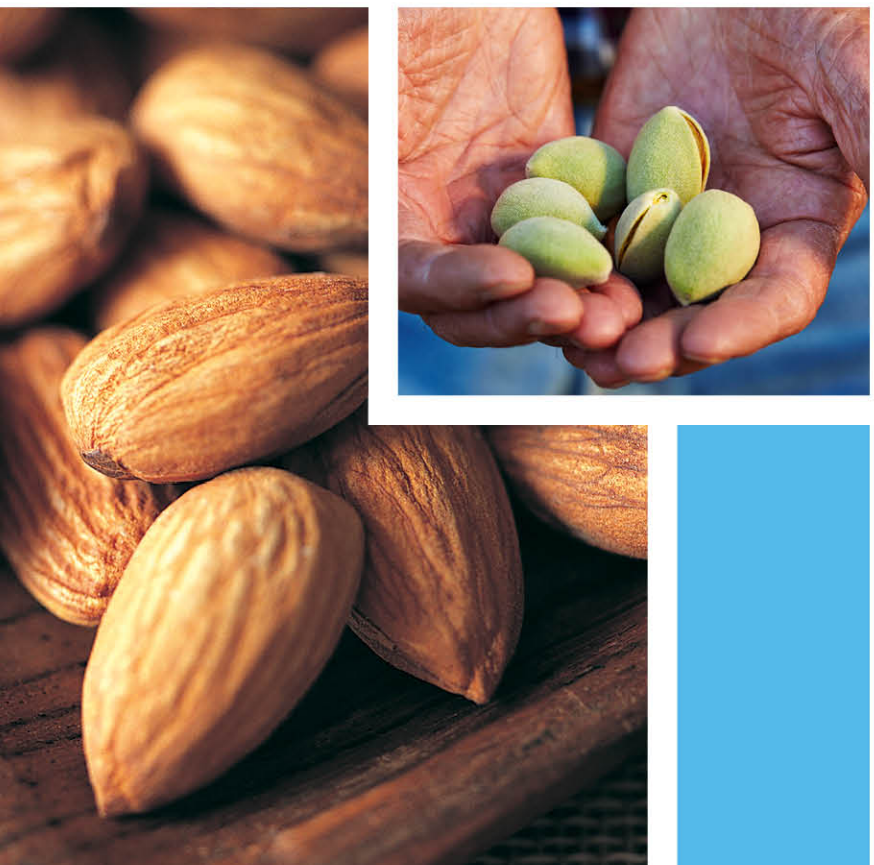

NOW Flight Capacity and Monitoring

Chuck Burks[1], Tom Sappington[2], and Brad Higbee[3]

[1]USDA, Agricultural Research Service, Parlier, CA

[2]USDA, Agricultural Research Service, Ames, IA

[3]Paramount Farming Company, Bakersfield, CA

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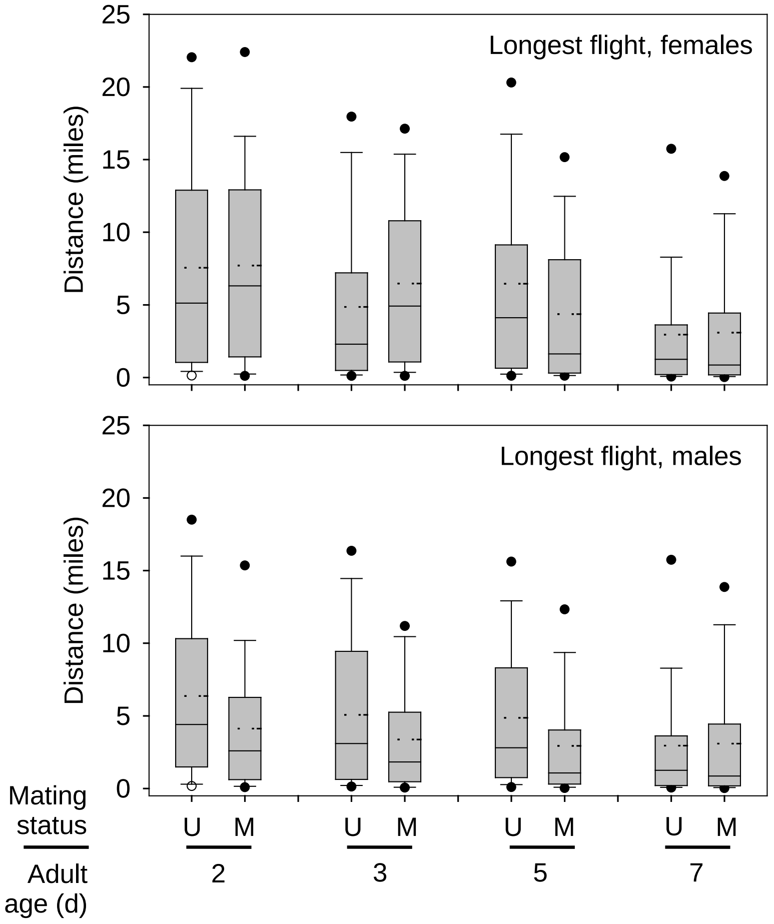
NOW and Flight Mills

Why laboratory flight mills?

- Cannot examine effects of age, sex, and mating as directly in the field
- These factors have different effects in different moth pests
- Best estimate of flight capability

Flight Capacity of NOW

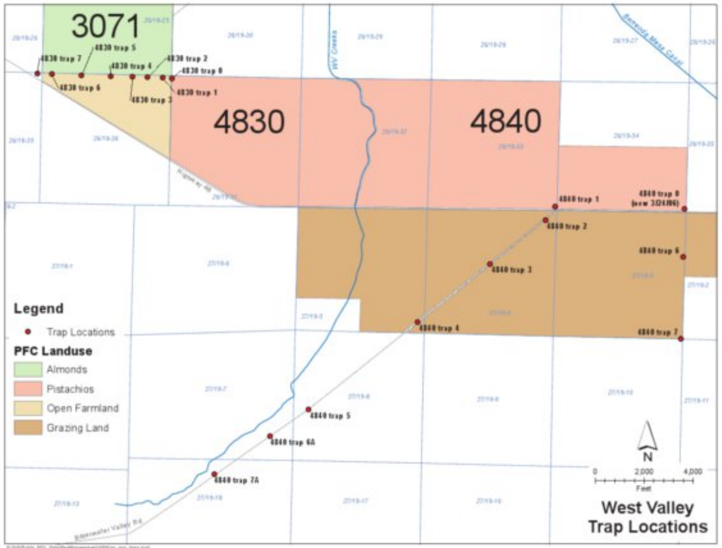
Effect of age and mating status on longest single flight (N = 855)

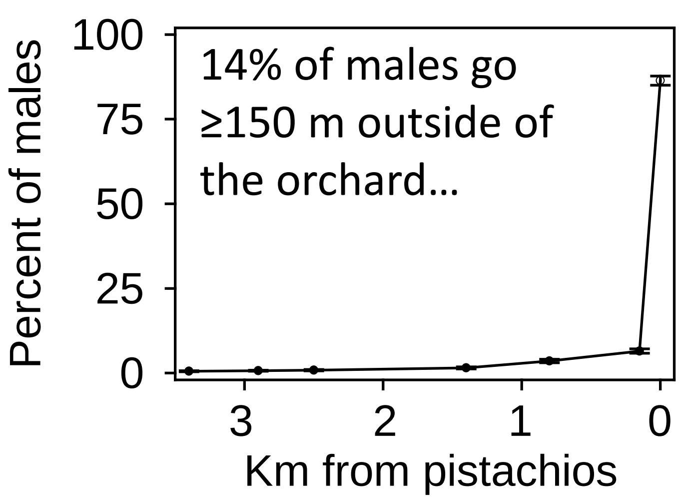


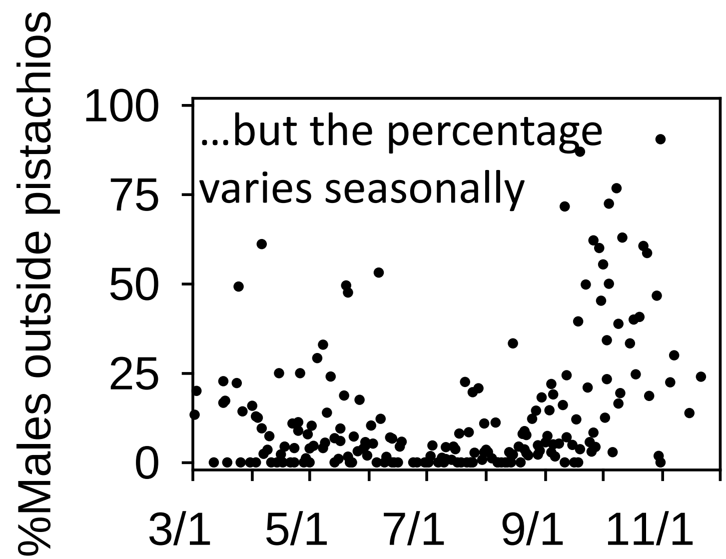
Findings

- Substantial flight capacity in all categories
  - Young mated females slightly better flyers
  - Young mated females slightly worse flyers
- Note—Capacity and field behavior not necessarily the same thing

NOW Flight Capacity and Field Behavior

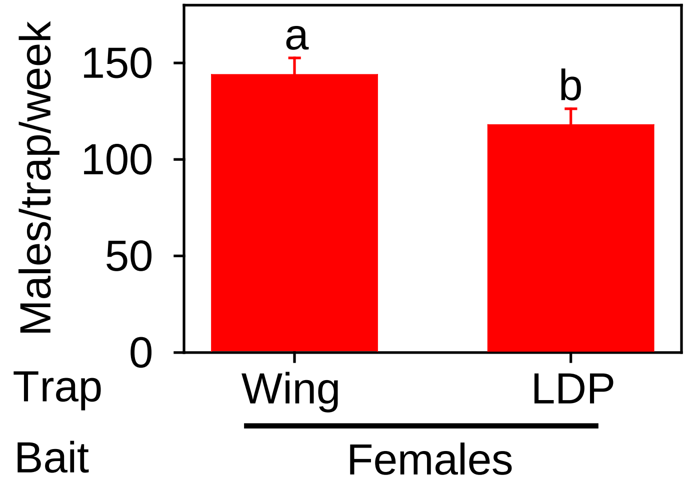




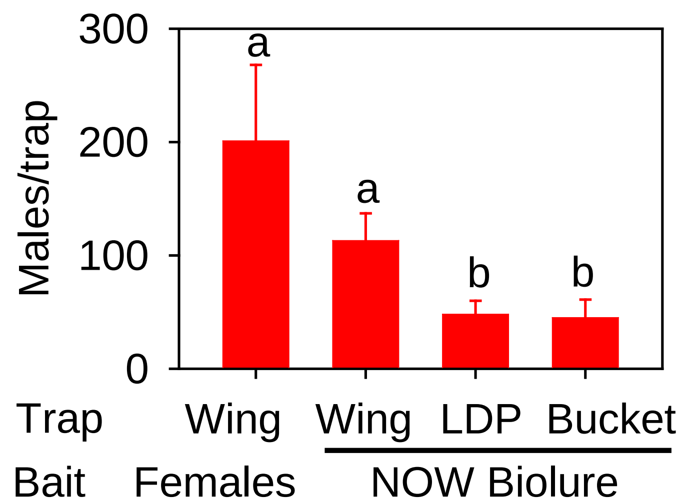


NOW Biolure and Trap Type

When both are baited with females, capture in wing and LDP traps is proportional to glue area…

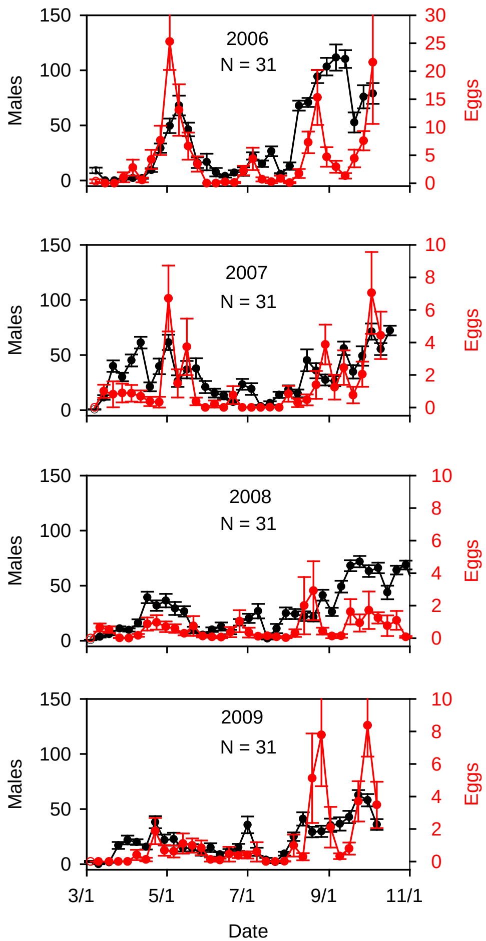


… but when baited with NOW Biolure, wing traps far outperform LDP traps.

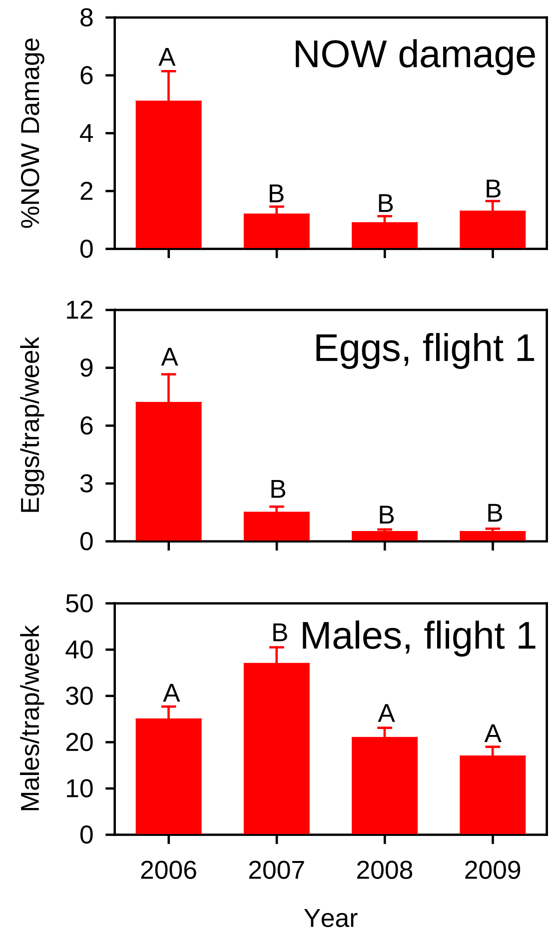


Monitoring for NOW: Pheromone vs. Egg Traps

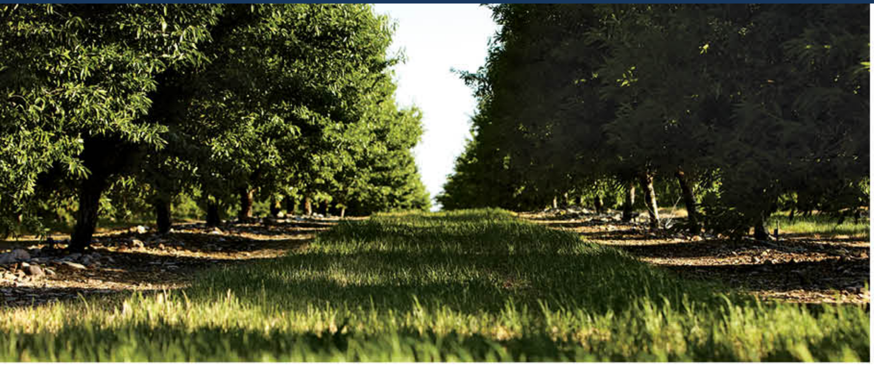
Pheromone and egg trap fluctuation are more similar in mid-summer compared to earlier and later in the year

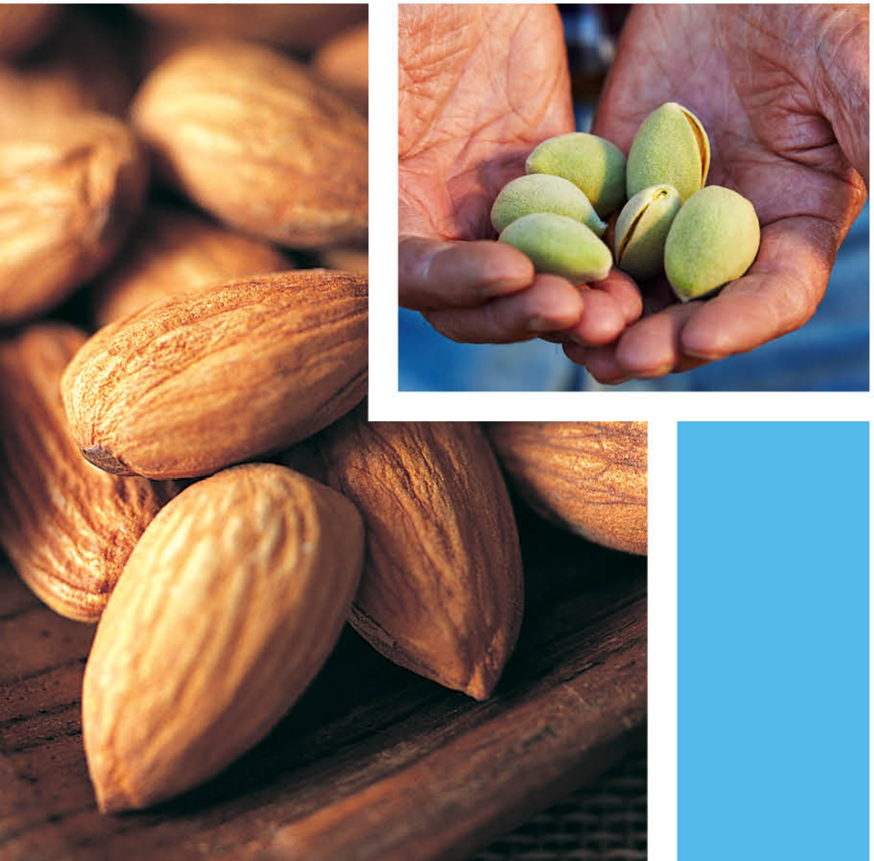


Year-to-year averages in egg traps and damage tend to move in tandem. This is not true of pheromone traps.



NOW Flight Capacity and Monitoring: Take-aways





- NOW has substantial flight capacity. Age, sex, and mating status have only minor impact on this capacity.
- Field data indicate seasonal effects on flight out of orchards.
- NOW Biolure performs similarly to unmated females, but use of wing rather than LDP traps is necessary for optimum performance.
- Pheromone lures should work well for hullsplit treatment timing. Running egg traps in spring may be beneficial for assessing relative year-to-year risk.

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Update on Navel Orangeworm in Almonds

Joel Siegel

USDA-ARS

San Joaquin Valley Agricultural Sciences Center

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Yes, I know this is a Pistachio, Please Forgive Me

Is there Adult Mortality with New Chemistries?

YES

Previously

Treatment	Hours	Mortality	Adults
Altacor (3.5oz)	24	32.46%	114
	48	46.67%	120
	72	65.83%	120
Control		32.00%	121
Delegate (6.2 oz)	24	66.67%	123
	48	83.33%	120
	72	98.33%	120

June 6, 200 gpa, 2 mph, Latron B-1956 at 3.2 oz/100 gal

Treatment	Time	Mortality	Adults
Control	24	1.40%	70
	96	**8.60%**	
Intrepid Edge 12 oz/ac	24	23.00%	73
	96	**84.00%**	
Intrepid Edge 10 oz/ac	24	4.00%	68
	96	**71.00%**	
Altacor 4 oz/ac	24	7.00%	71
	96	**49.00%**	

Dose Dependent, Adjuvant Important too

August 7, 200 gpa, 2 mph, Latron B-1956 at 3.2 oz/100 gal,

Treatment	Time	Mortality	Adults
Control	24	24.31%	144
	72	**41.67%**	
Intrepid Edge Tankmix **14 oz/ac**	24	33.56%	149
	72	**91.16%**	
Altacor **4.5 oz/ac**	24	52.78%	144
	72	**93.06%**	
•Voliam Xpress 12.5 oz/ac	**24**	**95.00%**	**57**

Treatment	Alive	Distress	Dead
Control +PHT 415 24	148	11	15 (8.62%)
48	134	24	16 (9.20%)
96	109	2	63 (36.21%)
Intrepid Edge 10.0 oz/ac + PHT 415 24	20	30	94 (62.50%)
48	3	31	110 (76.39%)
96	8	9	127 (88.19%)
Altacor 4.0 oz/ac + PHT 415 24	22	77	45 (31.25%)
48	4	94	46 (31.94%)
96	38	18	88 (61.11%)

Improving Spray Deposition & Reducing Drift

Research Team:

Ken Giles, UCD

Franz Niederholzer, UCCE

Jim Markle, CURES

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Project Goals: Develop new technology and evaluate technology and practices for improving spray deposition and reducing off-site movement.

Objectives: Integrate new multi-fan sprayer into commercial use and assess performance;

Determine if conventional spray application parameters can be modified to reduce spray volume and increase ground speed, thereby improving spray efficiency

Commercial use – Paramount Farms, Lost Hills, CA

Testing along side tower sprayer (and helicopter)

Testing along side tower sprayer (and helicopter)

Testing in the commercial orchard with commercial operator

Good result:

Mechanically robust and could be operated by untrained user.

Bad result:

Pest control was “not good” based on assessment; however, reps need to be increased.

Conventional (volume, speed) compared to higher Productivity (lower volume, higher speed) spray

Conventional (volume, speed) compared to higher productivity (lower volume, higher speed) spray

Conventional: 1.75 mph, 100 gal/acre, conventional axial fan

Alternative: 3.30 mph, 50 gal/acre, high velocity, air shear (with charging on / charging off)

Response: Nuts (upper & lower tree) collected & analyzed by Dr. Joel Siegel

Nuts & leaves tested for spray deposit (Mo tracer)

Material: Delegate® WG insecticide (rate: 7 oz/acre) Spinetoram 25%

Conventional (volume, speed) compared to higher productivity (lower volume, higher speed) spray

Results (details in poster and discussion):

Leaf deposition – higher productivity led to higher deposit
~ 30%

Leaf deposition – charging led to minimal increases in deposition
~ 3%

Nut data to be discussed on poster.

Armillaria Resistant Rootstocks

Kendra Baumgartner
United States Department of Agriculture
Davis, California

Dan Kluepfel
United States Department of Agriculture
Davis, California

Craig Ledbetter
United States Department of Agriculture
Parlier, California

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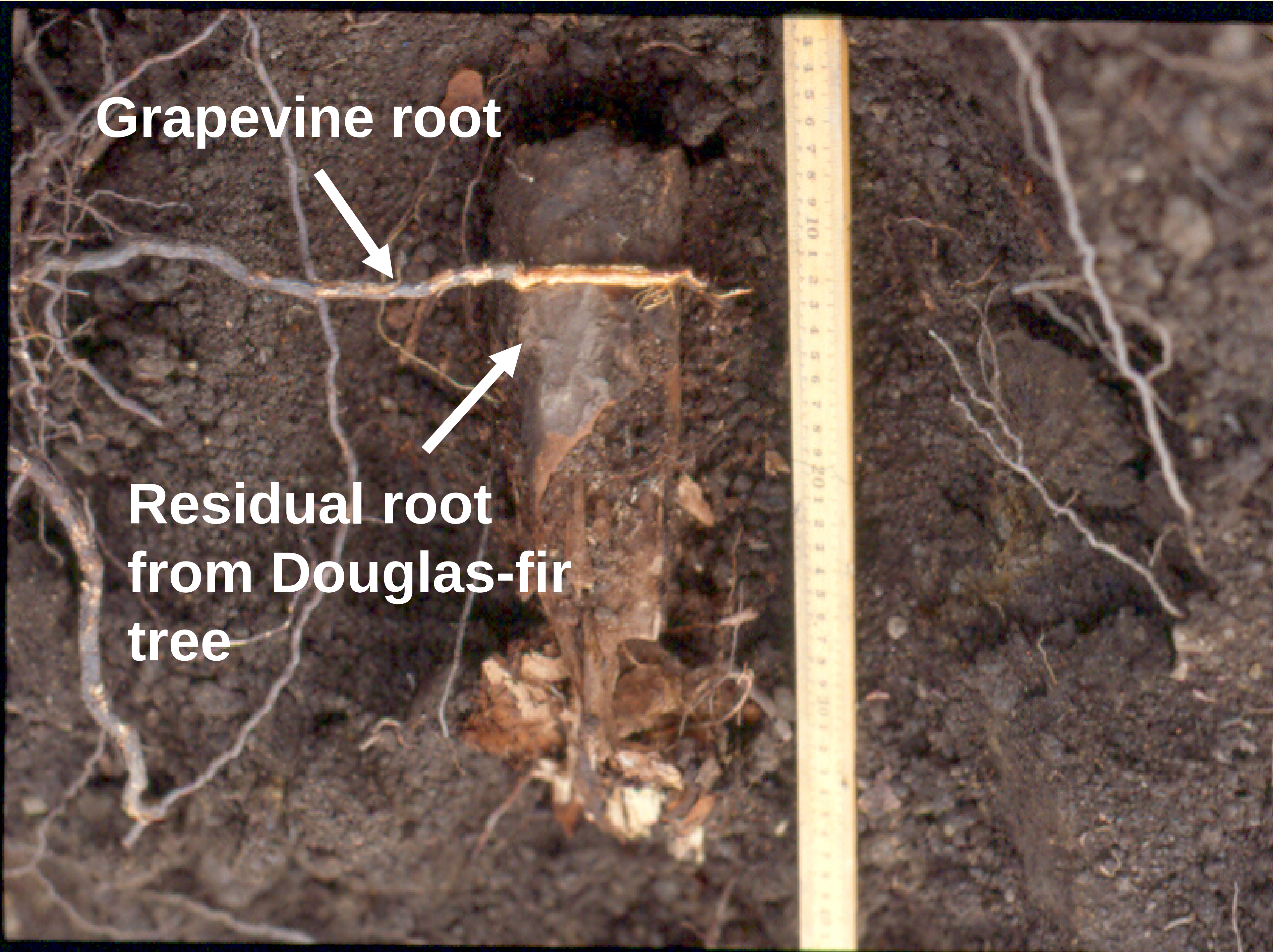

Grapevine root
Residual root from Douglas-fir tree

Soil fumigation with Methyl Bromide

Adaskaveg et al., 1999. Plant Disease 83:240-246.
Bliss, 1951. Phytopathology 86:665-683.
Munnecke et al., 1970. Phytopathology 60:992-993.

NEMAGUARD

Prunus persica x *P. davidiana*

- Rootstock for peach and almond
- Susceptible to *Armillaria*

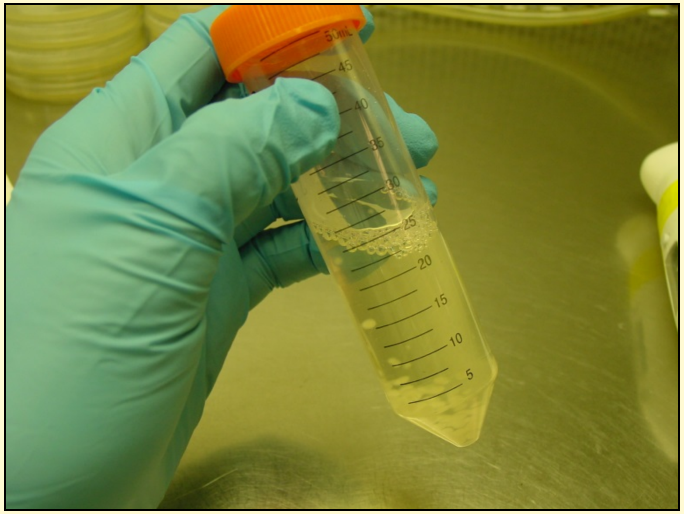
VIKING

***P. persica* x (*P. dulcis* [Jordanolo] x *P. blireiana*)**

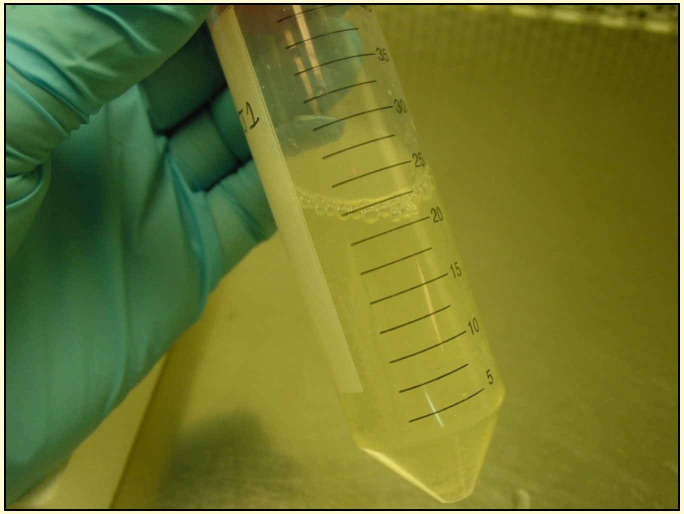
- **Rootstock for peach (incompatible with almond)**
- **Resistant to *Armillaria*, based on field observations.**

7-day liquid culture of *Armillaria mellea*

Prepare inoculum from 7-d liquid culture

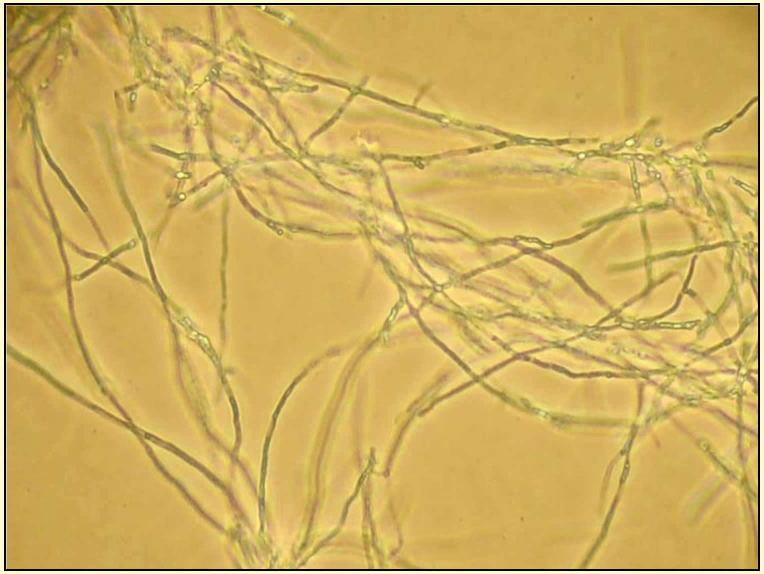


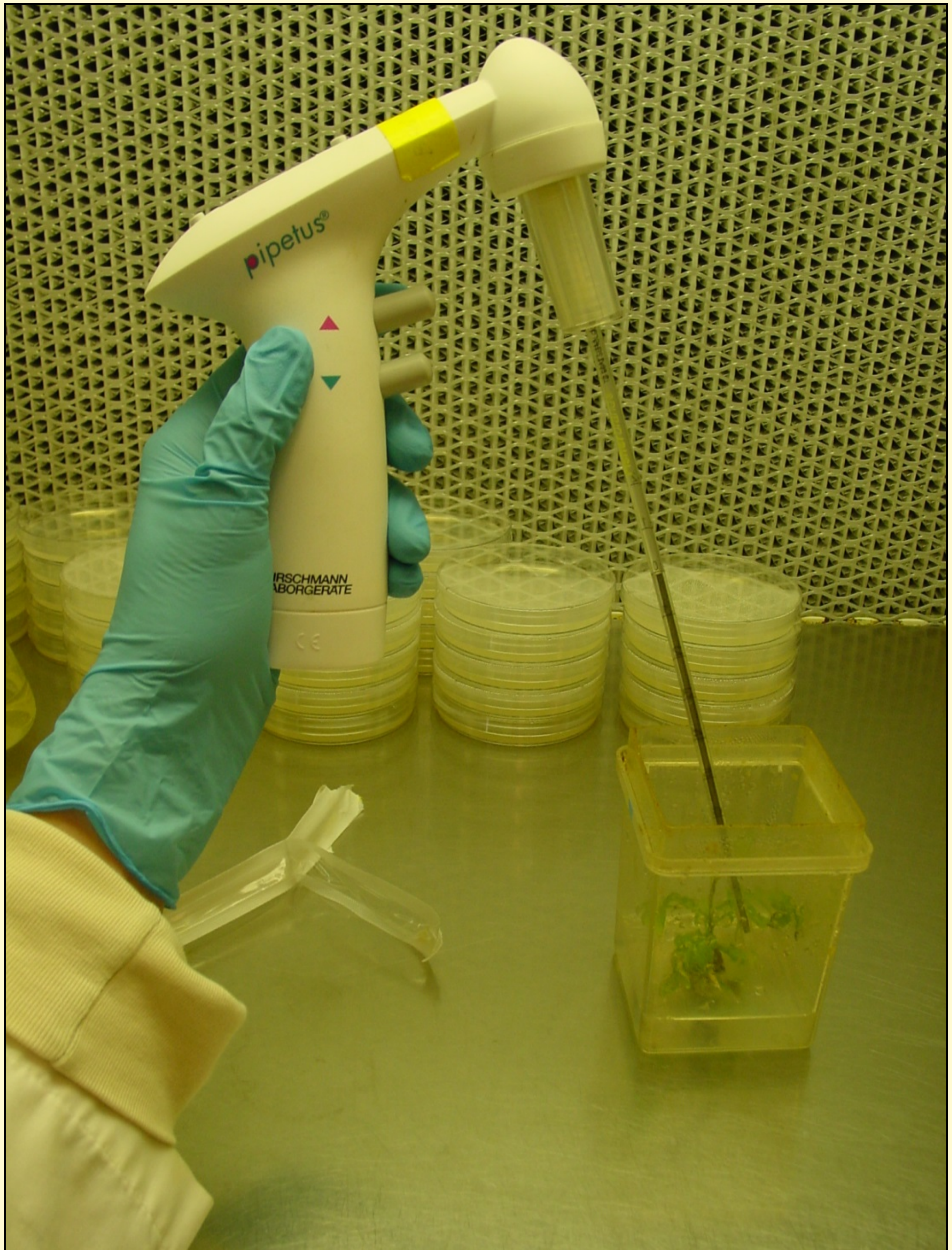
Homogenize

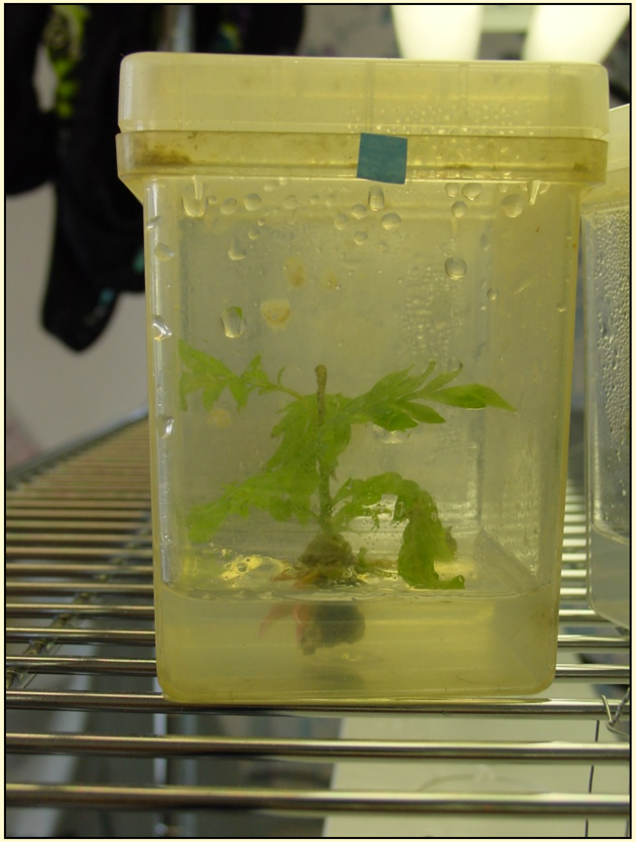


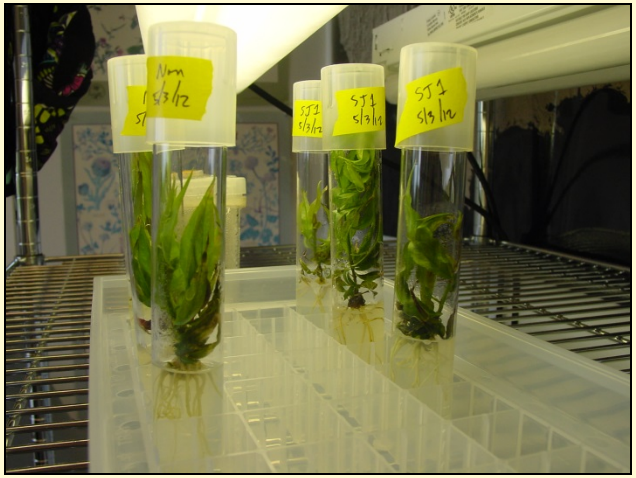
Mycelium on residual root

Mycelium in liquid culture




pipetus®




SJ 1
5/3/12


072413_K01
_NI_R03
072413_K01_
Sac304_R06
072413_K01
_Sol310_R07
072413_K01
_SC4_R05

Infection Assay

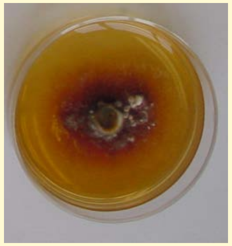
<u>Plant Material</u>

- Hansen 536
- Krymsk 1
- Krymsk 86
- Lovell
- Marianna 2624
- Nemaguard
- Bright 5
- Empyrean

<u>*Armillaria* strains</u>

Two *Armillaria mellea* from *Prunus* in Sacramento & Solano Counties

One *Armillaria tabescens* from peach in South Carolina



Rootstock	% Mortality at 2 MPI	Notes
Krymsk 86	33.44a	More resistant than Marianna 2624
Krymsk 1	41.11ab	As resistant as Marianna 2624
Marianna 2624	**46.11ab**	**Resistant control**
Lovell	71.79c	As susceptible as Nemaguard
Nemaguard	**76.44c**	**Susceptible control**
Hansen536	89.12d	More susceptible than Nemaguard



Fungicide Impact on Honey Bee Development

Louisa Hooven

Department of Horticulture

Oregon State University

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Almonds are the first stop in the annual pollination cycle for US honey bees

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- Most beekeepers leave almonds with healthy happy bees
- Some beekeepers report die offs in the holding yards
- Some beekeepers report problems with honey bee development during or after almonds

Commonly used fungicides are toxic to honey bee larvae in laboratory studies

Iprodione (Rovral)
- Found in pollen and wax
- Toxic to larvae in laboratory studies

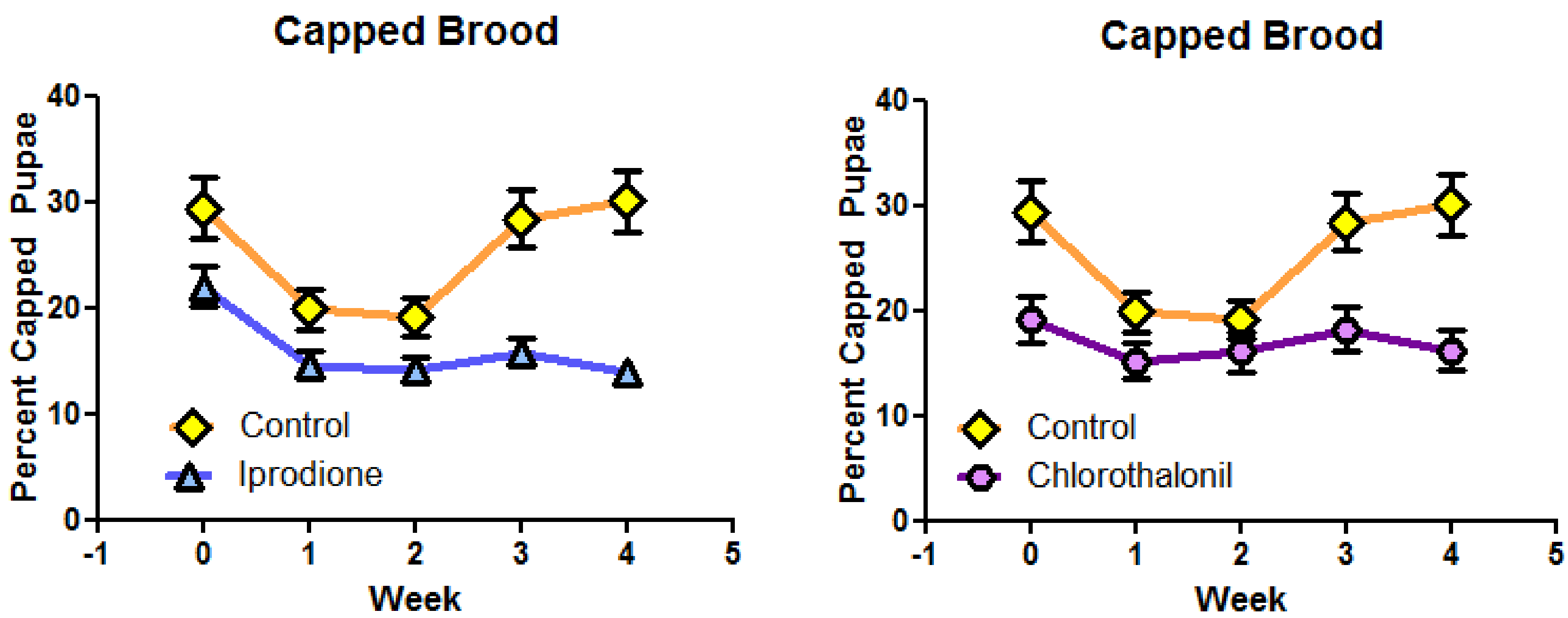
Chlorothalonil (Bravo, Echo, Dachonil)
- Found in pollen and wax
- Toxic to larvae in laboratory studies

Ziram (Ziram)
- Requires special testing, unknown if accumulates
- Toxic to larvae in laboratory studies

Are laboratory results relevant in the field?

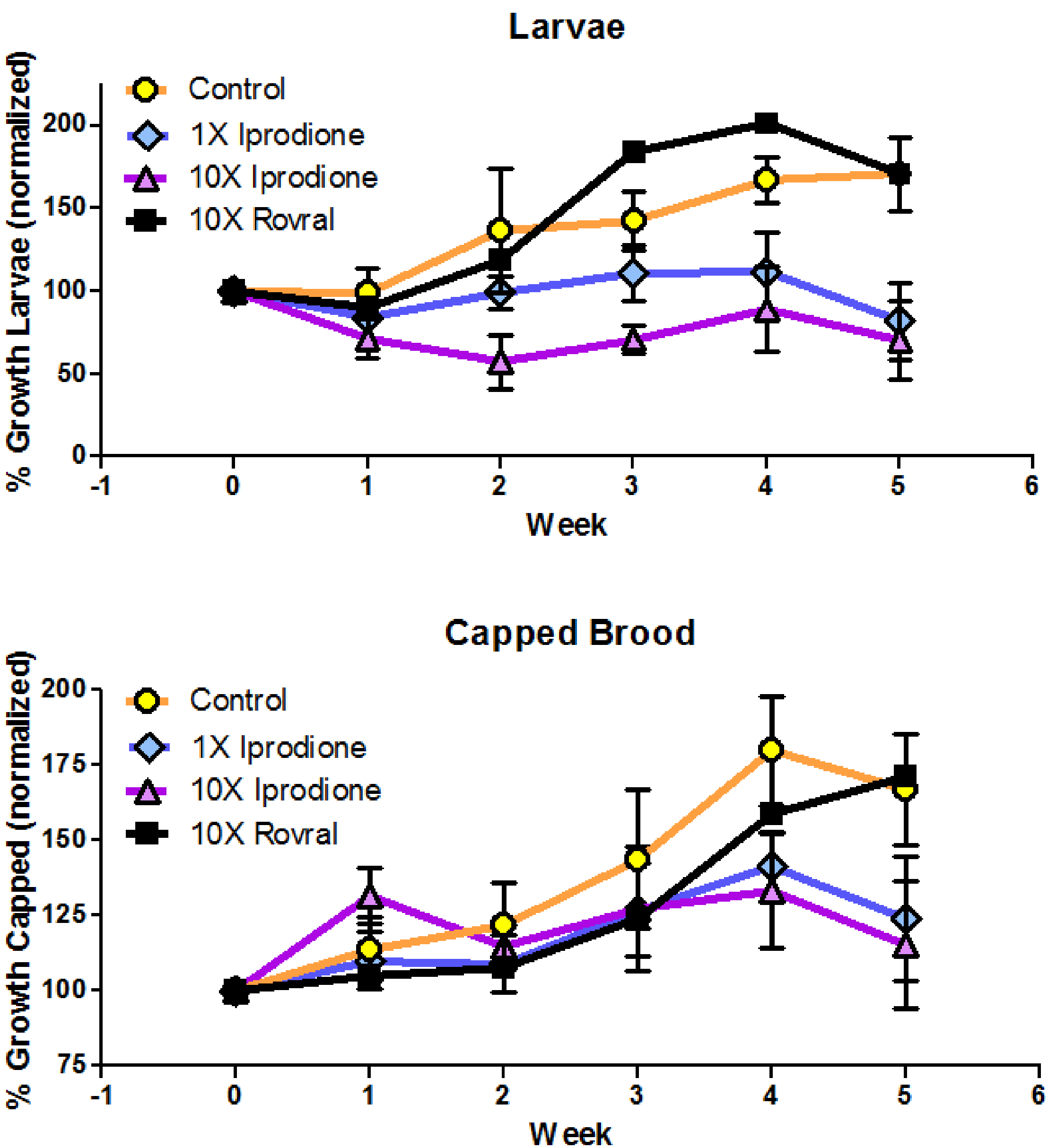
2012 Semi-field Experiment

2012 Preliminary data

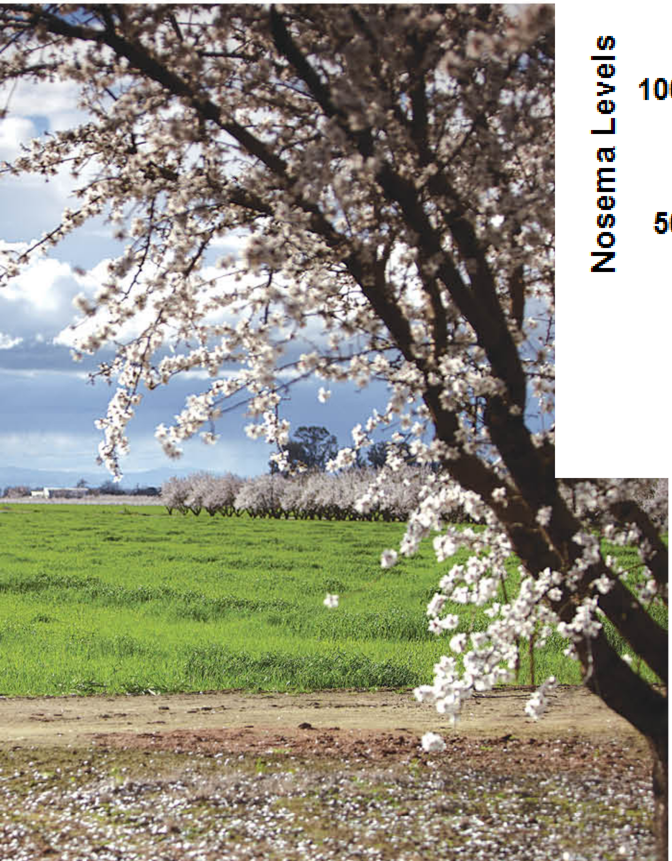


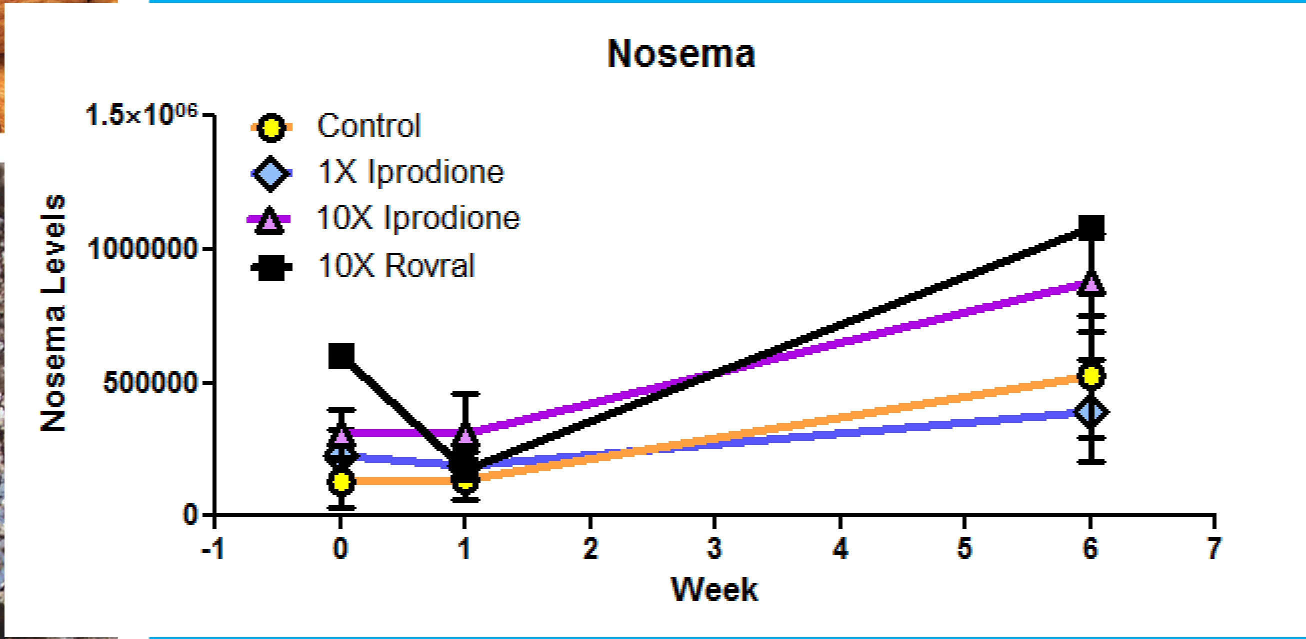
Less larvae developed to capped brood stage in colonies fed pollen spiked with iprodione or chlorothalonil


2013: 7 colonies each
Controls
1X Iprodione
10X Iprodione
10X Rovral
Rovral 4F (Flowable)

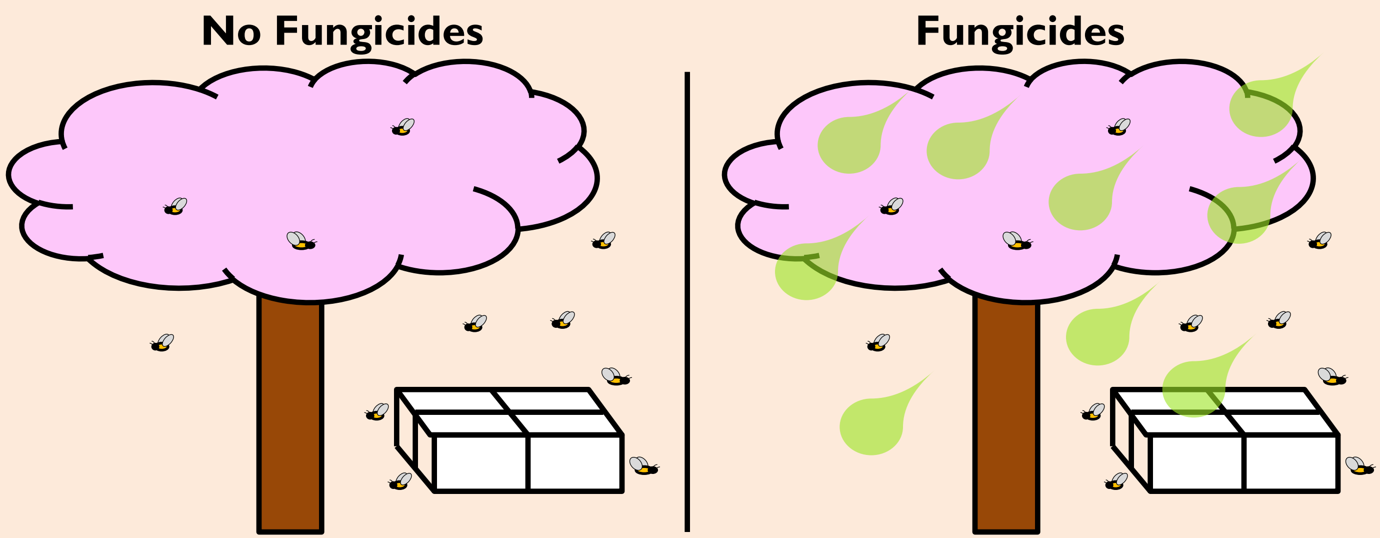


Larvae
% Growth Larvae (normalized)
Control
1X Iprodione
10X Iprodione
10X Rovral
0
50
100
150
200
-1
0
1
2
3
4
5
6
Week
Capped Brood
% Growth Capped (normalized)
Control
1X Iprodione
10X Iprodione
10X Rovral
75
100
125
150
175
200
-1
0
1
2
3
4
5
6
Week




Nosema
1.5×10^06
1000000
500000
0
Nosema Levels
Control
1X Iprodione
10X Iprodione
10X Rovral
-1
0
1
2
3
4
5
6
7
Week

Not quite that black and white



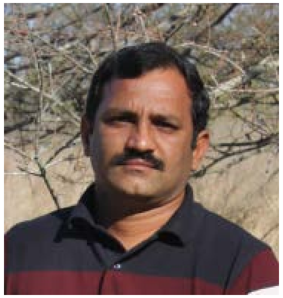
- Difficult to quantify actual exposures
- Additive & synergistic effects possible
- Fungicides are used in many crops

Take-home message: Minimize exposure

- Communicate
- Spray timing
- Hive placement

Acknowledgements

Collaborators:



The OSU Honey Bee Laboratory

Ramesh Sagili
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Elizabeth Records

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Matt Stratton
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Sarah Montague
Josean Perez

Funding:

National Honey Board

California Almond Board

Oregon State University General Research Fund

USDA NIFA

Thank You

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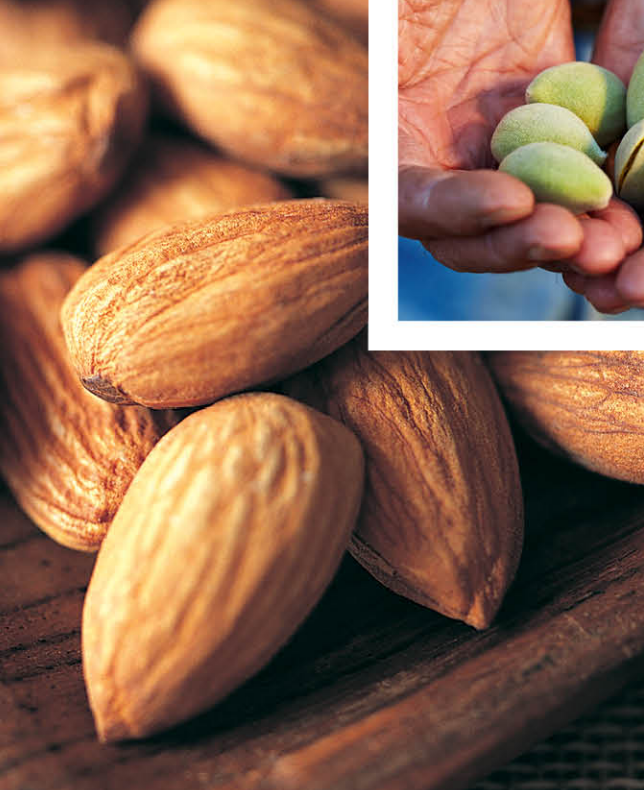

Integrated questions of pollination in almonds

Neal Williams
Dept. of Entomology
UC Davis

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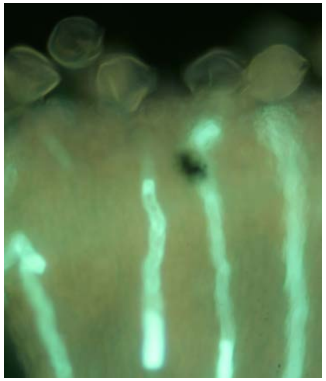
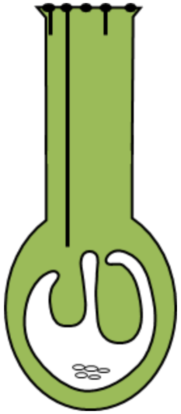
Two Parts:

1. Fungicide impacts on pollen germination: toward optimizing spray timing





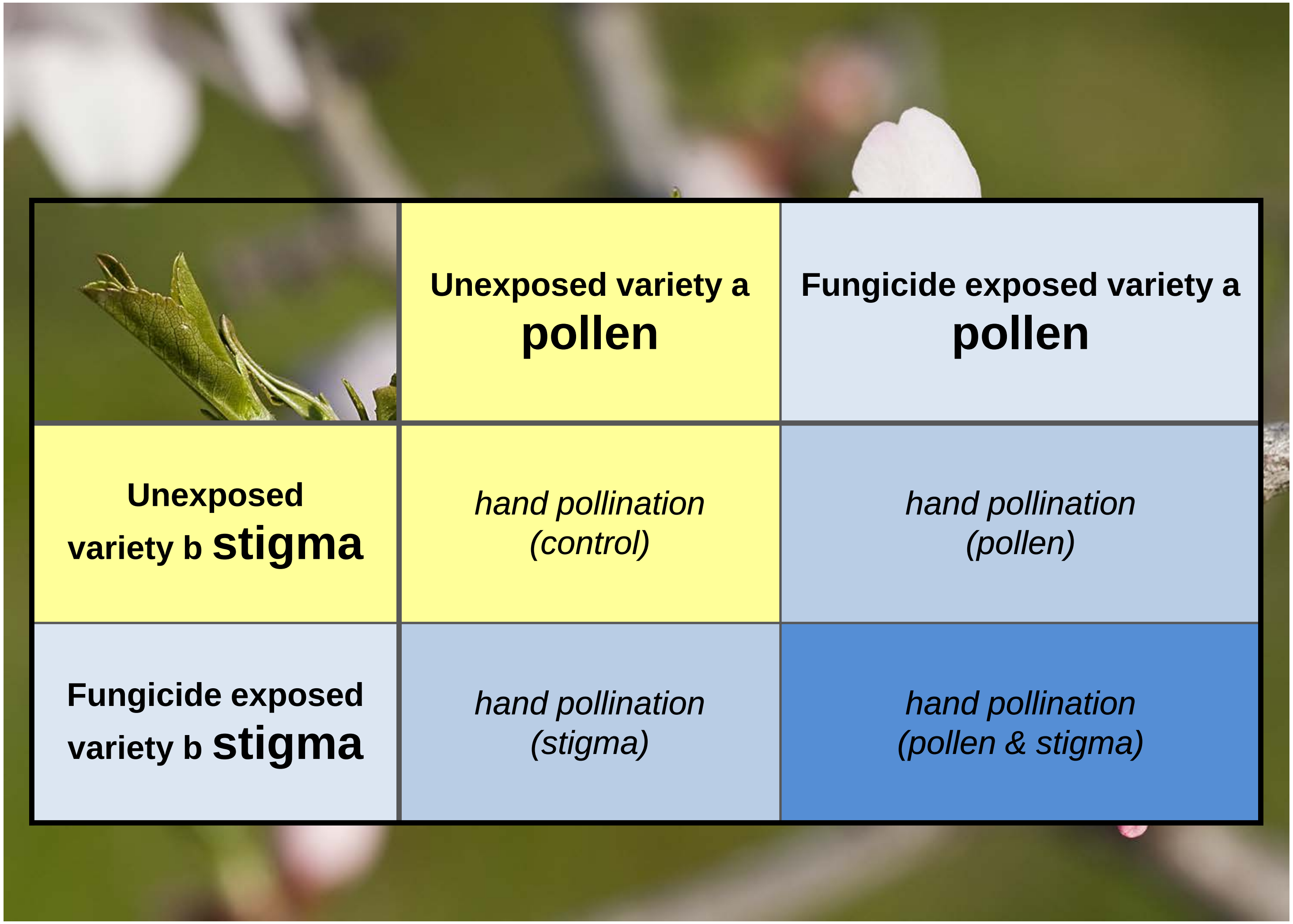
2. Forage plantings for almond pollinators

Study Aims

1. Quantify effects of in-the-field fungicide exposure on the fertilization of almond flowers through pollen, stigmas or both.

2. Test whether flowers still in bud during fungicide application are affected in the same way as are open flowers.

3. Investigate how the timing of pollen deposition relative fungicide application affects fertilization of almond flowers.

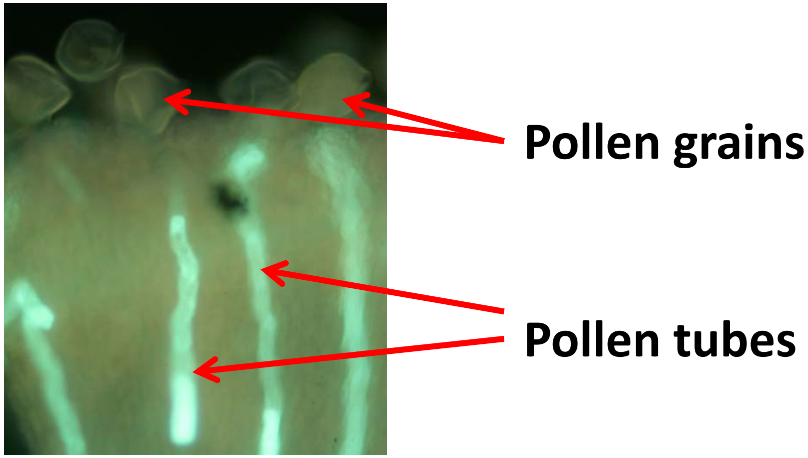


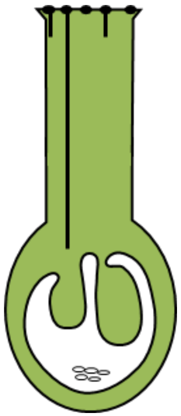
	Unexposed variety a **pollen**	Fungicide exposed variety a **pollen**
Unexposed variety b **stigma**	*hand pollination (control)*	*hand pollination (pollen)*
Fungicide exposed variety b **stigma**	*hand pollination (stigma)*	*hand pollination (pollen & stigma)*

Assess differences in ovule fertilization of intact flowers from the different treatments

1. Timing (open flower versus in bud)

2. Pollen versus stigma / style pathway





Forage plantings for almond pollinators

Integrated Crop Pollination Project

- Tree fruits throughout the country
- ALMOND targeted in CA

1. Integration of non-Apis bees
    - Blue Orchard Bee

2. Development of flowering plant mixes to support honey bees and others in almond landscape.

Forage plantings for almond pollinators

2012-13 Trial plantings (optimize mix)

- Determine phenology of bloom of different plants species and impact of different irrigation on performance and bloom timing
- Preliminary test of bee use

2013-14 Test mix in different orchard contexts

- Trials in orchards
- Honeybee and native bee use of different plant species
- Timing of bee visits relative to mixes relative to almond bloom
  - Seasonal and within Day

2014-16 Function impact on bees and pollination

- Examine impact of mix honey bee use, managed blue orchard bee performance

Study Sites

Lost Hills

Modesto

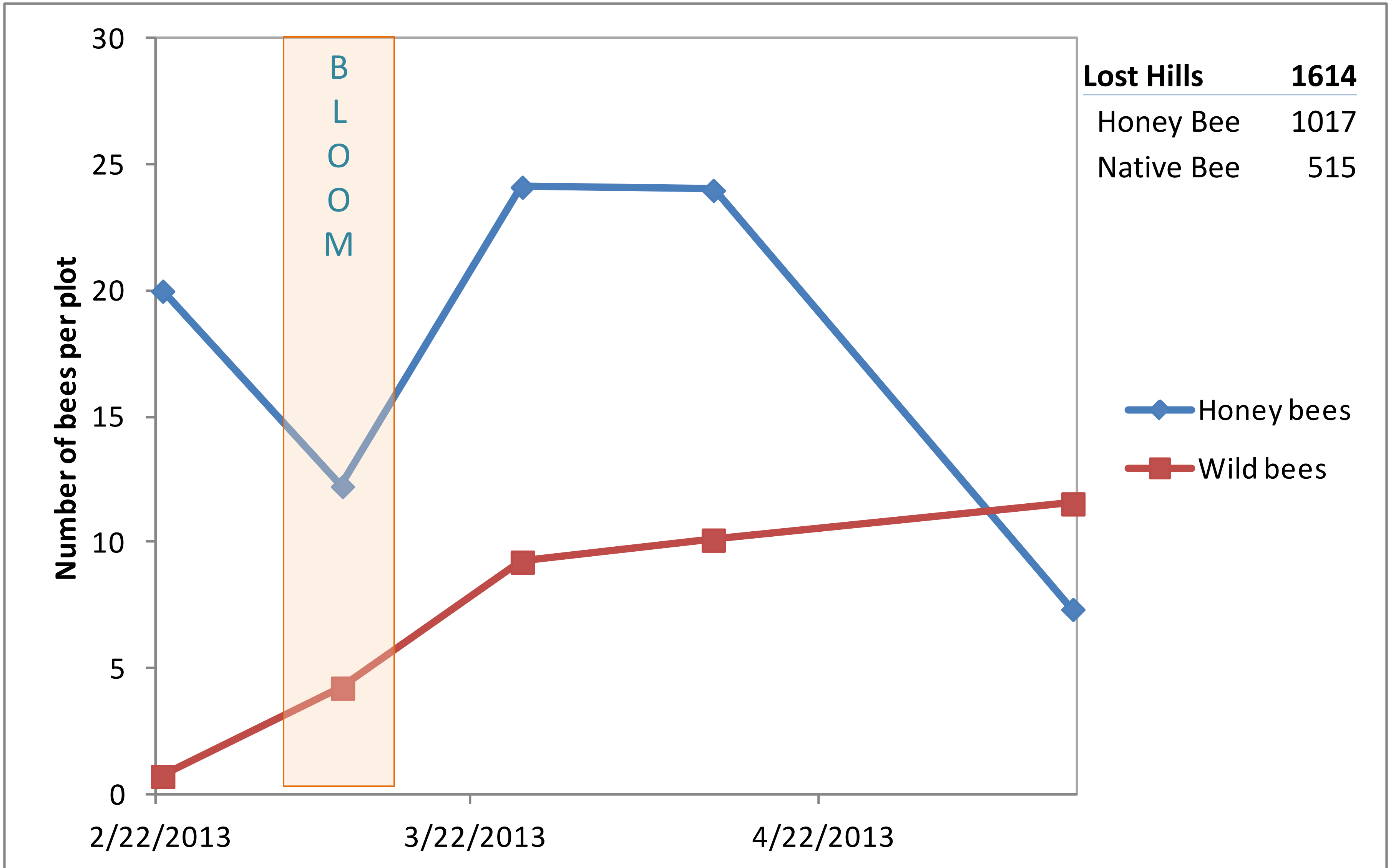
Lockeford

Sampling scheme

- Pre-almond bloom
- Mid-bloom
- Post-bloom

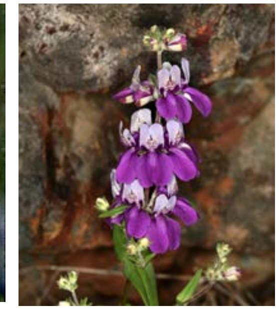
➢ Wildflower timing

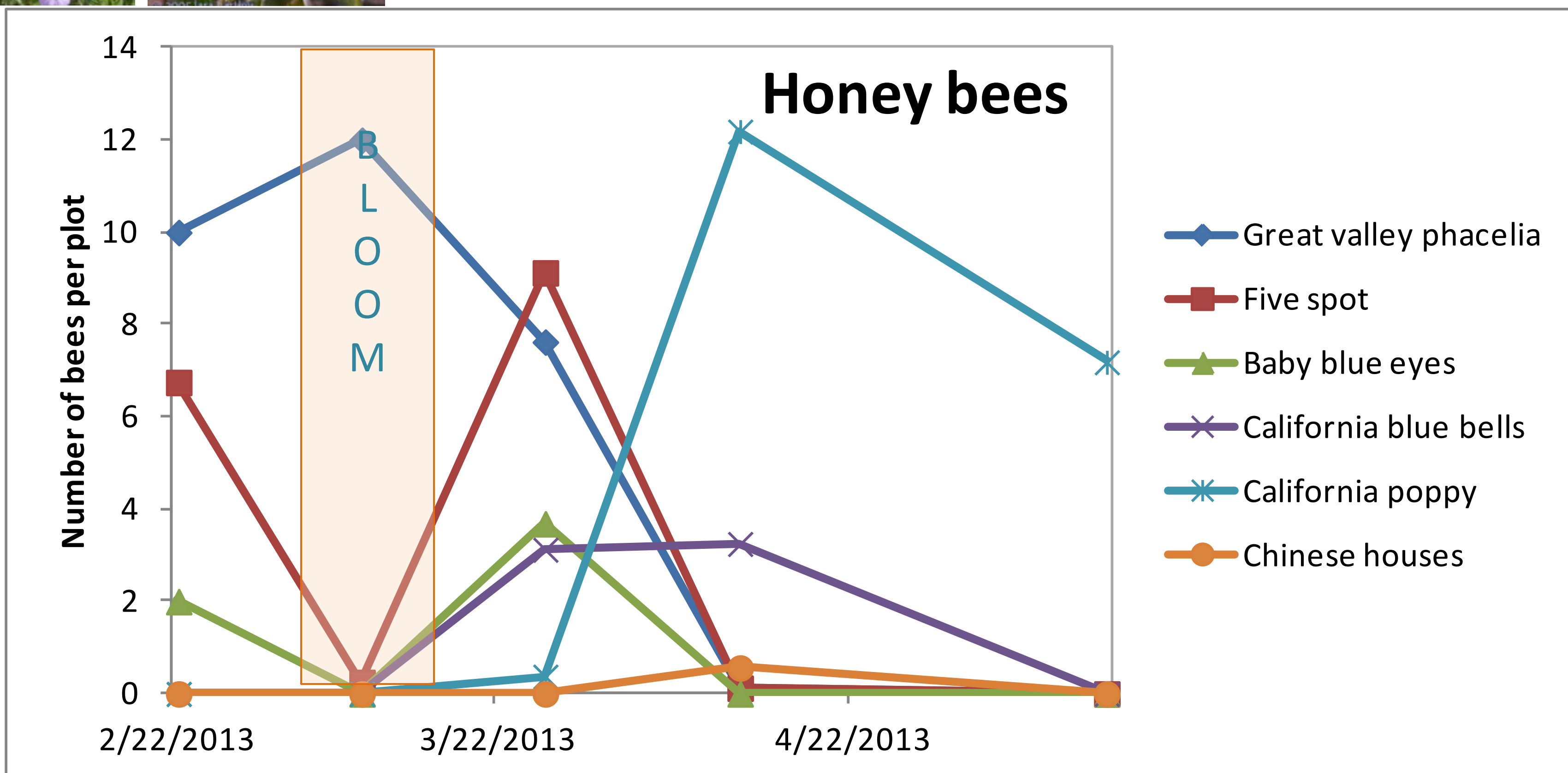
➢ Bee visitation


Number of bees per plot
30
25
20
15
10
5
0
2/22/2013
3/22/2013
4/22/2013
BLOOM
Lost Hills 1614
Honey Bee 1017
Native Bee 515
Honey bees
Wild bees

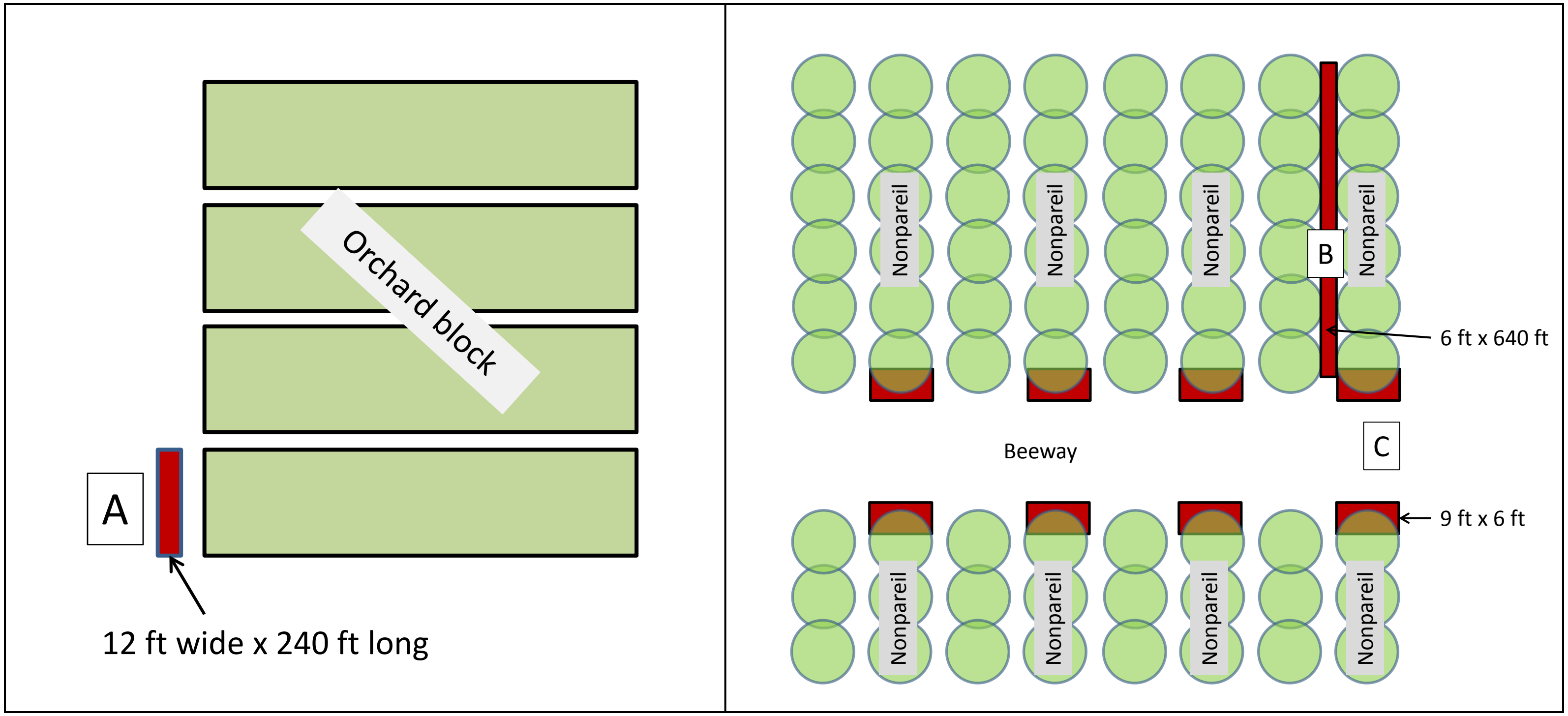






Honey bees
Number of bees per plot
0
2
4
6
8
10
12
14
2/22/2013
3/22/2013
4/22/2013
B
L
O
O
M
Great valley phacelia
Five spot
Baby blue eyes
California blue bells
California poppy
Chinese houses

Next steps: Test wildflower plantings in different orchard contexts



Next steps: Testing plantings in different orchard contexts

1. Plant performance
2. Flowering phenology
3. Among-week and within-day visitation patterns by bees to each flower
4. Visitation to almond during bloom

Interactions of Fungicides and Insecticides on Honey Bees

Reed Johnson
Ohio St University

Gordon Wardell
Project Apis m.

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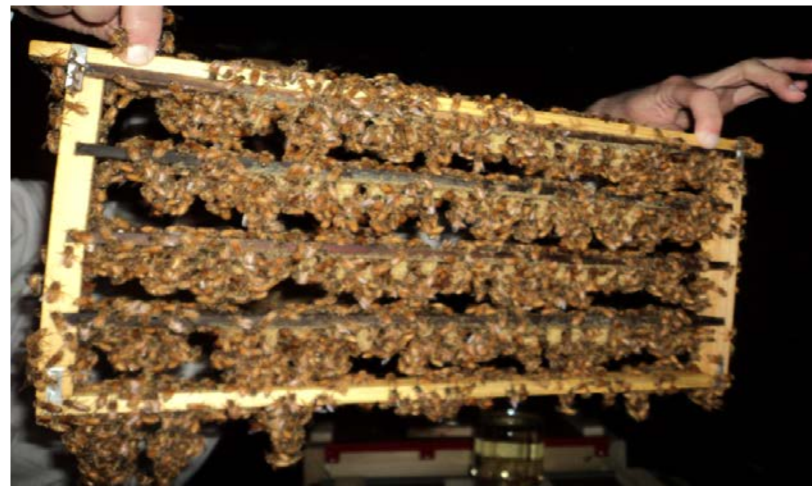
Interactions of Fungicides and Insecticides on Honey Bees



Gordon Wardell
on behalf of Reed M. Johnson

THE OHIO STATE UNIVERSITY
COLLEGE OF FOOD, AGRICULTURAL, AND ENVIRONMENTAL SCIENCES

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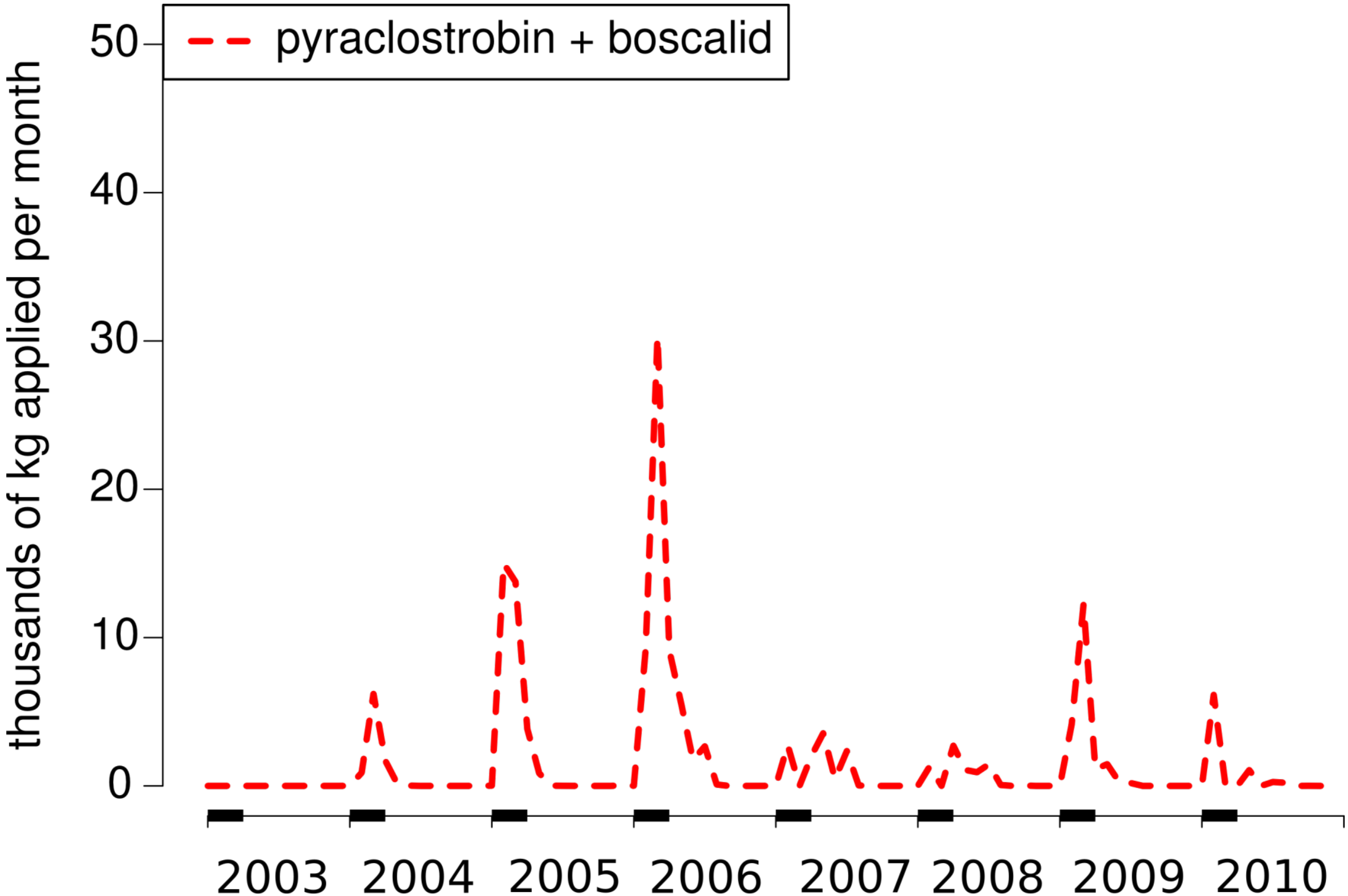
Dennis vanEngelsdorp (University of Maryland)
Gloria Degrandi-Hoffman (USDA-ARS)
Lizette Dahlgren and Marion Ellis (University of Nebraska)
Marla Spivak (University of Minnesota)
Eric Mussen (UC Davis)
Christof Schneider and Joe Wisk (BASF)
The California Bee Breeders Association

800,000 acres of almonds
1 million queens produced

Problem: Up to 80% of queens are dying during development in weeks after almond bloom

“Bee Safe” pesticides applied to almonds during bloom

- Fungicides, herbicides, a few insecticides
- Low acute toxicity to adult bees in laboratory testing
- Carry no cautionary language on label regarding bee exposure



Data from: California Pesticide Info. Portal http://calpip.cdpr.ca.gov/main.cfm

Pollen with Pristine

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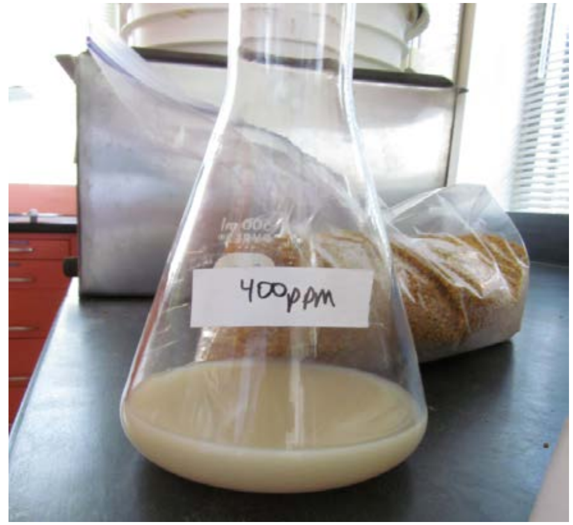



Day 4


Day 8

Frames filled with pollen (500g)

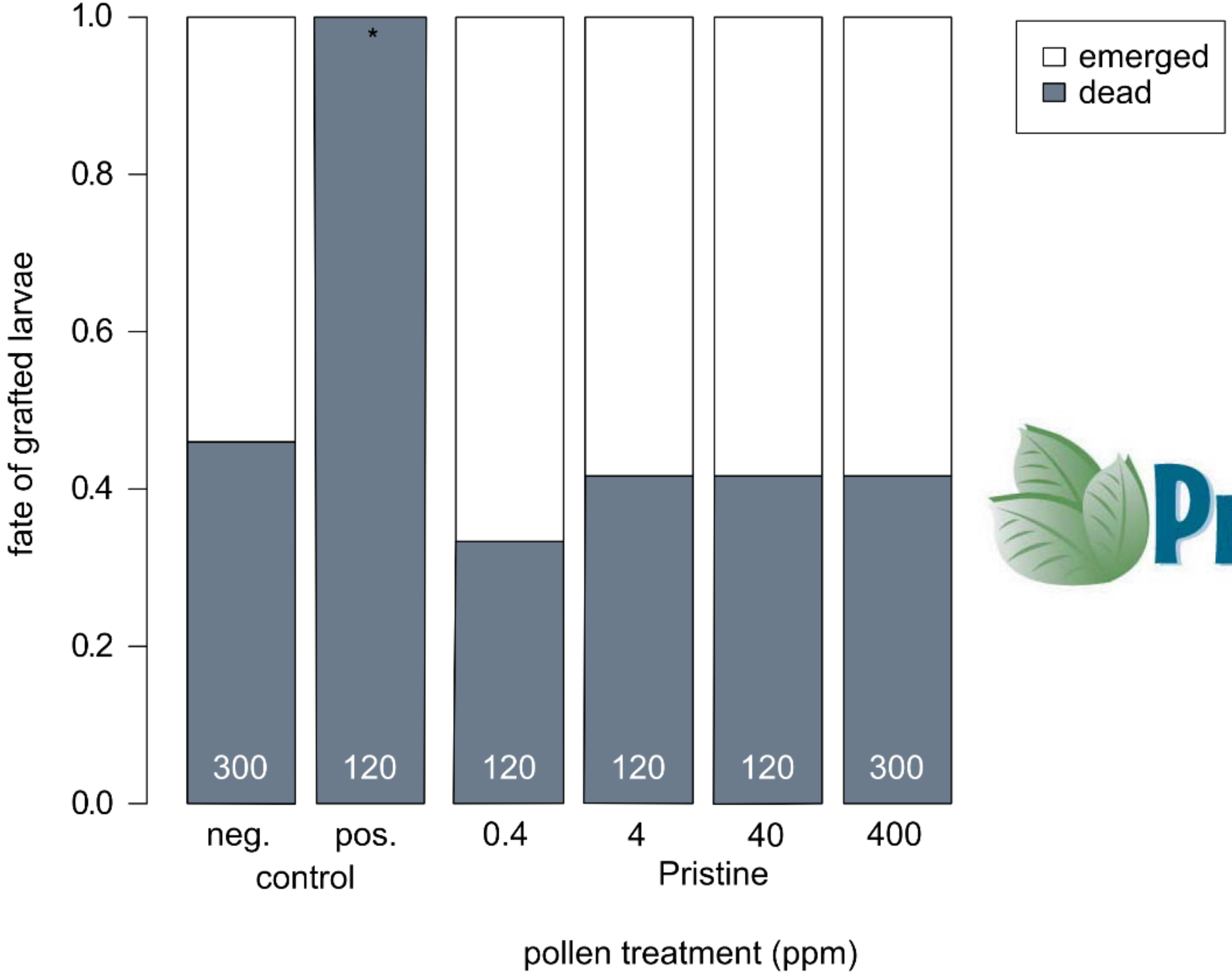
Pristine (ppm)

0.4 | 4 | 40 | 400

Controls + -

100

Dimilin untreated


1.0
0.8
0.6
0.4
0.2
0.0
fate of grafted larvae
*
300
120
120
120
120
300
neg.
pos.
control
0.4
4
40
400
Pristine
pollen treatment (ppm)
emerged
dead

Are queen larvae exposed to Pristine?

<u>Pristine 400 ppm</u>

Pollen: 47 ppm boscalid
22 ppm pyraclostrobin

Royal Jelly: 0 ppm boscalid
0.05 ppm pyraclostrobin

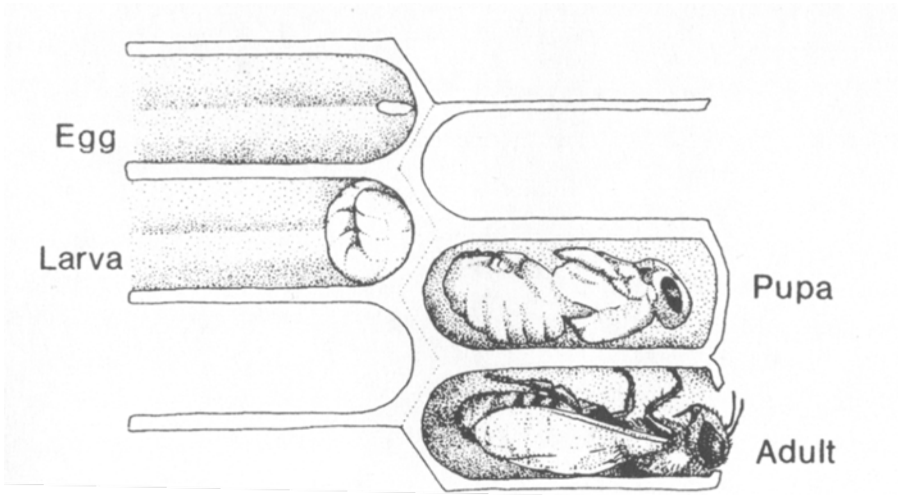
pollen
↓
nurse bee
↓
"food glands"
↓
royal jelly

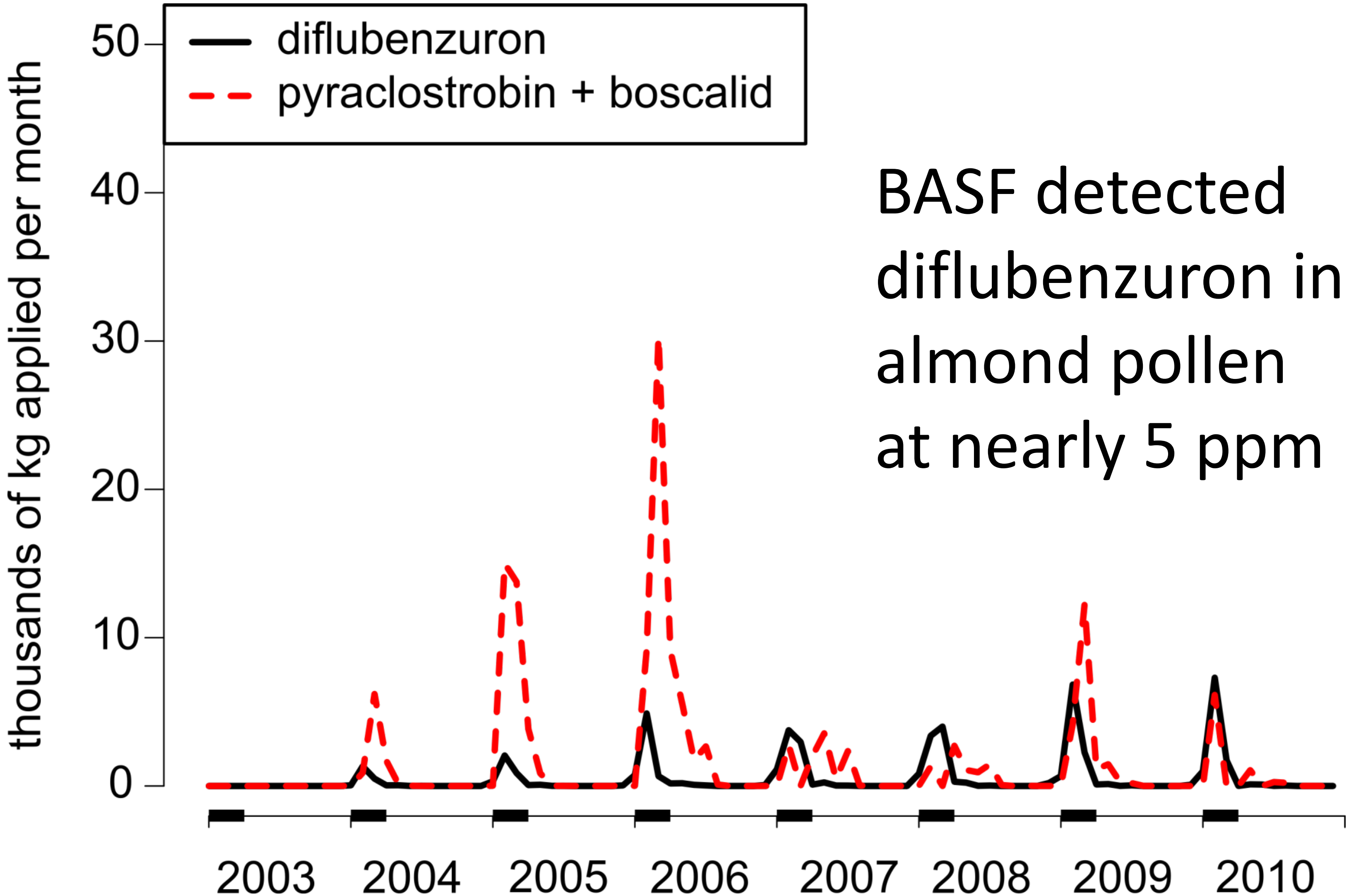
Diflubenzuron:Positive Control

Insect Growth Regulator (IGR)

(chitin synthesis inhibition)

Well-established toxicity to immature bees (reviewed in Tasei, 2001, Apidologie)





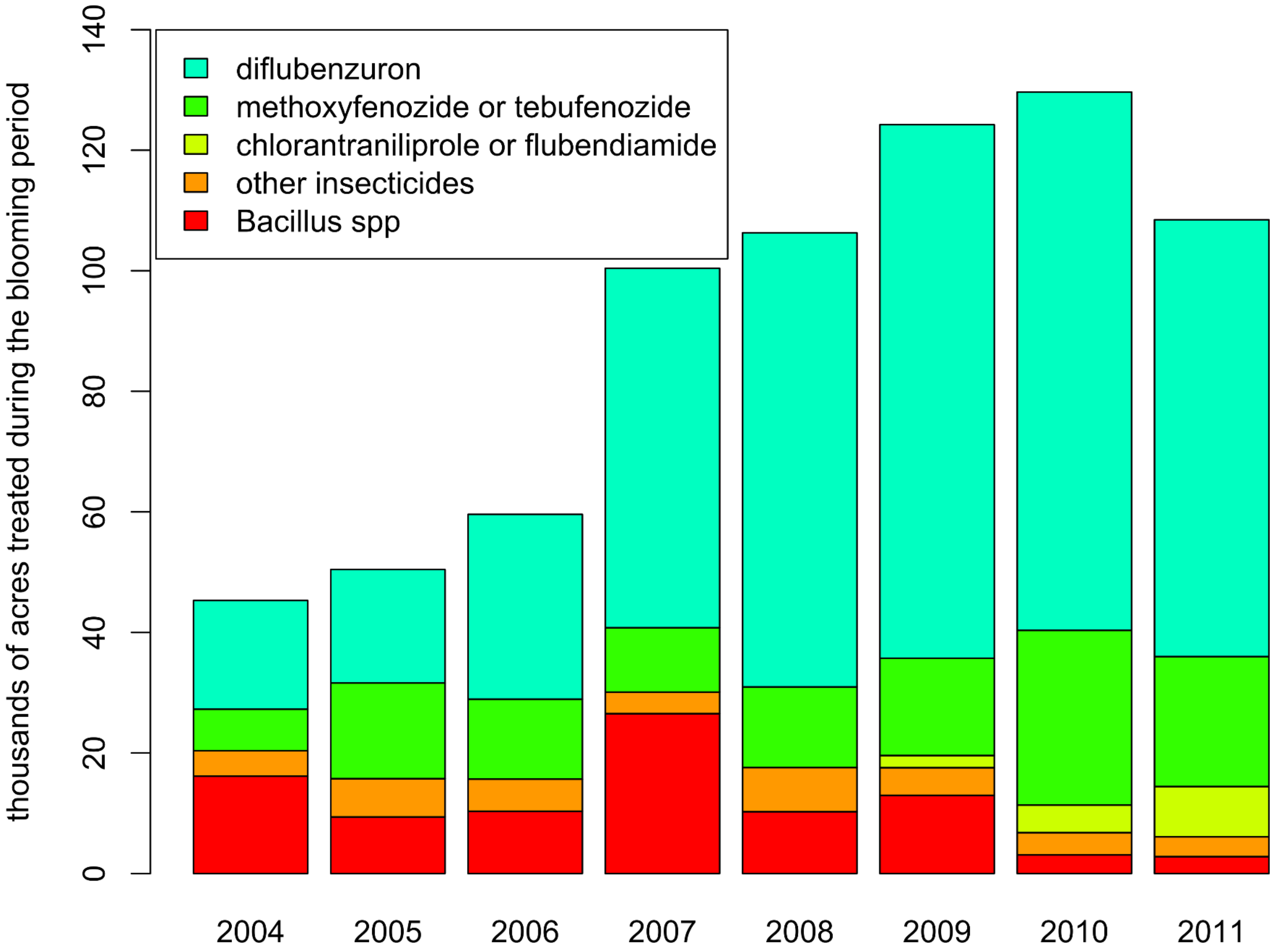
BASF detected diflubenzuron in almond pollen at nearly 5 ppm

Data from:
http://calpip.cdpr.ca.gov/main.cfm

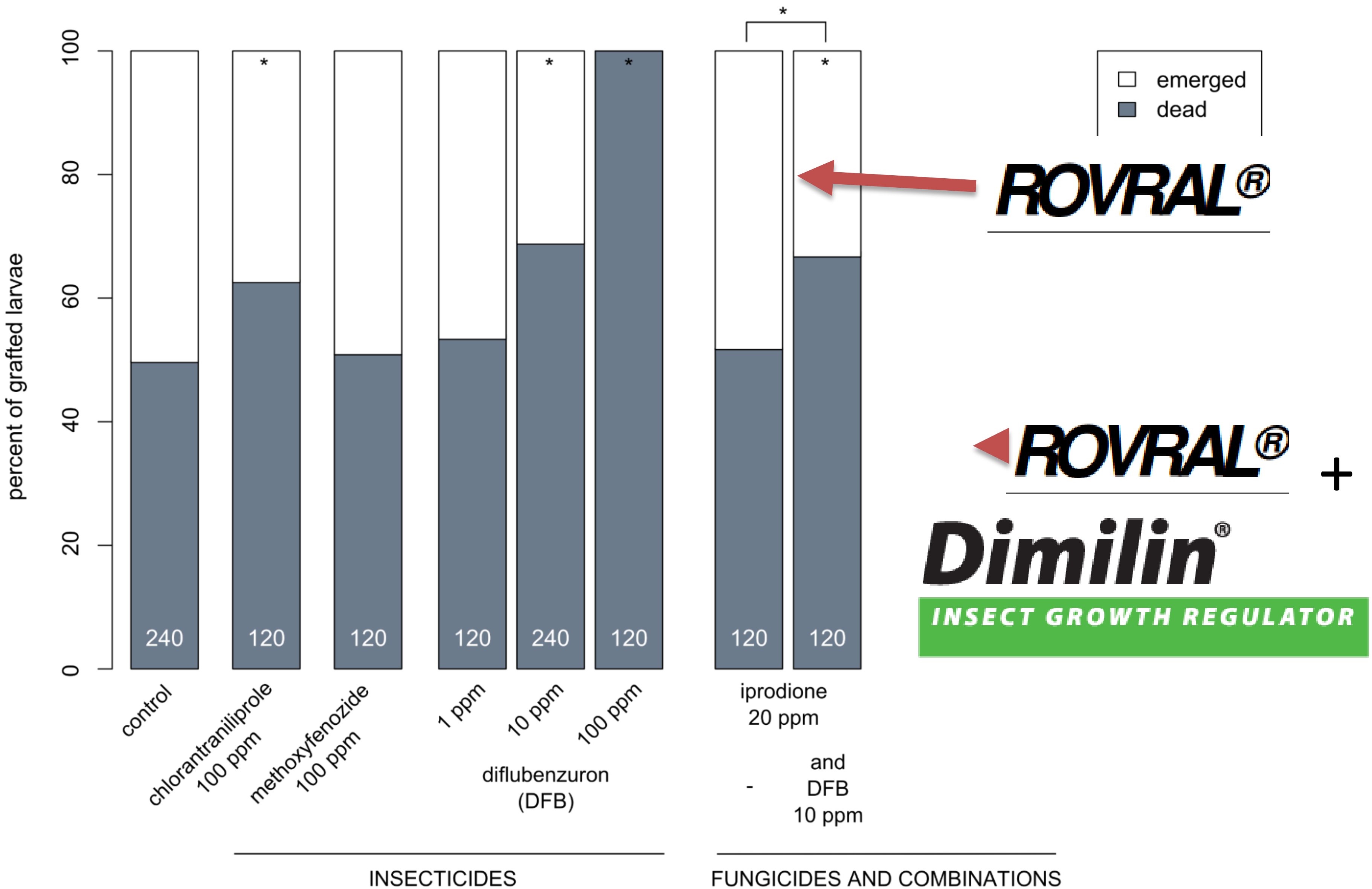
Peach Twig Borer (*Anarsia lineatella*)

Jack Kelly Clark

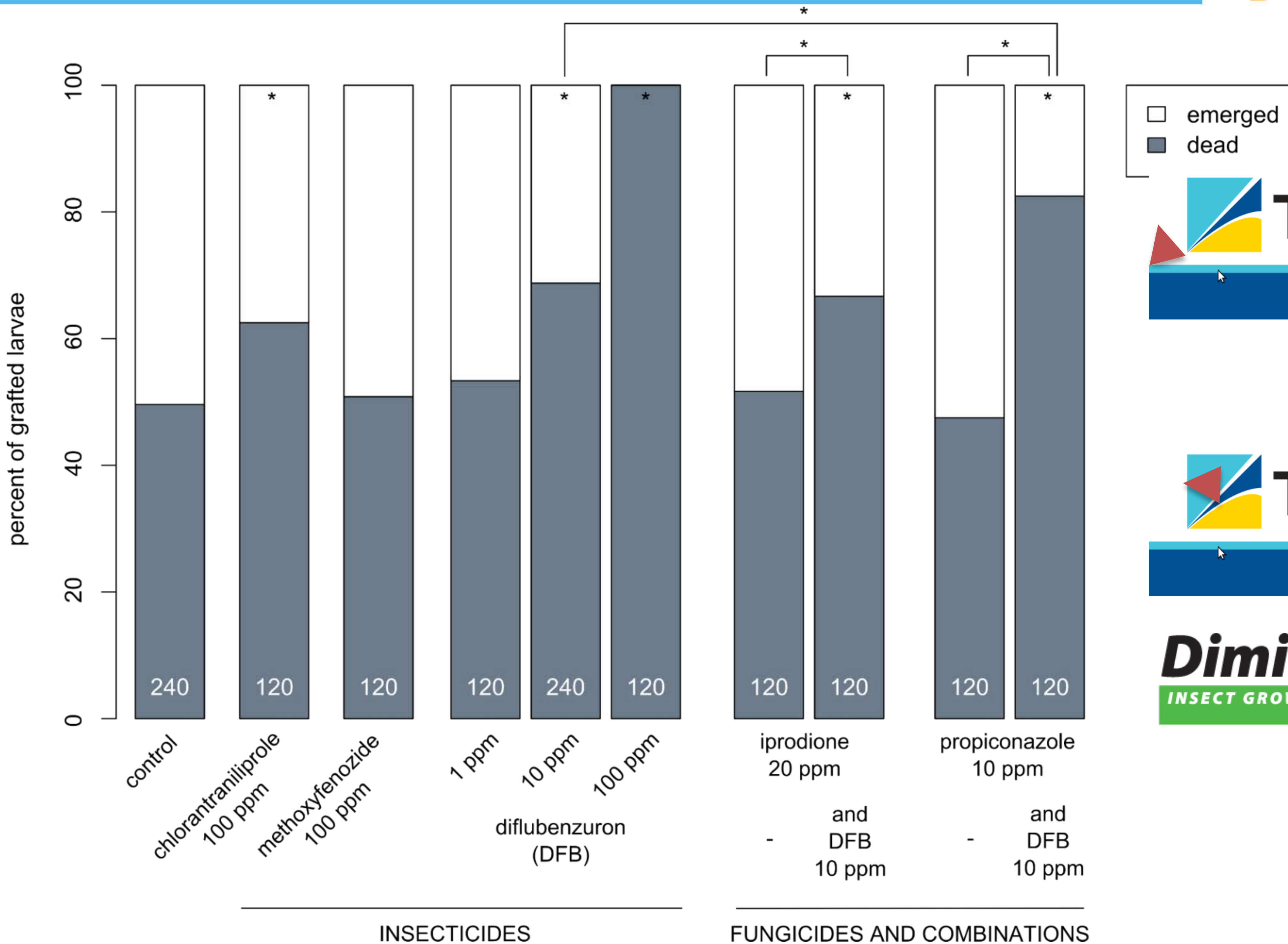
Acres of Almonds Treated with Insecticides During Bloom (Feb. 15 – Mar. 15)



Data from: http://calpip.cdpr.ca.gov/main.cfm



100
80
60
40
20
0
percent of grafted larvae
*
*
*
*
*
emerged
dead
240
120
120
120
240
120
120
120
control
chlorantraniliprole 100 ppm
methoxyfenozide 100 ppm
1 ppm
10 ppm
100 ppm
diflubenzuron (DFB)
iprodione 20 ppm
-
and DFB 10 ppm
INSECTICIDES
FUNGICIDES AND COMBINATIONS
ROVRAL®
ROVRAL®
+
Dimilin®
INSECT GROWTH REGULATOR


percent of grafted larvae
0
20
40
60
80
100
240
120
120
120
240
120
120
120
120
120
*
emerged
dead
control
chlorantraniliprole 100 ppm
methoxyfenozide 100 ppm
1 ppm
10 ppm
100 ppm
diflubenzuron (DFB)
iprodione 20 ppm
propiconazole 10 ppm
-
and DFB 10 ppm
INSECTICIDES
FUNGICIDES AND COMBINATIONS

Conclusions

No fungicide affected queen development

- Pristine (boscalid + pyraclostrobin - 400 ppm)
- Rovral (iprodione - 20 ppm)
- Tilt (propiconazole - 10 ppm)

Conclusions

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Tank mixing Dimilin increases the effect on queen development

Risk associated with Dimilin is increased when tank mixed with some fungicides

Mitigating the effects of bloom sprays

1. During Bloom – Only use insecticides only if necessary (>80% of almond acres not treated)
2. Reduce bee exposure with nighttime application
3. Don’t tank mix insecticides with fungicides
4. Use insecticides posing less risk to bees
5. Provide a clean water source for the bees

Future work

1. Measure concentrations of products entering the hive to determine real exposure
2. Repeat Dimilin experiment using worker larvae and pupae


Thank You

Importation and Preservation of Germplasm for US Honey Bee Breeding and Stock Improvement

Walter Sheppard
Susan Cobey
Department of Entomology
Washington State University
Pullman, WA.

WASHINGTON STATE UNIVERSITY

Rationale for Germplasm Importation

1. Enhance the diversity of US honey bee populations
2. Provide “raw material” for selection and breeding

Overseas Origins

First significant introduction of new germplasm from three subspecies since passage of 1922 honey bee act restricting importation.

Apis mellifera carnica
Apis mellifera ligustica
Apis mellifera caucasica

Queen Producer Joins the Search

Jackie Park-Burris
CA. Queen producer

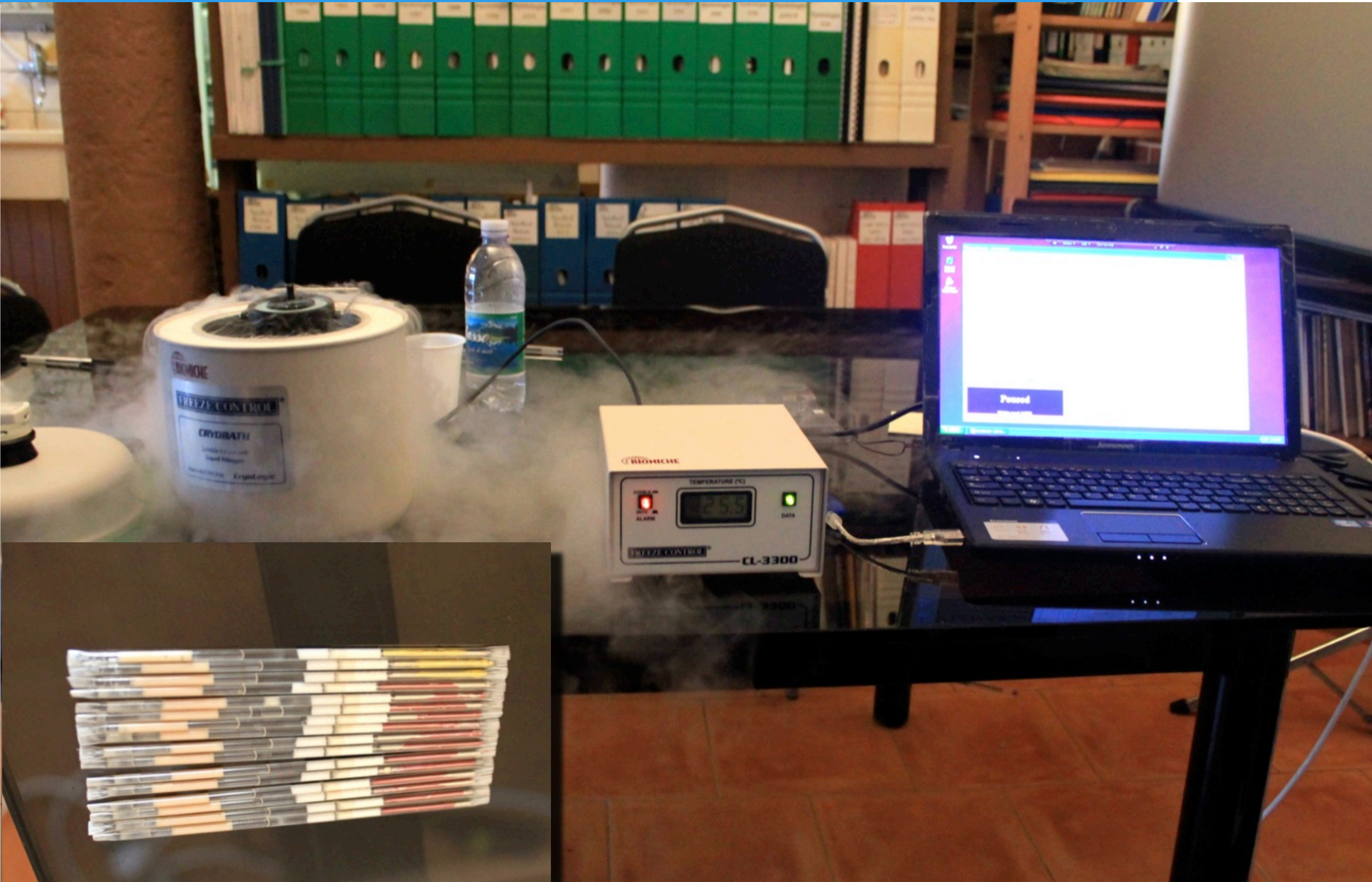
Joined the collection trip to Italy to assist with germplasm selection of *A.m. ligustica*.

Reggio Emilio with Dr. Cecilia Costa

Laboratory with genetic accessions of honey bee stocks from throughout Italy.

Germplasm Collection

Cryopreservation of Semen



Apis mellifera carnica from Slovenia

Enhance the New World Carniolan Line

Re-establishing *Apis mellifera caucasica* from the Republic of Georgia

Apis mellifera caucasica

Propolis Collection,
A Self Medication

Quarantine Of Imported Stocks

- Isolated quarantine station at WSU Ecological Preserve
- Released by USDA-APHIS after virus analysis
- Distributed to industry for Propagation - CA Bee Breeders

Partnering With CA. Queen Producers

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Partnering with the CA. Tech Team

Steps toward utilization of honey bee genetic resources

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- Continue importation of three subspecies for selection and breeding purposes

- Collaborate with queen producers on stock maintenance, breeding and distribution

- Cryopreservation of imported and “top-tier” domestic germplasm in a genetic repository

Thank you for your support !

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Honey Bee Nutrition: Protein Supplements vs. Natural Forage

Gloria DeGrandi-Hoffman[1], Mark Carroll, and Judy Chen[2]

[1]Carl Hayden Bee Research Center, USDA-ARS, Tucson, AZ,
[2]USDA-ARS Beltsville Bee Lab, Beltsville, MD

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Materials and Methods

Protein supplement –A

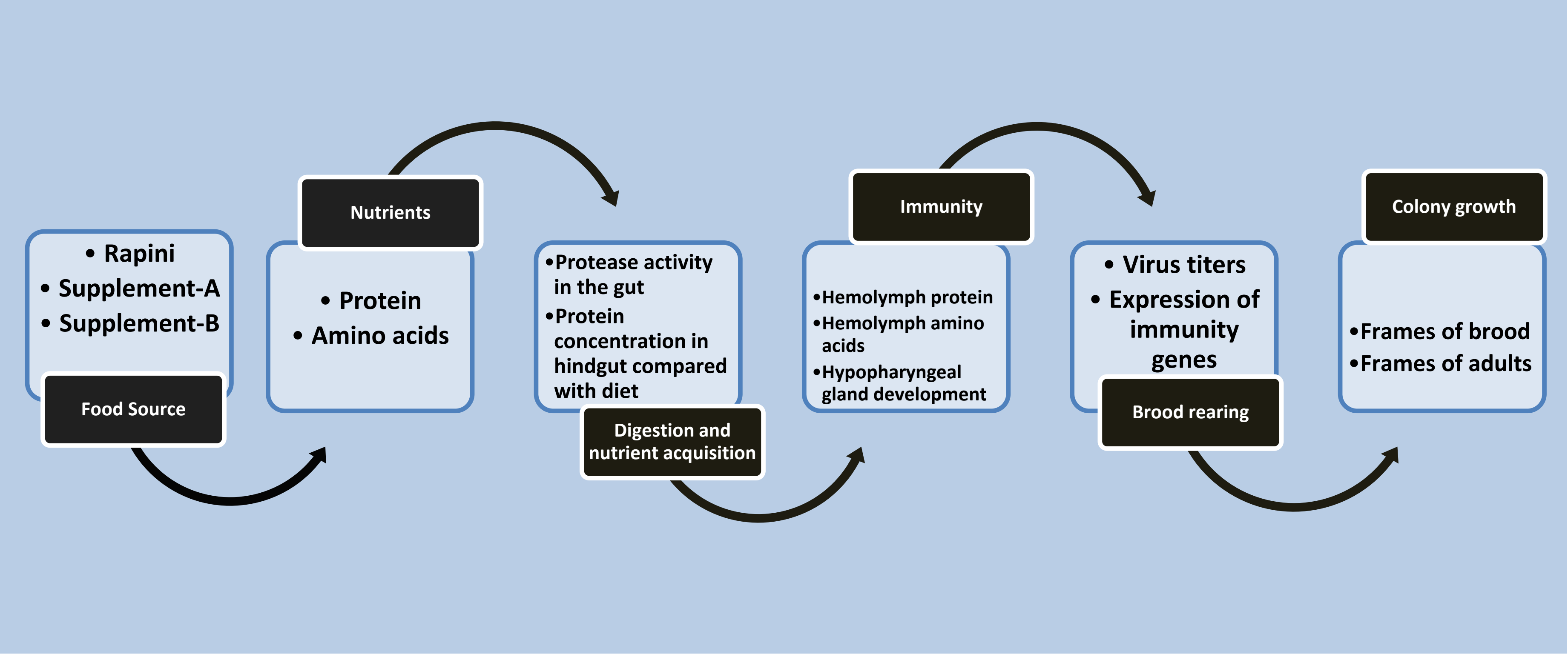
Protein supplement –B

Rapini plants

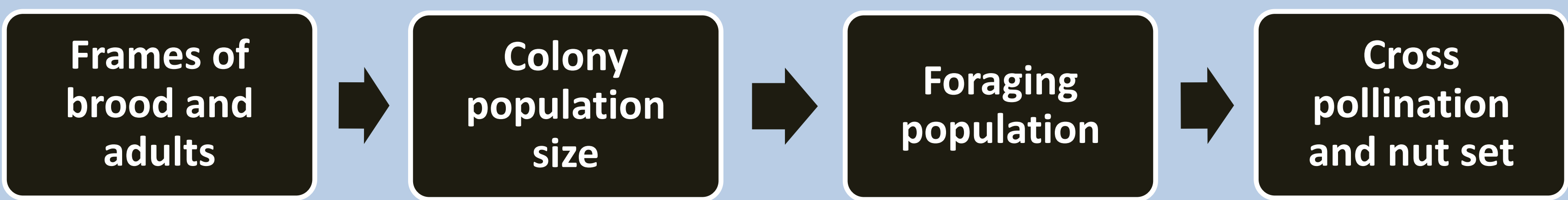
Full-sized colonies in the field

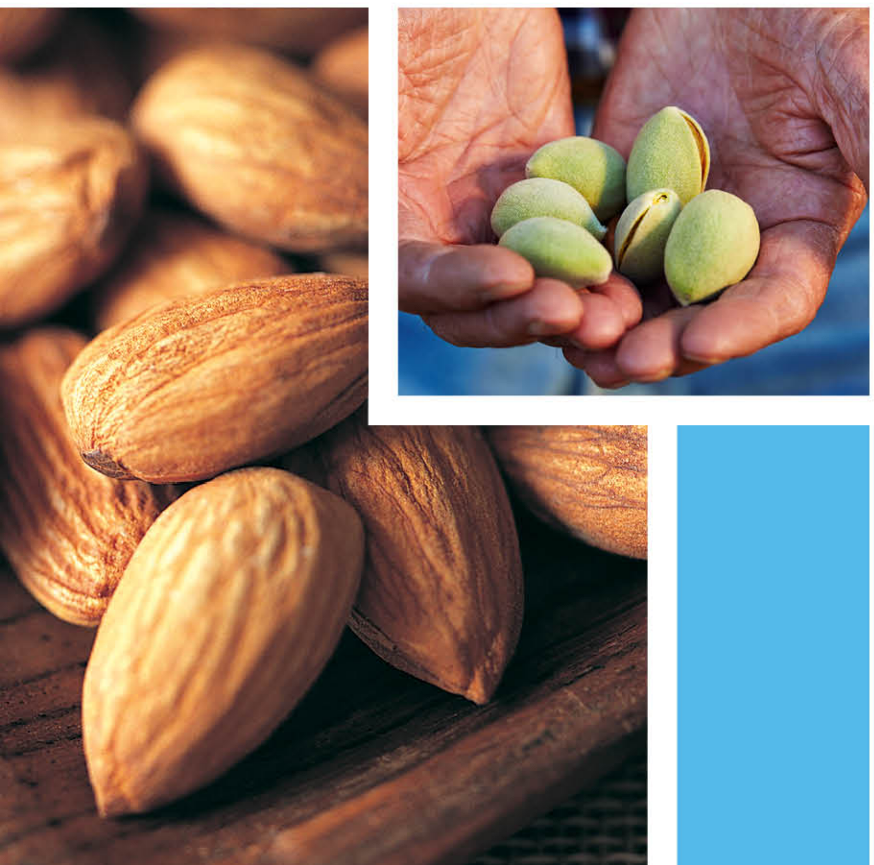
5-frame nucleus colonies in the enclosed flight area

Logical flow for data collection



Potential Benefits to Almond Growers of pre-Bloom Nutrition



VARROA TREATMENTS

Efficacy and Economic Impact

Fabiana Ahumada
AgScience Consulting

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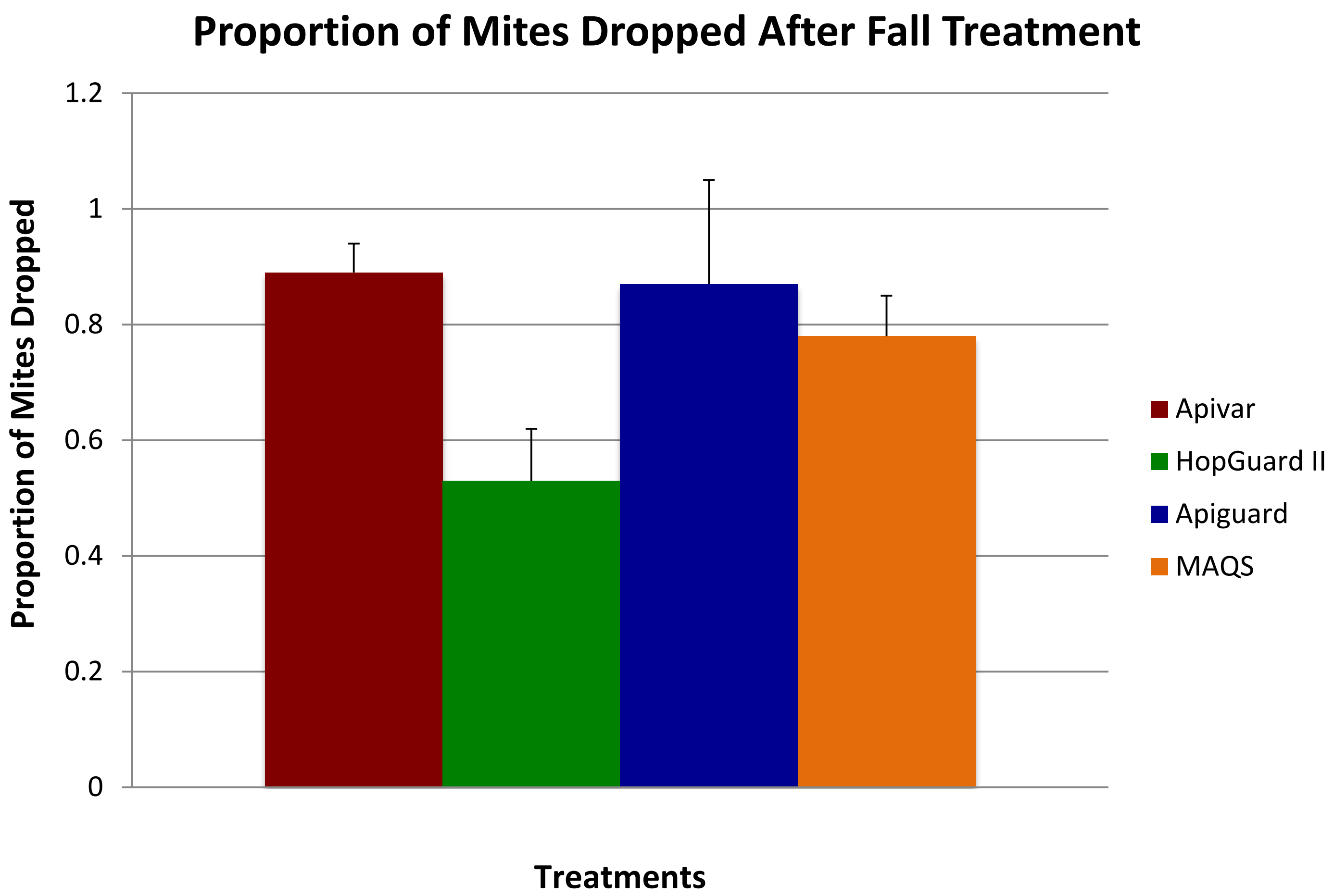
PROJECT OVERVIEW

Test the efficacy of commercially available natural treatments and their economic impact.

- Monterey County, CA.
- Collaborator: Mr Gene Brandi.
- Treatments: Apiguard, HopGuard II, Mite Away Quick Strips, Apivar.
- Fall Treatment: September 4, 2013.
- 2014 Treatments.

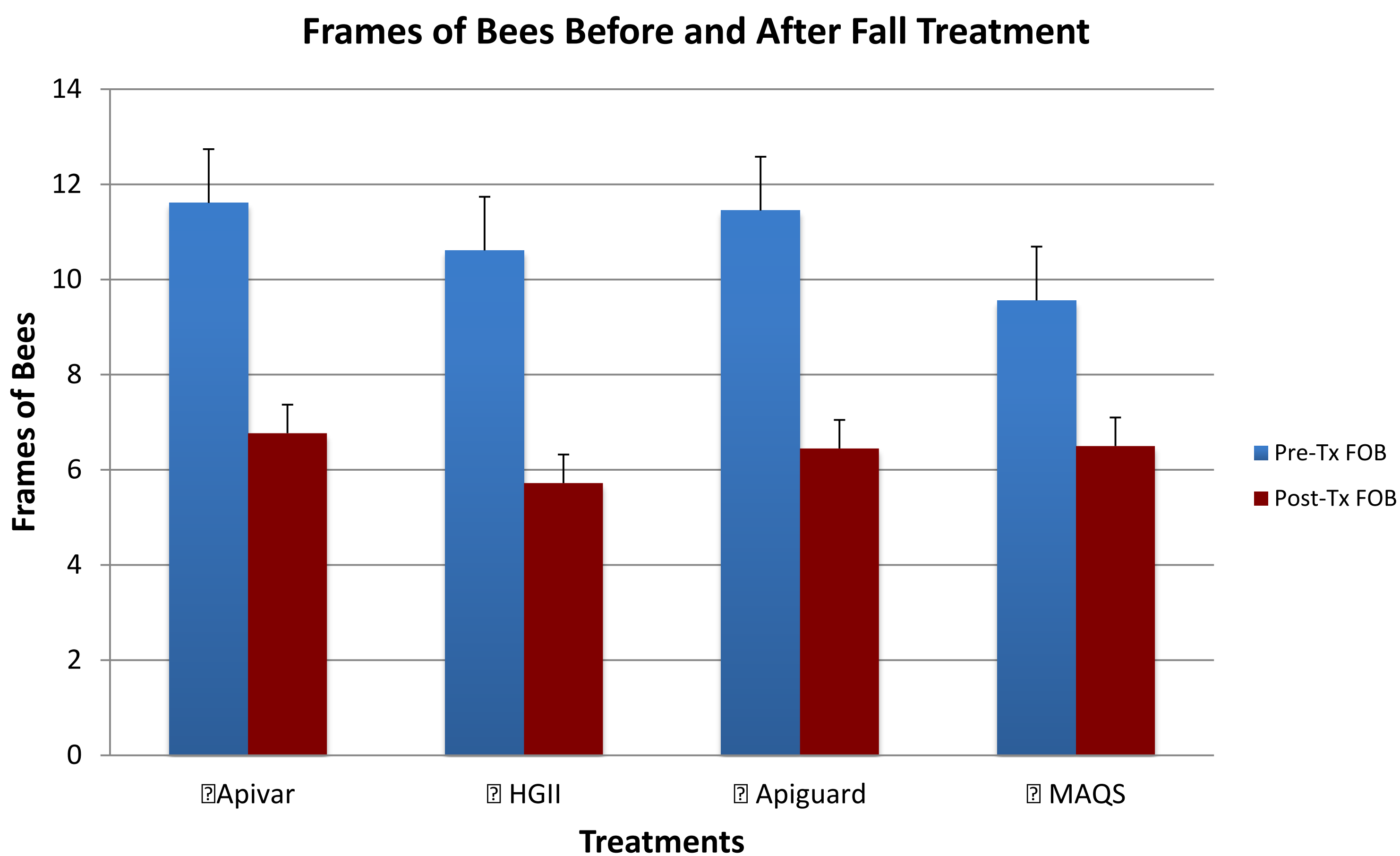
Objective 1

Determine the efficacy of the treatments on mite levels.

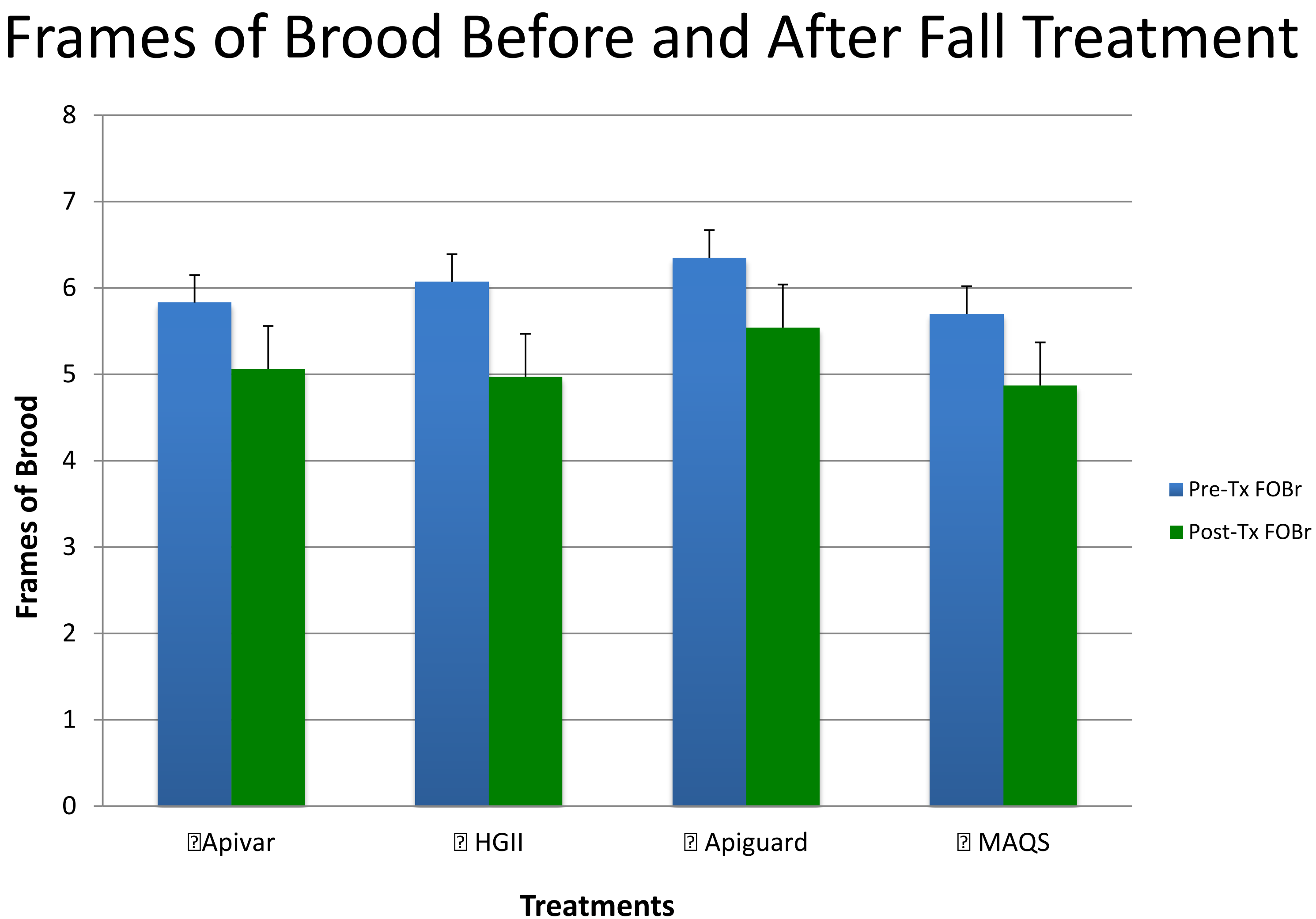


Objective 2

Determine the treatment effect on colony strength and behavior.



Objective 2

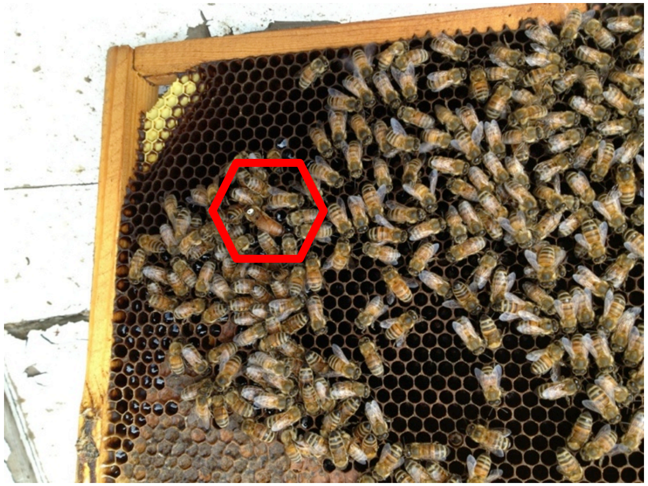


Frames of Brood Before and After Fall Treatment
8
7
6
5
4
3
2
1
0
Frames of Brood
Apivar
HGII
Apiguard
MAQS
Treatments
Pre-Tx FOBr
Post-Tx FOBr

Objective 3

Determine the economic impact of the treatments

- Treatment costs
- Application costs
- Treatment related queen loss and replacement
- Colony loss
- Labor costs
- Economic analysis



Next Phase

January 2014:

Colony assessment: Mite counts, colony strength and queen survivorship.

Apply treatments.

April 2014:After almond pollination

Colony assessment as described above.

Split colonies.

Apply treatments if necessary.

Acknowledgments

Almond Board of California
Gene Brandi Apiaries
Dr. Gloria DeGrandi-Hoffman

Enhancing the Tech Team Program for the Commercial Beekeeping Industry

University of Minnesota
Megan Mahoney
Marla Spivak
Katie Lee

University of Maryland
Dennis VanEnglesdorp

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Tech-Transfer Teams

Tech-Team Objectives

Assist beekeepers with:

1. Monitoring colonies for disease and pests
2. Stock selection for traits that will improve bee health and genetic diversity
3. Small-scale experiments and facilitate cooperative research

Goals:

Short-Term: Provide individual beekeepers with useful information about their colonies

Long-Term: Reduce over all US colony losses by using data to develop best management practices for different regions

Problem: Colony Health

Varroa destructor

Problem: Colony Health

Varroa destructor

Solutions:

1. Treat
2. Breed

Problem: Colony Health

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Varroa destructor

Solutions:

1. Treat
2. Breed

Goals:

1. Develop *Varroa* economic thresholds for commercial, migratory beekeepers
2. Quantify success of the selection progress for bee breeders participating in the Bee Tech Team services.

Treat

1. Develop *Varroa* economic thresholds for commercial, migratory beekeepers

Steps

a. Develop *a priori* hypotheses about Varroa and interaction factors including, Nosema, viruses, pesticides, nutrition, region, and treatments.
b. Follow a cohort of bee colonies from multiple beekeepers, recording information about disease, Varroa levels and colony health factors, and mortality.
c. Analyze data to test hypotheses.

Breed

2. Quantify success of the selection progress for bee breeders participating in the Bee Tech Team services.

Steps

a. Test colonies of bee breeders that are selecting for hygienic behavior and those that are not selecting.
b. Track disease and mite levels over time.
c. Compare levels of hygienic behavior, disease levels, and mite levels between beekeepers selecting to those that are not
d. Stock certification program

Extension

Get information back to beekeepers

Beeinformed.org


Thank you!