNDER THEIR DIRECT SUPERVISION, AND ONLY FOR THOSE USES COVERED BY THE CERTIFIED APPLICATOR'S CERTIFICATION.

GROUP 6 INSECTICIDE



# Agri-Mek® 0.15EC

## Miticid/Insecticide

Active Ingredient:

Abamectin<sup>1</sup> ..... 2.0%\*

Other Ingredients: ..... 98.0%

Total: ..... 100.0%

<sup>1</sup>CAS No. 65195-56-4 and No. 65195-55-3

\*1 gal. contains 0.15 lb. abamectin

### KEEP OUT OF REACH OF CHILDREN. WARNING/AVISO

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

See additional precautionary statements and directions for use in booklet.

EPA Reg. No. 100-898

EPA Est. 39578-TX-1

SCP 898A-L2Q 0909

299248

1 gallon

Net Contents

Product of China  
Formulated in the USA

syngenta®

16 oz/ac

# Lepidopterous Larvae in Desert Lettuce

Yuma Ag Center, Fall 2017

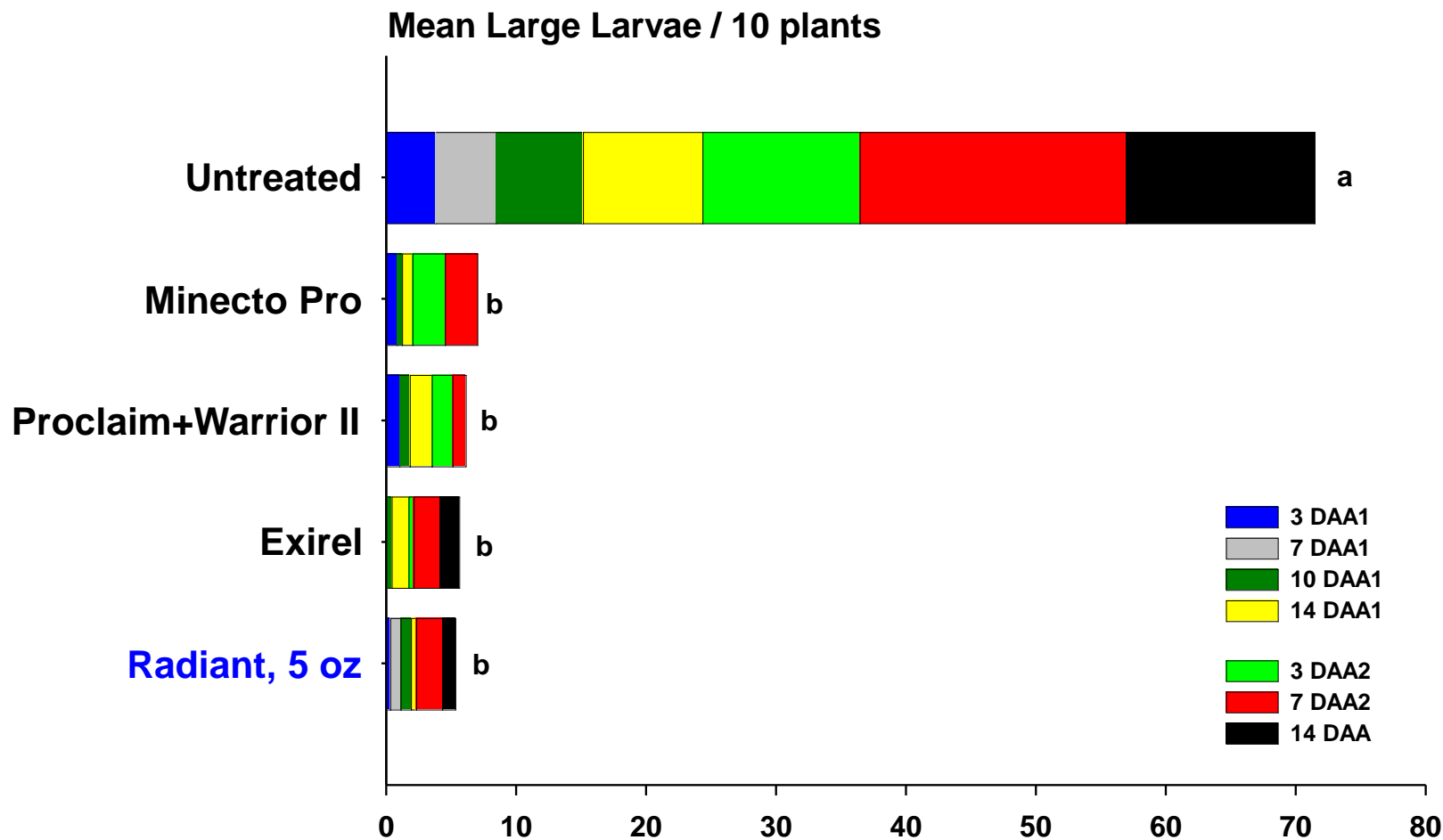


<b>Treatment</b>	<b>Rate</b>
<b>Minecto Pro</b>	<i>10 oz</i>
<b>Exirel</b>	13.5 oz
<b>Proclaim + Warrior</b>	4.0 + 1.9 oz
<b>Radiant</b>	5 oz
<b>UTC</b>	-

- **2 sprays** (14 d spray intervals)
- Dyne-Amic applied @ 0.125 vol/vol
- 22.5 gpa @ 50 psi
- Assessments: 3, 7, 10, 14 DAA

# Lep Larvae in Desert Lettuce

Yuma Ag Center, Fall 2017





# Whitefly Adult /CYSDV Efficacy with **New Foliar Alternatives**

Summer 2017

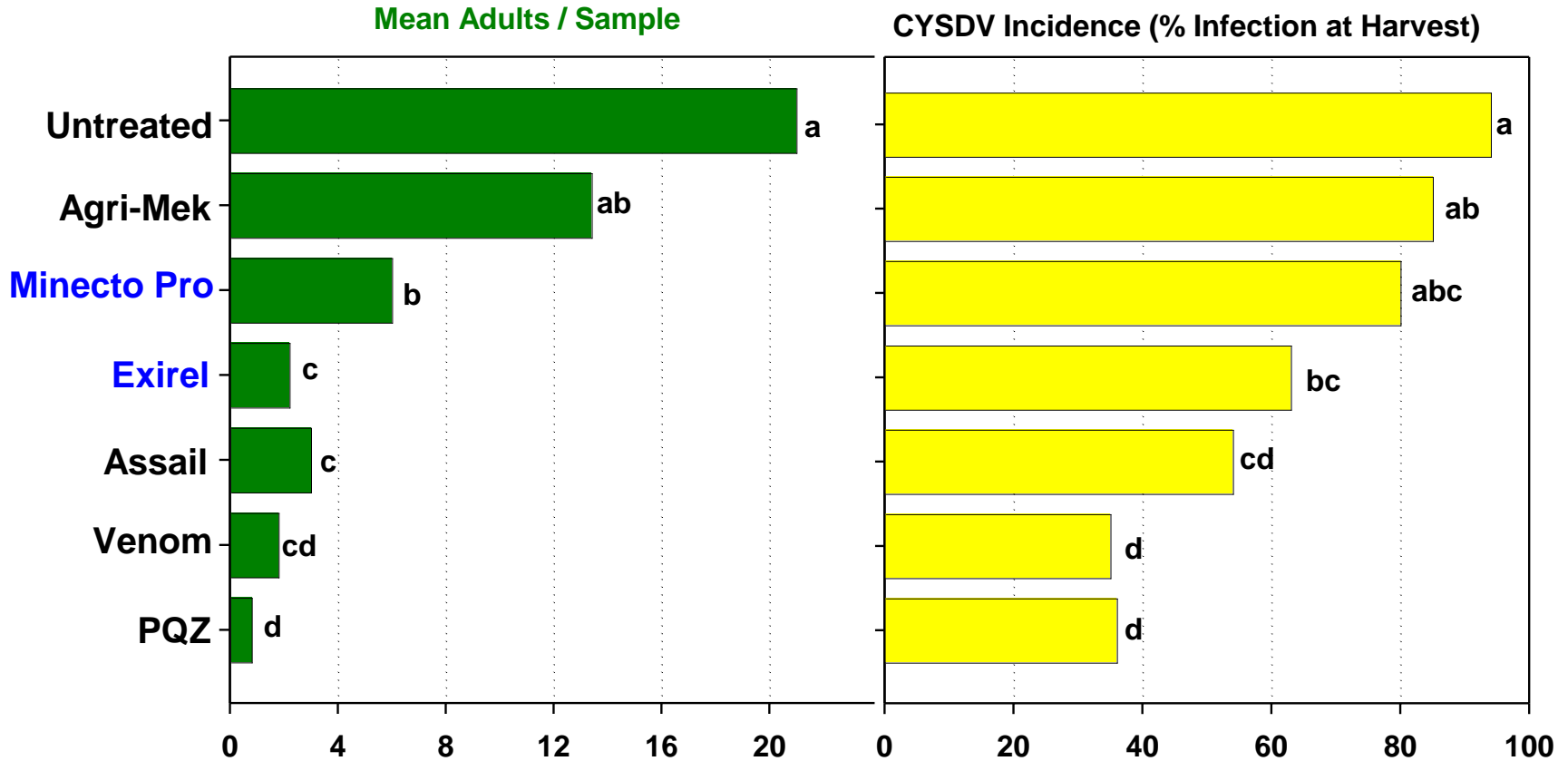


Treatment	Rate
<b>Minecto Pro</b>	<b>10 oz</b>
<b>Agri-Mek SC</b>	<b>3.5 oz</b>
<b>→ Exirel</b>	<b>20 oz</b>
<b>Assail</b>	<b>5.3 oz</b>
<b>Venom</b>	<b>4.0 oz</b>
<b>PQZ</b>	<b>3.2 oz</b>
<b>Untreated</b>	<b>-</b>

- **3 sprays** (7-8 d spray intervals)
- 23.5 gpa @ 50 psi
- Assessments: 1, 3, 7 DAA

\* No soil insecticide (Venom or Sivanto) applied

# Whitefly Adult /CYSDV Efficacy with **New Foliar Alternatives** Fall 2017



# Thrips Control in Spring Romaine

Yuma Ag Center, Fall 2017

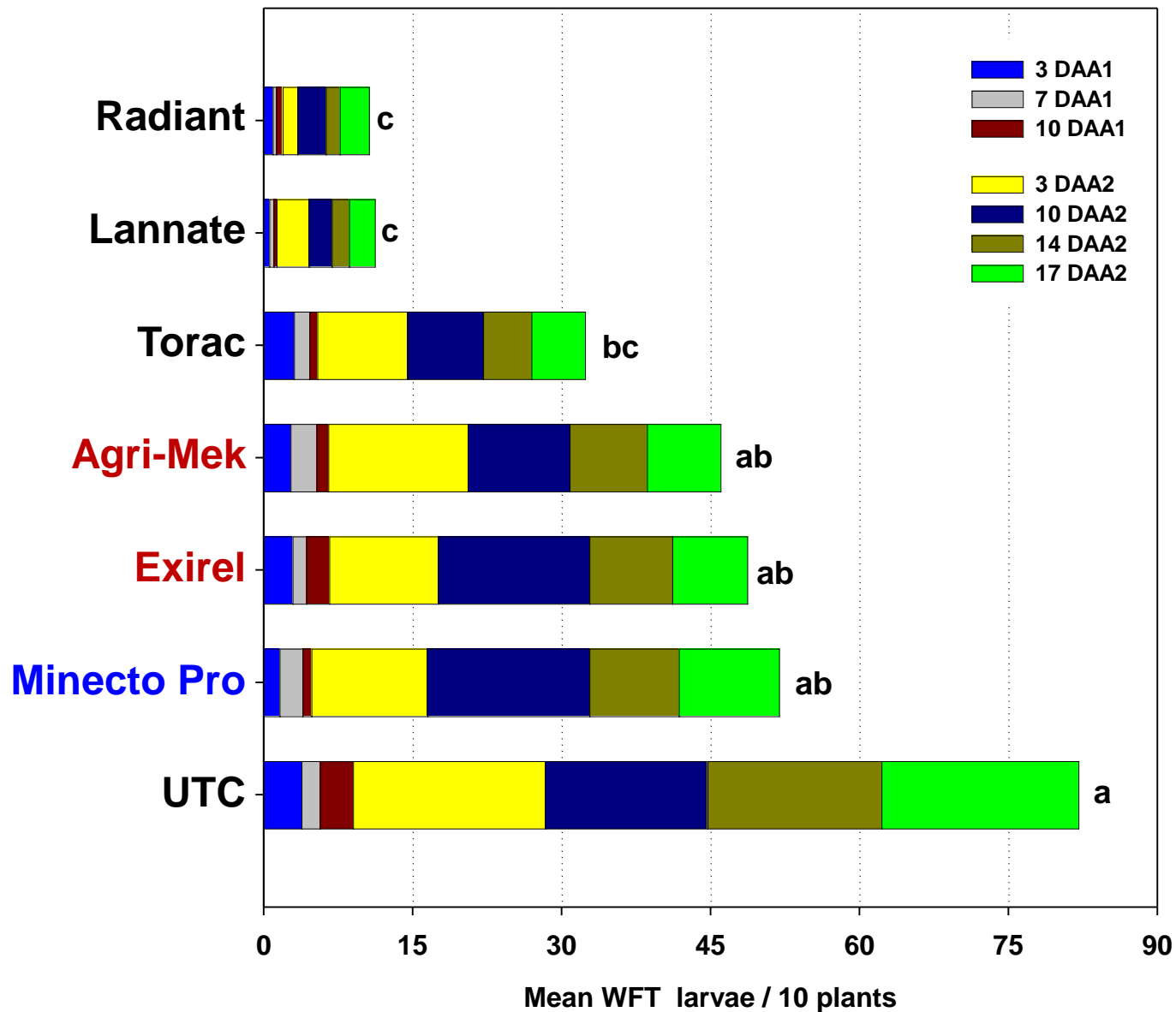


Treatment	Rate
<b>Minecto Pro</b>	<b>10 oz</b>
<b>Exirel</b>	<b>13.5 oz</b>
<b>Agri-Mek SC</b>	<b>3.5 oz</b>
<b>Torac</b>	<b>21 oz</b>
<b>Lannate</b>	<b>1 lb</b>
<b>Radiant</b>	<b>7 oz</b>
<b>UTC</b>	<b>-</b>

- **2 sprays** (12 d spray intervals)
- Dyne-Amic applied @ 0.125 vol/vol
- 22.5 gpa @ 50 psi
- Assessments: 3, 7, 10, 14 DAA

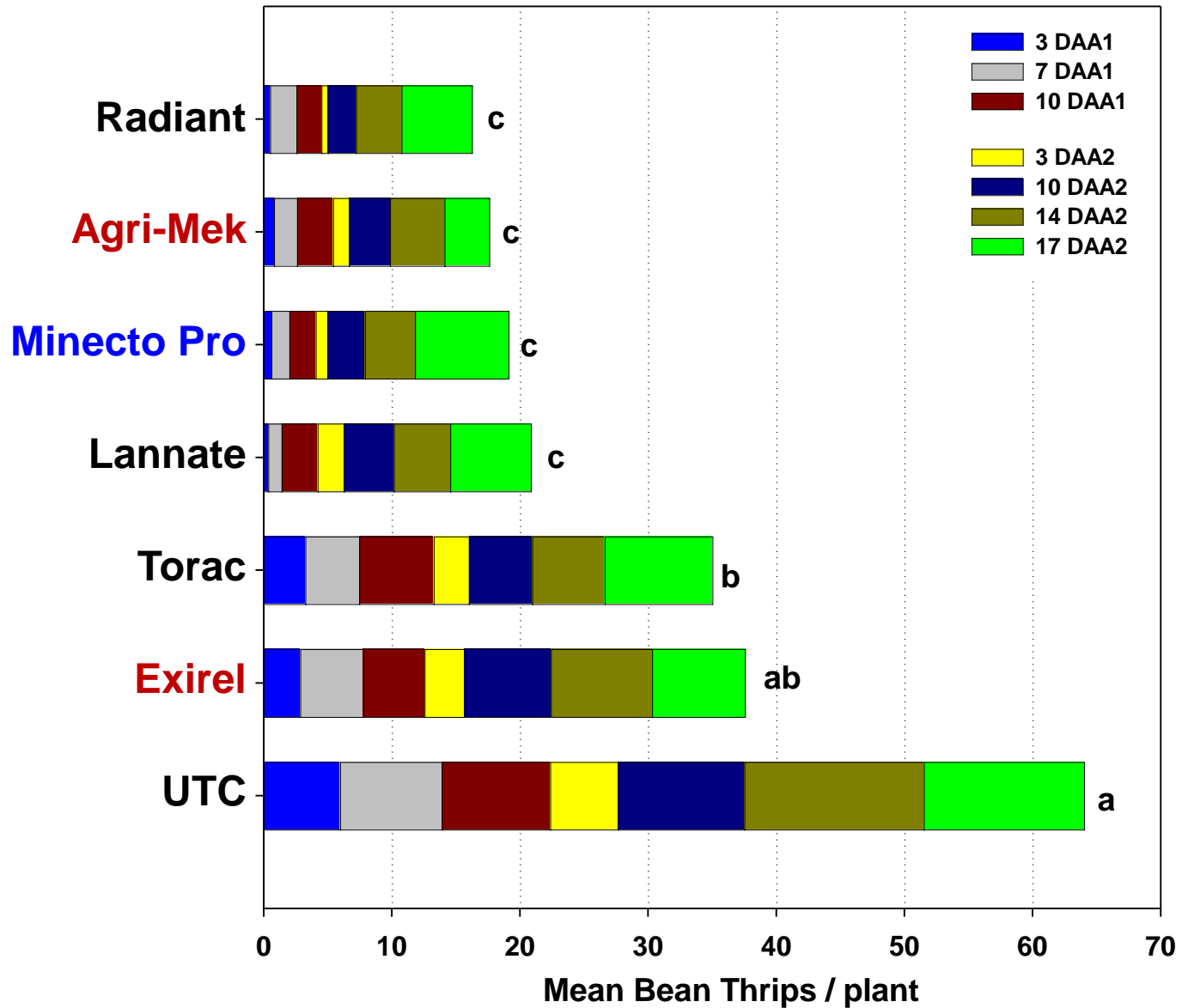
# WFT Control in Fall Romaine

Yuma Ag Center, Fall 2017



# Bean Thrips Control in Fall Romaine

Yuma Ag Center, Fall 2017



# Minecto Pro

*cyazapyr + abamectin*

## *Chewing / Sucking Insects*

<b>Pest</b>	<b>IPM Standards</b>	<b>Comparative Efficacy</b>
<b>Worms</b>	Radiant, Coragen	<b>A</b>
<b>Whiteflies –Nymphs</b>	Exirel, Movento	<b>A</b>
<b>Whiteflies – Adults/ <i>CYSDV</i></b>	Venom, Exirel	<b>B</b>
<b>Leafminers</b>	Radiant, Exirel	<b>A</b>
<b>Aphids</b>	Movento	<b>B</b>
<b>Thrips</b>	Radiant, Lannate	<b>B</b>

<b>A</b>	As good as the standard
<b>B</b>	Not as good as the standard
<b>C</b>	Not economically effective

# Cormoran

*Novaluraon + acetamiprid*



*Dispersible concentrate*

## Chemistry

- Benzoylurea + Neonicotinoid
- IRAC group – 15 + 4A

## Mode of Action

- Chitin synthesis inhibitor
- Nicotinic AchE agonist

## Route of Activity

- Translaminar / ingestion
- Contact (acetamiprid)

## Effective Spectrum

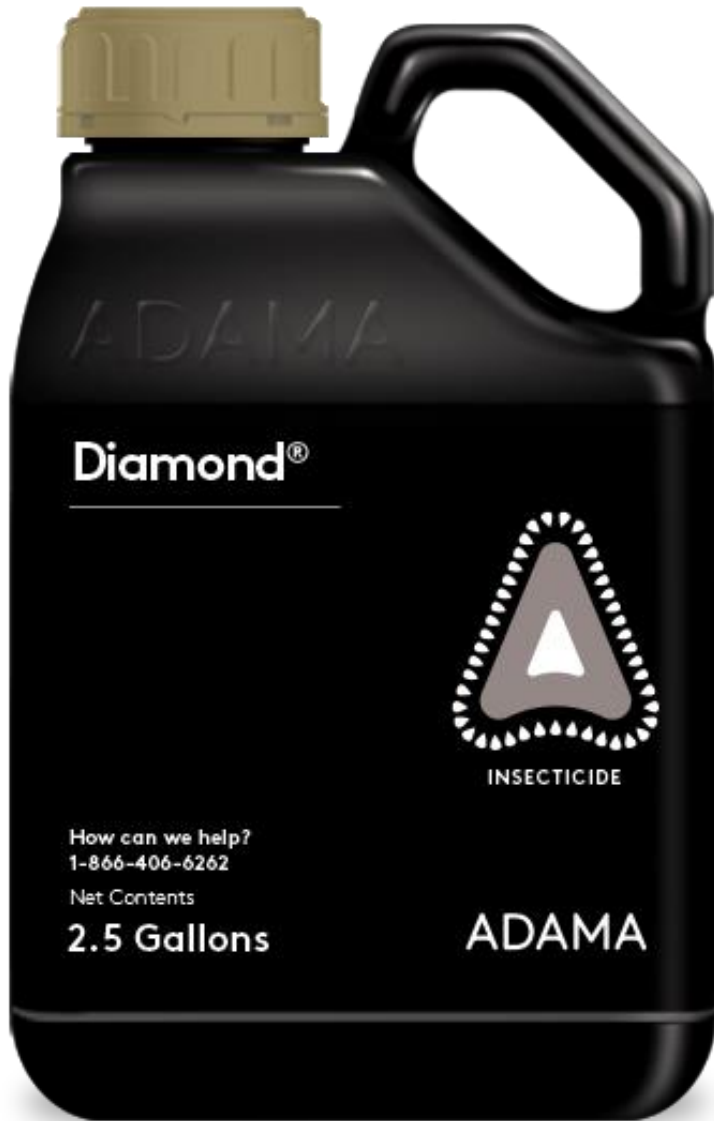
- Worms, Whiteflies, Lygus

## X Rate:

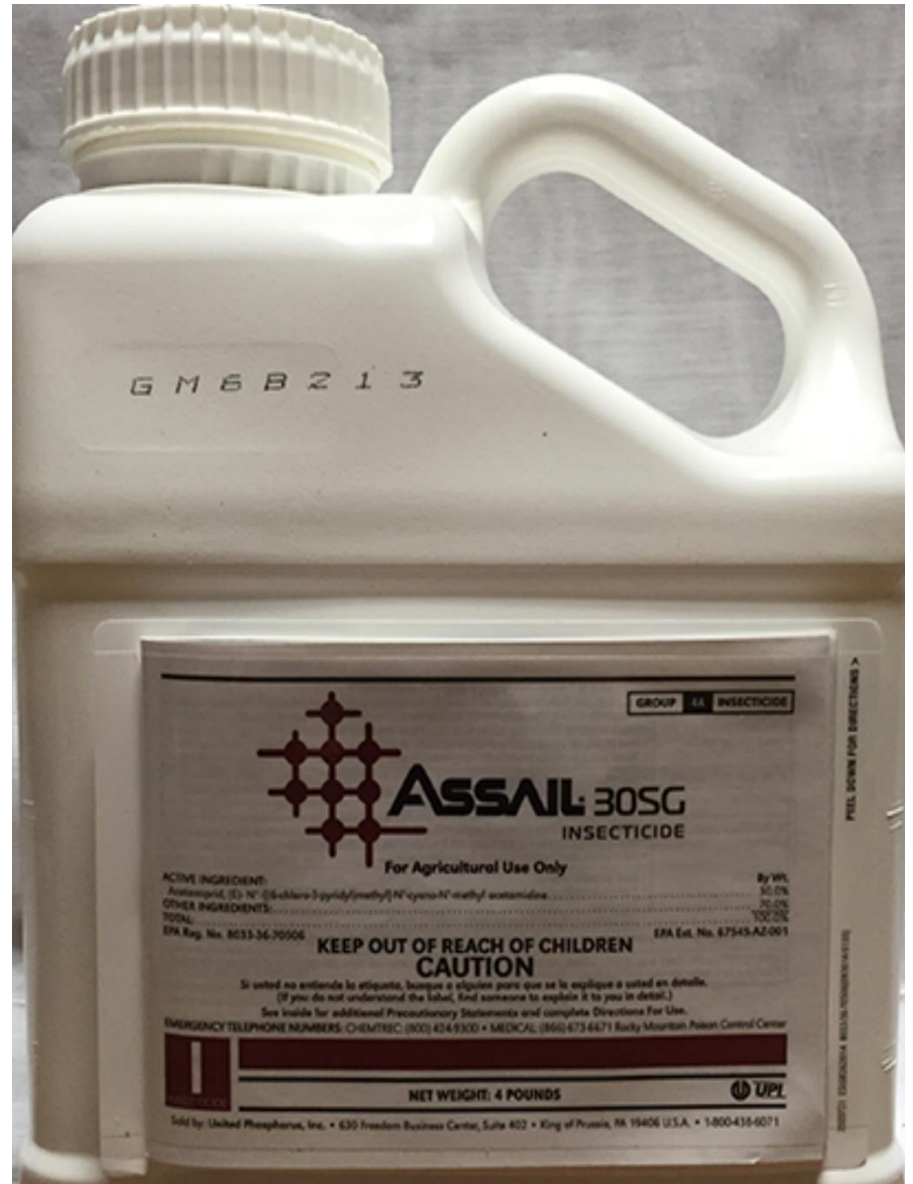
- 12 oz

## Key Crops:

- Brassica Crops and Melons



12 oz



3.3 oz

*Dispersible concentrate*



# Insecticide Efficacy I - DBM in Broccoli

Yuma Ag Center

October 2017



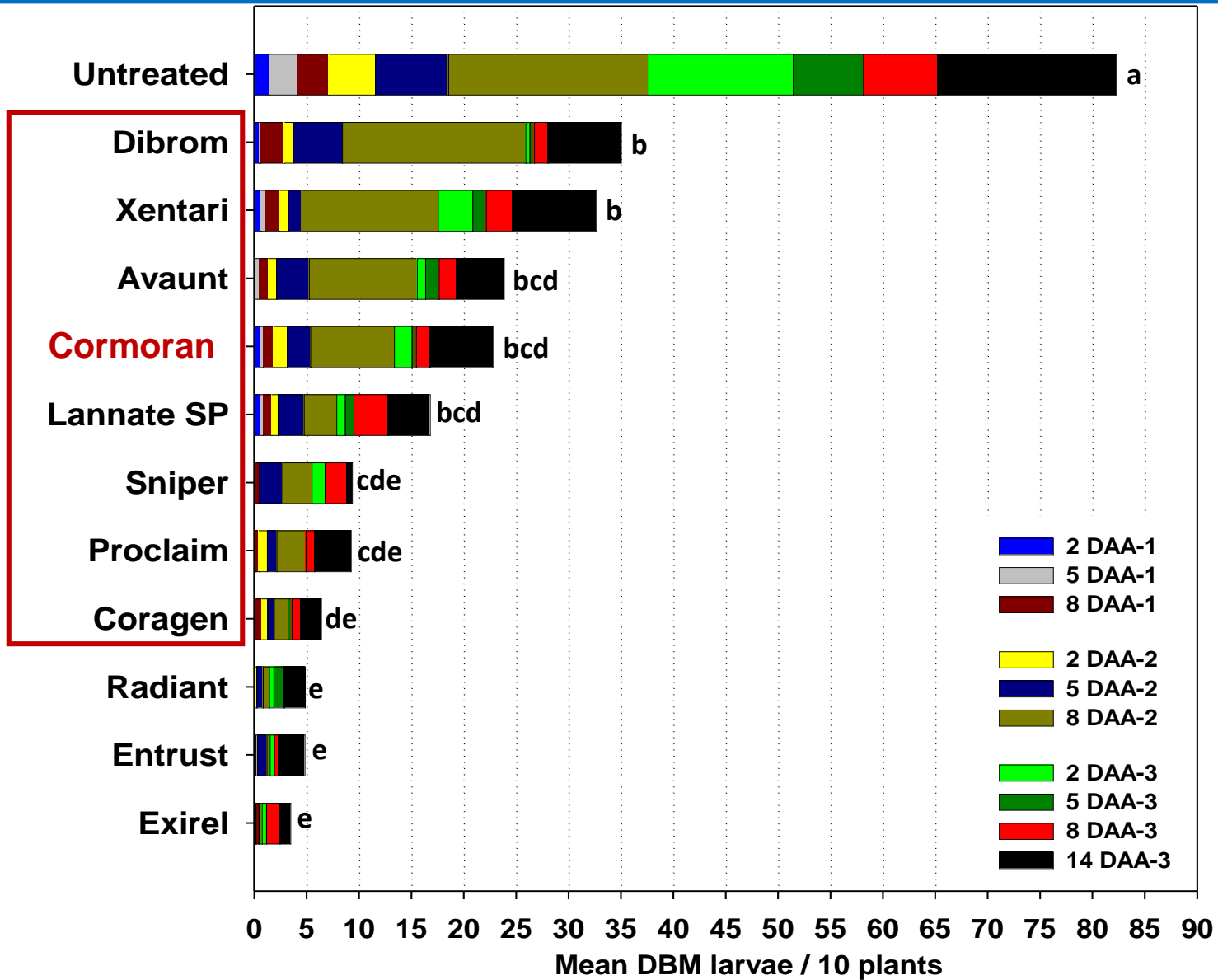
- 3 applications
- 10 day spray interval
- 23.5 gpa @ 50 psi
- Sampled: 2, 5 and 8 DAA

<u>Treatment</u>	<u>Rate/ac</u>
Radiant	5 oz
Proclaim	4.8 oz
Lannate SP	1 lb
Sniper	5 oz
Coragen	5 oz
Exirel	15.0 oz
Avaunt	3.5 oz
Dibrom	1.5 pt
<b>Cormoran</b>	<b>12 oz</b>
Entrust	5 oz
Xentari	1.5 lb
Check	-

# Insecticide Efficacy DBM in Broccoli

Yuma Ag Center

October 2017



# Cross-Spectrum Activity in Broccoli

Yuma Ag Center, Fall 2017



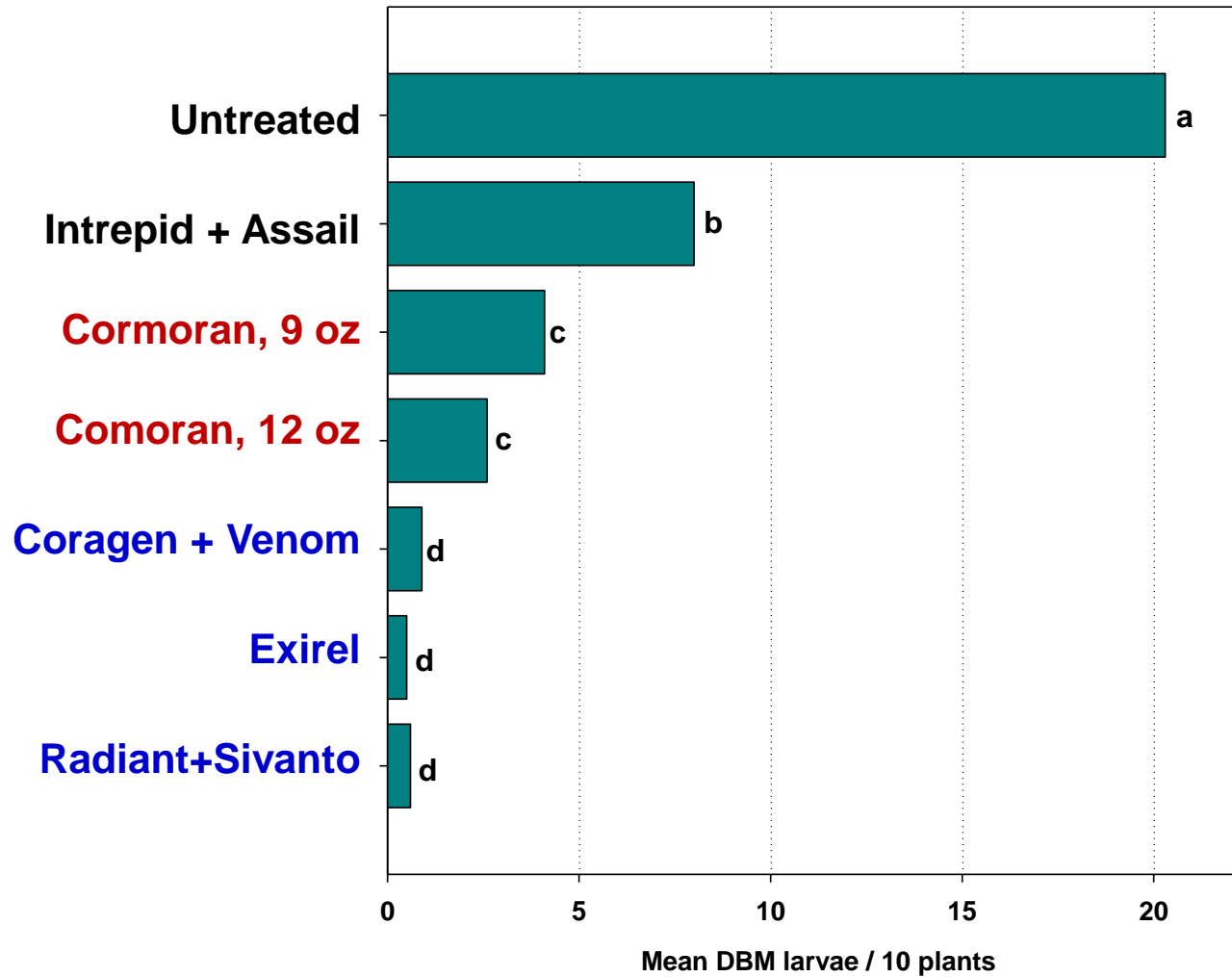
Treatment	Rate/ac
<b>Cormoran</b>	12 oz
<b>Cormoran</b>	9 oz
Intrepid + <b>Assail</b>	16 oz + <b>4 oz</b>
<b>Radiant</b> + Sivanto	5 + 10.5 oz
<b>Coragen</b> + Venom	5 + 4 oz
<b>Exirel</b>	16 oz
Untreated	-

- 2 applications
- 10 day spray interval
- 23.5 gpa @50 psi
- Sampled: 3,7 and 14 DAA

# Cross-Spectrum Activity in Broccoli

Yuma Ag Center, Fall 2017

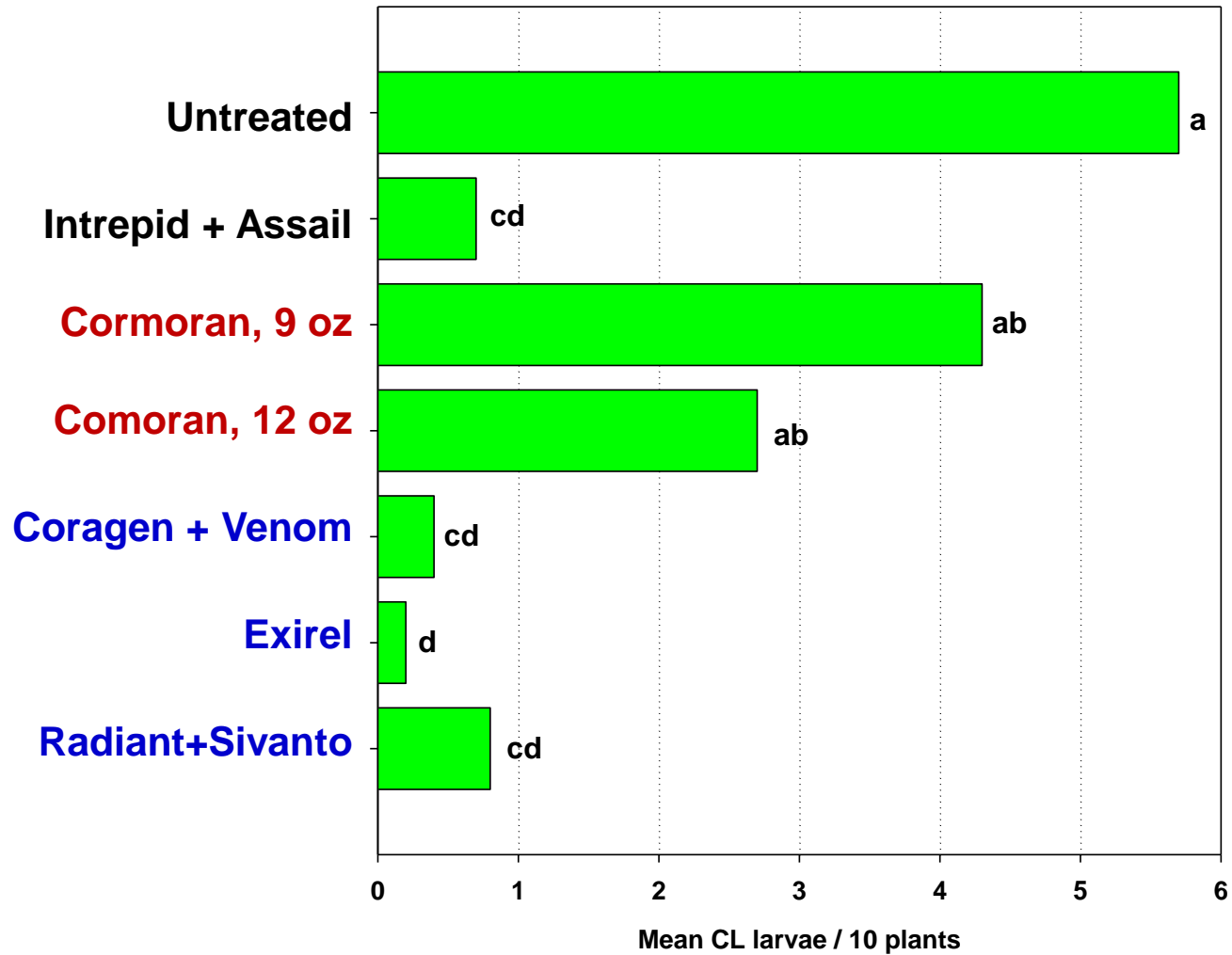
## Diamondback moth



# Cross-Spectrum Activity in Broccoli

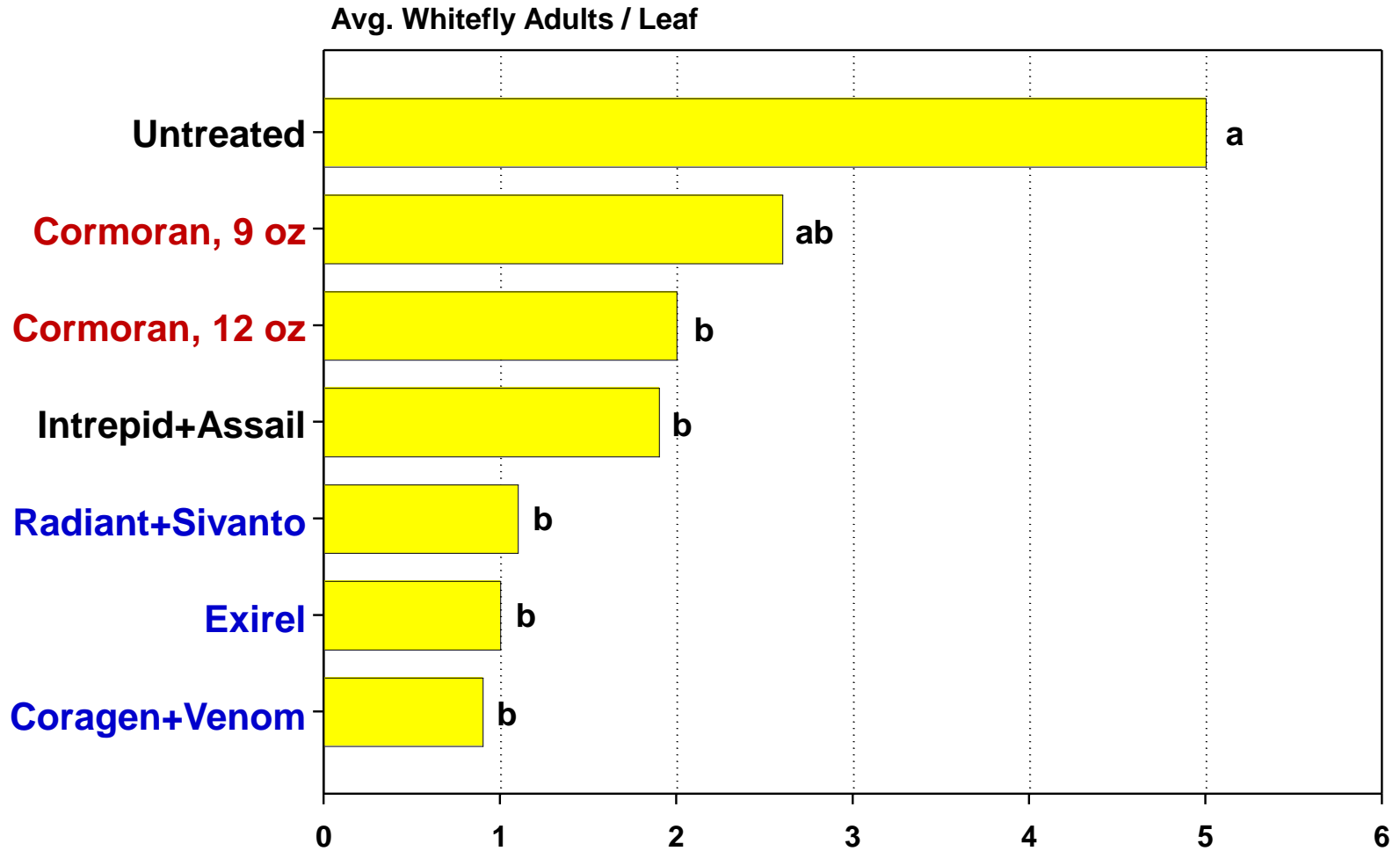
Yuma Ag Center, Fall 2017

## Cabbage looper



# Cross-Spectrum Activity in Broccoli

Yuma Ag Center, Fall 2017



# Whitefly Efficacy with **Cormoran** on Cantaloupes

Spring 2018



<b>Treatment</b>	<b>IRAC group</b>	<b>Rate/ac</b>
<b>Cormoran</b>	<b>15</b>	<b>12 oz</b>
<b>Assail</b>	<b>4A</b>	<b>5.3 oz</b>
<b>PQZ</b>	<b>9B</b>	<b>3.2 oz</b>
<b>Exirel</b>	<b>28</b>	<b>20.0 oz</b>
<b>Venom</b>	<b>4A</b>	<b>4 oz</b>
<b>Non-treated</b>	<b>-</b>	<b>-</b>

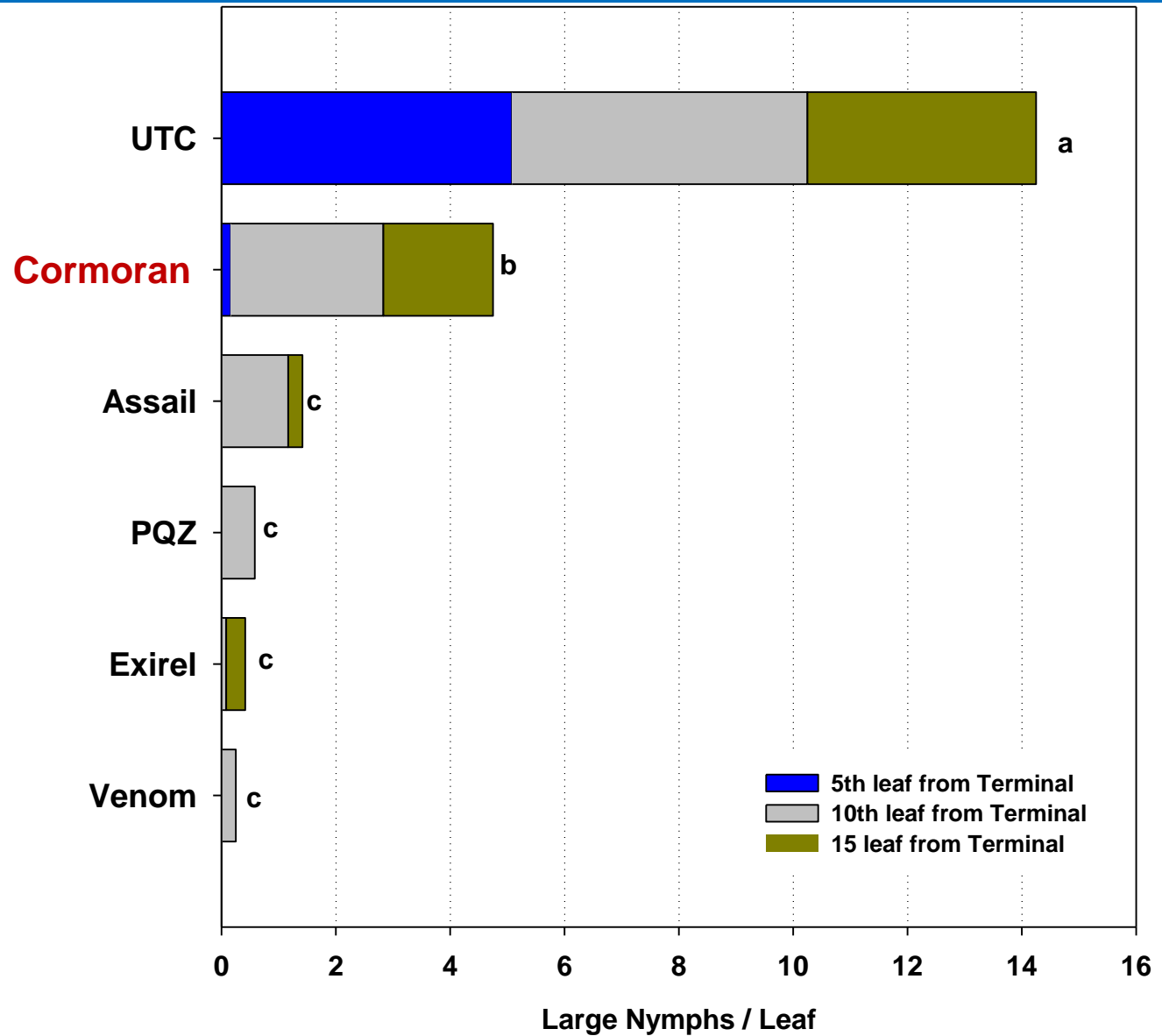
- 3 applications
- 7-8 day spray interval
- 23.5 gpa@50 psi

\* No soil insecticide (Venom or Sivanto) applied

# Whitefly Efficacy with **Cormoran** on Cantaloupes

Spring 2018

14 DAA-3

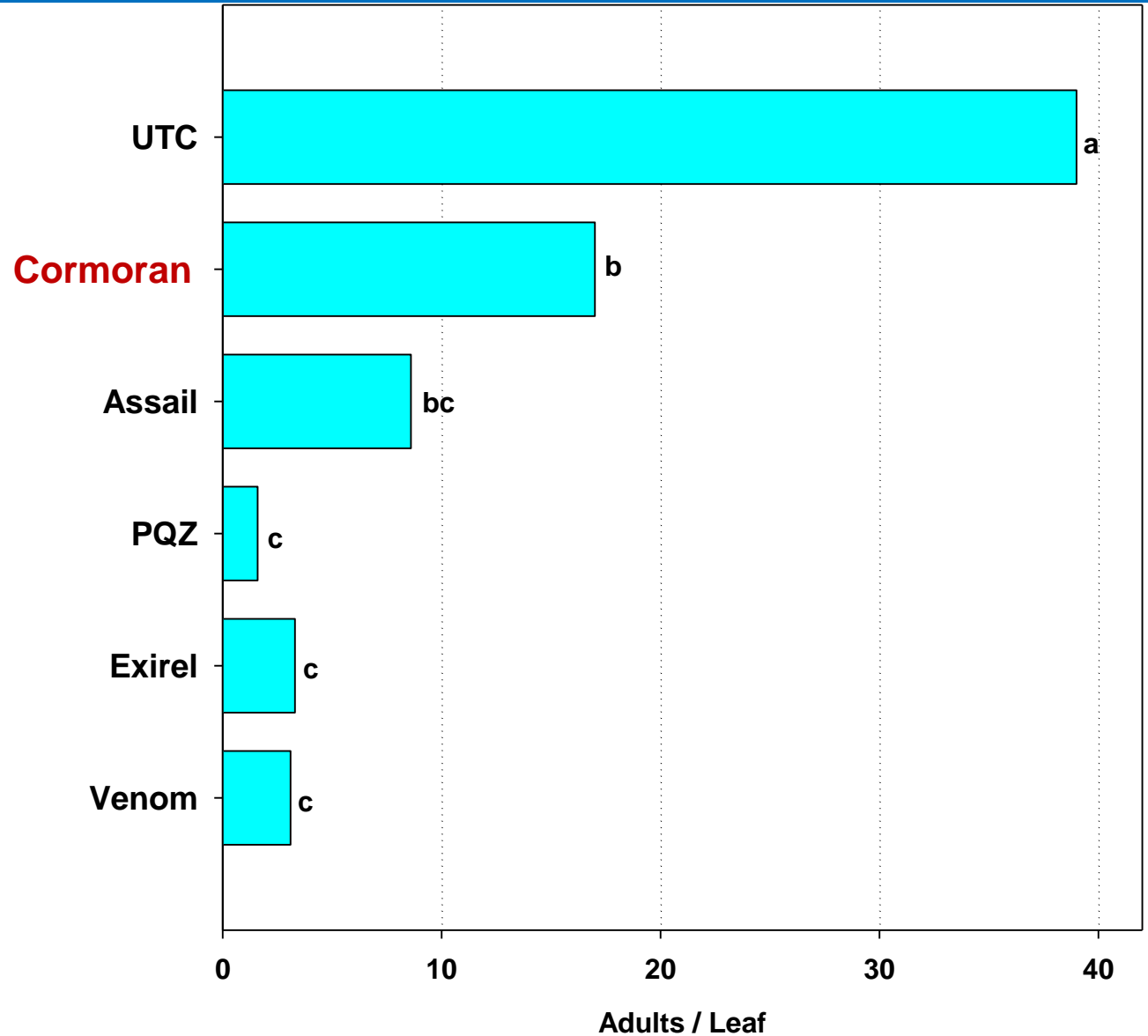




# Whitefly Efficacy with **Cormoran** on Cantaloupes

Spring 2018

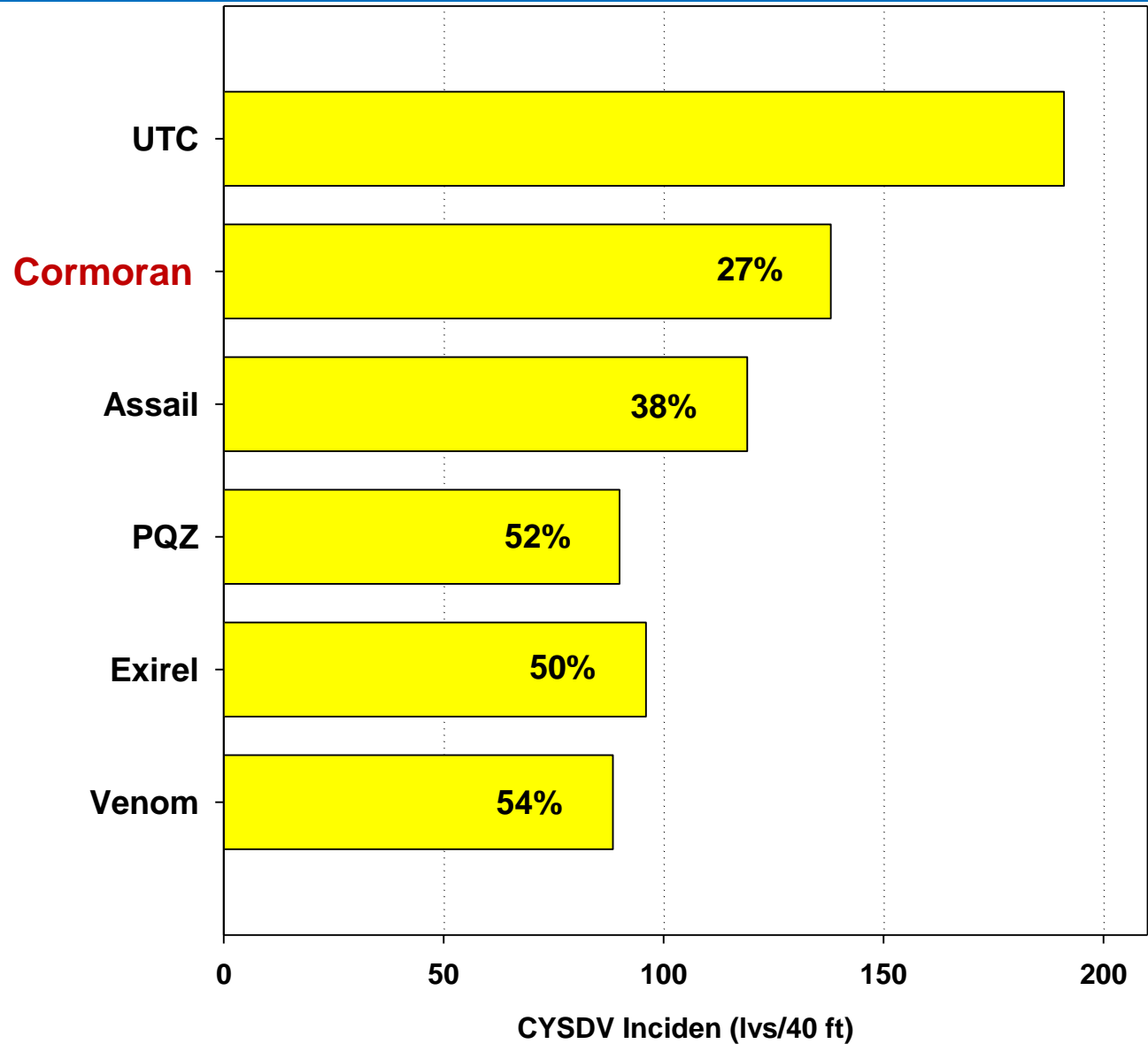
Trial Avg.



# Whitefly Efficacy with **Cormoran** on Cantaloupes

Spring 2018

14 DAA-3



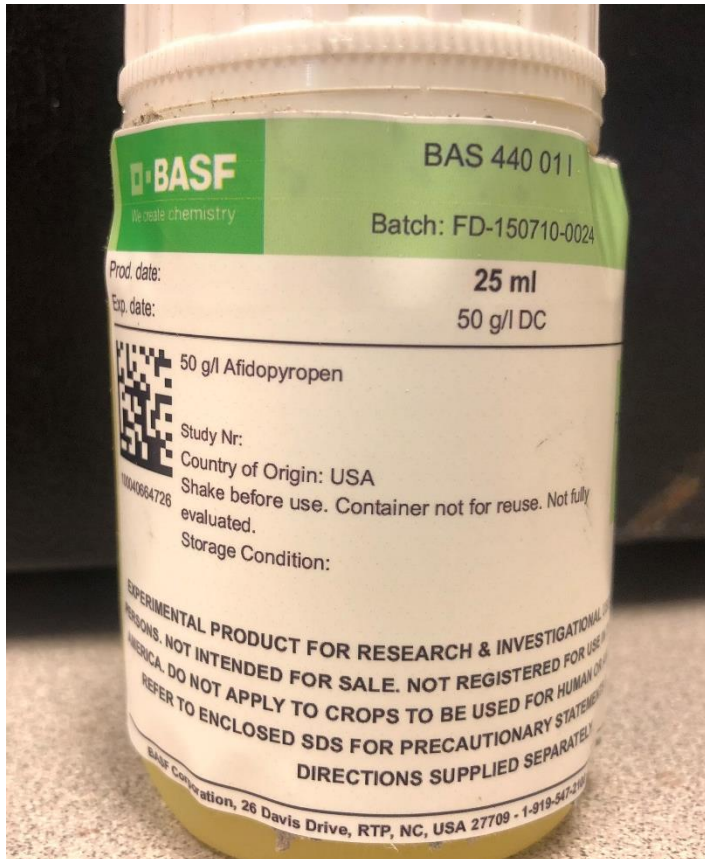
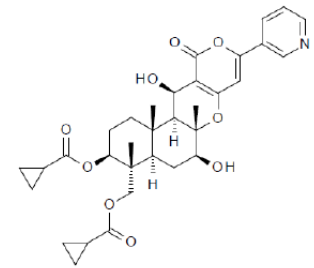
### Sucking Insects

<b>Pest</b>	<b>IPM Standards</b>	<b>Comparative Efficacy</b>
<b>Whiteflies</b> –Nymphs	Exirel, Movento	<b>B</b>
<b>Whiteflies</b> – Adults/ <i>CYSDV</i>	Venom, Exirel	<b>B</b>
<b>Worms</b>	Radiant, Exirel	<b>B</b>
<b>Lygus</b>	Beleaf, Sequoia	<b>?</b>

- A** As good as the standard
- B** Not as good as the standard
- C** Not economically effective

# Versys, Sefina

Inscalis, *afidopyropen*, BAS440



\* New effective MOA for Sucking Insects

## Chemistry

- Pyropenes
- IRAC group – 9D

## Mode of Action

- Chordotonal TRPV channel modulator  
(disrupts feeding behavior)

## Route of Activity

- Translaminar / ingestion

## Effective Spectrum

- Aphids, whitefly

## X Rate:

- Versys: 1.5 oz
- Sefina: 7 oz

## Key Crops:

- Versys: Leafy and Brassica Veg
- Sefina: Melons, Cotton

**Versys, Sefina**

**Inscalis, afidopyropen, BAS440**

**0.83 and 1.67 lb AI/gal  
Dispersible Concentrate**



# Green Peach Aphid in **Baby Spinach**



# Green Peach Aphid Control in **Baby Spinach**:

Yuma Ag Center, **Spring 2015**

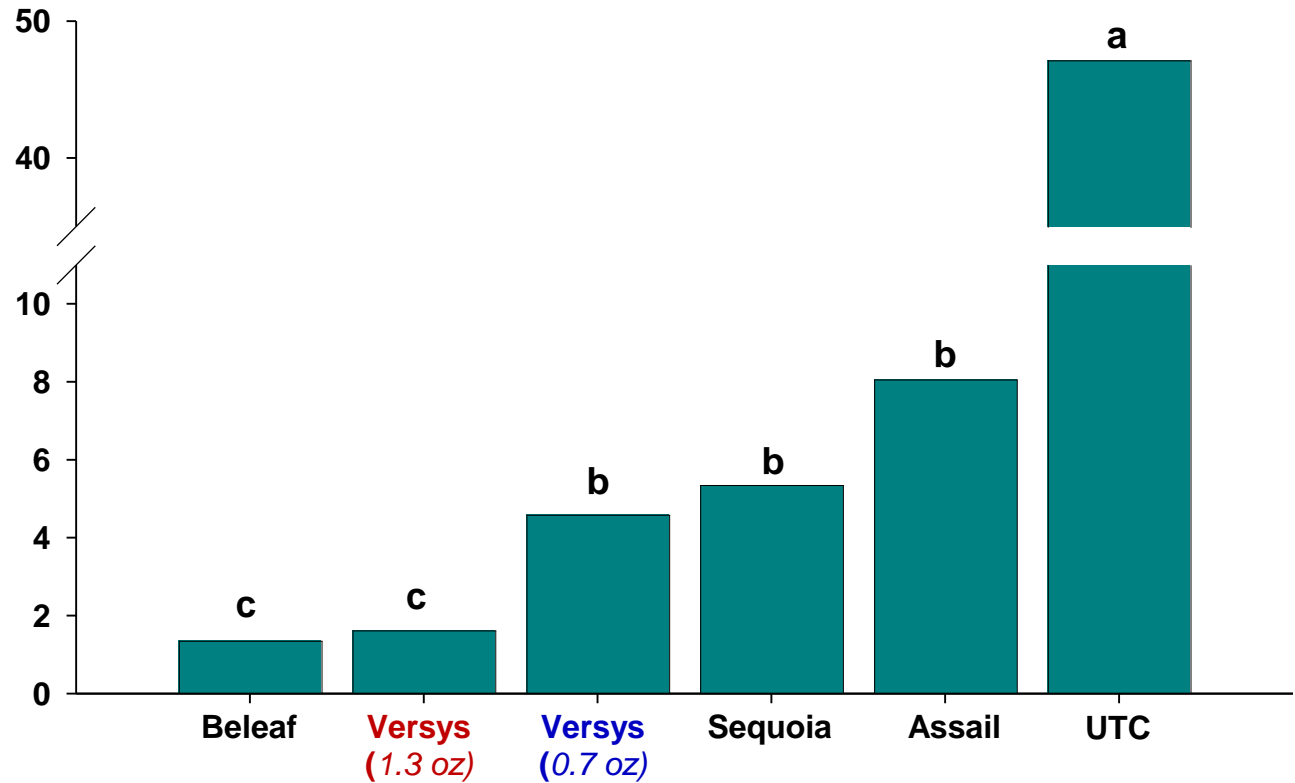
# Versys



- 2 applications
- 14 day spray interval
- 25 gpa@50 psi
- **No adjuvants used**

Aphids/ 10 leaves

Trial Avg.



# Green Peach Aphid Control in **Baby Spinach**:

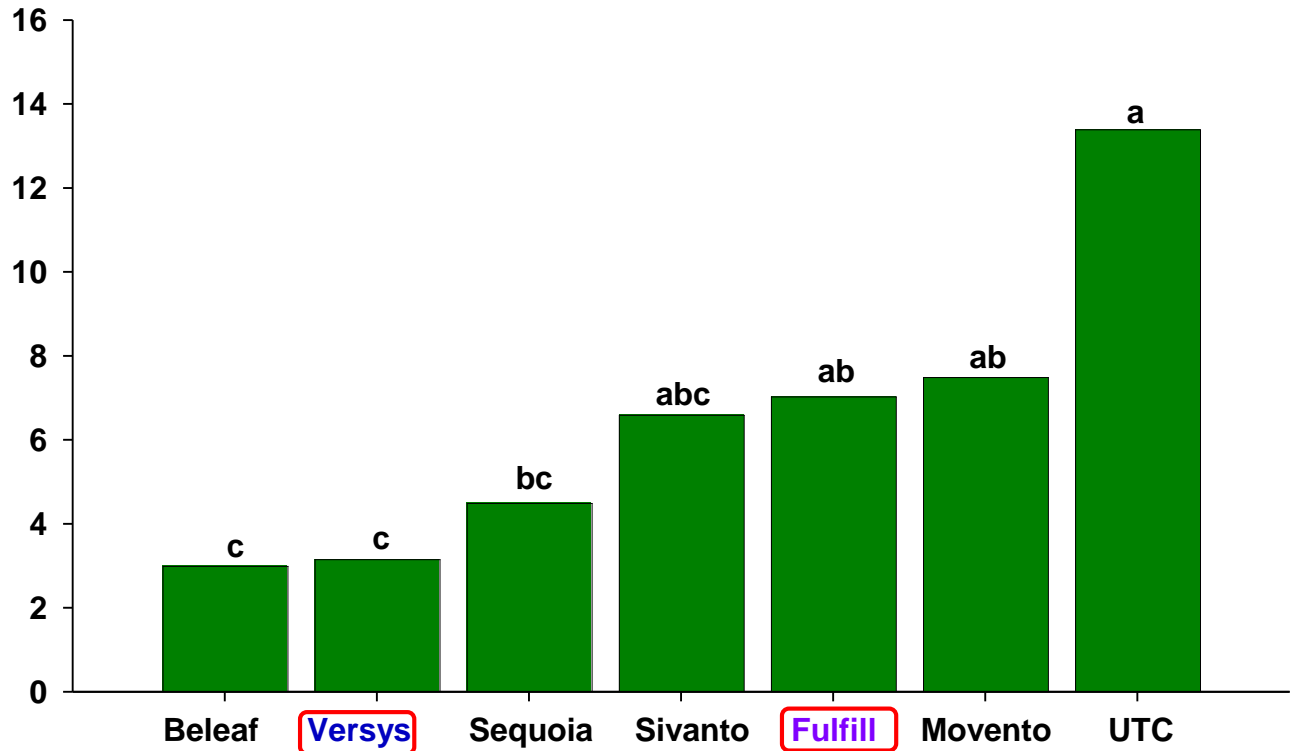
Yuma Ag Center, **Spring 2016**

# Versys

**Trial Average**

**Aphids/ 10 leaves**

**Aphids / 10 leaves**



- 2 applications
- 14 day spray interval
- 25 gpa@50 psi
- *No adjuvants used*



# Green Peach Aphid in **Cabbage**

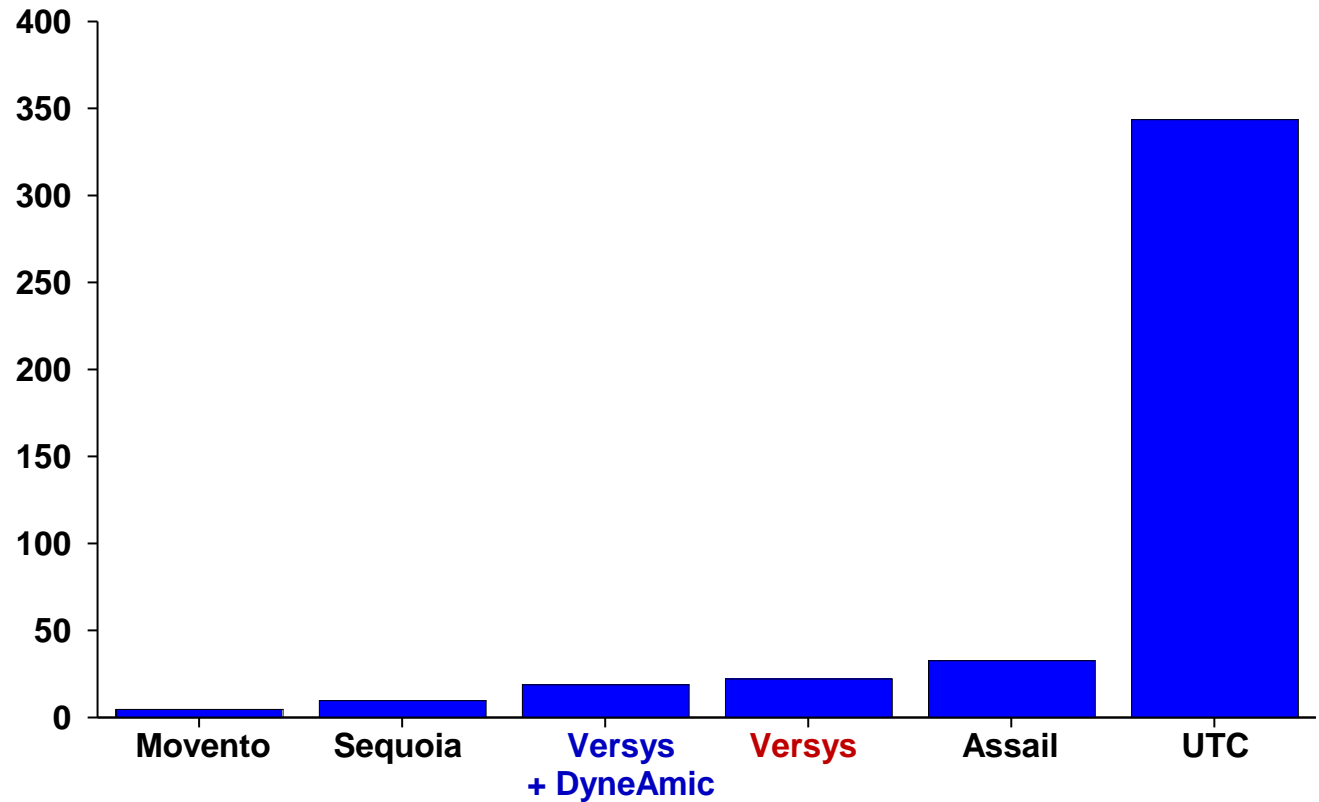


# Versys Aphid Activity in Cabbage

Yuma Ag Center, Spring 2013

Trial Average

Aphids / plant



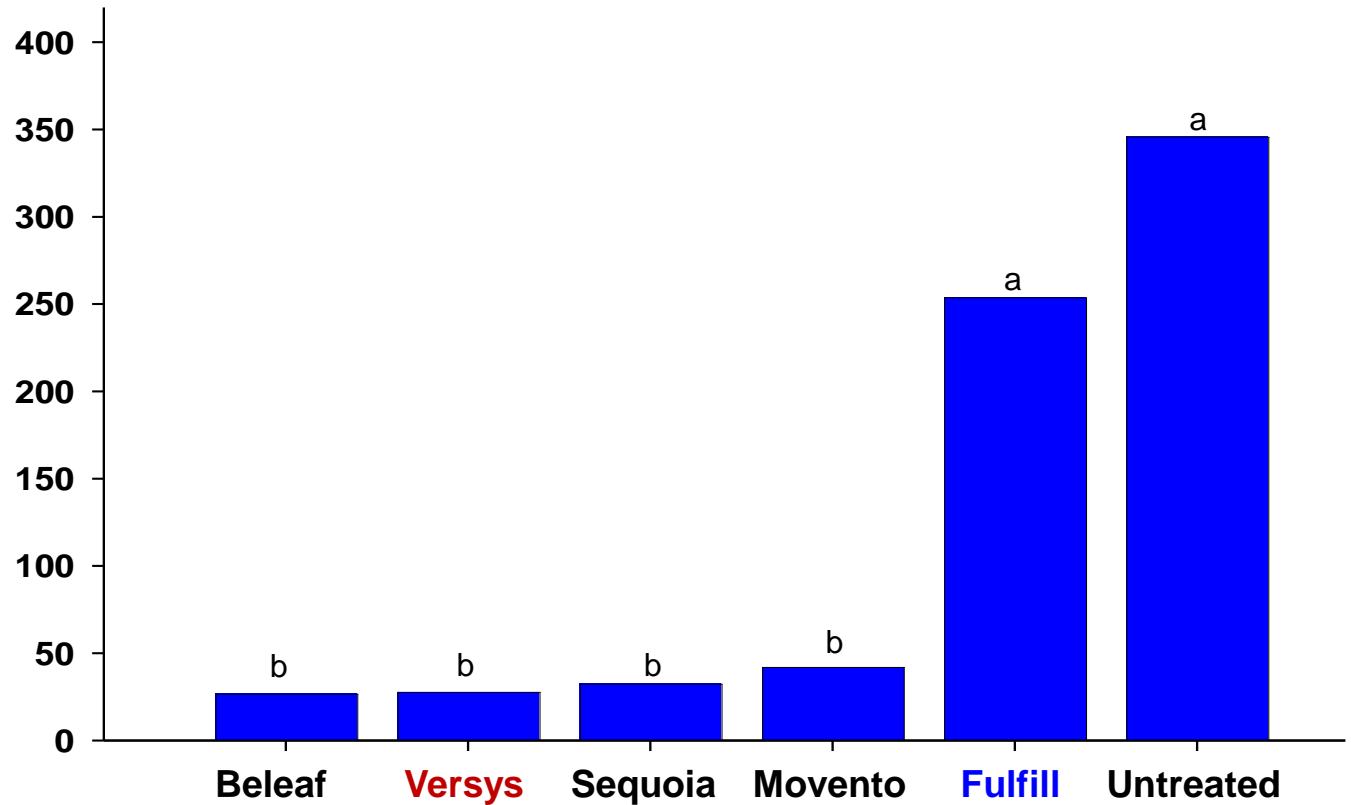
- 2 applications
- 14 day spray interval
- 22.5 gpa@50 psi
- *Dyne-Amic @ 1 pt / 100 gal*

# Versys Aphid Activity in Cabbage

Yuma Ag Center, Spring 2018



Aphids / plant



- 2 applications
- 14 day spray interval
- 22.5 gpa@50 psi
- *Dyne-Amic @ 1 pt / 100 gal*

# Green Peach Aphid in **Head Lettuce**



# Versys - Aphid Activity in Head Lettuce

Yuma Ag Center, Spring 2018



<u>Treatment</u>	<u>Rate/ac</u>
<b>Versys</b>	1.5 oz
<b>Sequoia</b>	2.0 oz
<b>Beleaf</b>	2.85 oz
<b>Fulfill</b>	2.8 oz
<b>Movento</b>	5.0 oz
<b>Untreated</b>	10.0

*\*Dyne-Amic added to all sprays at 0.125% v/v*

## Trial I

- Wet date: 17 Nov
- 1 spray (24 Jan)
- 21.0 gpa @40 psi

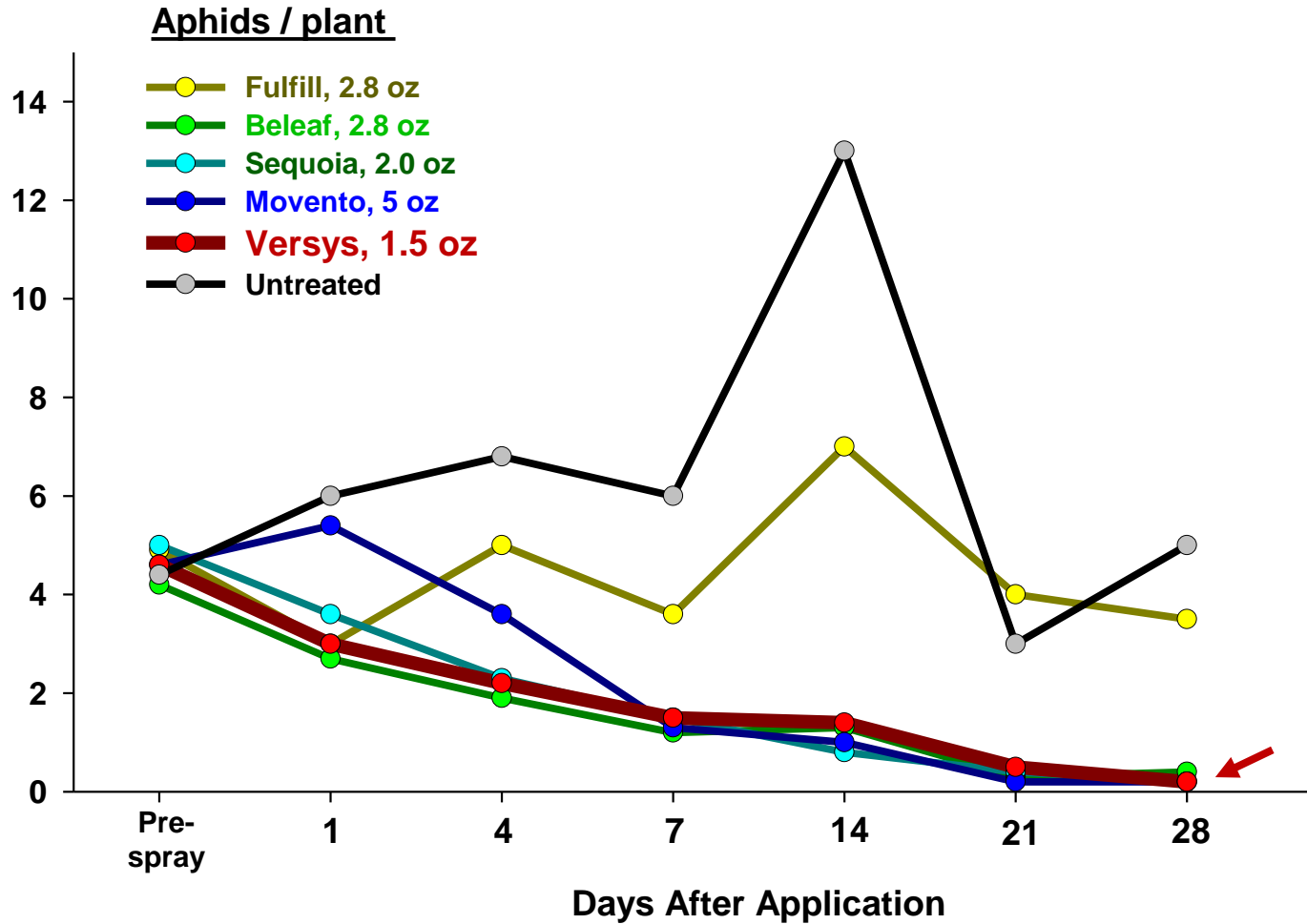
## Trial II

- Wet date: 15 Dec
- 1 spray (5 Feb)
- 21.0 gpa @40 psi

# Versys - Aphid Activity in Head Lettuce

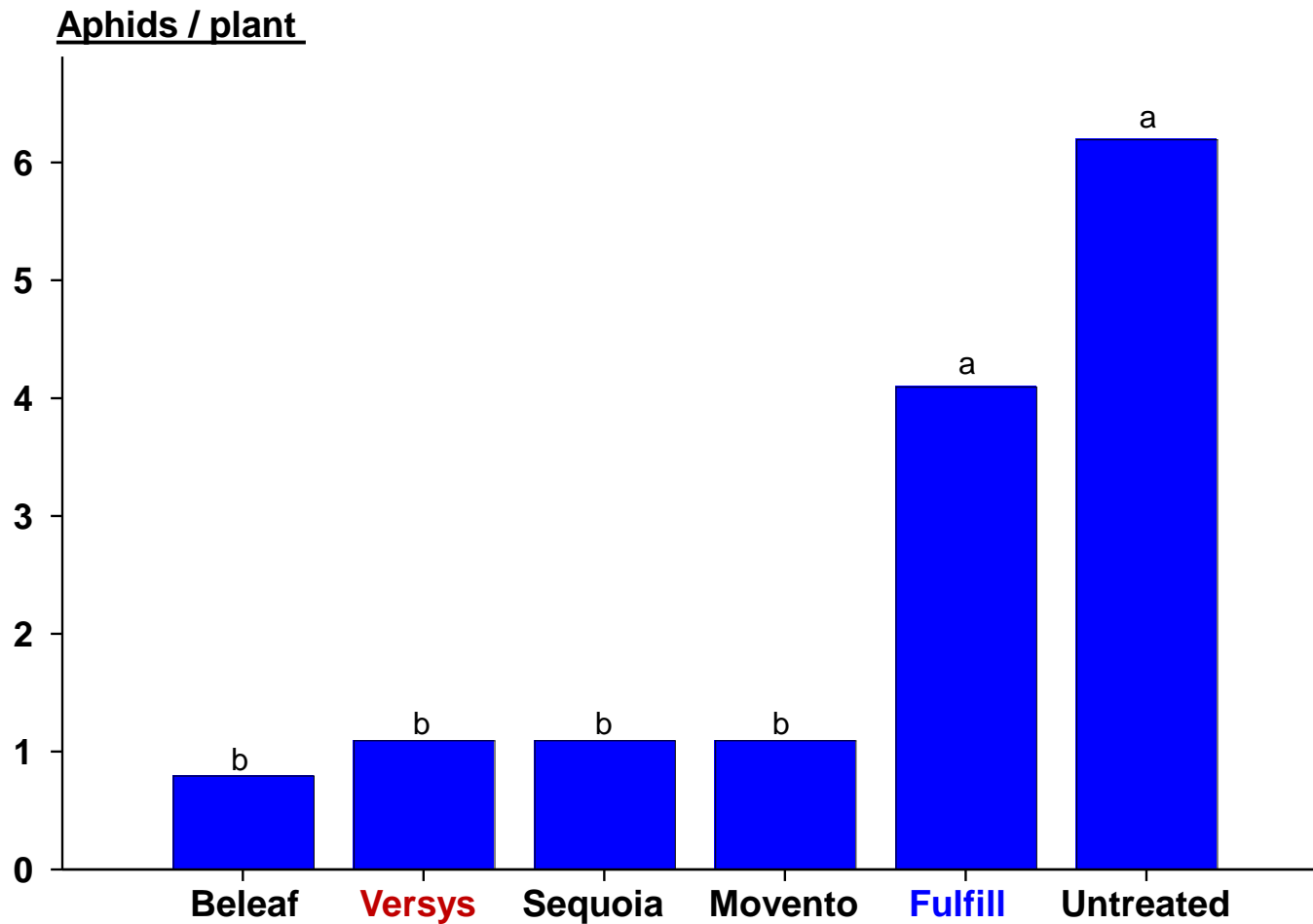
Yuma Ag Center, Spring 2018

Trial I



# Versys - Aphid Activity in Head Lettuce

Yuma Ag Center, Spring 2018



Trial Avg.

# Sweetpotato Whitefly in **Cantaloupes**





# Sefina - Whitefly Efficacy on Fall Melons

Yuma Ag Center, Fall 2014



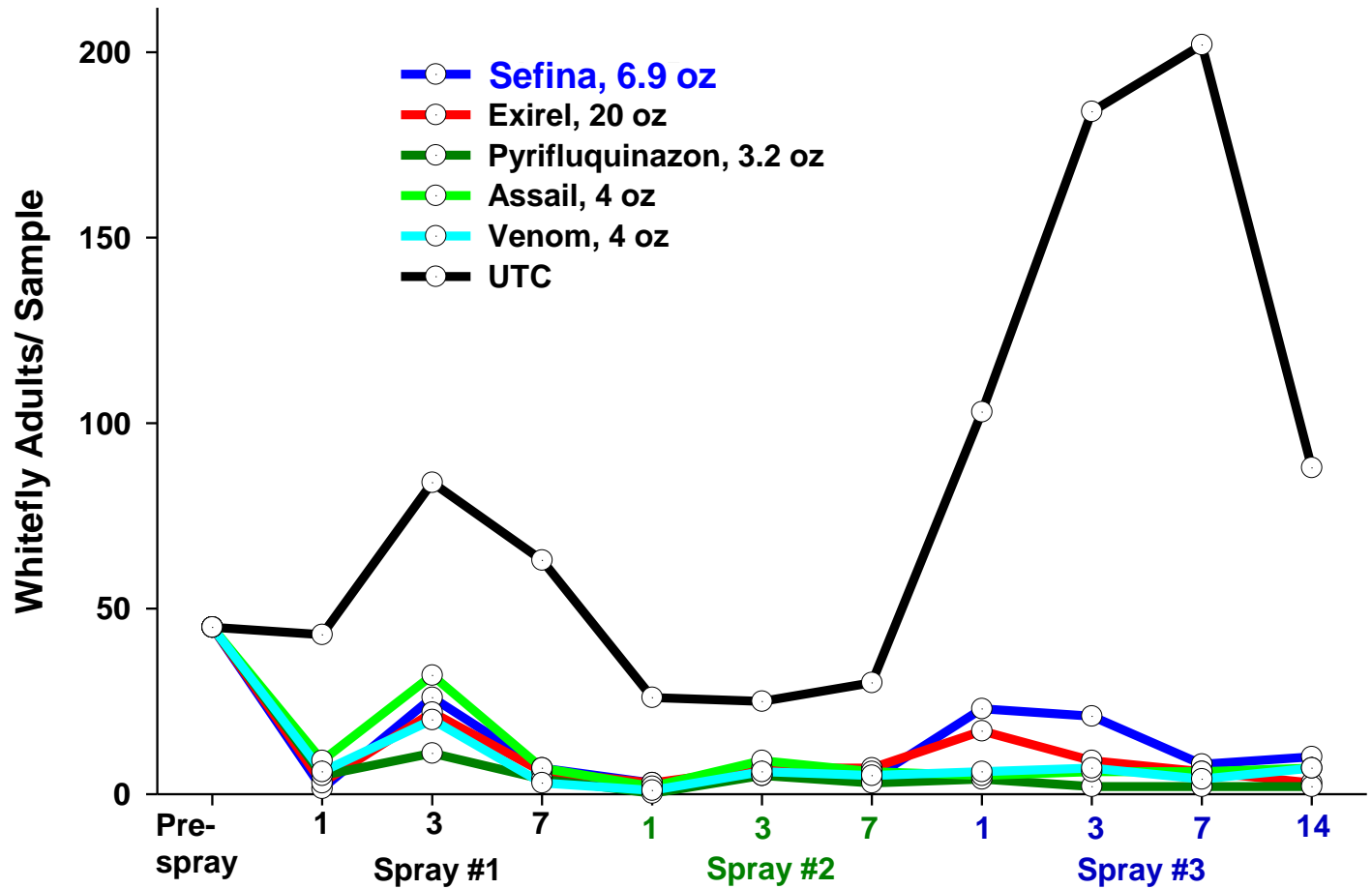
Treatment	Rate/ac
<b>Sefina</b>	<b>6.9 oz</b>
<b>Exirel</b>	<b>20 oz</b>
<b>Pyrifluquinazon</b>	<b>3.2 oz</b>
<b>Assail</b>	<b>4.0 oz</b>
<b>Venom</b>	<b>4.0 oz</b>
<b>Untreated</b>	<b>-</b>

*\*Dyne-amic added at 0.125% v/v*

- 3 applications
  - 7-14 day spray intervals
  - Assessments @ 1, 3, 7 & 14 DAA
- 
- ***Venom (6 oz) applied at plant to all plots except UTC***

# Sefina - Whitefly Efficacy on Fall Melons

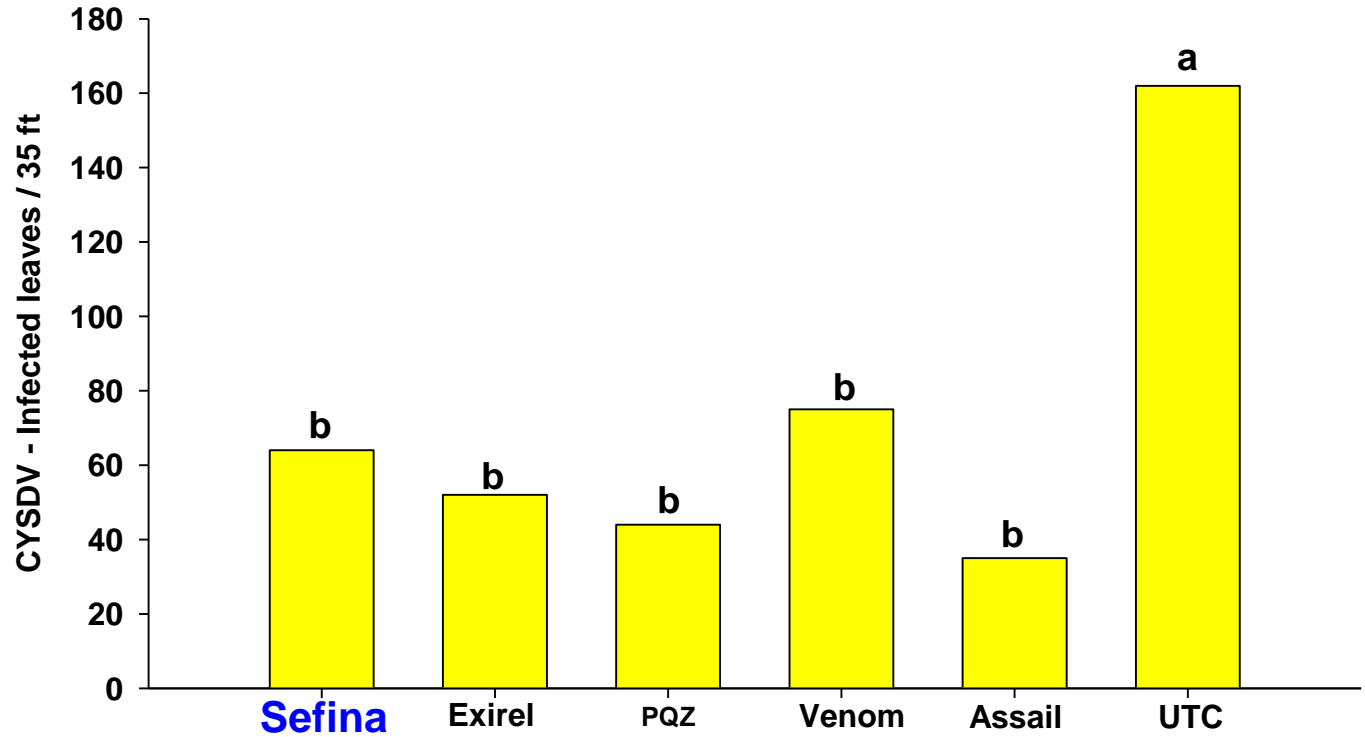
Yuma Ag Center, Fall 2014

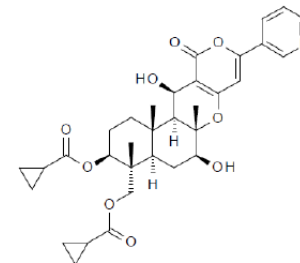


# Sefina - Whitefly Efficacy on Fall Melons

Yuma Ag Center, Fall 2014

21-DAA3





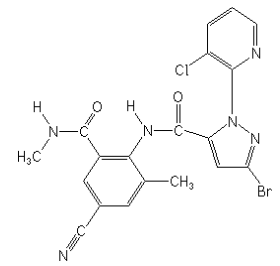
### *Sucking Insects*

<b>Pest</b>	<b>IPM Standards</b>	<b>Comparative Efficacy</b>
<b>Whiteflies –Nymphs</b>	Exirel, Movento	<b>B</b>
<b>Whiteflies – Adults/ <i>CYSDV</i></b>	Venom, Exirel	<b>A</b>
<b>Aphids (GPA)</b>	Movento, Sequoia	<b>A</b>

- A** As good as the standard
- B** Not as good as the standard
- C** Not economically effective

# PQZ

## Pyrifluquinazon (Labs 140, NNI-0101)



### Chemistry

- Quinazolinone
- IRAC group - 9

### Mode of Action

- Chordotonal TRPV channel modulator  
(disrupts feeding behavior)

### Route of Activity

- Foliar translaminar
- Contact / ingestion

### Effective Spectrum

- Whiteflies, Aphids, Citrus thrips

### Effective Rates

- Foliar: 3.2 oz

### Key Crops:

- Leafy Vegetables, Brassica and Melons

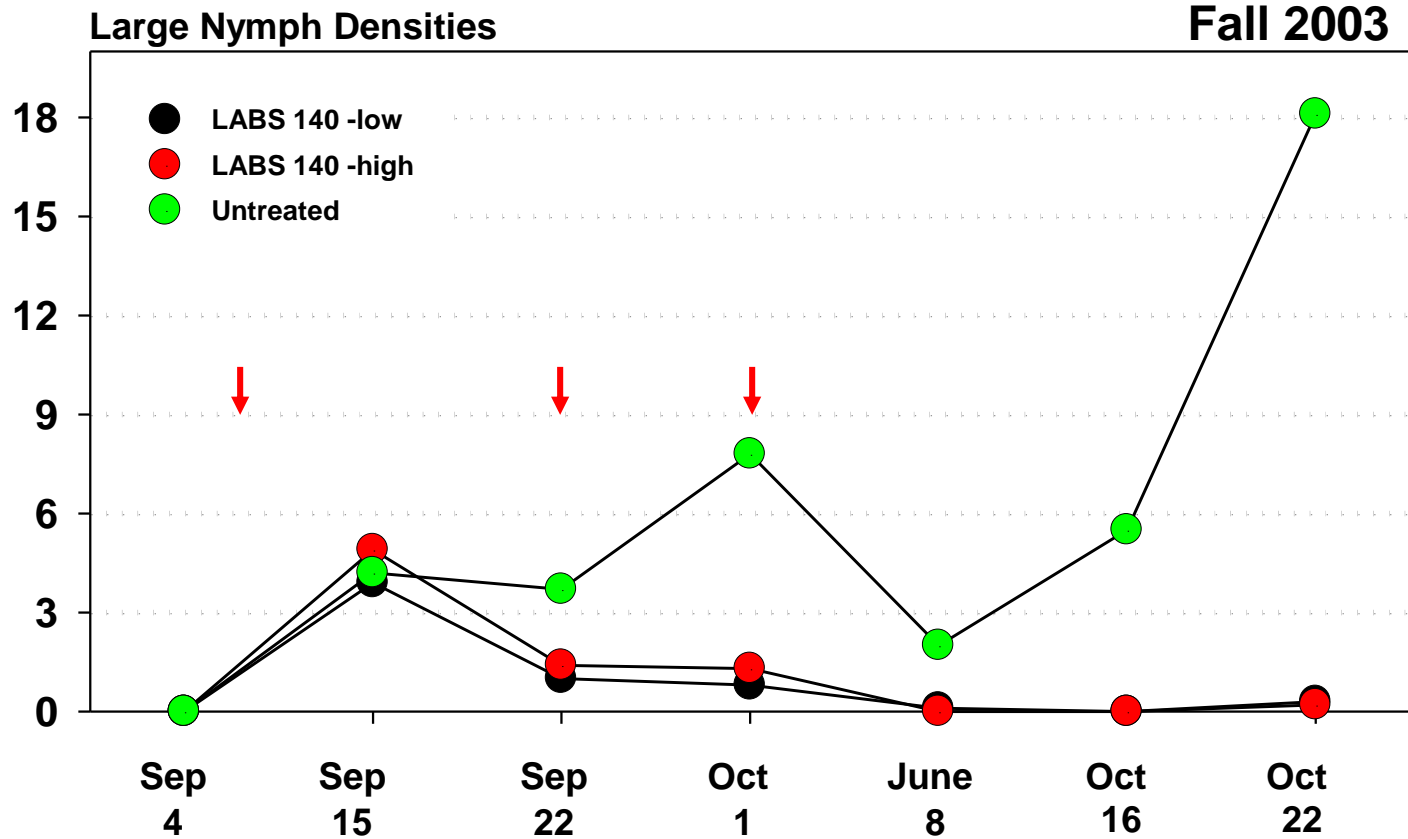
# PQZ 20 SC



PQZ in 30 gpa final mix

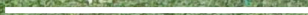
# LABS 140

- Unknown Chemistry
- Unique MOA
- Feeding Paralysis

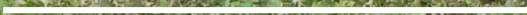


Fall 2003

Labs 140 (High)



Untreated  
Check



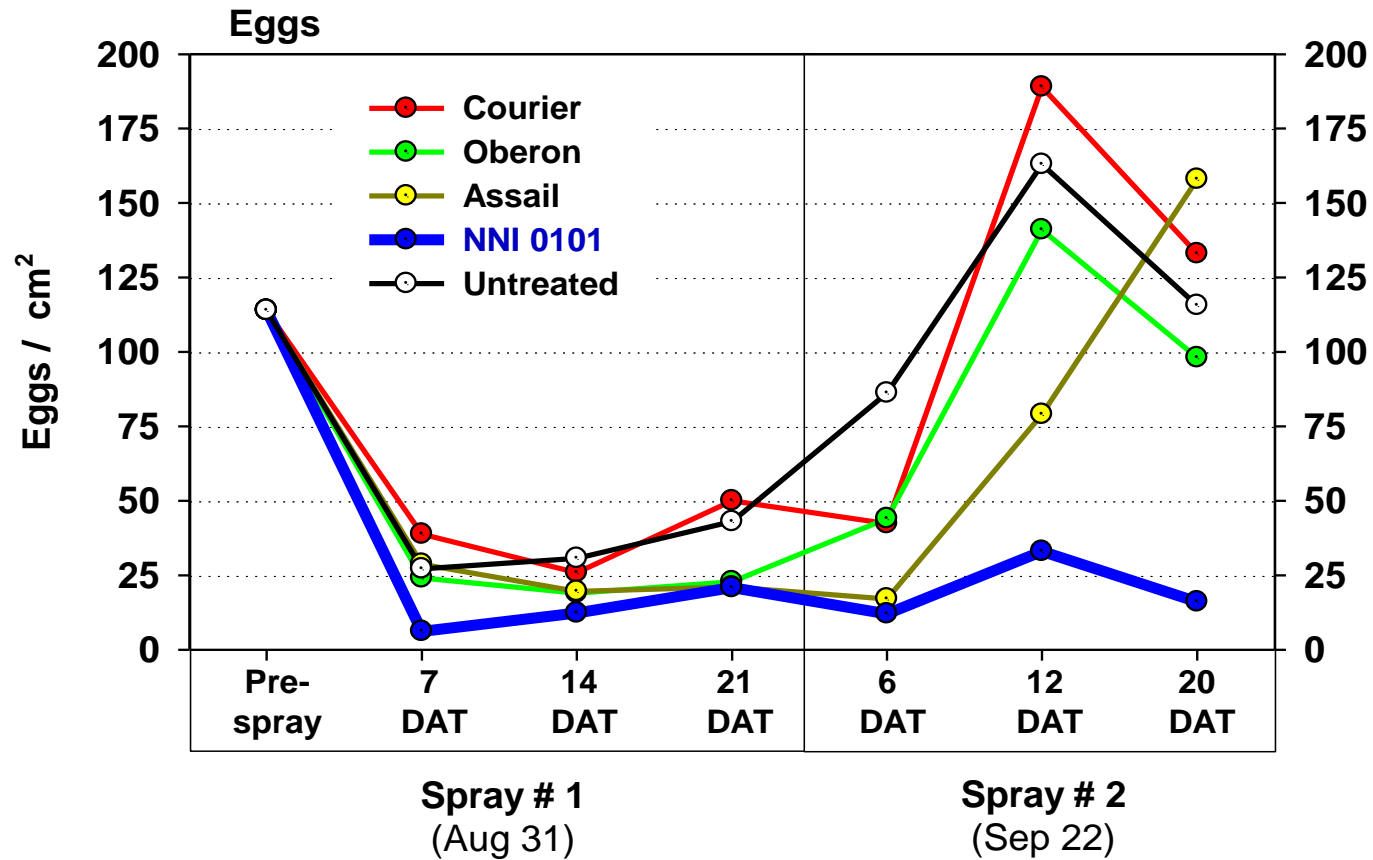
Labs 140 (Low)





# NNI-0101 Performance in Fall Melons

Yuma Agricultural Center, 2005



Fall 2005

NNI - 0101

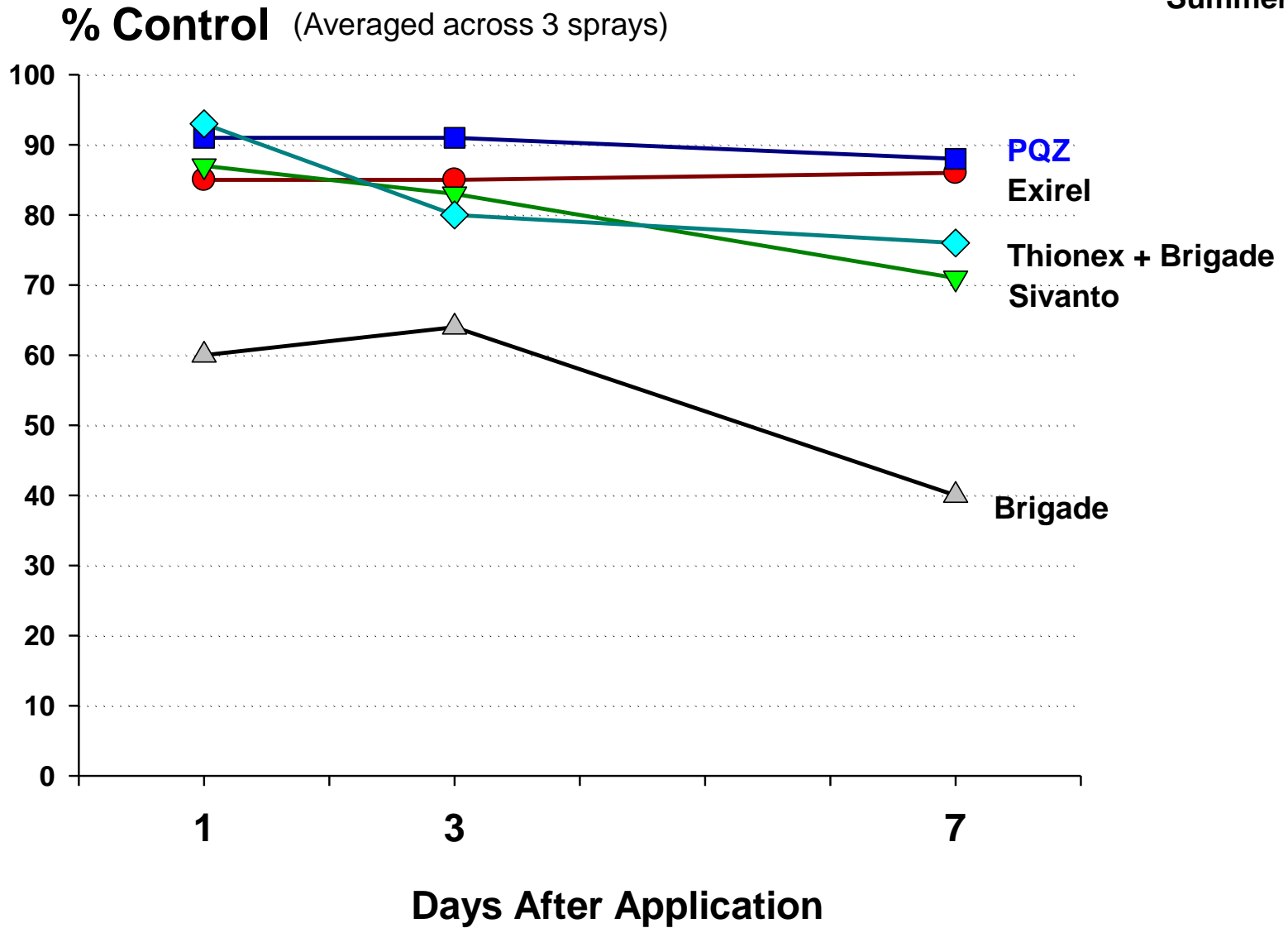
Assail

Untreated



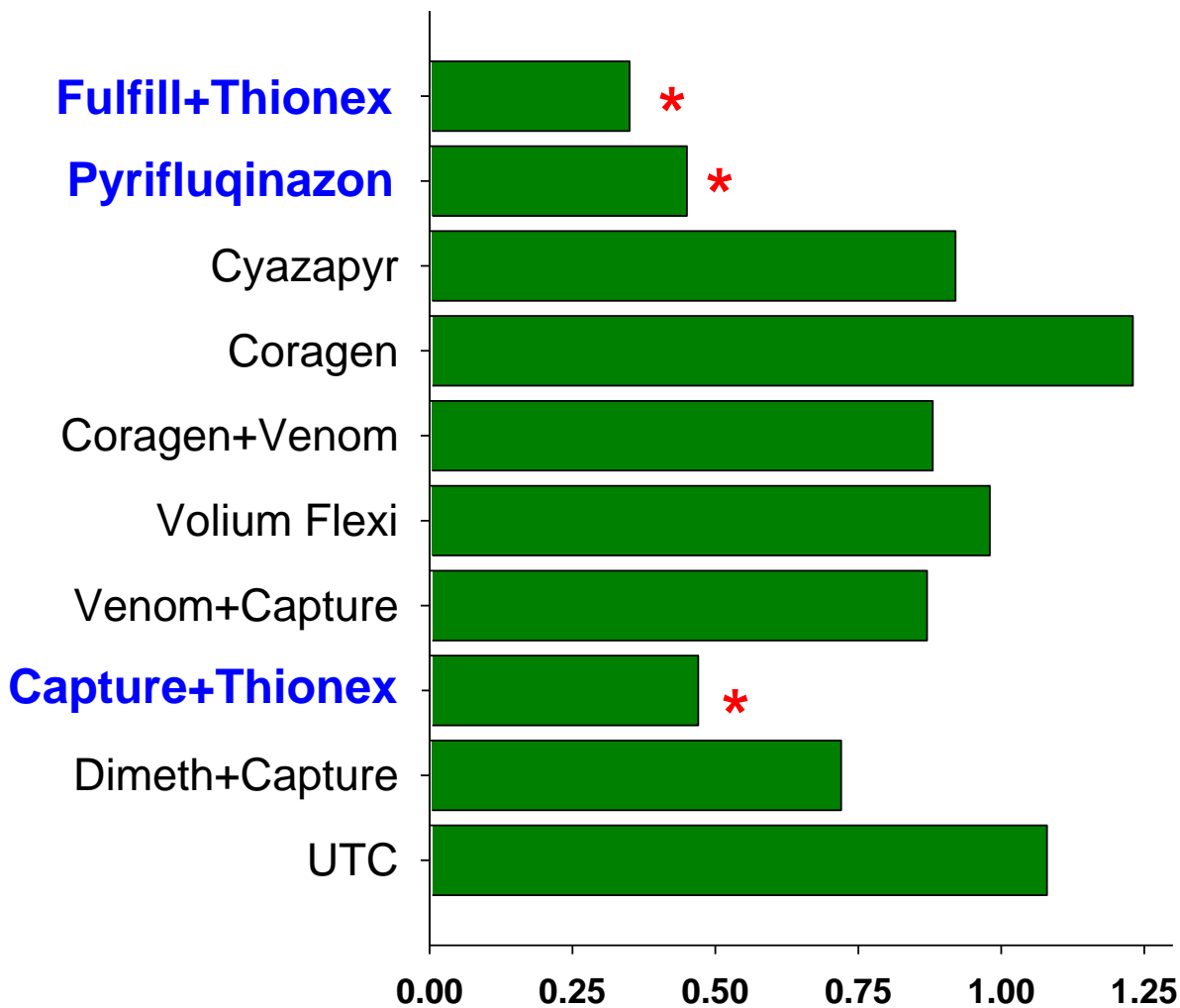
# Experimental Insecticides for Whitefly Adult / CYSDV

Summer 2008



# Foliar Insecticides on Whitefly Adults – Summer Trial -2009

**CYSDV Incidence**  Symptomatic leaves / row ft



July 1



**\***  
**Significant reduction**  
**~ 60-65%**

2013

**PQZ**

**Assail**

**Untreated check**



2013



**PQZ** →

← **Venom**

← **Endigo**

← **Non-treated**

# PQZ Performance

2008-2017



Product	Trials	Sprays
Capture + Thiodan	3	9
Assail	11	33
Exirel	17	46
Venom	17	48
PQZ	21	60

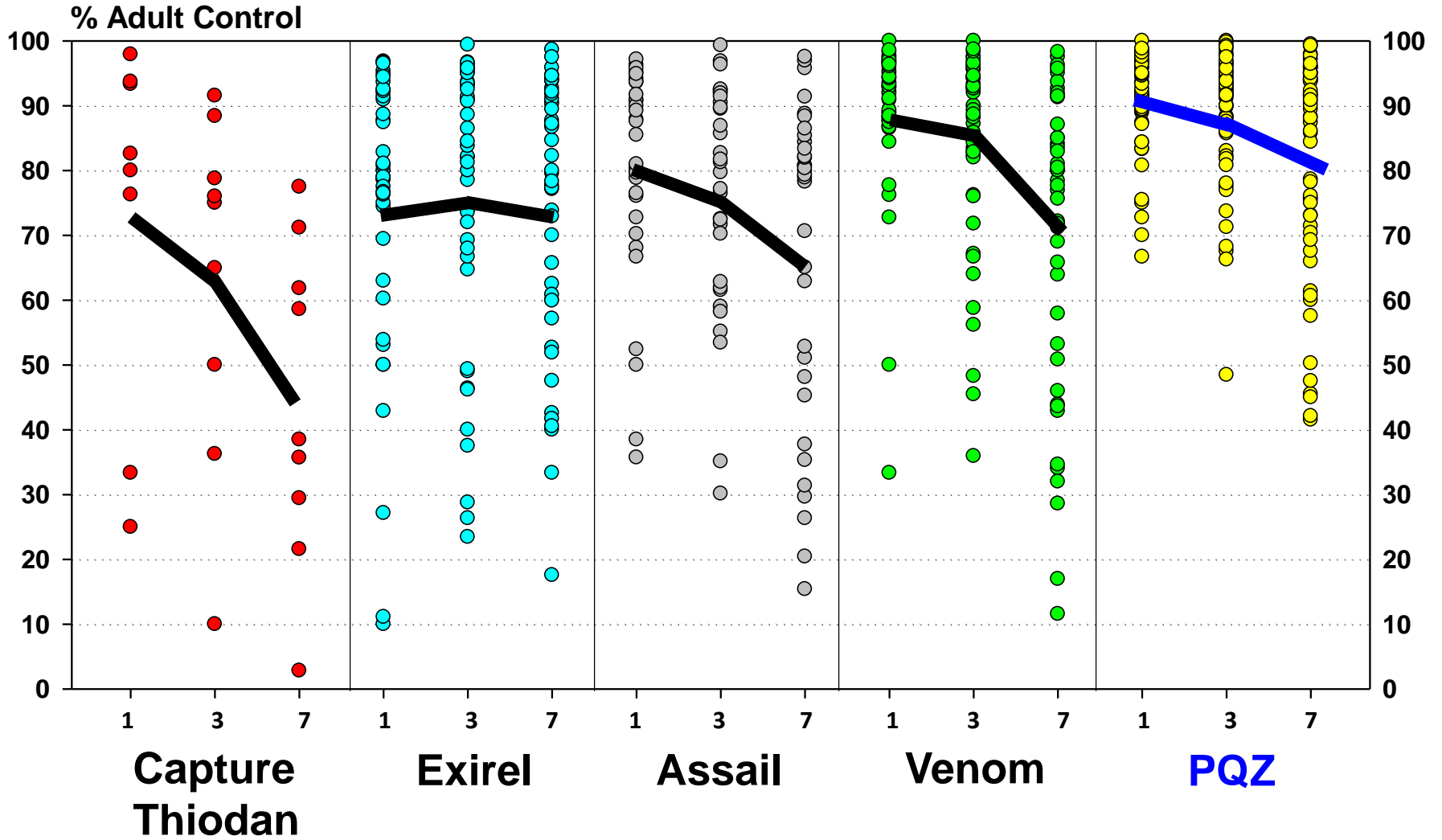
## Experimental Design

- Replicated plots: 1 bed \* 45 ft
- Foliar sprays: 20 - 25.5 gpa / 50 psi

## Assessments

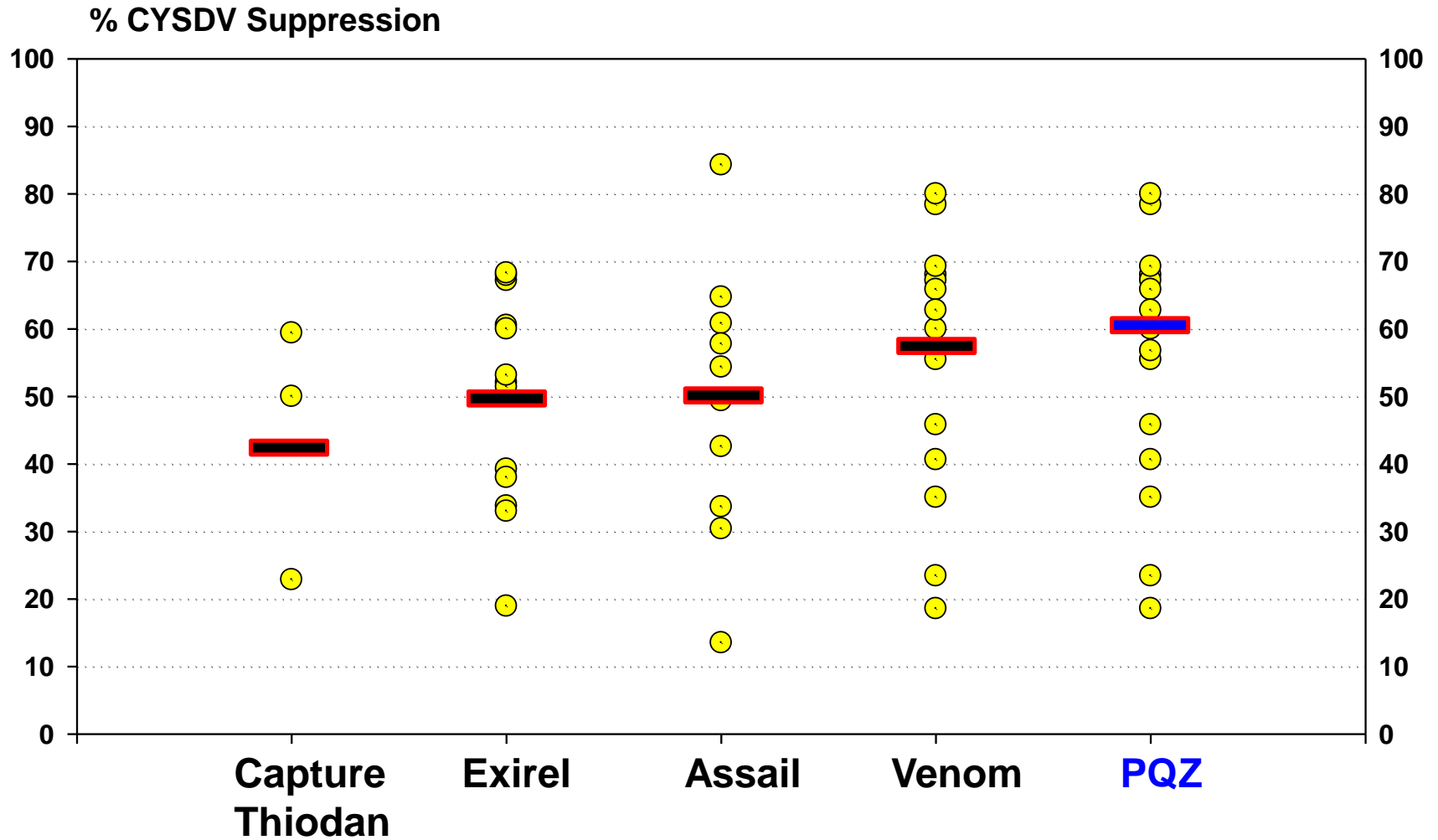
- Adult whitefly abundance
- 1, 3 and 7 DAA
- Vacuum sample
- CYSDV Incidence

Spring /Fall 2008-2017





Spring /Fall 2008-2017



# WF /CYSDV Management Program



## Soil, systemic insecticides

- *Venom /Scorpion*
- *Sivanto*

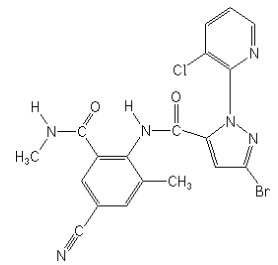
## Aggressive foliar regime

- *Assail*
- *Venom / Scorpion*
- *Exirel*
- ***PQZ***
- ***Sefina***



# PQZ

## Pyriproxyfen (Labs 140, NNI-0101)



Insect efficacy in small plot trials  
Yuma Ag Center, 2003-2017

### Sucking Insects

Pest	IPM Standards	Comparative Efficacy
Whiteflies – Adults / Nymphs	Exirel, Movento	A
Whiteflies – CYSDV	Venom, Exirel	A
Aphids	Movento	A
Citrus thrips	Delegate	A

- A** As good as the standard
- B** Not as good as the standard
- C** Not economically effective

**ARIZONA**



**VEGETABLES**