

# New Pesticides for Tree Fruit: Safer for Whom?

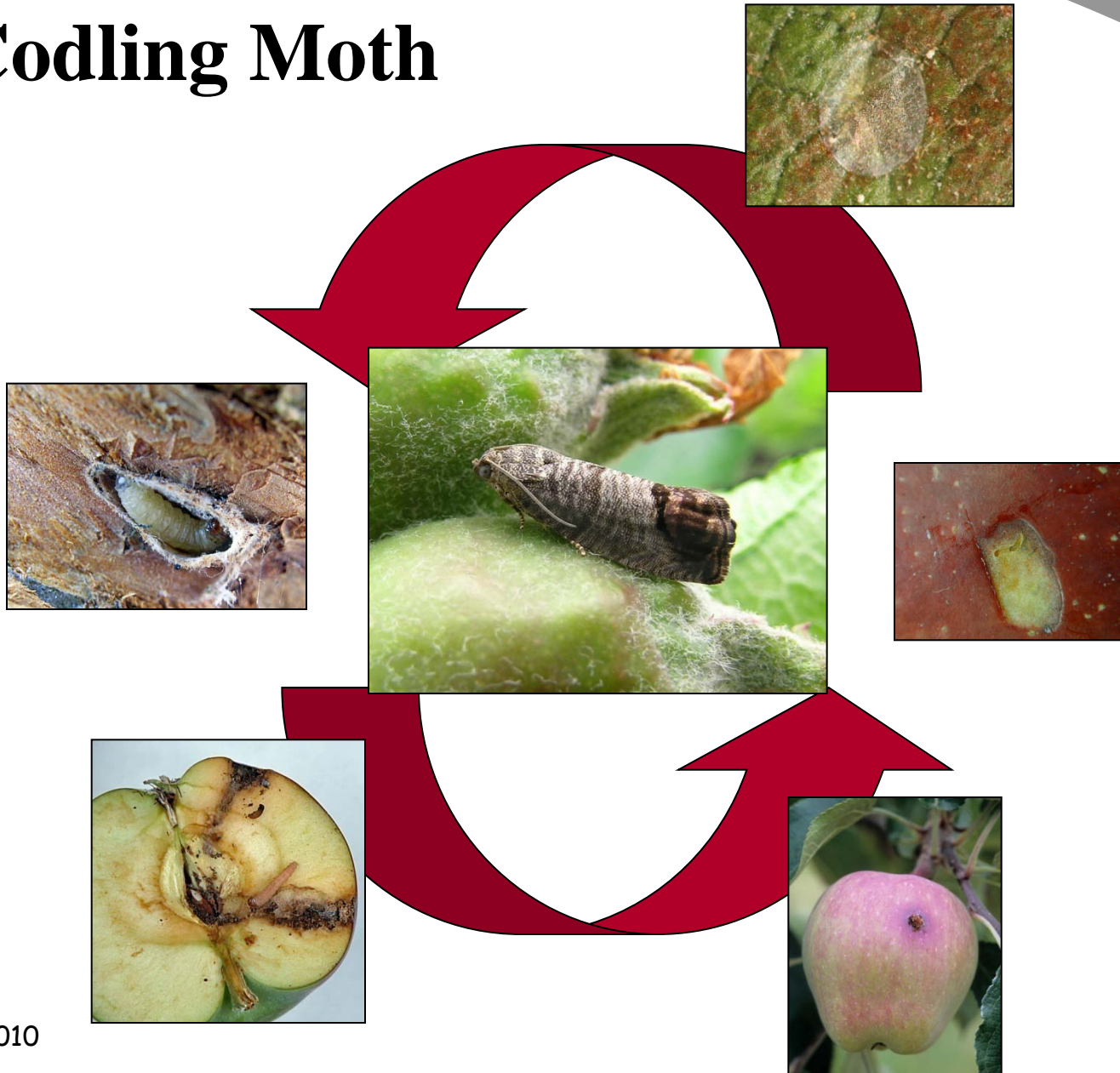
Pacific Branch, Entomological Society of  
America - 94<sup>th</sup> Annual Meeting  
14 April 2010  
The Grove Hotel, Boise ID

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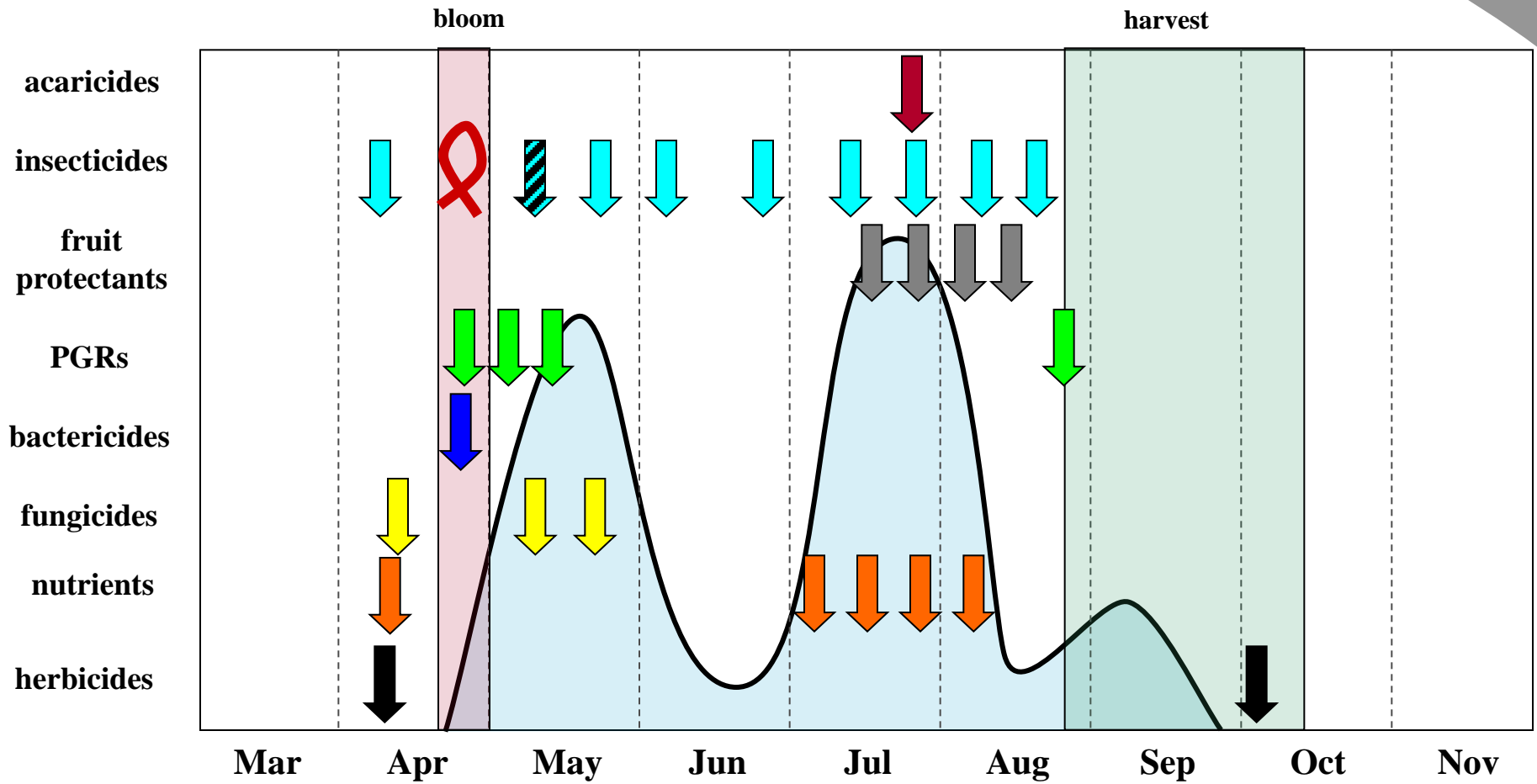
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**Tree Fruit Research & Extension Center**  
**1100 N. Western Ave.**  
**Wenatchee, Washington**



# Codling Moth



# Apple Spray Program



# New Orchard Pesticide to Replace Guthion (azinphosmethyl)

Pesticide	AI	Class	Targets
Assail	acetamiprid	Neonicotinoid	Codling moth, Heteroptera, thrips
Rimon	novaluron	IGR	Codling moth
Delegate	spinetoram	Spinosyn	Codling moth, pear psylla, thrips
Altacor	chlorantranil iprole	Diamides	Codling moth
Calypso	thiacloprid	Neonicotinoid	Codling moth, Heteroptera
Entrust	spinosad	Spinosyn (organic)	Leafrollers, codling moth, cherry fruit fly

## Spider mite predator-prey system



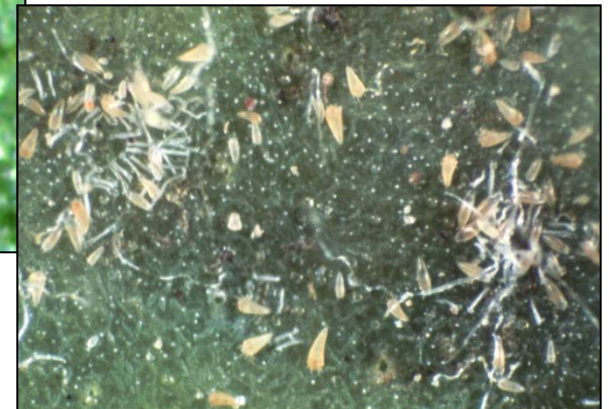
Twospotted spider mite  
*Tetranychus urticae*



Western predatory mite  
attacks European red mite  
*Galendromus (Typhlodromus) occidentalis*  
*Panonychus ulmi*



Mcdaniel mite  
*Tetranychus mcdanieli*



Apple Rust Mites  
*Aculus schlechtendali* Nalepa



# Woolly Apple Aphid



# Why the comeback?

- **Disruption of biological control**
- **Substitution of broad spectrum for narrow spectrum**





# Testing Nontarget Effects

## Leaf Disk “Microcosm”



E. Be

## Potted plant “Mesocosm”



## Field Trial “Macrocosm”





## *G. occidentalis* – Lethal & Sublethal

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- **Mortality**

- Adult females – contact, residues
- Larvae – contact

- **Prey consumption (females)**

- **Fecundity (females)**

- **Egg viability + larval survival**

- **Repellency (females, residues)**

- **Persistence (lab-, field-aged bioassays of residues)**



# **Altacor**

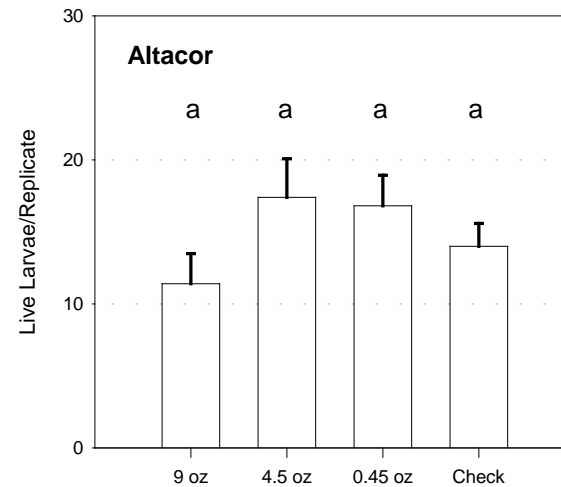
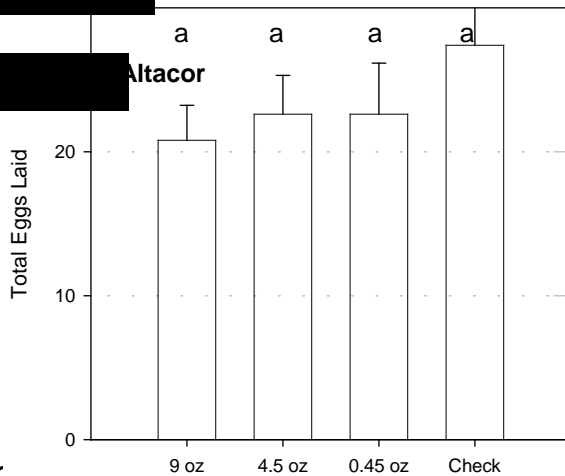
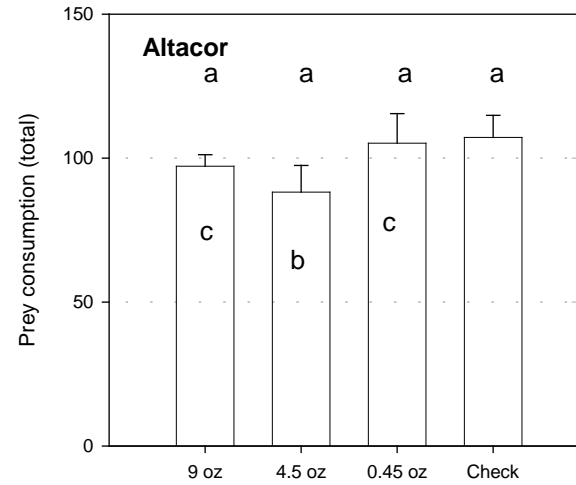
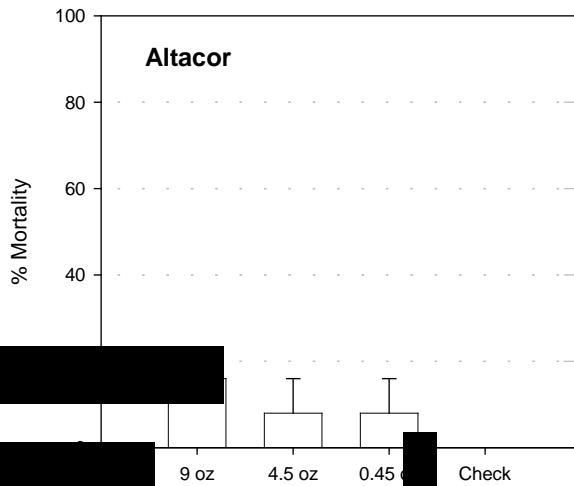
**chlorantraniliprole**

**diamide; ryanodine receptor**

**inhibitor**

# Prey Consumption Bioassay

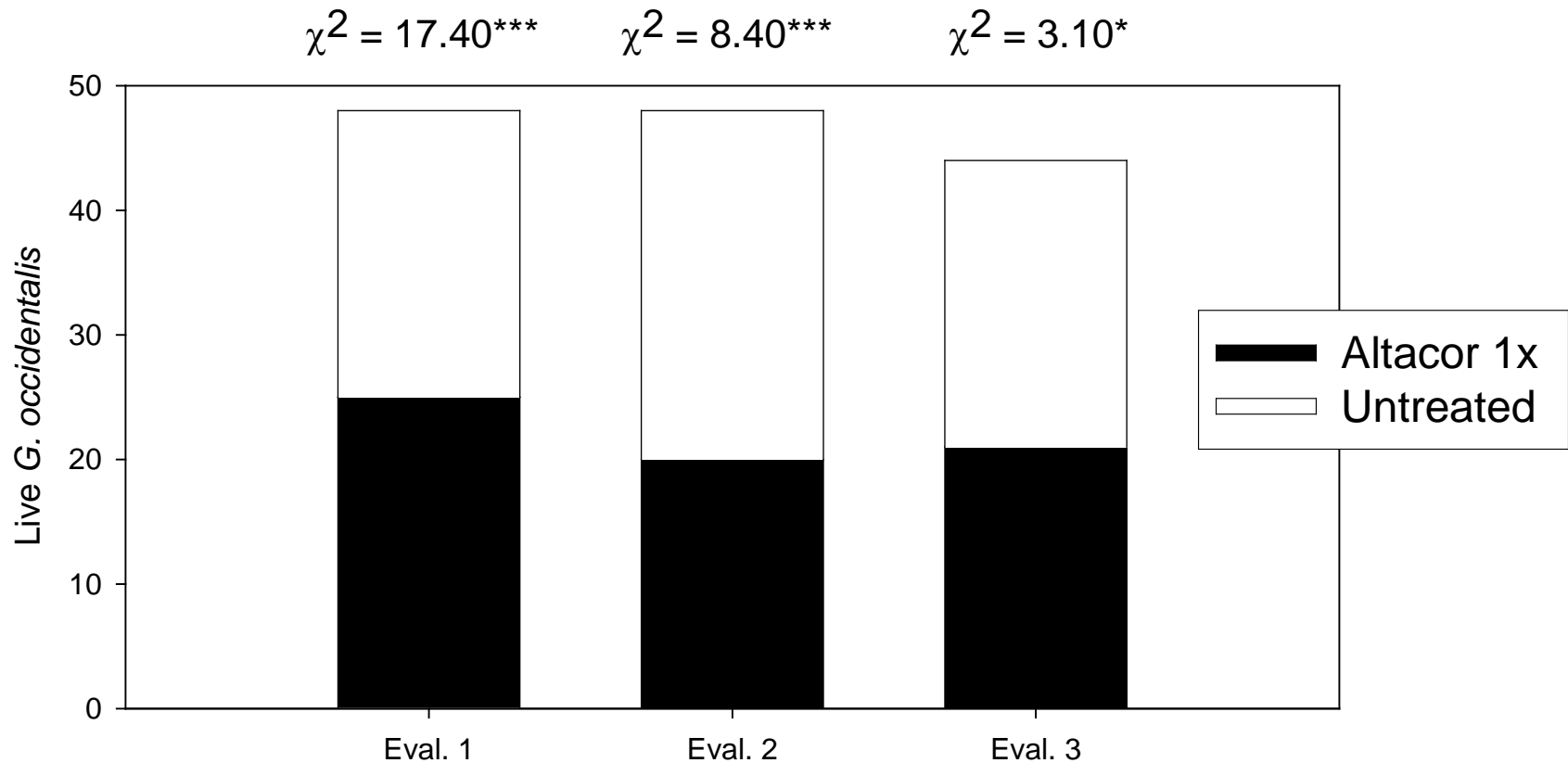
## Altacor





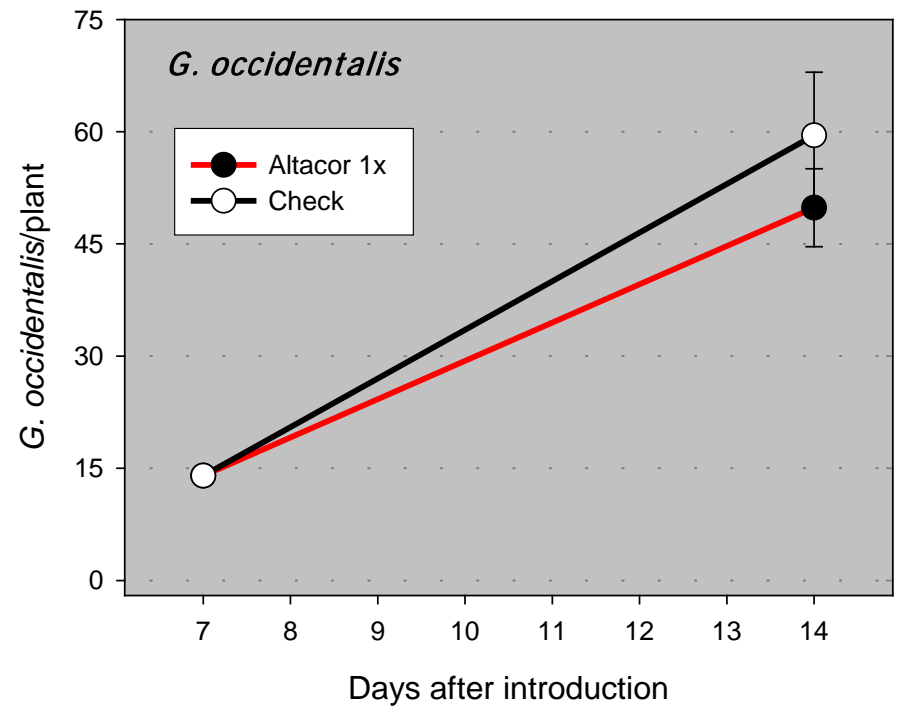
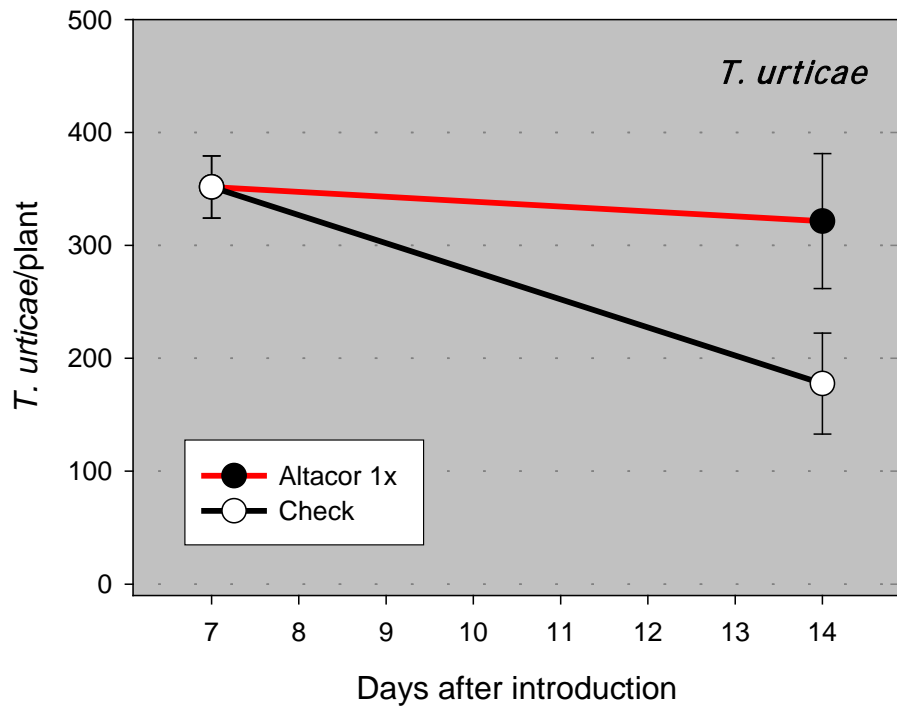
# Typh Repellency Bioassay

## Altacor



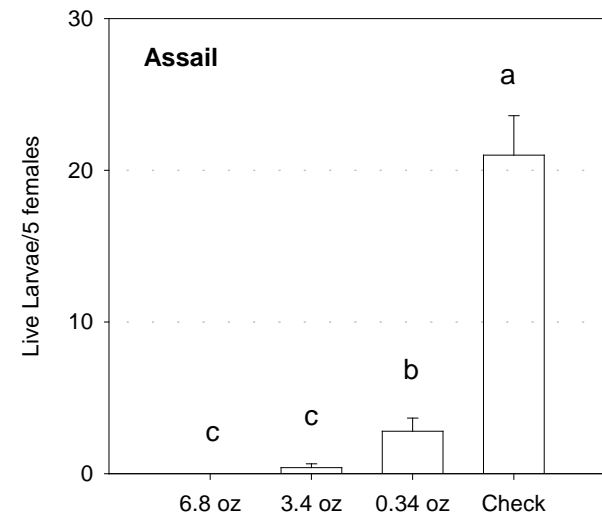
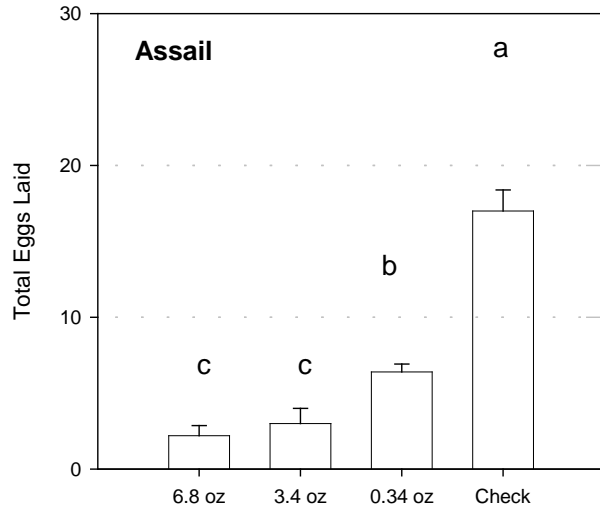
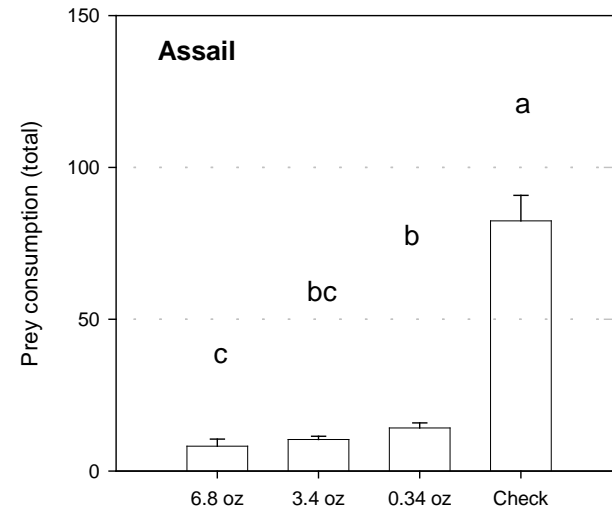
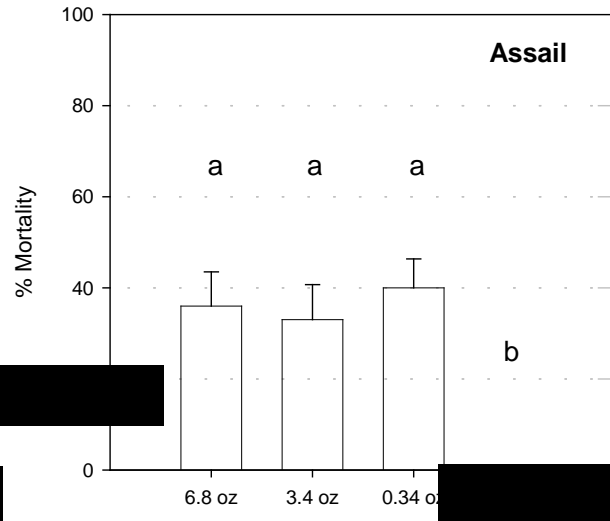
# *G. occidentalis* Mesocosm Bioassay

## Altacor



# Prey Consumption Bioassay

## Assail



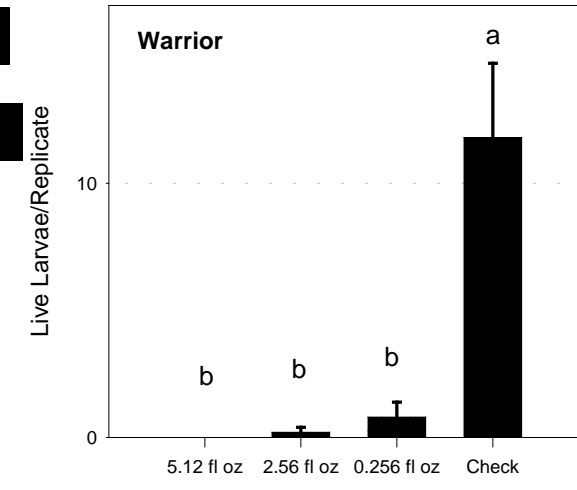
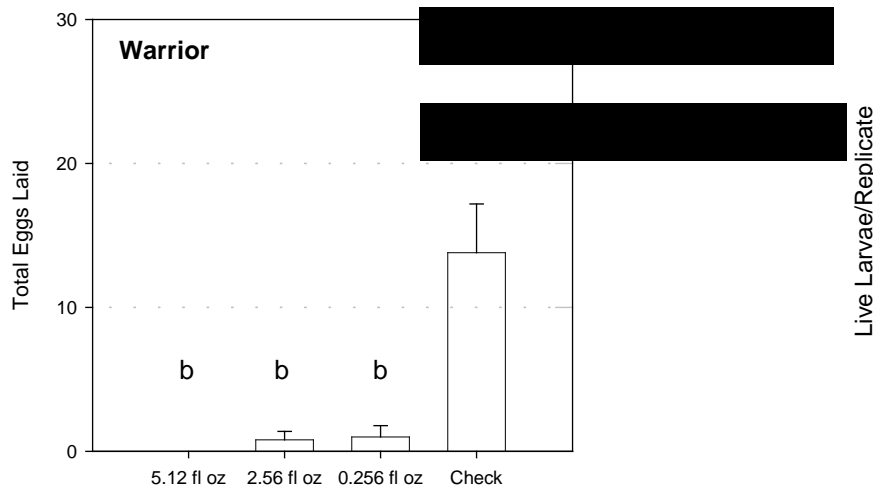
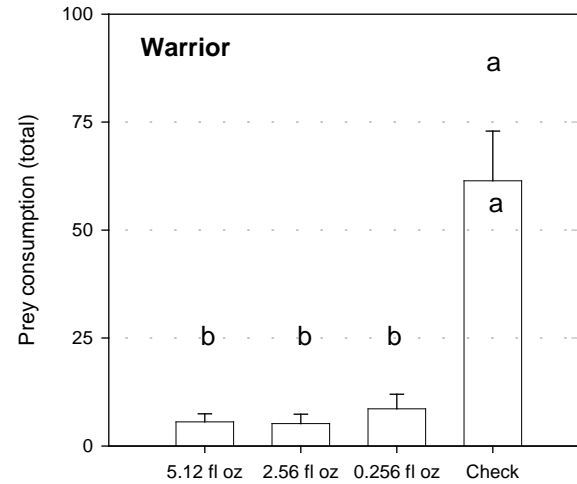
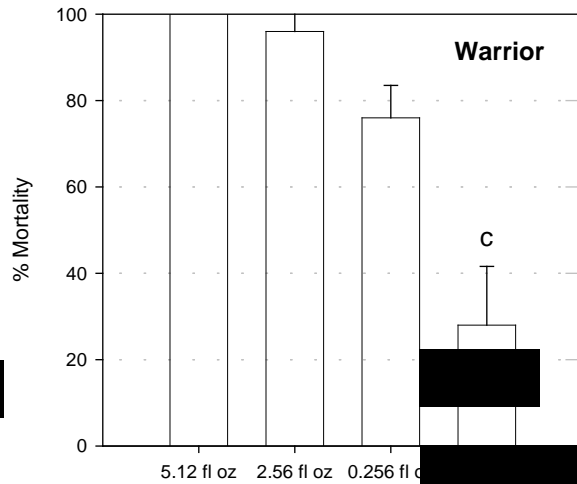


# Warrior

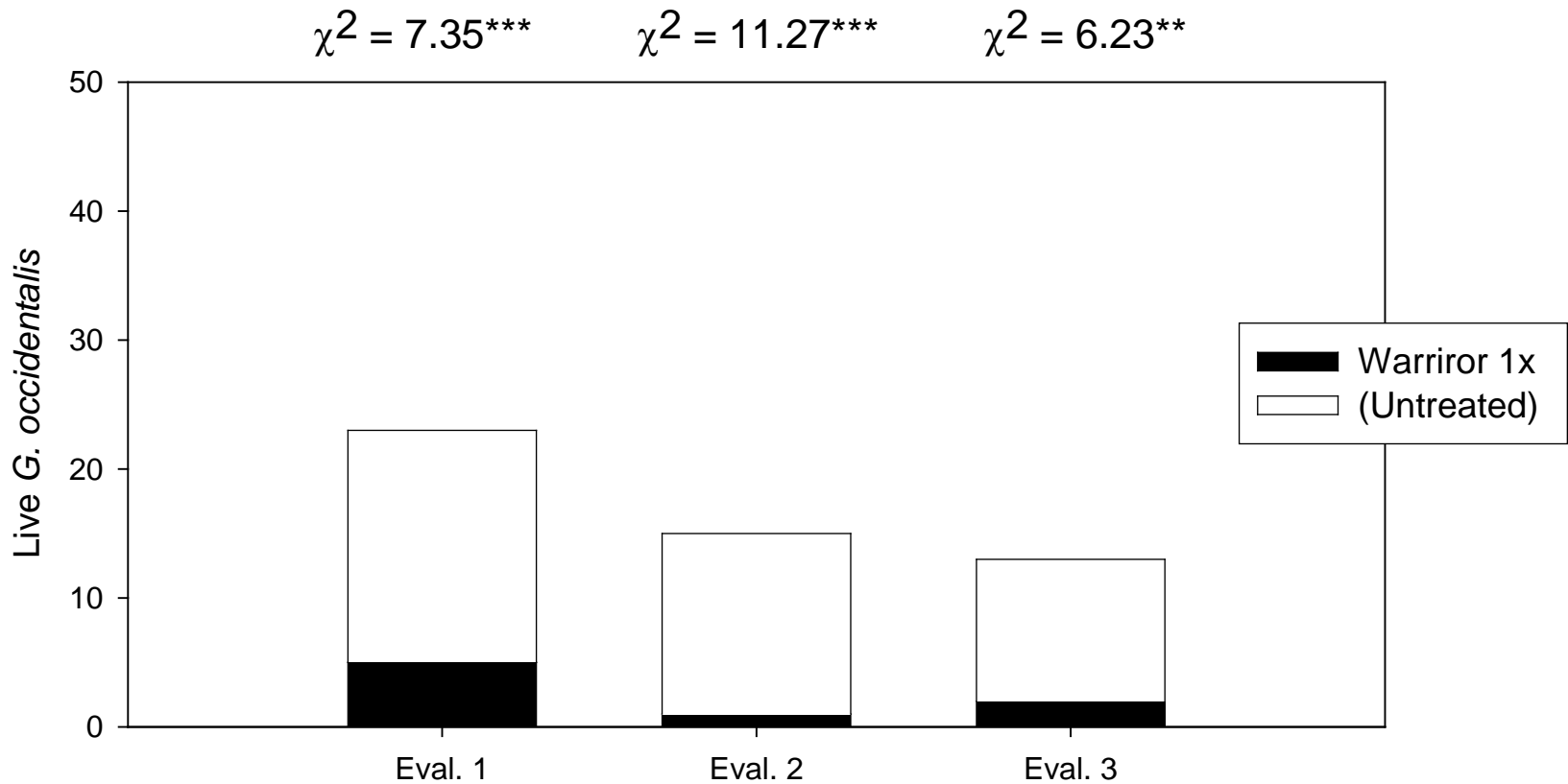
lambda-cyhalothrin  
synthetic pyrethroid

# Prey Consumption Bioassay

## Warrior

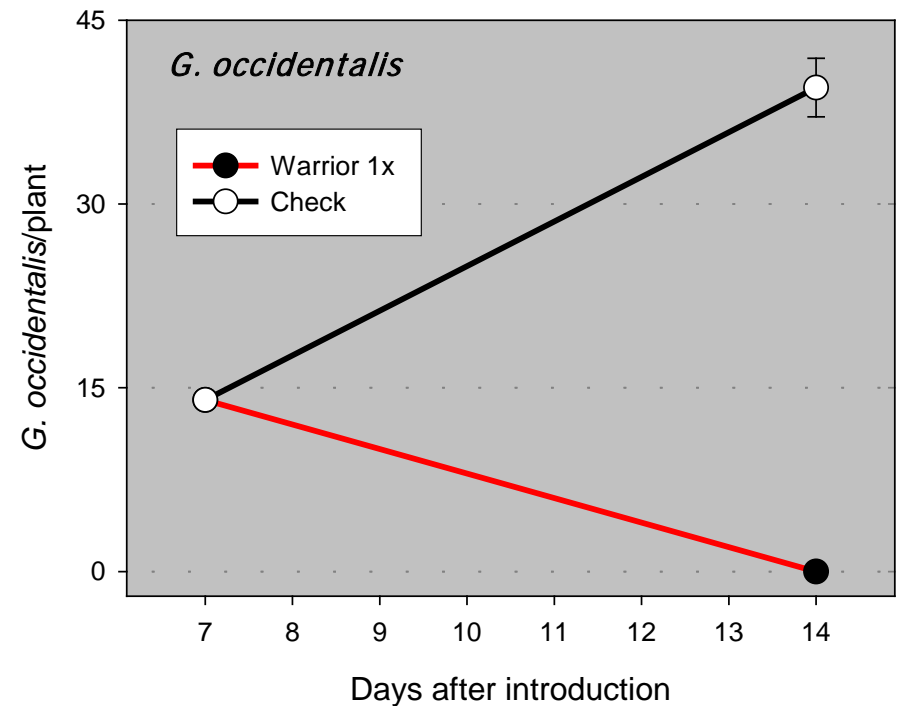
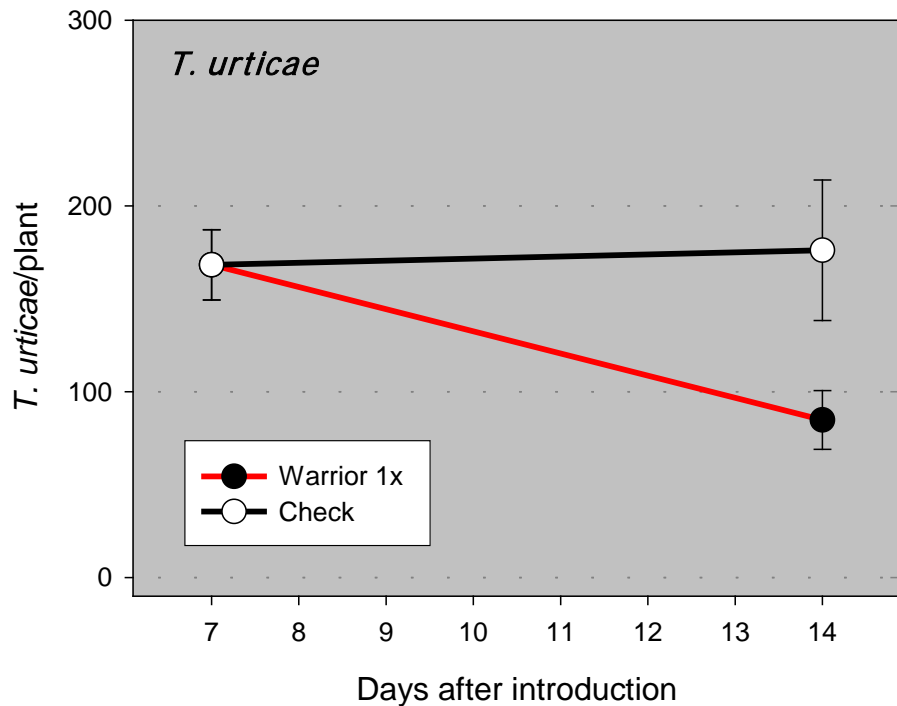


# Typh Repellency Bioassay Warrior





# Typh Mesocosm Bioassay Warrior

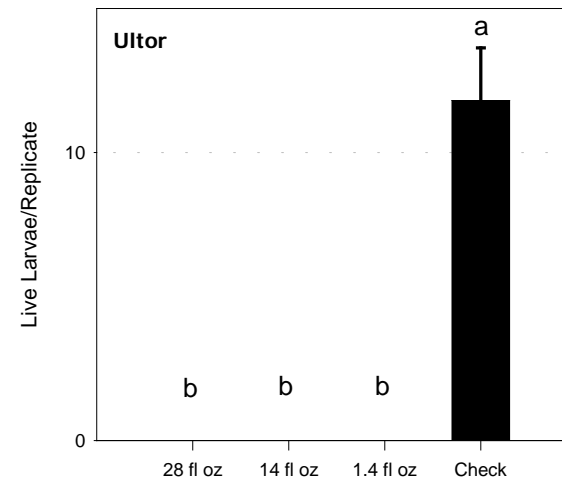
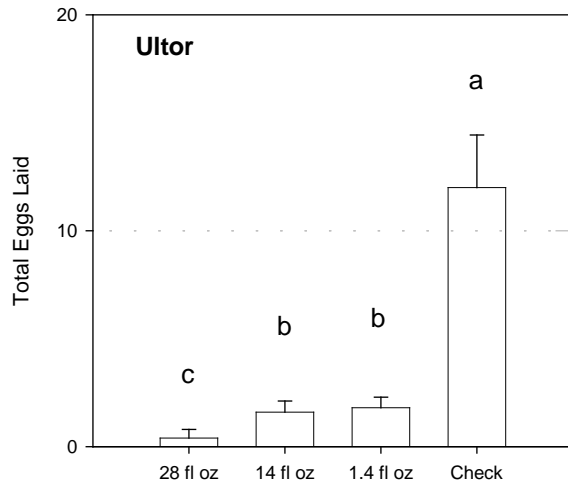
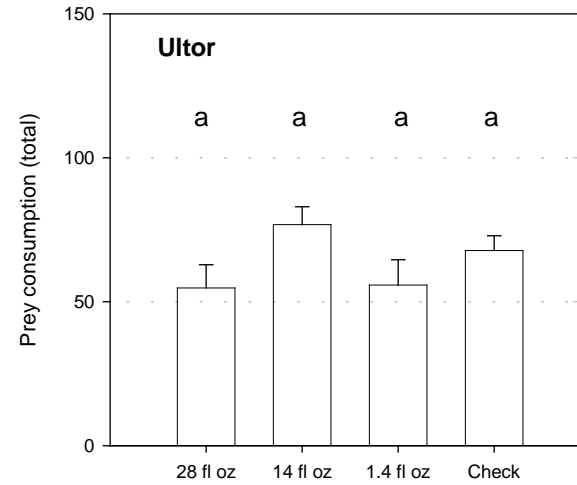
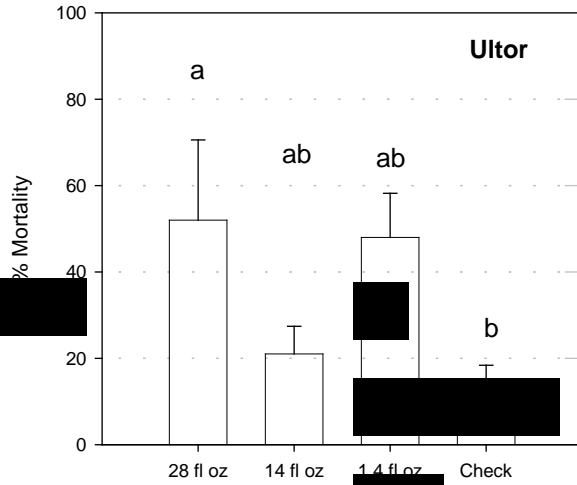


# Ultor

spirotetramat  
tetramic acids

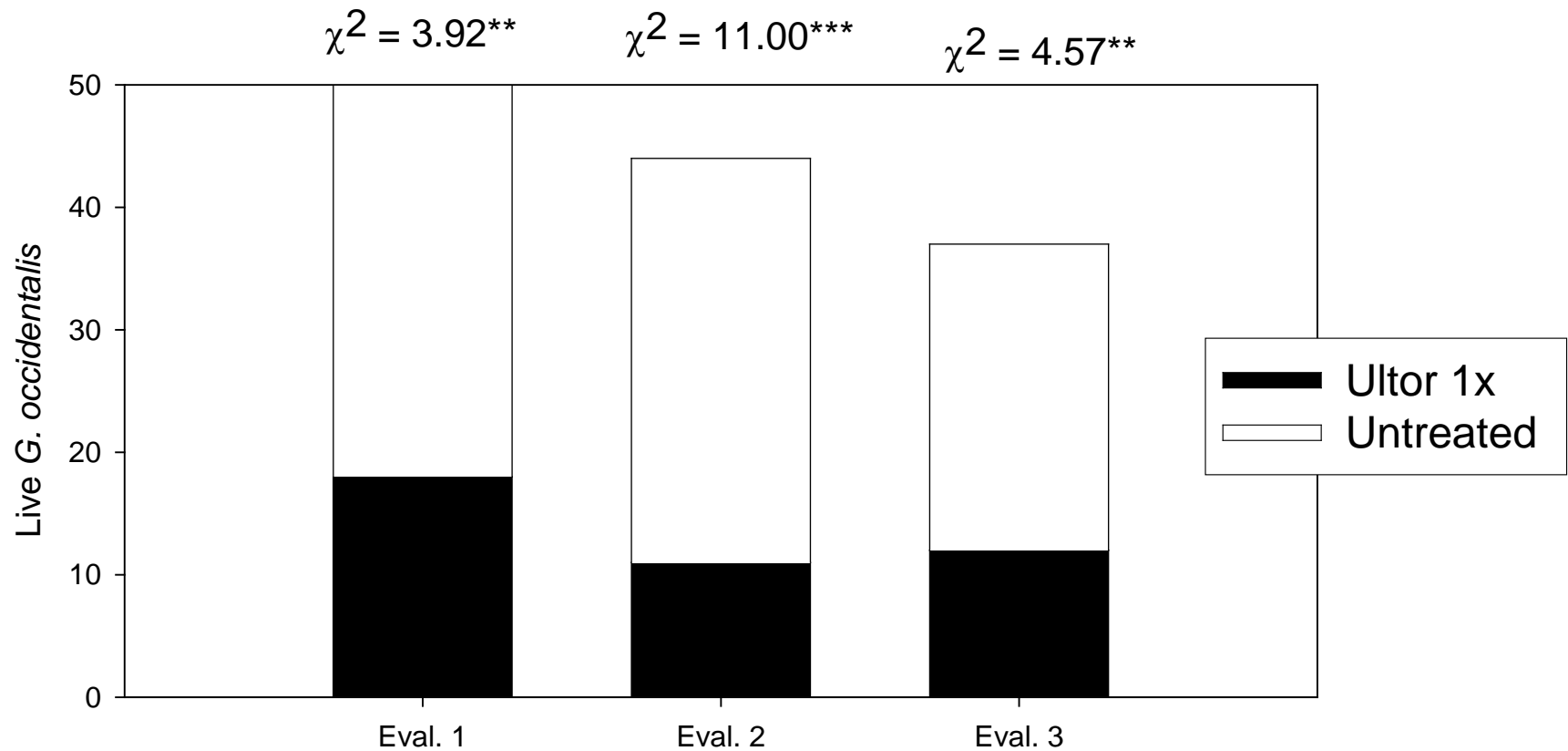
# Prey Consumption Bioassay

## Ultor



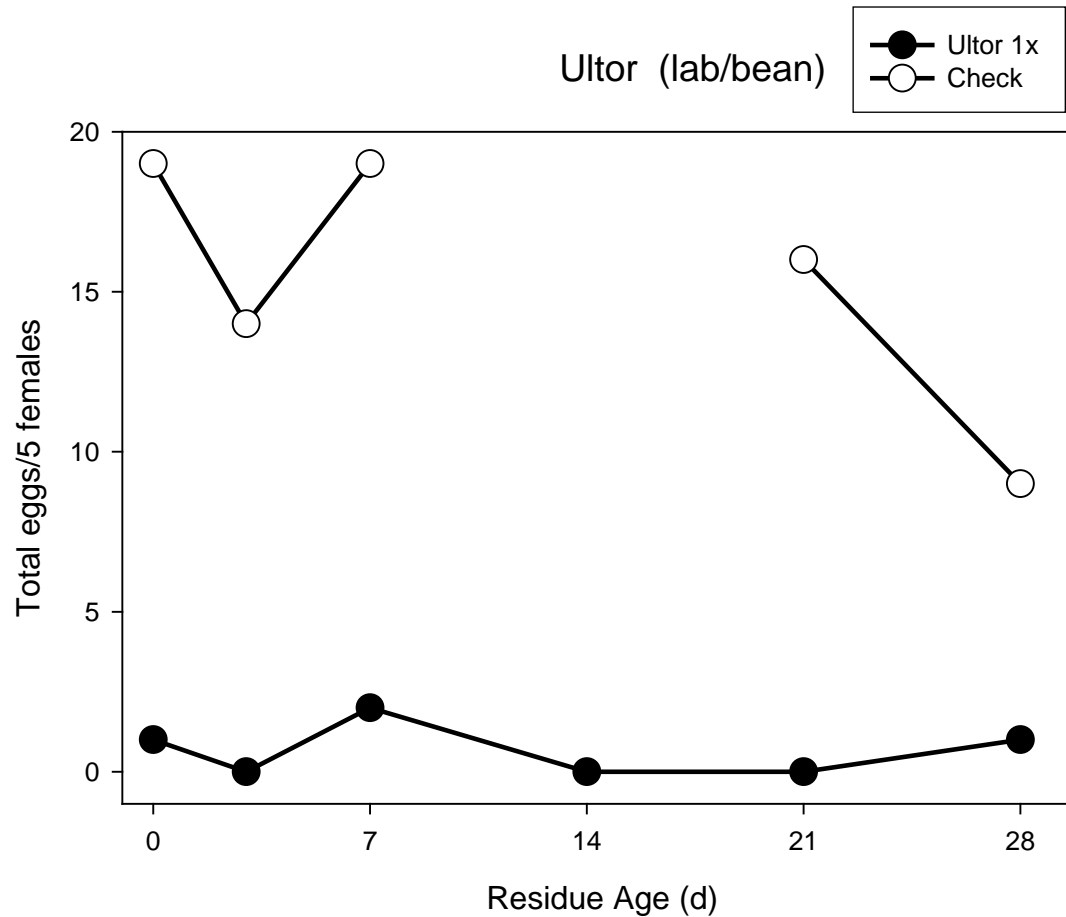
# Typh Repellency Bioassay

## Ultror

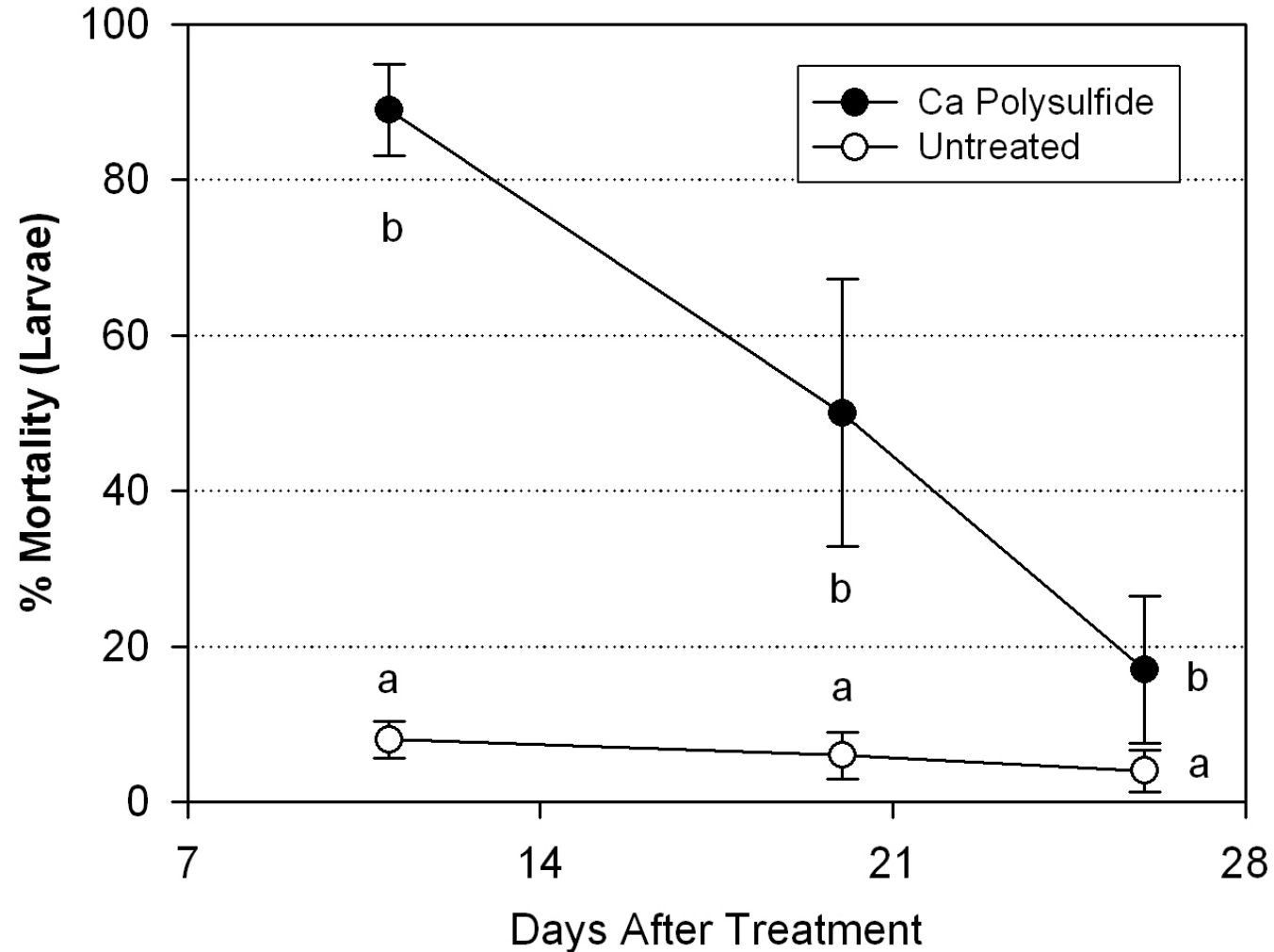


# Lab-Aged Residue Bioassay

## Ultor



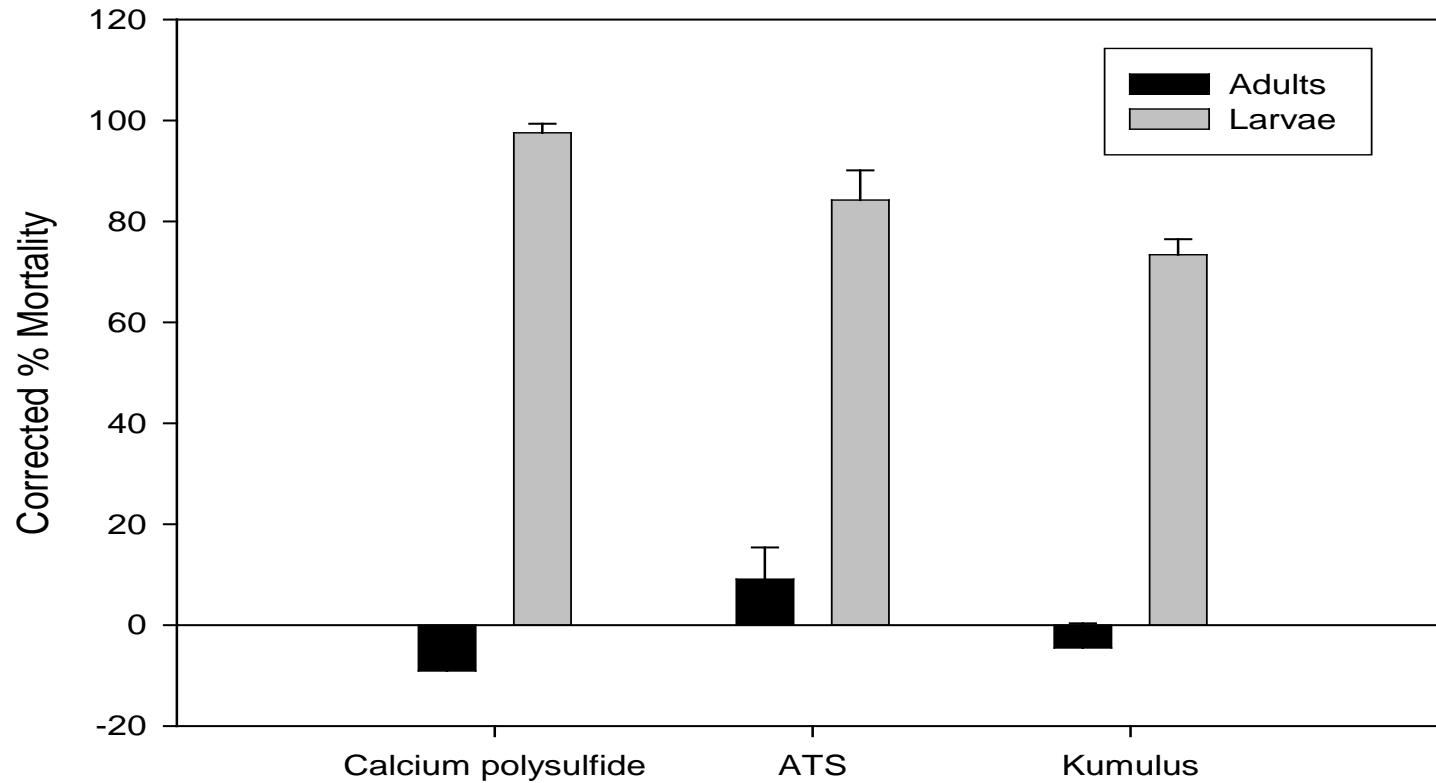
# Lime-sulfur residues on apple toxic to Typh larvae



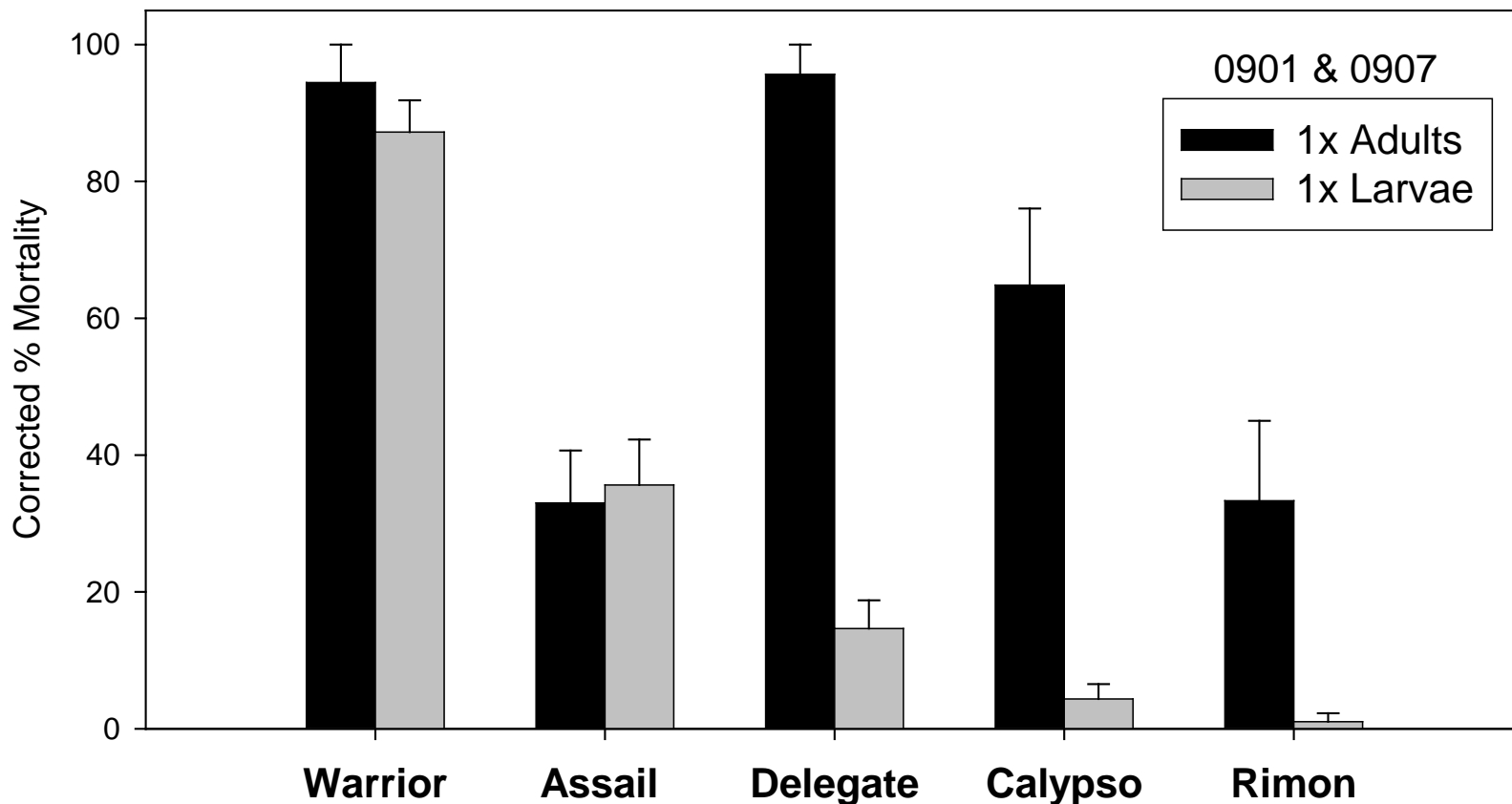


# Adults vs Larvae

*G. occidentalis* exposed to residues

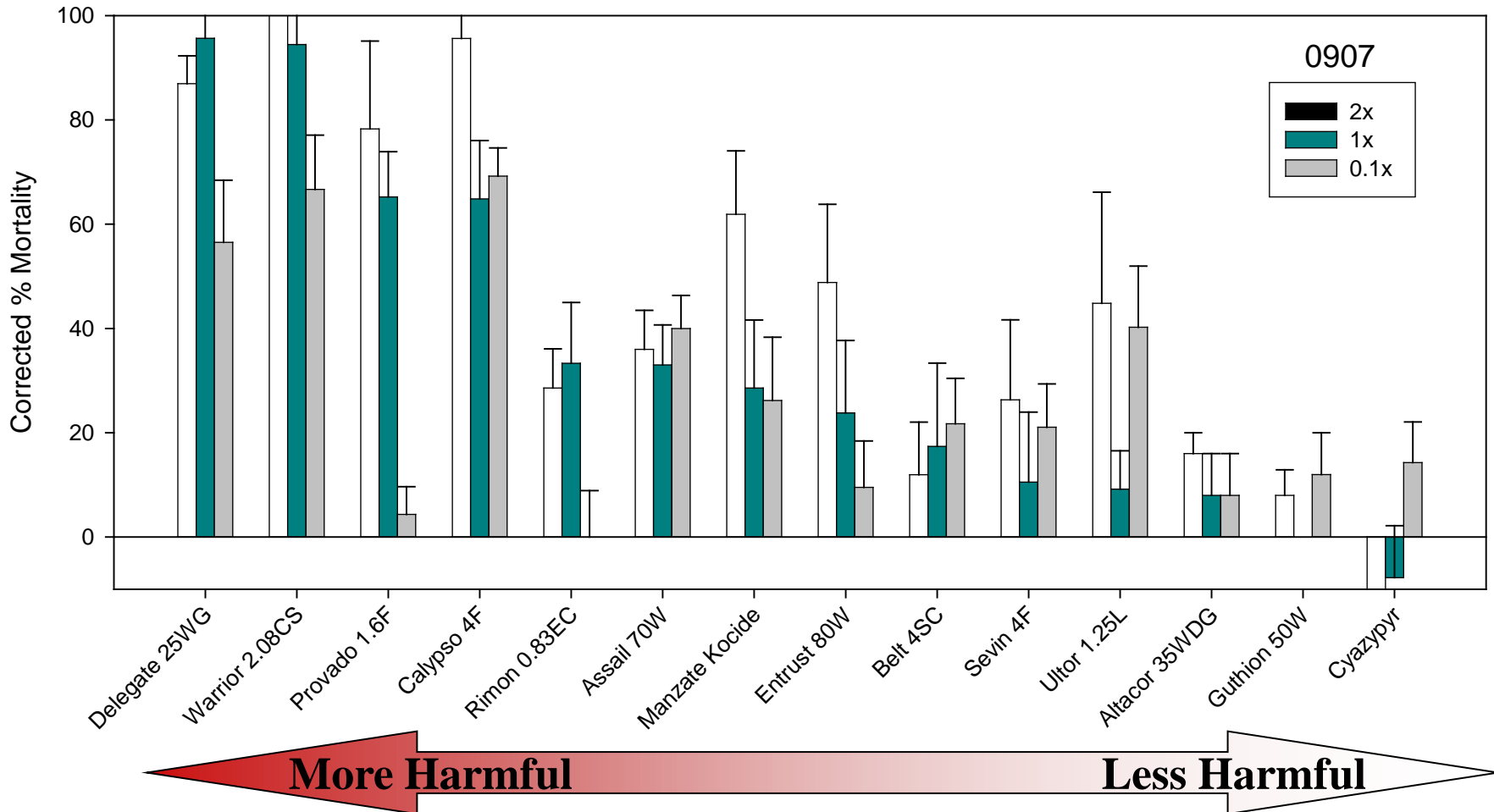


# *G. occidentalis* – Contact Toxicity Adults vs. Larvae



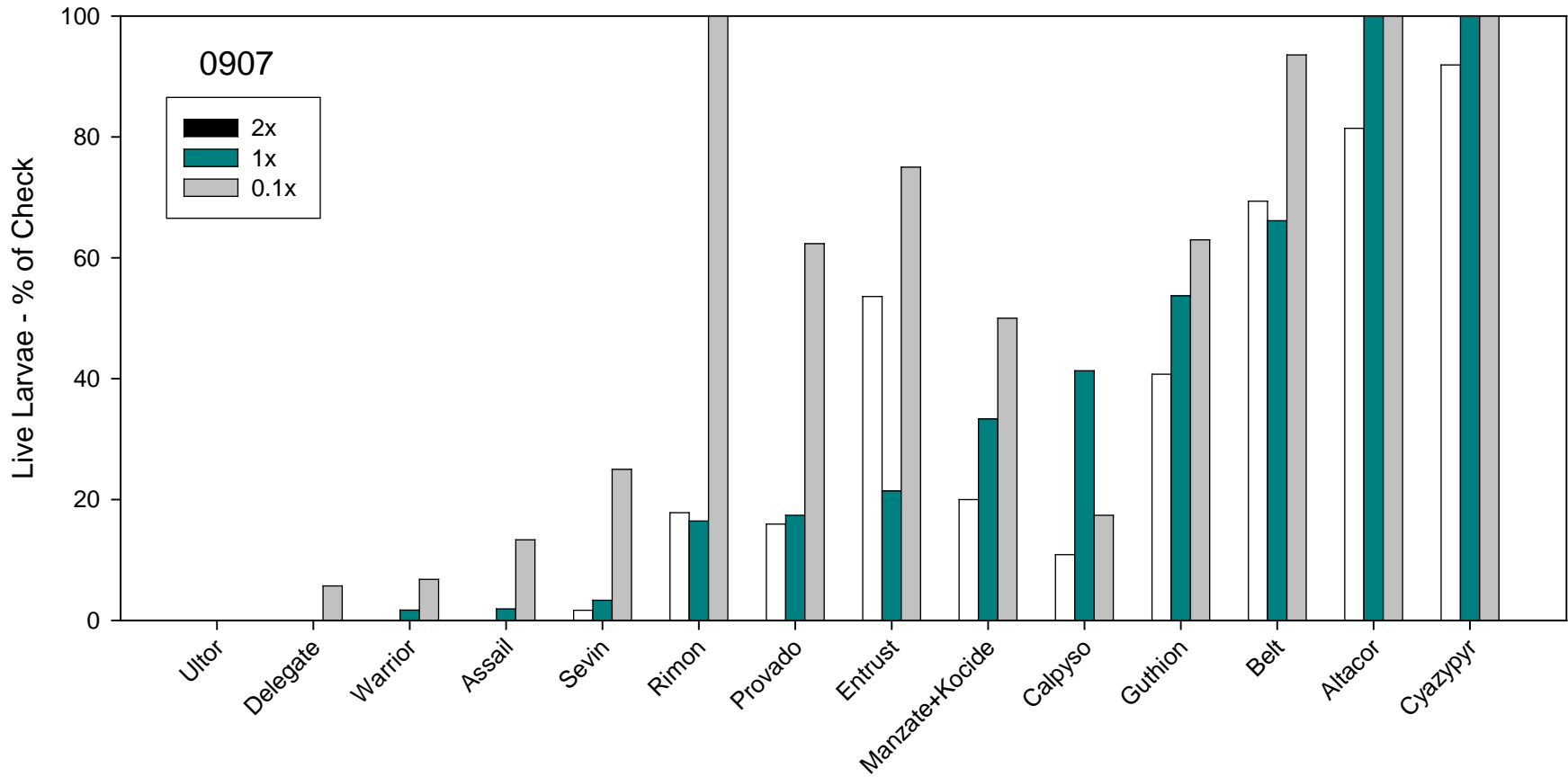
# *G. occidentalis*

## Acute Topical Mortality

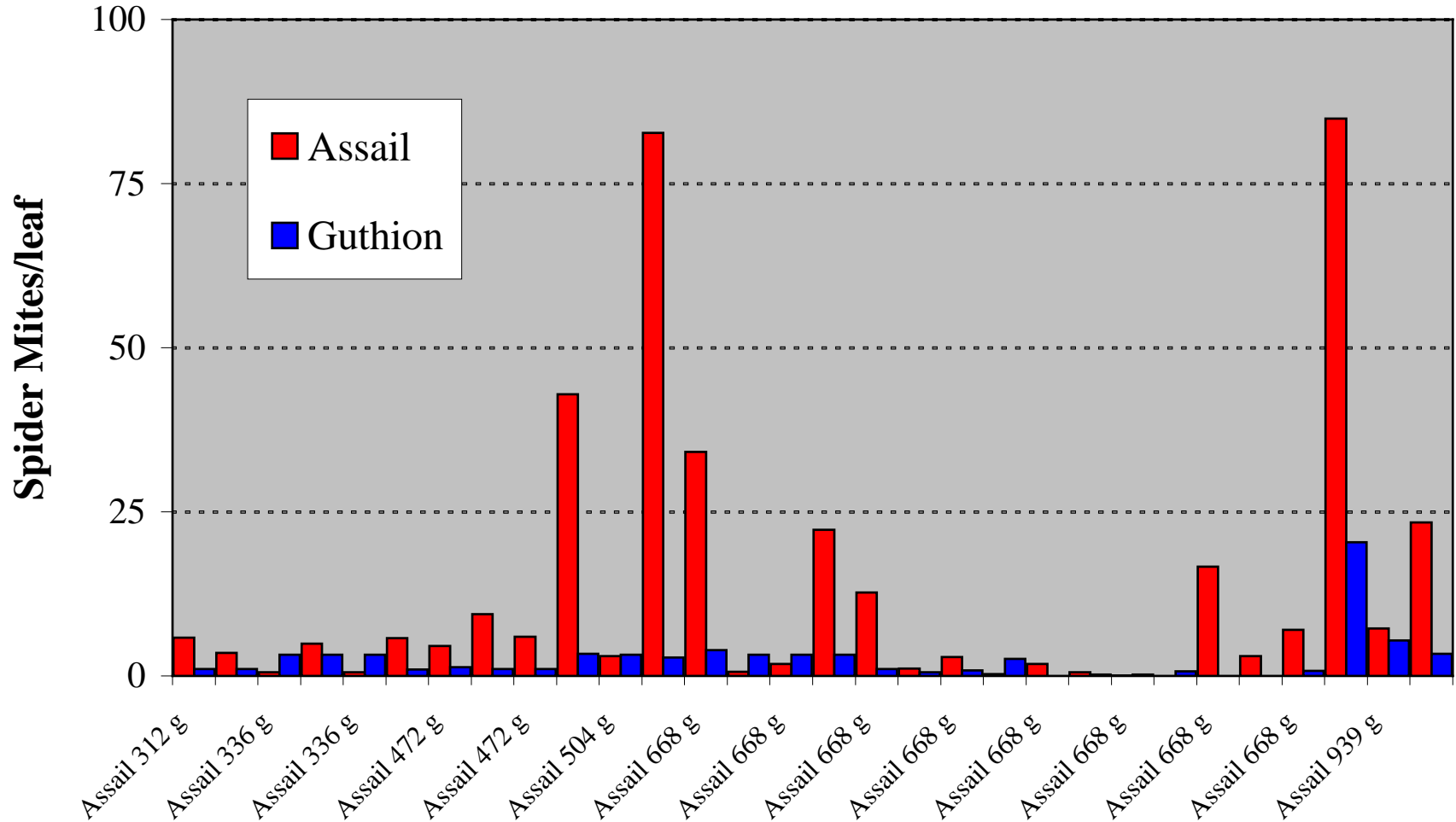


# *G. occidentalis*

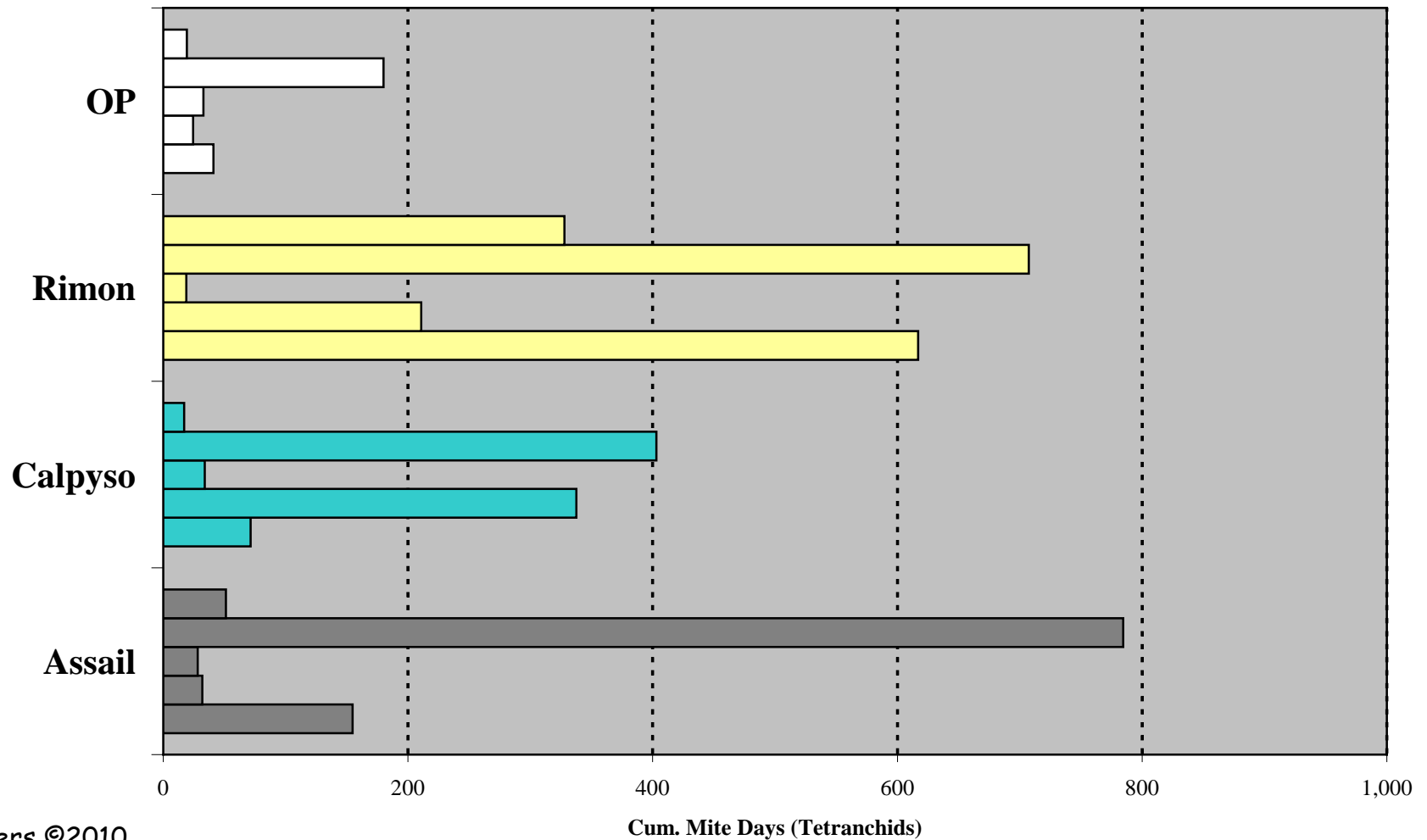
## Live Larvae



# Neonicotinyls for Codling Moth - Assail



# 2006 Commercial Trials





***G. occidentalis* Lethal & Sublethal Effects: do they help us predict field behavior?**

- **Effect on alternate prey**
- **Effect on primary prey (pest spp)**
- **Year-to-year variation**
- **Regional variation (climatic)**
- **Other disruptive materials**
- **Other natural enemies**
- **Refugia inside/outside the orchard**

# Safer for Whom?

- **Entomologists!**