# Pesticide Studies on PSHB & KSHB

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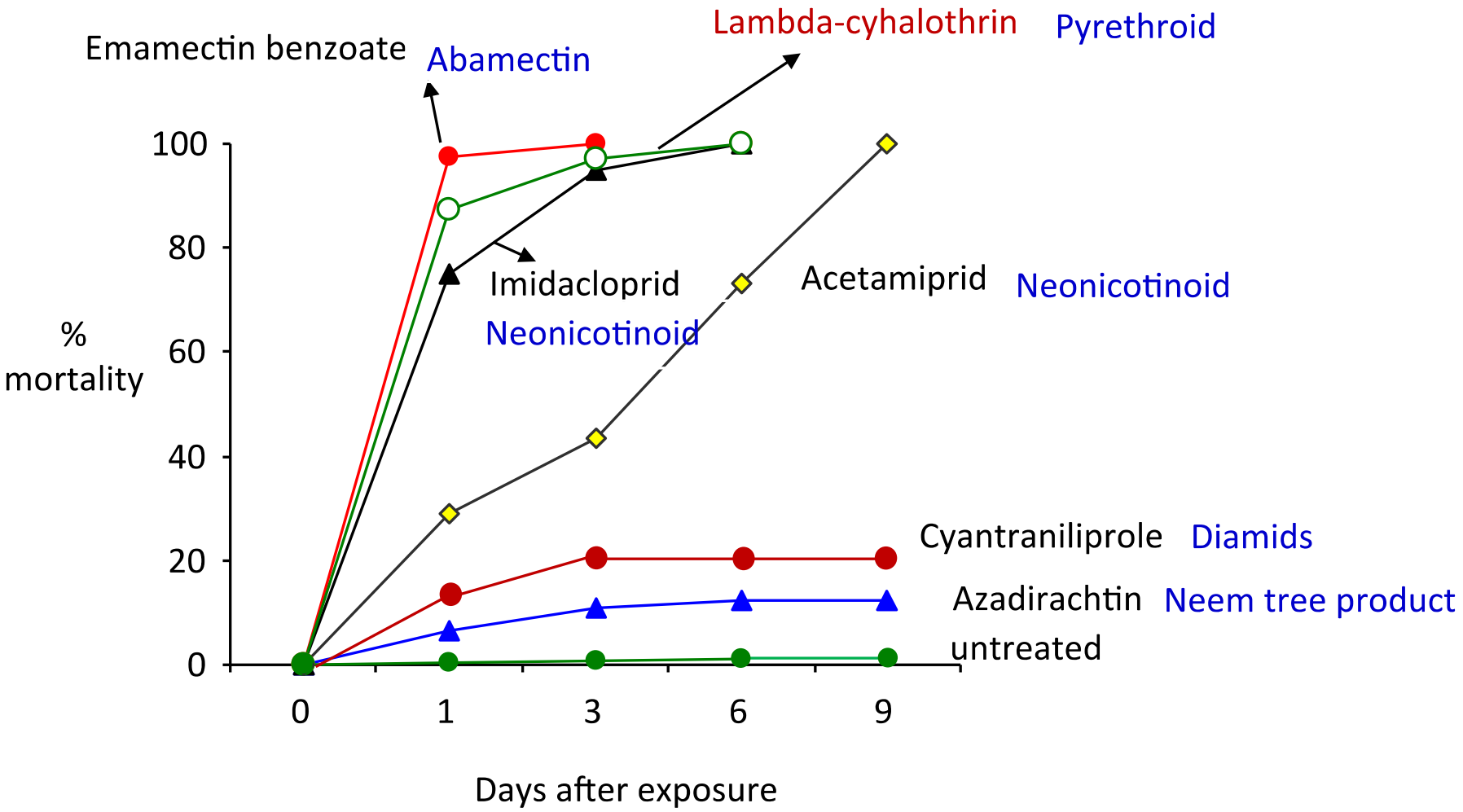
# Pesticide Studies on PSHB & KSHB

- Prevention or Cure
- There is no effective chemical treatment for severely infested trees
- Data already available from other sources
  - Israel
  - Florida (redbay ambrosia beetle/laurel wilt)

# Systemic insecticides (mostly) tested against the larvae feeding on fungus growing on PDA with the incorporation of 10 ppm of the tested chemical

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# Pesticide Studies on PSHB & KSHB

- What are the options?
  - Surface/contact treatments (wood not foliar)
    - Prevent new infestations
    - Manage newly emerging beetles
    - Generally require multiple applications
  - Sub-surface treatments (systemic)
    - Soil drenches for root uptake
    - Inject material directly into trees
    - Prevent new infestations
    - Manage newly emerging beetles??

# Current Pesticide Studies

- San Diego County - Escondido Grove
  - KSHB well established at this site
  - Mobile lab permits on-site bioassays
  - Priority to test chemicals to support Section 18 registration for HERO EW as a persistent wood surface treatment against adults

Section 18 of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) authorizes the EPA to allow an unregistered use of a pesticide for a limited time if the agency determines that an emergency condition exists

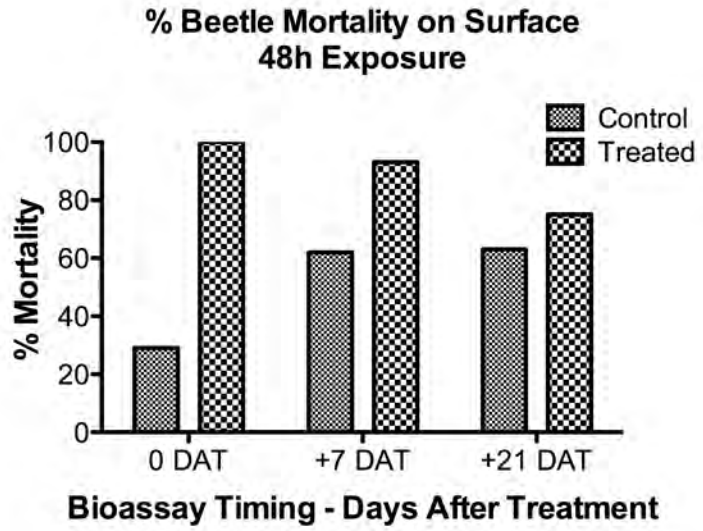
# Current Pesticide Studies

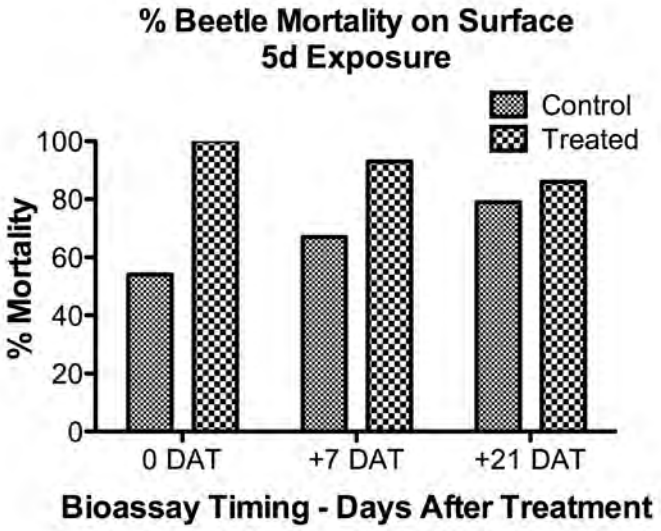
- San Diego County - Escondido Grove
  - KSHB well established at this site
  - Mobile lab permits on-site bioassays
  - Priority to test chemicals to support Section 18 registration for HERO EW as a persistent wood surface treatment against adults
    * Bifenthrin (9.72%) and zeta-cypermethrin (3.24%)
    * Currently registered insecticides for avocados (most unsuitable for use as wood treatments)

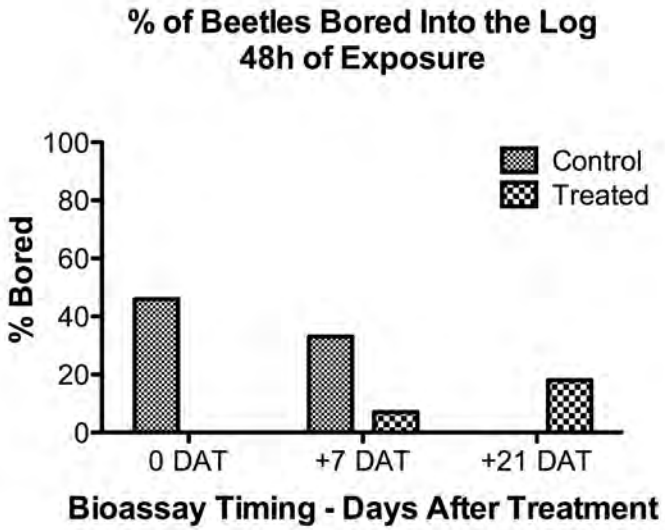
# Hero Bioassays

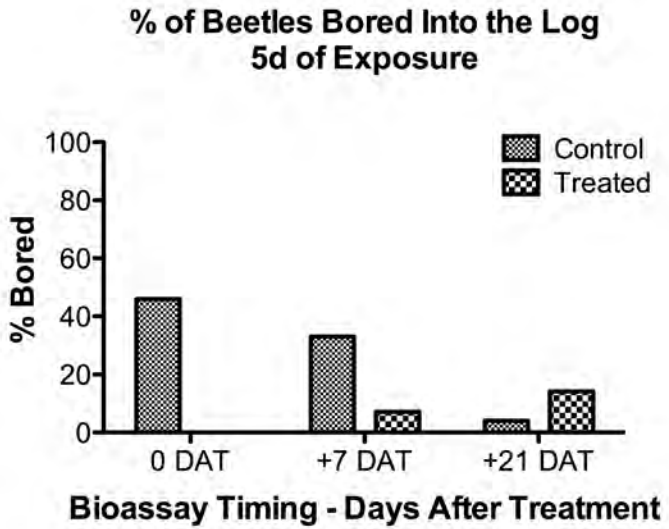
Bryan Vander Mey & Jim Bethke

# Hero Bioassays

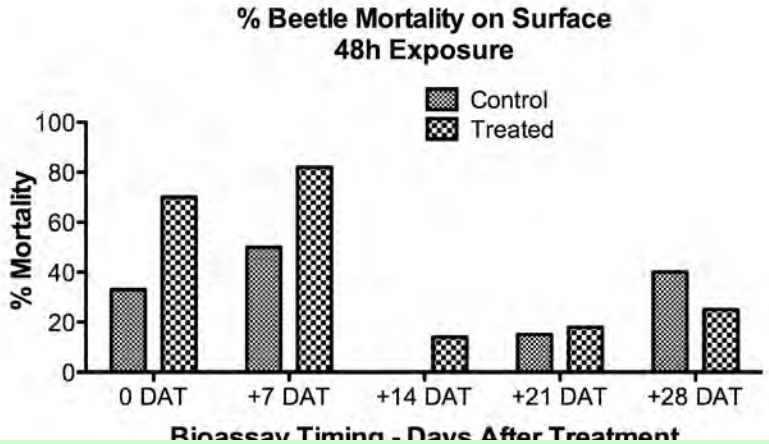


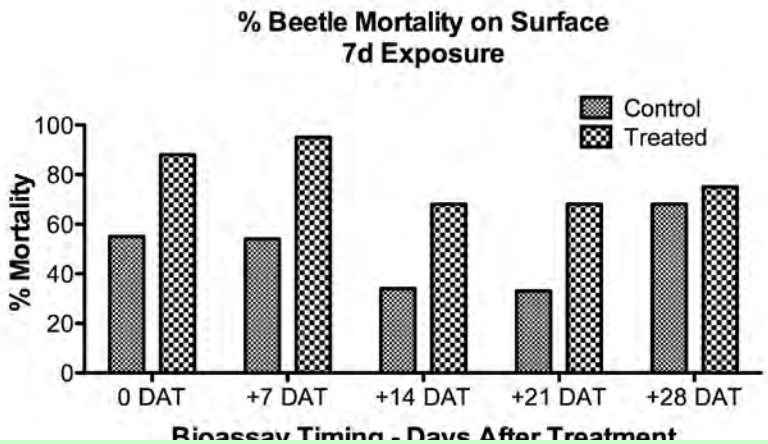



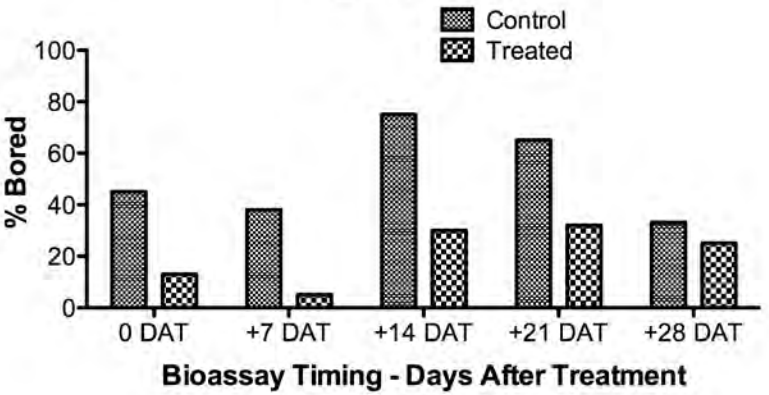



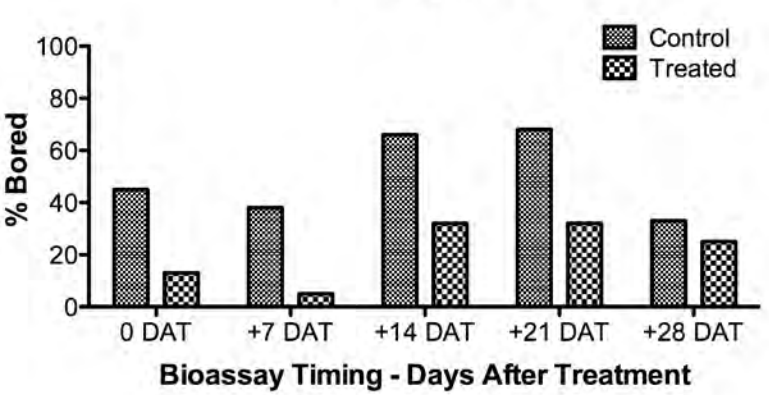
# Hero Bioassays




- Note there is little change in beetle boring between 48h and 7d assessments
- This indicates that the critical period for contact activity is within the first 48h of exposure
- If insects don't bore within 48h, then they die



# Hero Bioassays

- Very high control mortality
  - Handling issues
  - Insect not well-adapted to local conditions
- Importance of contact activity of Hero evident from 2 perspectives
  - High toxicity to beetles upon direct contact within 48h of exposure
  - Dramatic decrease in the number of bore holes present on the treated logs means Hero effectively reduces colonization
  - Key to success of any surface treatment is that it works within 48h

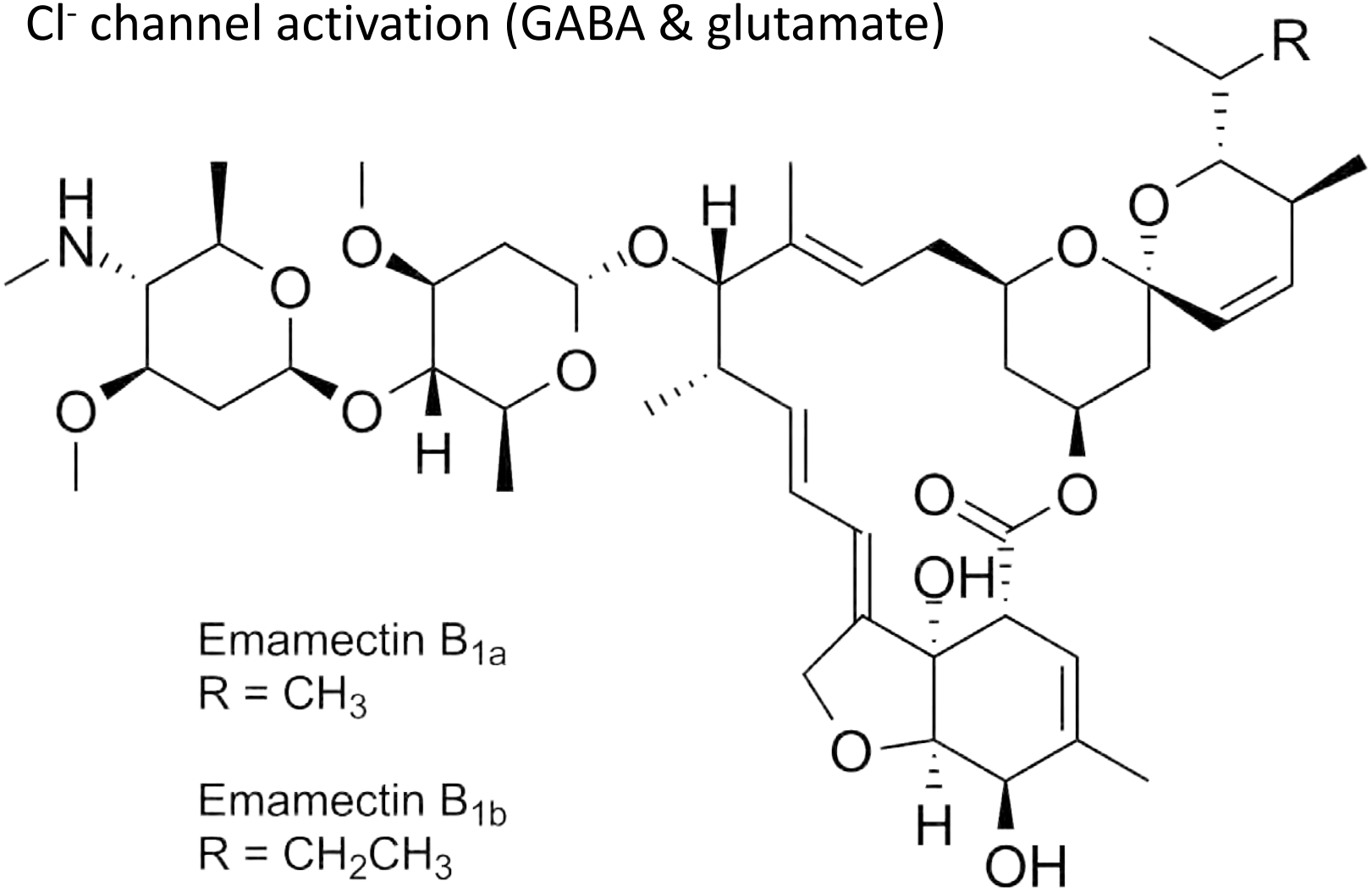
Bryan Vander Mey & Jim Bethke

# Current Pesticide Studies

- Ventura County - Pine Tree Ranch Trial
  - Started in January 2015
  - Insecticide and fungicide evaluations
  - TREE-age (Arborjet formulation of emamectin benzoate; 4%)

# Emamectin Benzoate

- Avermectin family
- Macrocyclic lactone
- $Cl^-$ channel activation (GABA & glutamate)




Emamectin $B_{1a}$
$R = CH_3$

Emamectin $B_{1b}$
$R = CH_2CH_3$

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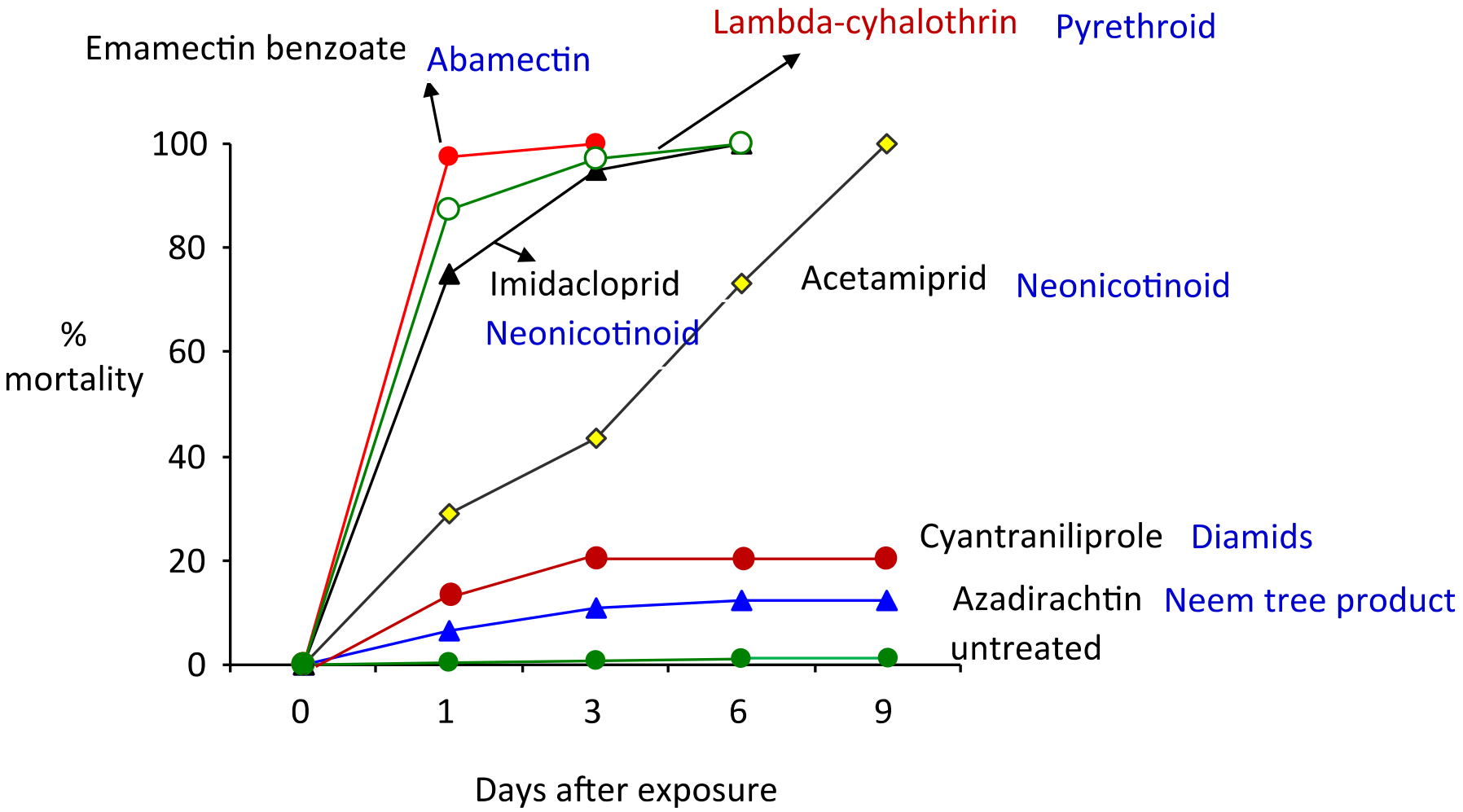


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# Current Pesticide Studies

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  - Insecticide and fungicide evaluations
  - TREE-age (Arborjet formulation of emamectin benzoate; 4%)
  - Label: 2 years of control of Ambrosia beetles
  - NOT registered for use on commercial avocados
  - Collecting data in support of IR-4 application
    - Field data
    - Lab-based bioassay data using Stouthamer saw dust diet (UCR quarantine)

# Current Pesticide Studies

- Ventura County - Pine Tree Ranch Trial
  - Neat vs Diluted TREE-age (same a.i. amount)
  - Neat injected with Quikjet Air
  - Diluted injected with Tree IV system
  - Fruit residue work completed (dilute treatments only were tested)
  - Emamectin also injected with Propizol

| Treatment | Emamectin | Emamectin + Propiconazole |
|---|---|---|
| 1 Month | 0.003 ppm | 0.002 ppm |
| 3 Month | 0.002 ppm | 0.002 ppm |


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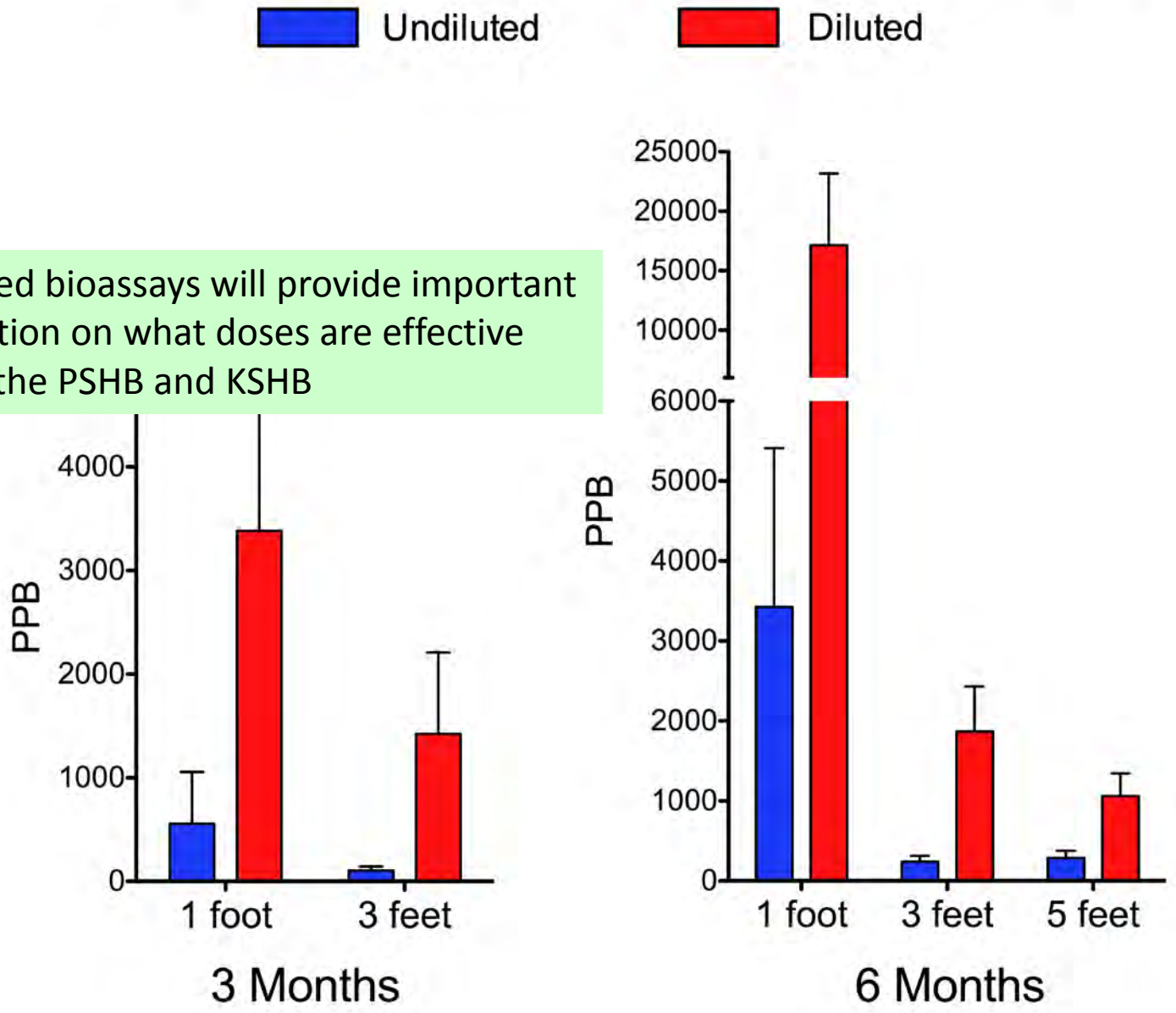
# Emamectin Benzoate Movement in Avocado Trees



# In The Works

- Tilt Section 18
  - Propiconazole
  - Already in the IR-4 program for avocados
  - 3 studies completed at the South Coast REC
  - Recently submitted wood core samples from our Pine Tree Study and South Coast REC IR-4 Study for residue analysis
    * Florida data shows Tilt moves very slowly within trees, but can provide up to 2 years control of the laurel wilt pathogen

# Future Studies

- Emamectin benzoate formulations
  - 3 formulations will be compared
  - October 5, 2015
  - Rates of injection
    - Efficacy
    - Persistence
    - PHI
- Mode of injection
  - Arborjet v Sidewinder
- San Diego and Ventura groves

# Future Studies

- Neonicotinoid formulations
  - 2 formulations will be evaluated in the October trials
  - San Diego and Ventura groves
- Neonicotinoid injections proved effective against avocado thrips and avocado lace bug
  - Leaf residues only were measured
  - Rate of uptake was fast - too fast?
  - Timing of injections affected uptake