



# Sustainable Solutions For Agriculture

Peter Bierma

[www.sym-agro.com](http://www.sym-agro.com)

# CINNERATE

Broad spectrum, contact foliar fungicide & miticide.

For the effective control for a variety of diseases and mites



# CINNERATE



## Features:

- Fast Acting knock down pest control
- Non phytotoxic
- High efficacy at low use rates
- **No** sulfur restrictions (can use with, before, or after sulfur applications)
- Cost Effective
- For conventional & organic use

# CINNERATE



## Features:

- 25B Exempt Pesticide –
  - Minimum risk pesticides that meet certain criteria are exempt from EPA federal registration
- Organic Listed
  - USDA NOP Organic
  - OMRI listed Organic
  - WSDA Listed Organic

# CINNERATE



## Labeled Uses:

- **Contact fungicide:**
- Powdery mildew / Botrytis / Rust
- **Miticidal activity:**
  - Adults / Juvenile / Eggs (**ovicide**)
- **Scale Control** – affects armored females & crawlers
- **Activity on the following:**
- Aphids, Sharpshooter Aphids, Leafhoppers, Whiteflies, Thrips , Lygus Bugs, Stink Bugs, Box Elder bugs , Tomato Pin Worm, Cabbage Looper, Fruit Worms , San Jose Scale, Alfalfa Weevil Larvae, Armyworm , Mealy bugs, Gape Berry Moth, Walnut Husk Fly Adults, Apple Maggot, Peach Twig Borer, Codling Moth

# CINNERATE



Cinnerate purified cinnamon oil emulsified with potassium oleate

## ACTIVE INGREDIENTS:

Cinnamon Oil . . . . .60.0%

OTHER INGREDIENTS: ..... 40.0%

Potassium oleate

TOTAL: .....100.0%

## What is Cinnerate ?

- Cinnamon Oil contains Cinnamaldehyde an organic aromatic aldehyde compound that is best known for giving cinnamon its flavor and odor
- In plants, volatiles show anti-microbial and anti-herbivore activity,
- It is believed that they are a defensive component to protect plants from enemies

# CINNERATE

## What is Cinnerate ?

- Cinnamaldehyde is well documented to be effective as a contact insecticide, nematocide, miticide or fungicide, when applied to the plant surface as a spray.
- Numerous trials under laboratory conditions and in-field use, validate its efficacy.



# CINNERATE

## Previous Cinnamon Pesticides

- The high volatility and potential phytotoxicity of cinnamon oil led to limited use of previous cinnamon oil pesticides.
- This was complicated by high use rates & fairly high cost per treated acre.
- High efficacy was often obtained on diseases and mites.

# CINNERATE

## How is Cinnerate Different?

- Cinnerate uses refined Cinnamon oil
  - Reducing the impurities which can lead to phytotoxicity.
- Cinnerate utilizes potassium oleate as an emulsifier.
  - Slowing down the volatility of the aldehyde
  - Increasing the “active time” on the plant surface
  - Improves spreading on the plant surface for better efficacy

## Concentration is Key

The concentration of the spray solution is critical

- This is what determines the proper dose for pesticidal activity on the treated surface.
- Labelled rates are NOT rates per acre BUT the rate per 100/ gallons of water!
- Spray solution per acre can be determined by volume required for complete coverage.

# CINNERATE

**Low Impact on Beneficial's: below illustrates a rating of harmless (< 25% reduction of egg, larvae or adults)**

<b>bumble bee</b> - Bombus sp. (abejorros)	<b>parasitic wasp</b> - encarsia formosa
<b>predatory mite</b> - amblyseius californicus	<b>parasitic wasp</b> - aphidius spp.
<b>predatory mite</b> - amblyseius cucumeris	<b>green lacewing</b> - chrysoperla carnea
<b>predatory mite</b> - amblyseius swirskii	<b>lady bug</b> - coccinellidae (mariquitas)
<b>predatory midge</b> - aphidoletes aphidimyza / feltiella acarisuga	<b>leafminer parasite</b> - dacnusa sibirica / diglyphus isaea
<b>hoverfly</b> - episyrrhus balteatus (sírfidos)	<b>predatory mirid bug</b> - Macrolophus caliginosus / nesidiocoris tenuis
<b>whitefly parasite</b> - eretmocerus spp.	<b>minute Pirate Bugs</b> - orius spp.
<b>predatory mite</b> - phytoseiulus persimilis	<b>predatory mite</b> - typhlodromus pyri (viñedo y frutales)

# CINNERATE

*CINNERATE vs. Powdery mildew*

*Cinnerate Mode of Action on diseases?*



Disrupt the permeability barrier of cell membrane

Inhibits the formation of germ tubes and mycelia growth

Break the sporulation (dehydration & eradication)

## *How does Cinnerate work?*

**Curative**: CINNERATE inhibits the mycelium development and prevents the conidia germination. The result is the eradication of the fungal attack, and preventing its spread.

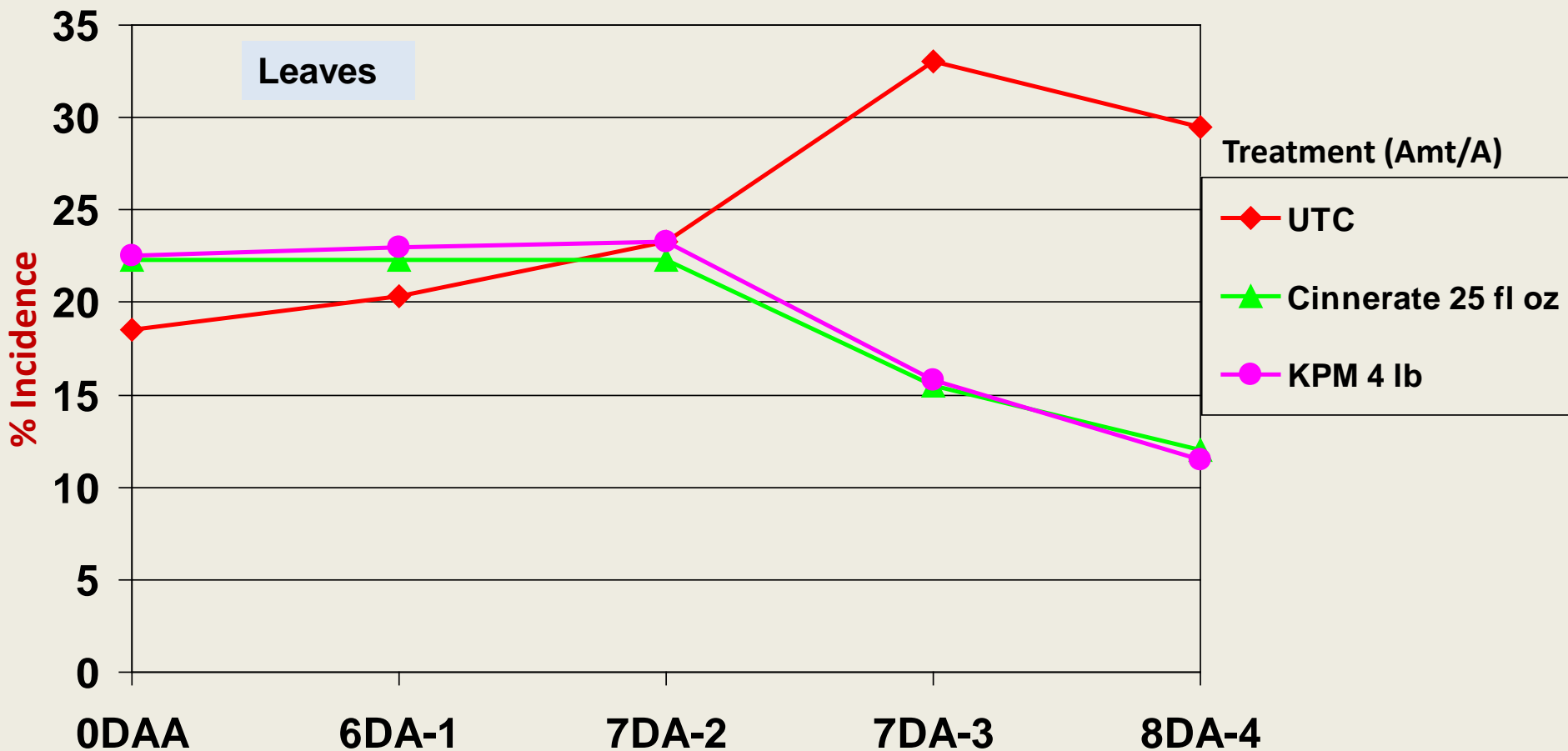
**Eradicant**: CINNERATE affects mitochondrial oxidative phosphorylation and induces profound changes in the enzymatic activity of the cell membrane of the pathogen, which causes its dehydration and resulting in the disappearance of foliar symptoms.

**CINNERATE inhibits growth, colonization and penetration of the mycelium and spores** of the pathogen into the plant tissue.

# Cinnerate and KPM in Grapes

Control of Powdery Mildew (*Erysiphe necator*) - 2012

Brooks Bauer, TWO BEES CONSULTING, Escalon, CA

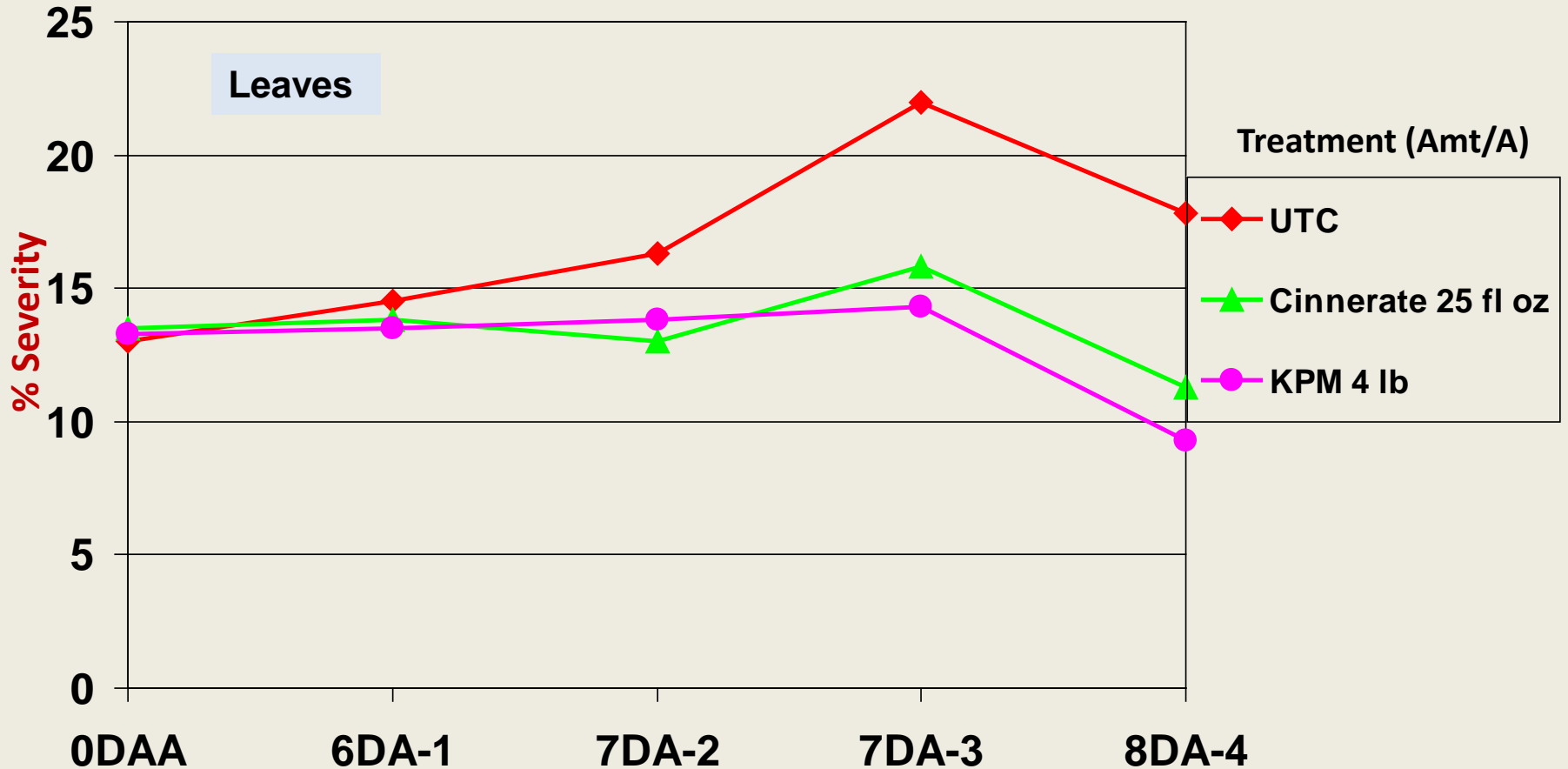


Escalon, CA; Grape (var. 'Cabernet Sauvignon'); Sprayed on 7/31, 8/7, 8/14 and 8/21/12 at 118 GPA;  
Application made by backpack mist blower; **No phytotoxicity was observed in any of the plots.**

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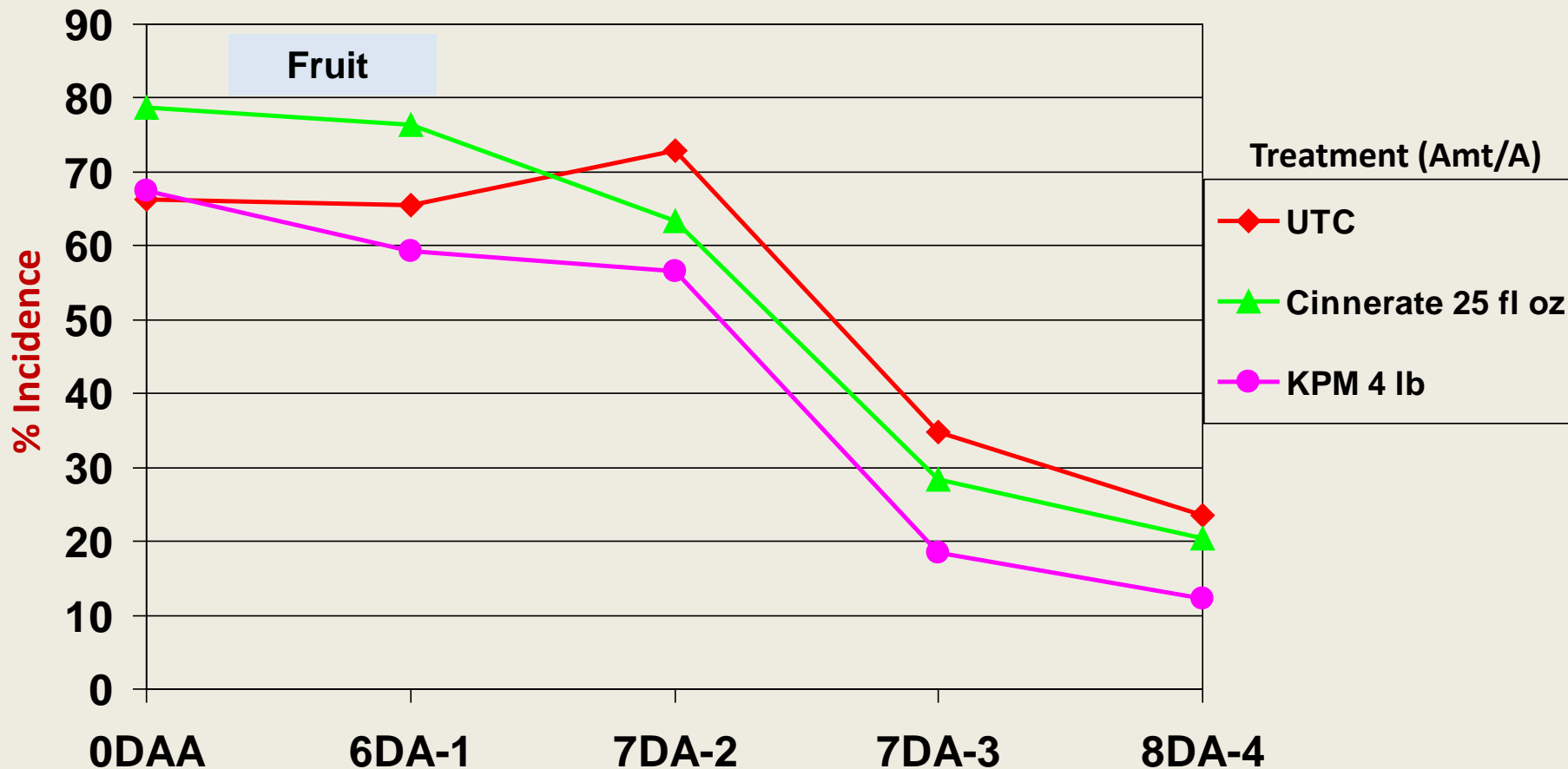
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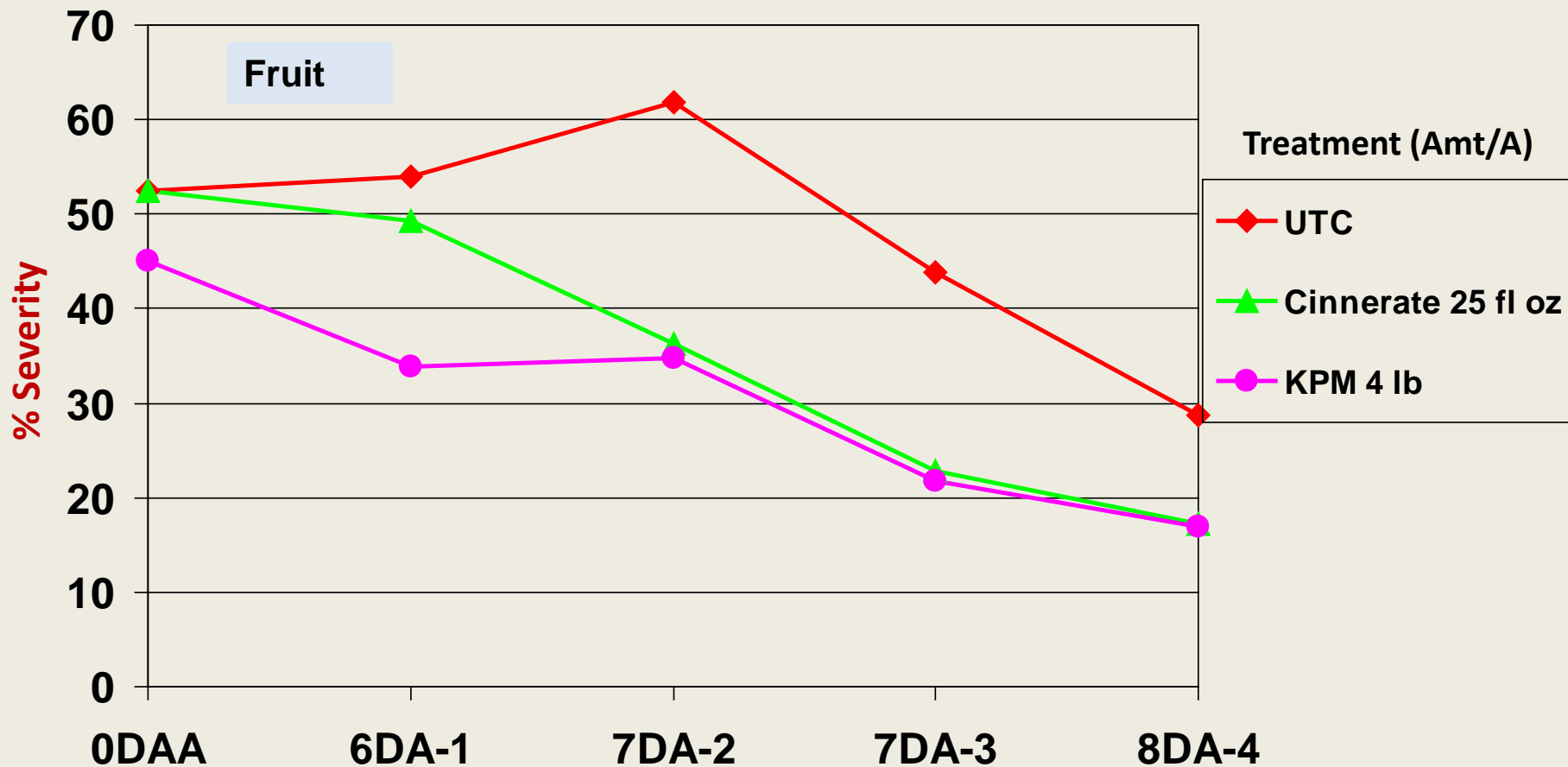


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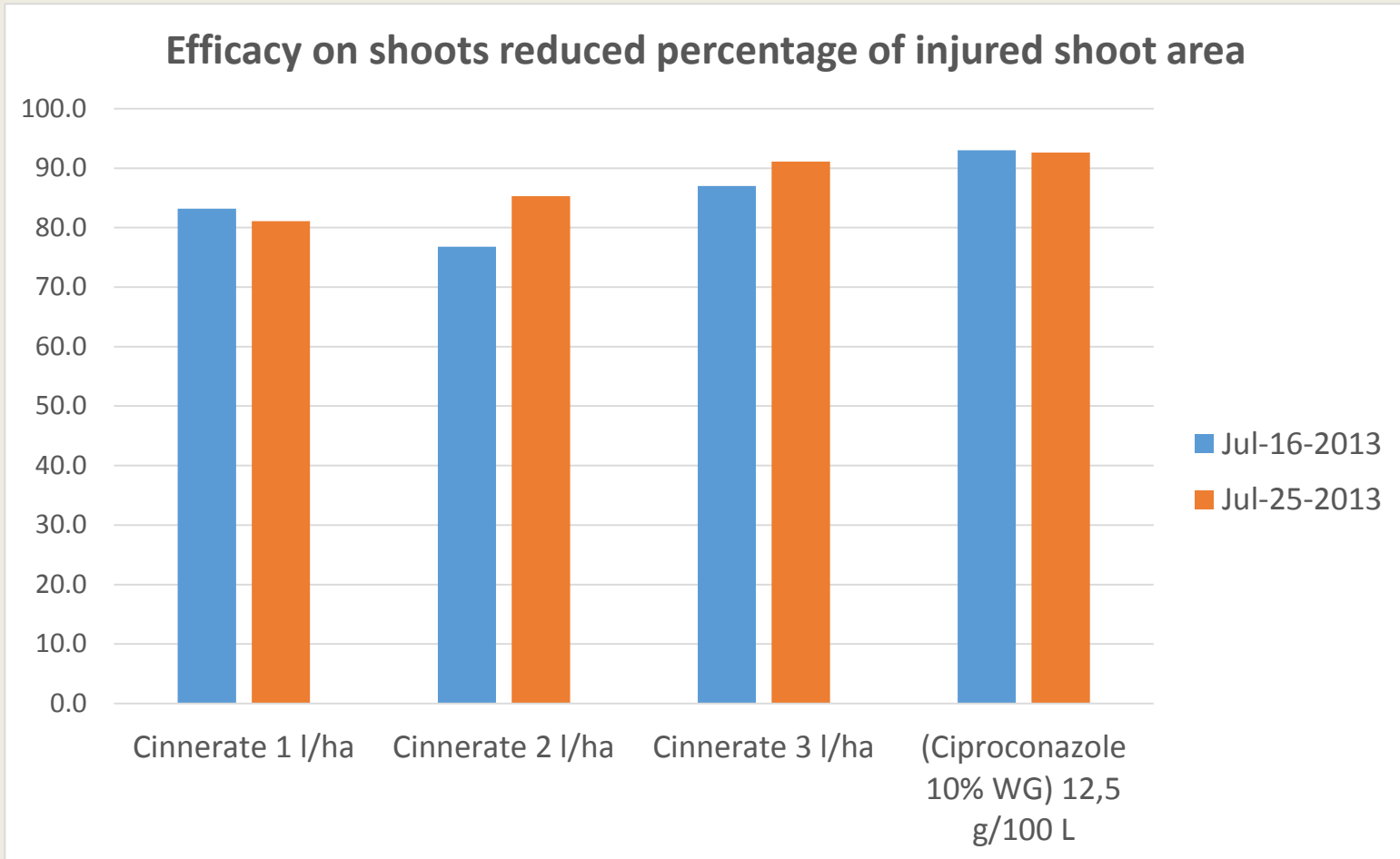


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# CINNERATE vs. Powdery mildew



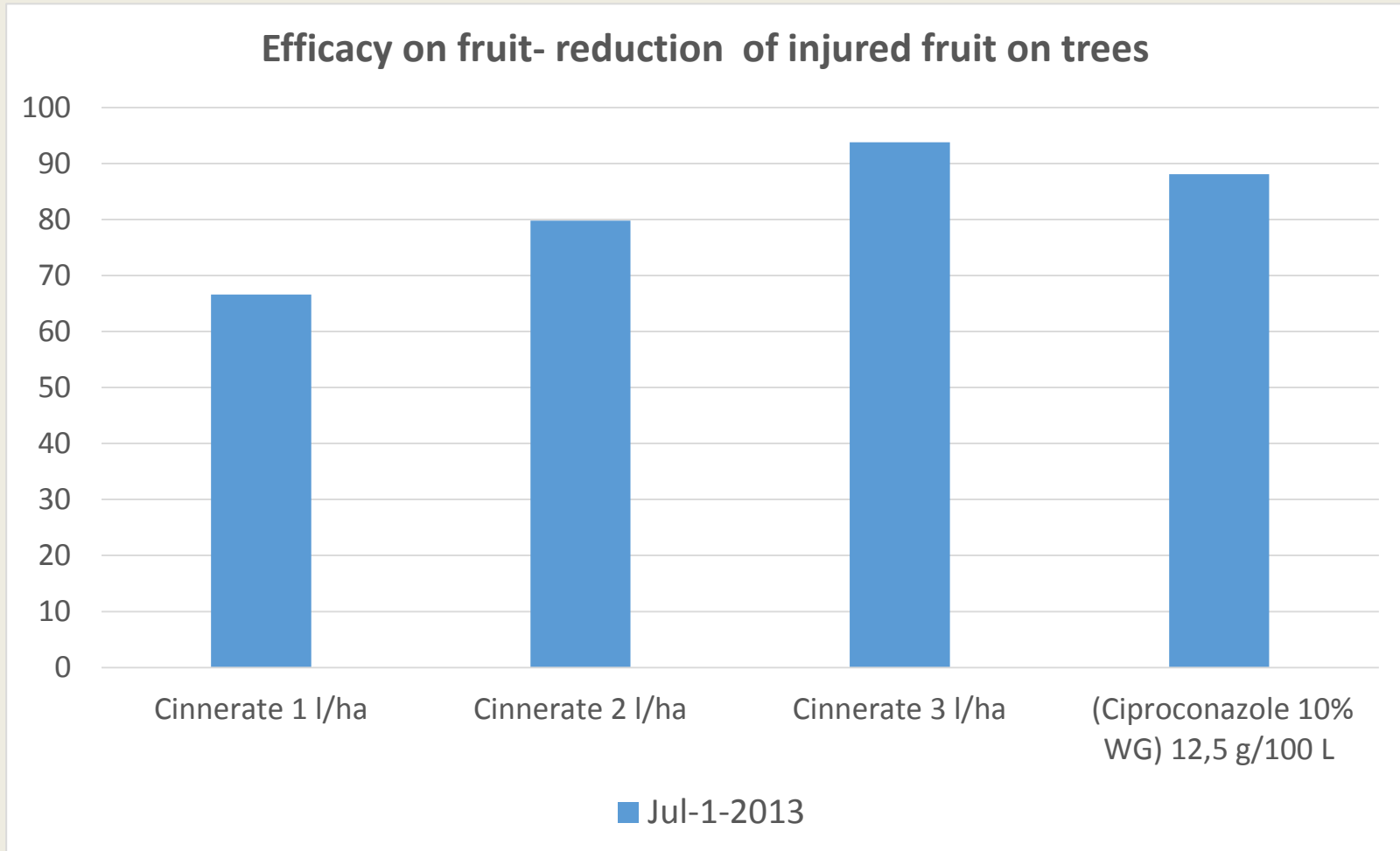
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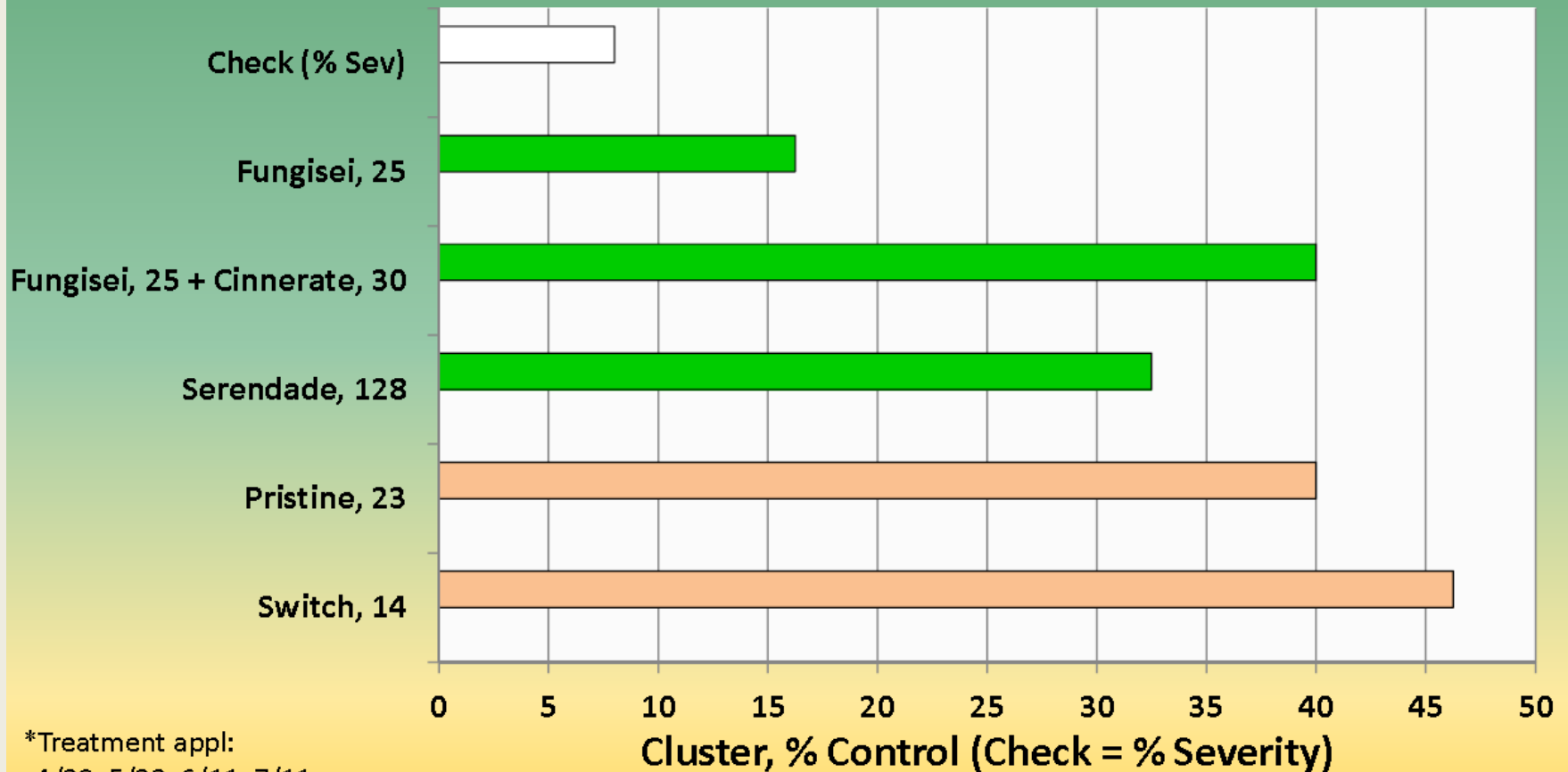
# Trial F2014-LF05-01 Grape Soft Berry, post-harvest

## Red Globe Table Grape, Mendota, CA

(physiological raisining)

Product, Rate (oz/ac) \*

■ 10/31 (post-harvest)



\*Treatment appl:  
4/29, 5/22, 6/11, 7/11

# CINNERATE

*CINNERATE vs. Mites*

## ***MODE OF ACTION***

**CINNERATE** acts by contact:

Causing **death by asphyxiation** of the insect;

**Sealing the spiracles**;

**Altering the nervous system.**

## **OVICIDE**

**kills mite eggs on contact**

An **alternative to mineral oils** and conventional miticides.

Provides **repellency** effect to slow return infestations.



# CINNERATE

*CINNERATE vs. Mites*

## *MODE OF ACTION*



Altered Nervous System



Softens the exoskeleton



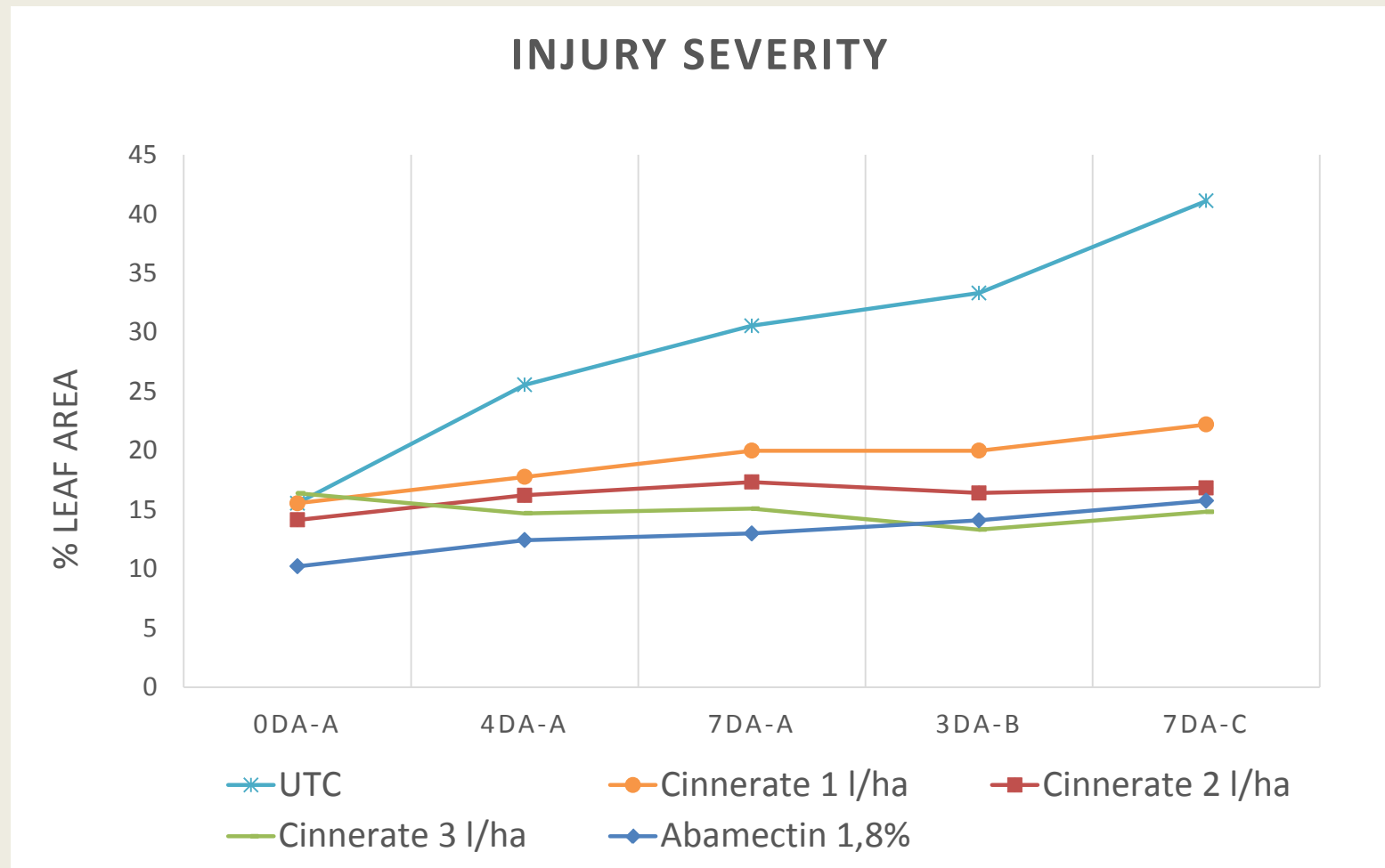
Promotes dehydration

# CINNERATE

CINNERATE vs. Mites



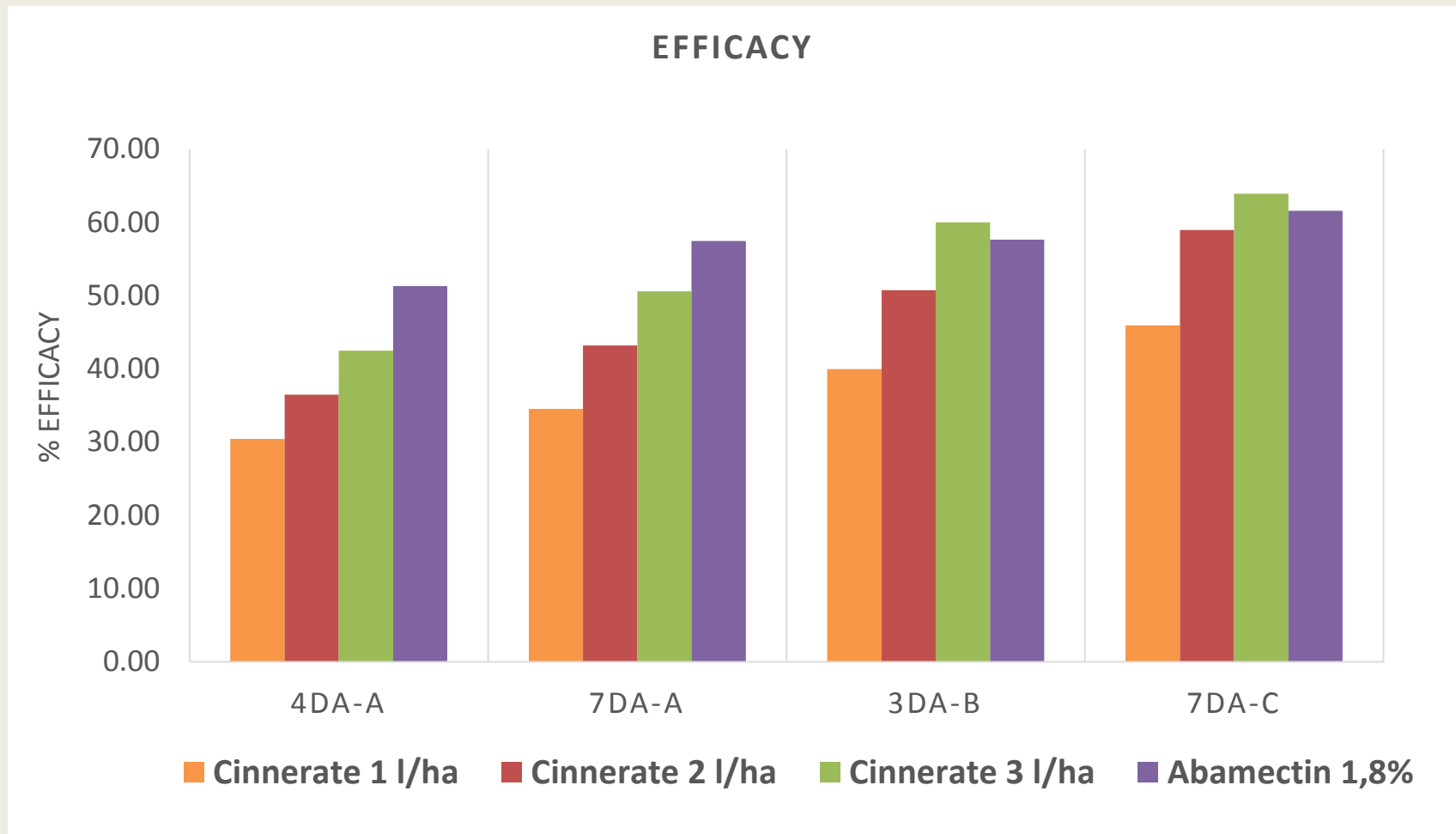
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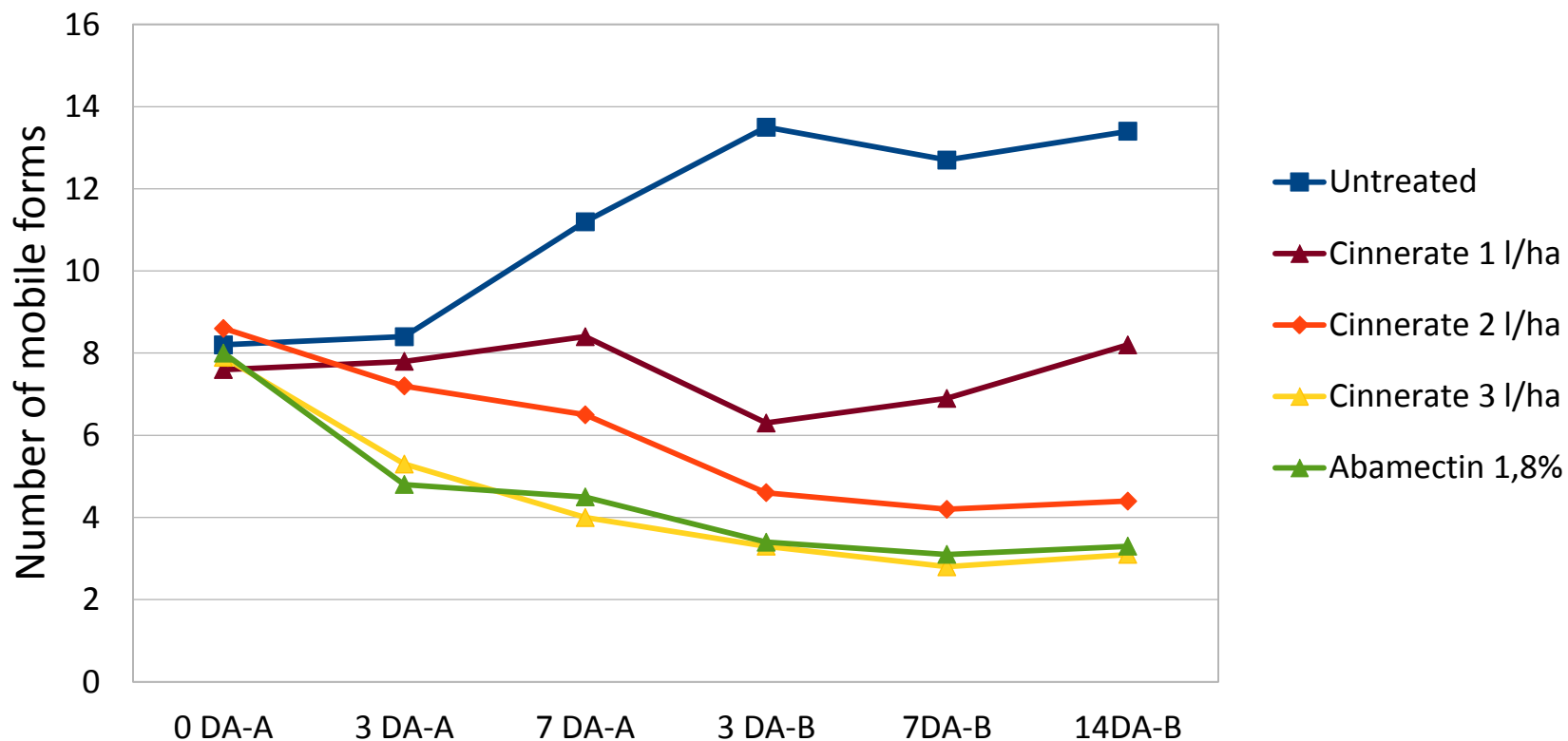
# CINNERATE

CINNERATE vs. Mites



Efficacy mites on Beans (Spain): 4 applications, interval 7 days

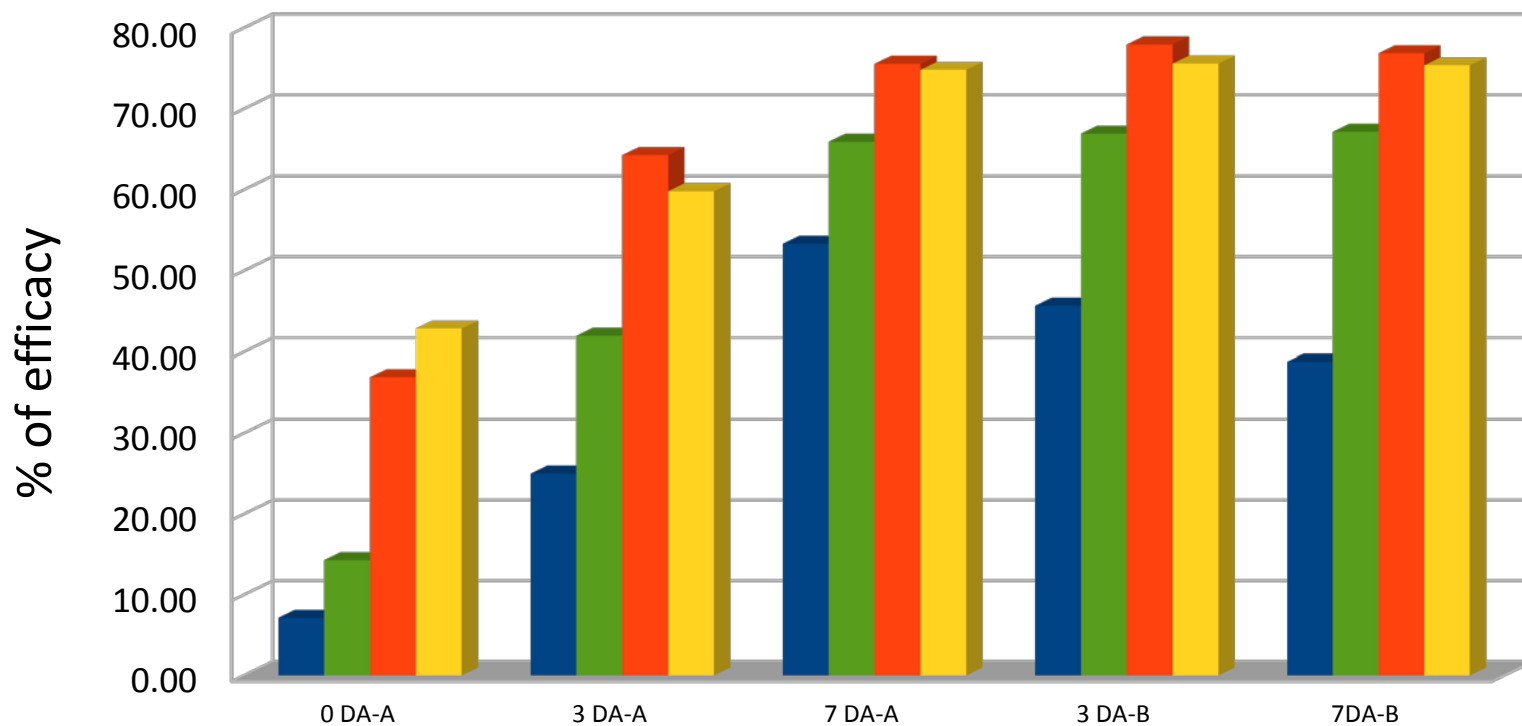
NUMBER OF MOBILE FORMS PER LEAF





Efficacy **mites on Beans** (Spain): 4 applications, interval 7 days

(%) OF MOBILE FORMS

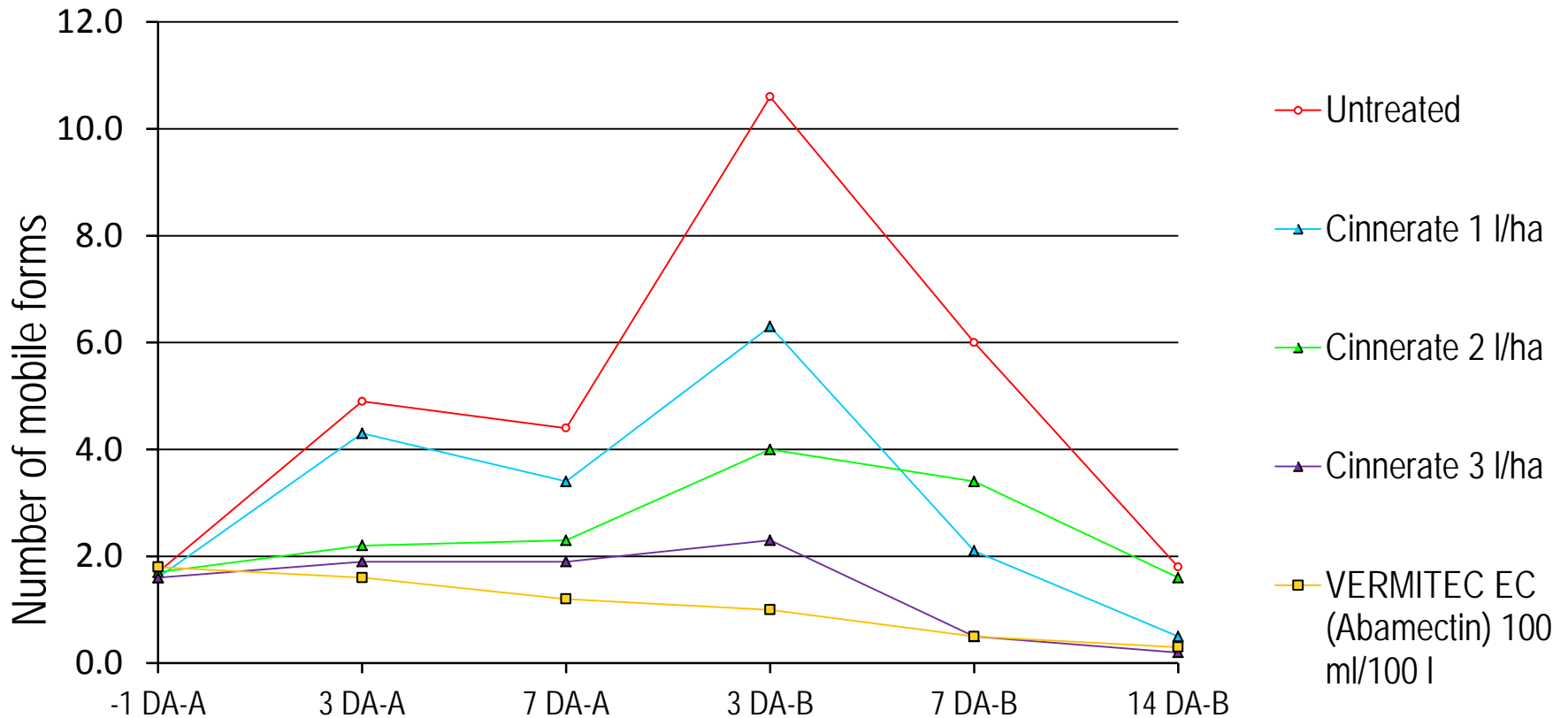


■ Cinnerate 1 l/ha ■ Cinnerate 2 l/ha ■ Cinnerate 3 l/ha ■ Abamectin 1,8%



Efficacy mites in strawberry (Spain): 2 applications, interval 7 days

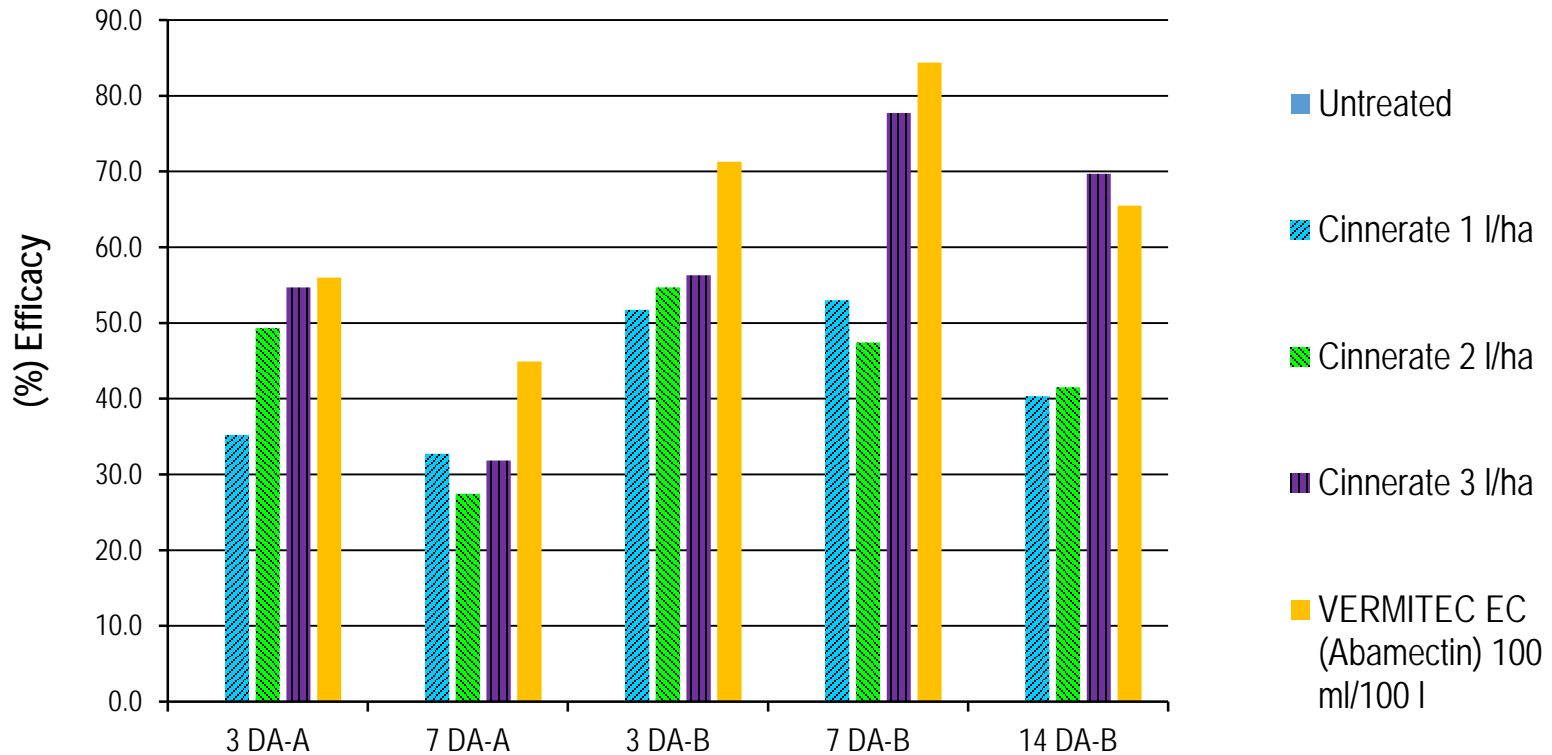
Graph I. number of mobile forms per leaf





Efficacy on **mites in strawberry** (Spain): 2 applications, interval 7 days

Graph II. Henderson-Tilton (%) mobile forms



# CINNERATE

## Summary Efficacy Trials

### ✓ **Powdery mildew**

- Control on grapes is excellent
- Similar curative activity than Kaligreen

### ✓ **Field Experience:**

- Less oxidizing to plant & fruit surfaces than potassium bicarbonate
  - Reducing potential secondary disease entry on fruit
- Early season sanitation works well and cost effective due to the lower use rates of spray solution.

# CINNERATE

## Summary Efficacy Trials

### ✓ Mite Control

- 2015 commercial use showed knock down of adults 95% & 90% + ovicidal activity
- Populations stayed static for 10 day following treatments

### ✓ Field Experience:

- Excellent mite control in Strawberries, Hops, Almonds, Citrus and Grapes.
- High ovicidal activity achieved before heavy webbing.
- Beneficial insects remain in high number after post treatment

### ✓ General

- No phytotoxicity observed in hot weather with high rates

# CINNERATE

## Recommendations

- Apply as a knock down material in season
- Tank mix with other fungicides for an upfront knock down component
- Tank mix with mite pesticides / miticides to add knock down and ovicide activity
- Late season curative disease control
- Pre-harvest applications to reduce post harvest disease incidence.



# CINNERATE

## Recommendations

- Early applications provide a cost effective “clean start” for mites and disease.
  - Lower spray volume required for coverage reduces the cost per acre.
  - Combine with other fungicide & mite products early in the season for an alternative mode of action.

# CINNERATE

## RECOMMENDATIONS:

### **Pest: Powdery Mildew & Mites**

- ✓ **General Rate:** 13-35 fl. oz. of in 100 gallons of water.
- ✓ Apply 85 - 125 gallons of diluted solution per acre.
- ✓ Increase concentrations when disease pressure is high and reduce concentrations when disease is low.
- ✓ **Tank Mix - Mites:** Compatible with most pesticides
- ✓ **Temperature:** Avoid applications during the heat of the day - Apply in early morning, evening or night
- ✓ **Cost:** Grower Cost @ \$1.00/ oz

# CINNERATE



## TIMING:

- Early season treatments are most cost effective due to lower gallons required for coverage
- Coverage Is Essential
  - Works **best** when all plant tissue is thoroughly covered to reach all affected areas

# CINNERATE

## **Will my fruit taste like Cinnamon ?**

- The cinnamon aldehyde does not penetrate the surface of the treated plant material
- Typically the odor will volatilize away with in 12-14 hours

## **Will Cinnerate leave a residue on fruit?**

- The typical use rate is a .002 - .0027% spray solution so very little oil will be on the surface.
- The Cinnamon aldehyde component will volatilize away with in 12-24 hours