Updates on *Varroa* Research

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OUR BUSY BEES
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Bryan William

Current Lab Members

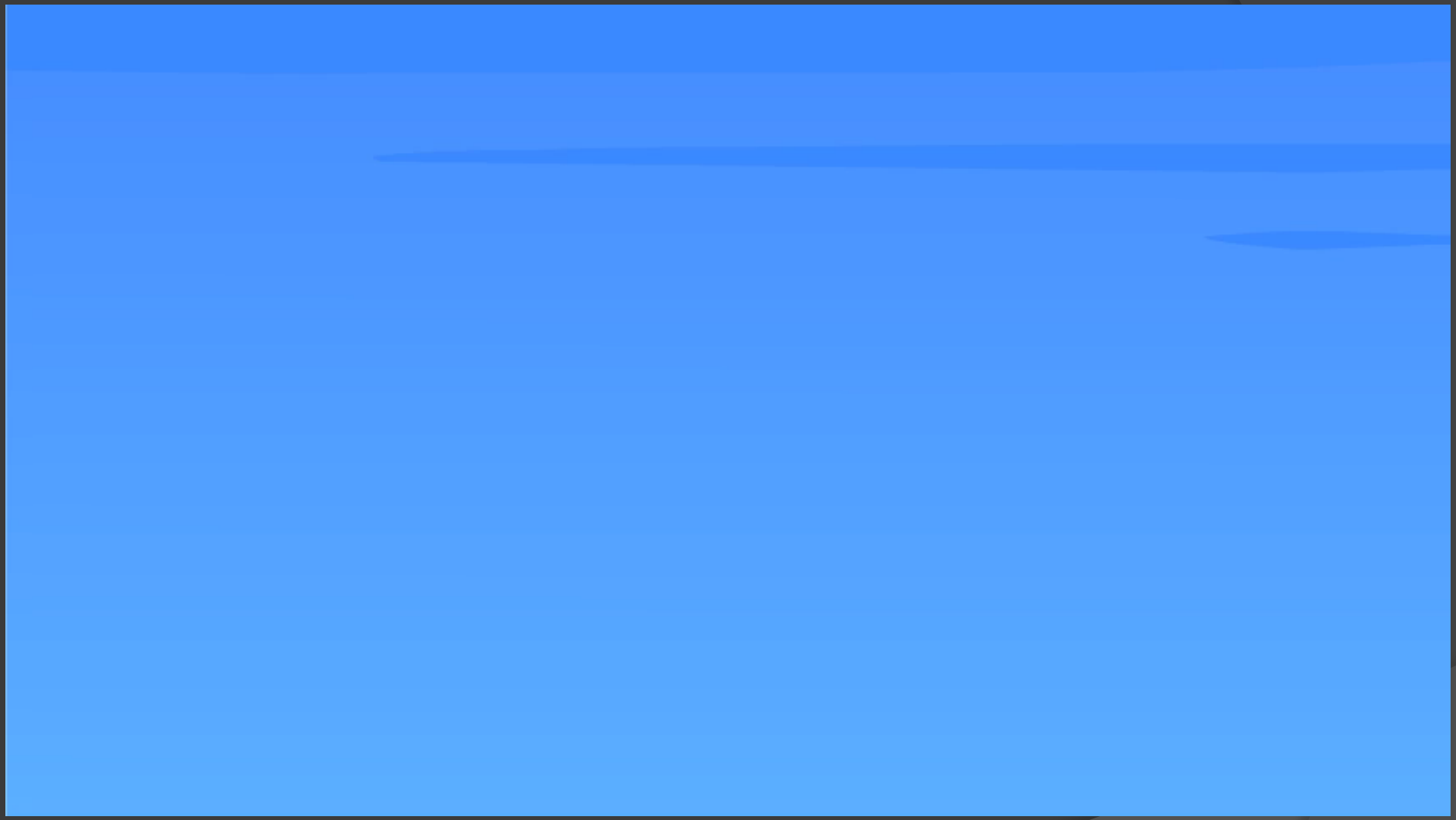
Varroa mite life cycle

(1) Reproductive Phase & (2) Phoretic Phase

- **Female mite enters a cell with larva about 12 hours prior to cell capping and hides beneath the larval food.**
- **Once the larval food is consumed by the larva the mite gets out and starts feeding on the larva.**
- **Lays first egg about 2.5 to 3 days after cell capping and subsequently one egg every 30 hours.**
- **Male and first female are ready to mate a week from hatching.**

Phoretic Phase

Reproductive Phase

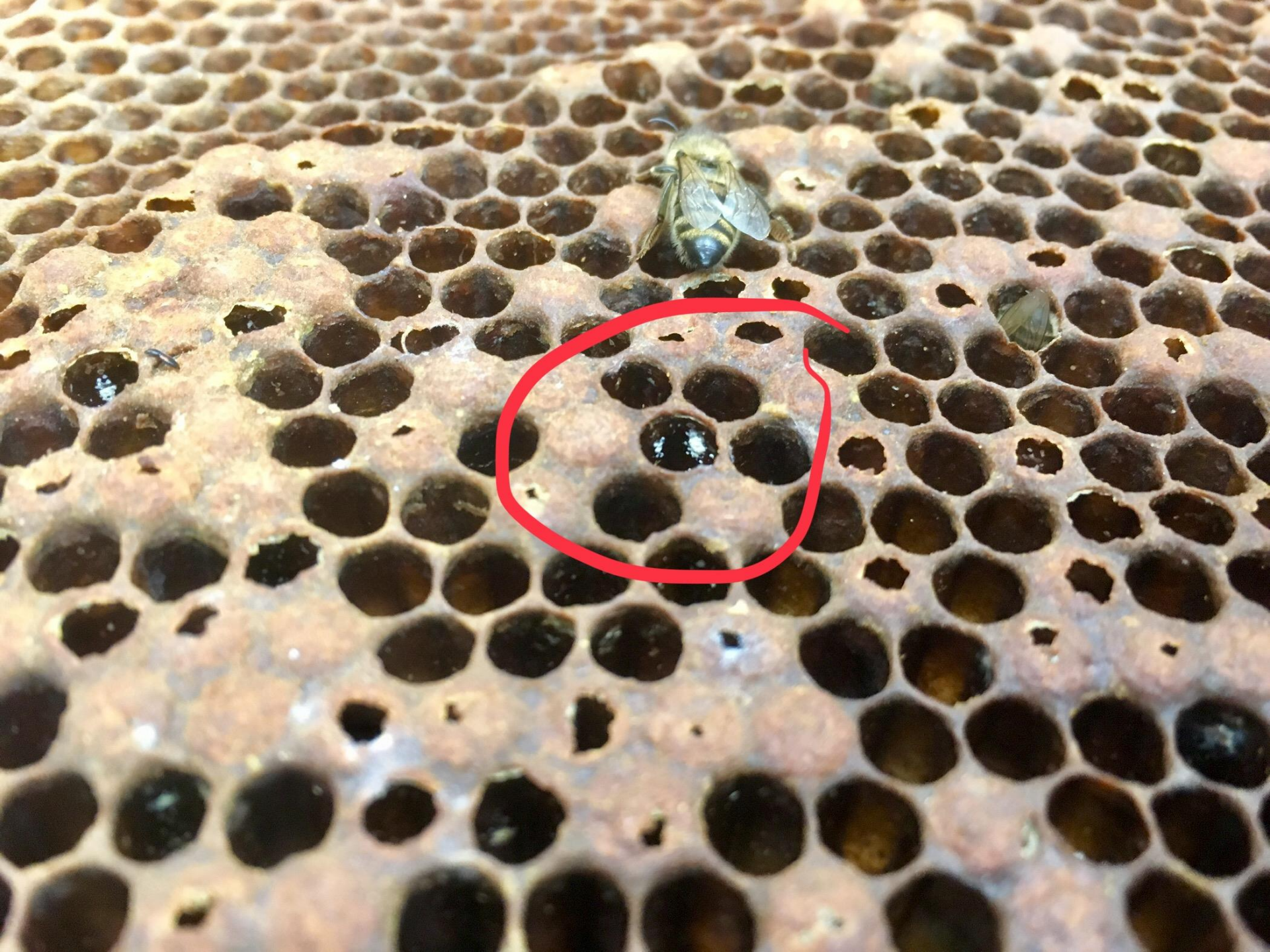


Courtesy: Kashyap Basu

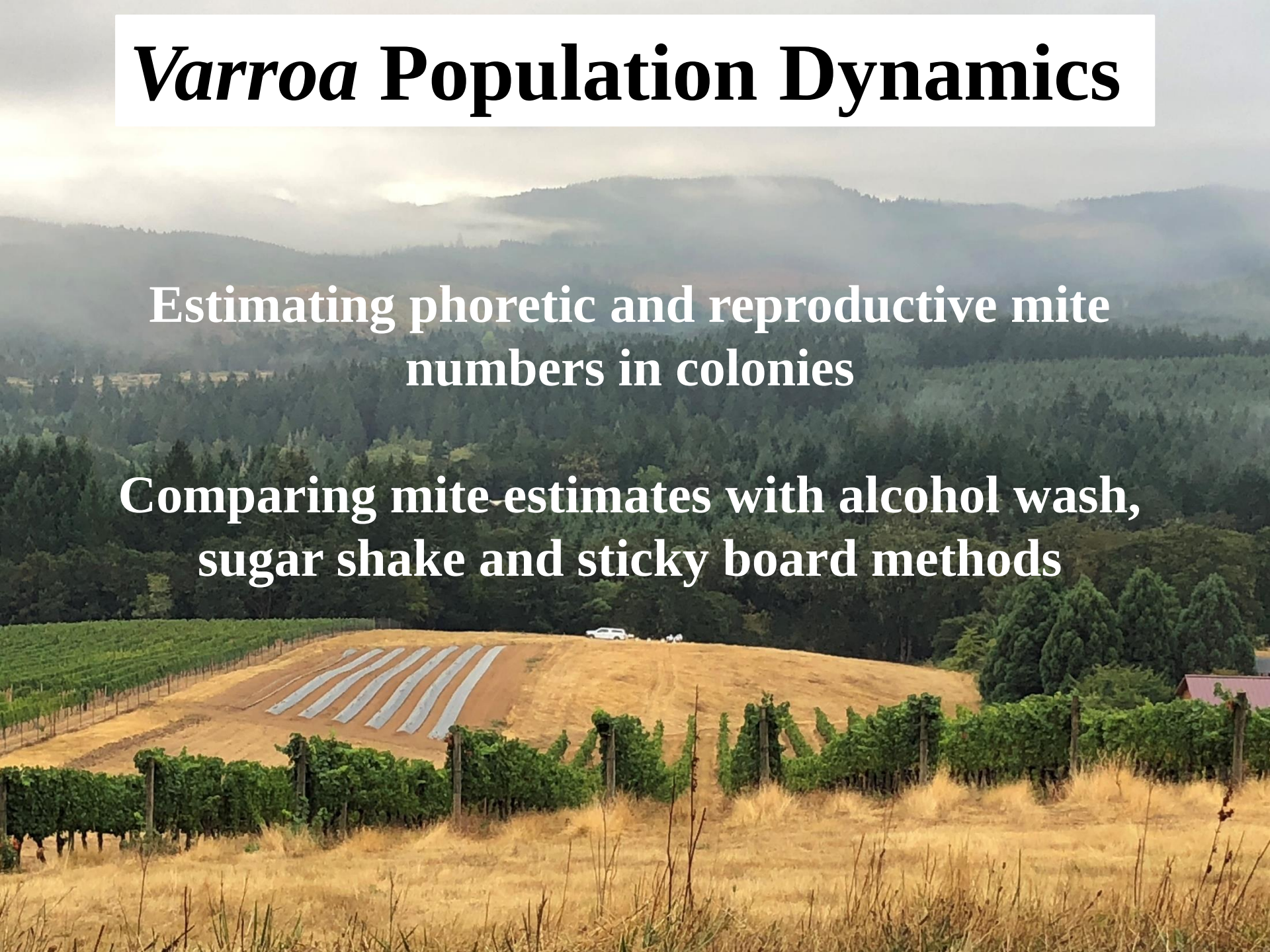
PMS

(Parasitic Mite Syndrome)

Spotty brood pattern.
Bees with deformed wing virus.
Larvae (c-shape stage) appear to be melting but with no odor.
Uncapped pupal cells.



Varroa Population Dynamics



Estimating phoretic and reproductive mite numbers in colonies

Comparing mite estimates with alcohol wash, sugar shake and sticky board methods

What percentage of mites are in the capped brood cells (reproductive) and what percentage of mites are on the adult bees (phoretic)?

(A) 50 : 50

(B) 80 : 20

(C) 20 : 80

(D) 60 : 40

(E) 40 : 60

(F) 100 : 0

(G) 0 : 100

(H) None of the above

Objectives

- Estimate number of phoretic (on adult bees) and reproductive (in capped brood cells) mites in colonies

- Compare mite estimates obtained from three common mite sampling methods (alcohol wash, sugar shake and sticky boards)

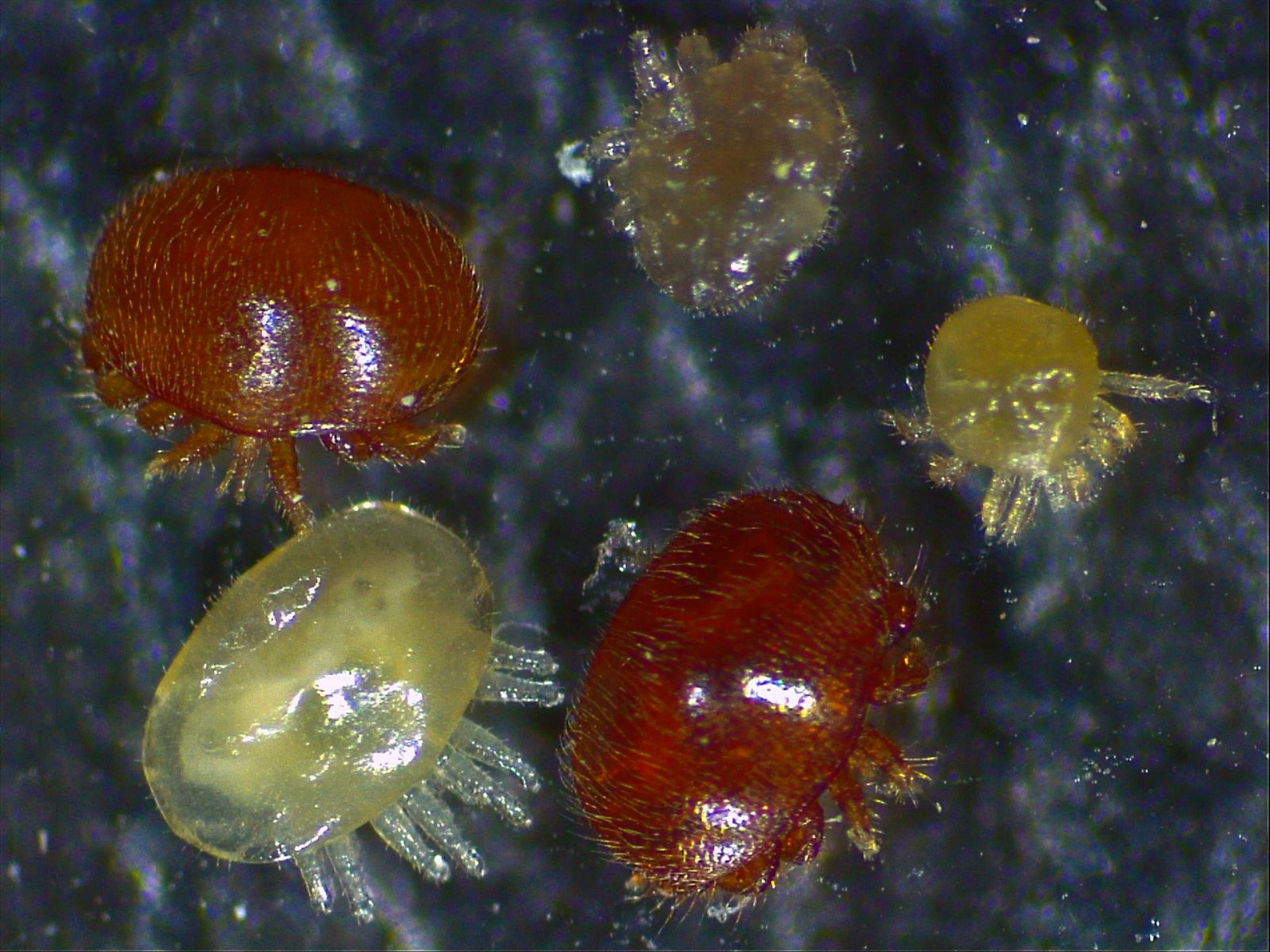
Methods

- Number of colonies used: 6
- Feb 11 and March 22: received Apivar
- March 22 to Sep 14: No mite control measures
- Mite levels monitored throughout summer 2018
- Sep 14, 2018: Adult bees from all six colonies killed in alcohol and brood frames collected and stored in freezer for mite population analysis.

Buckets with dead bees in alcohol

Extraction of mites from capped brood frames

Quantifying mites in brood cells

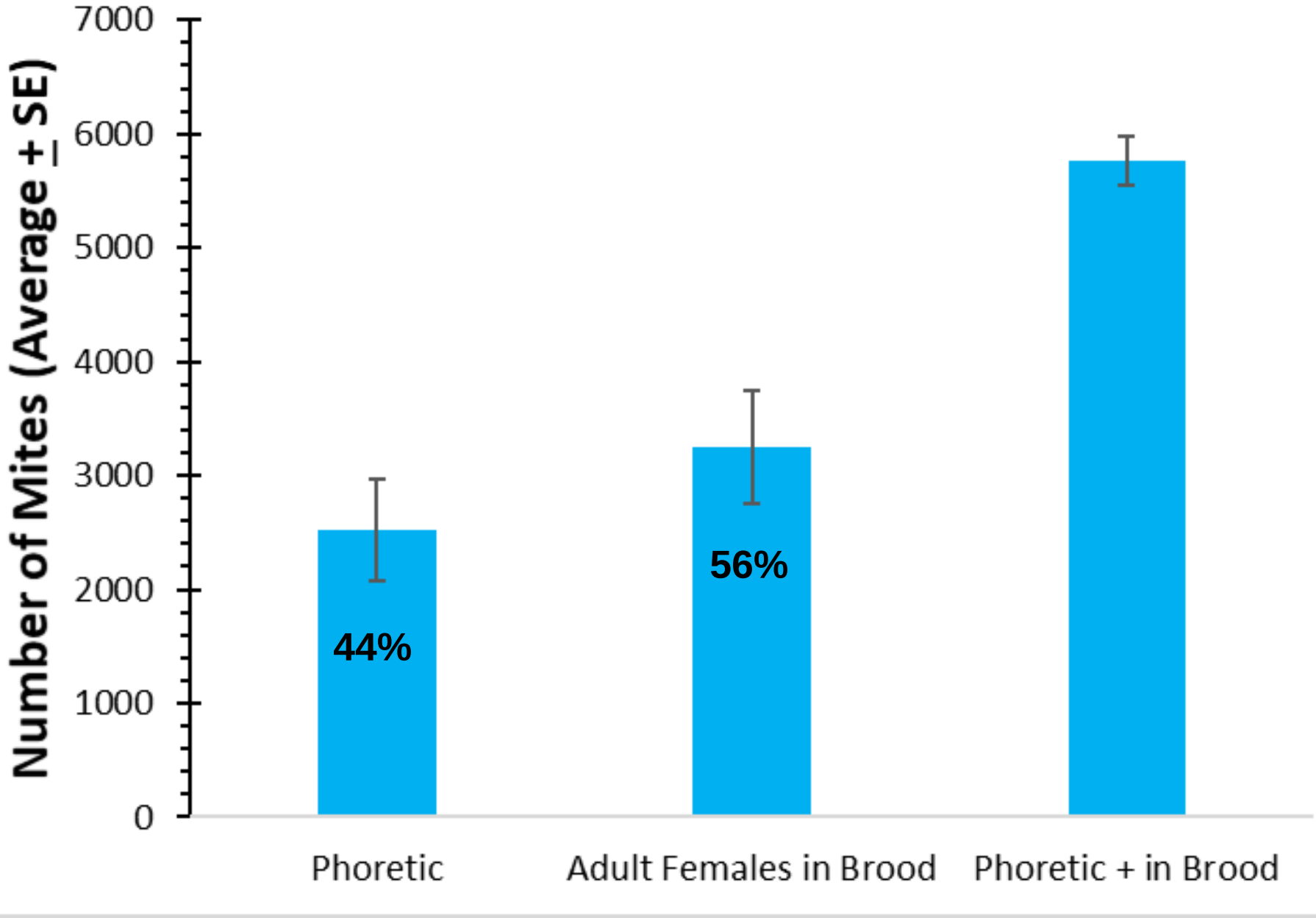


Vials with extracted mites

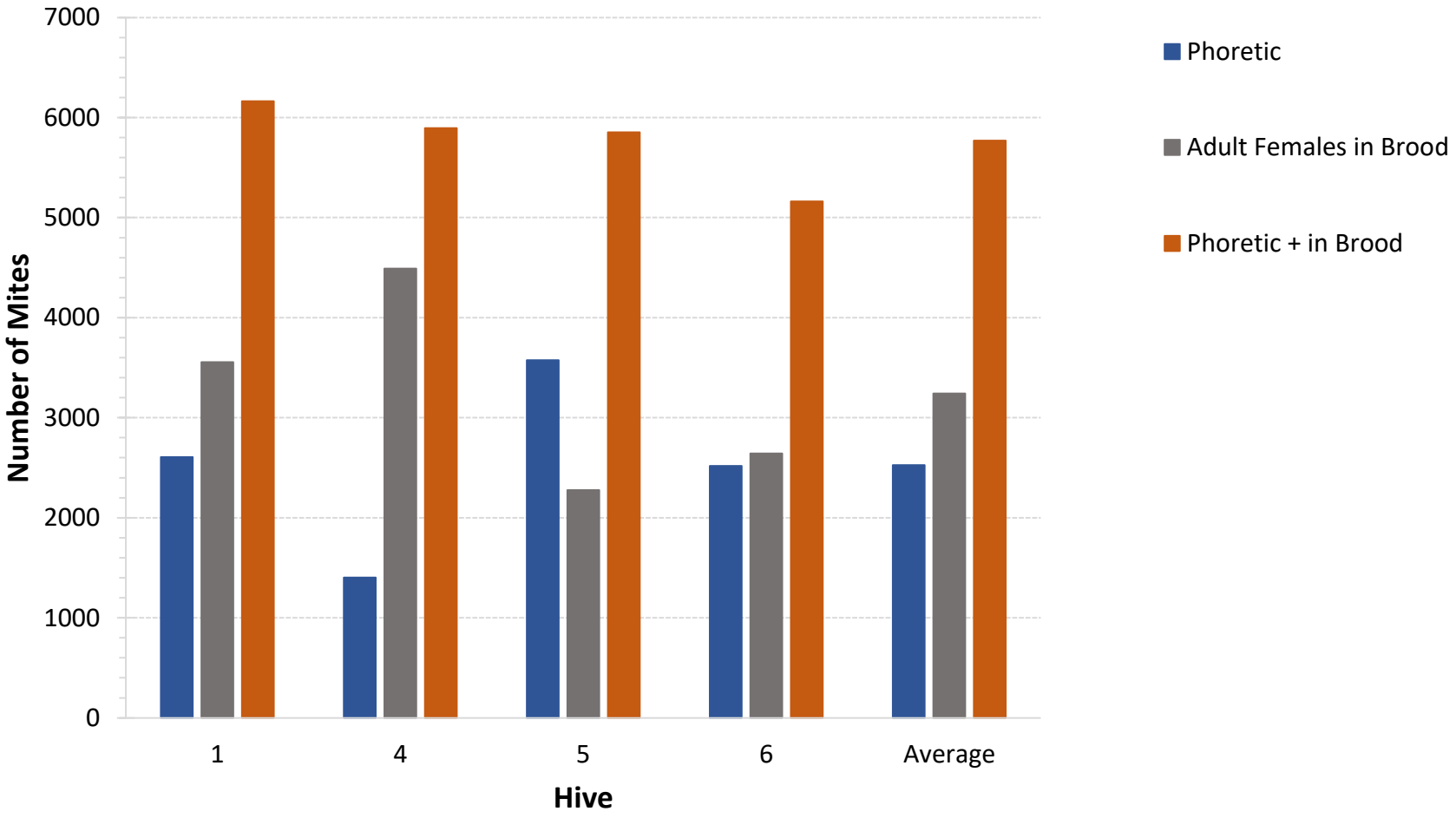
OSU Honey Bee Lab *Varroa* Analysis Protocol

Preliminary Results

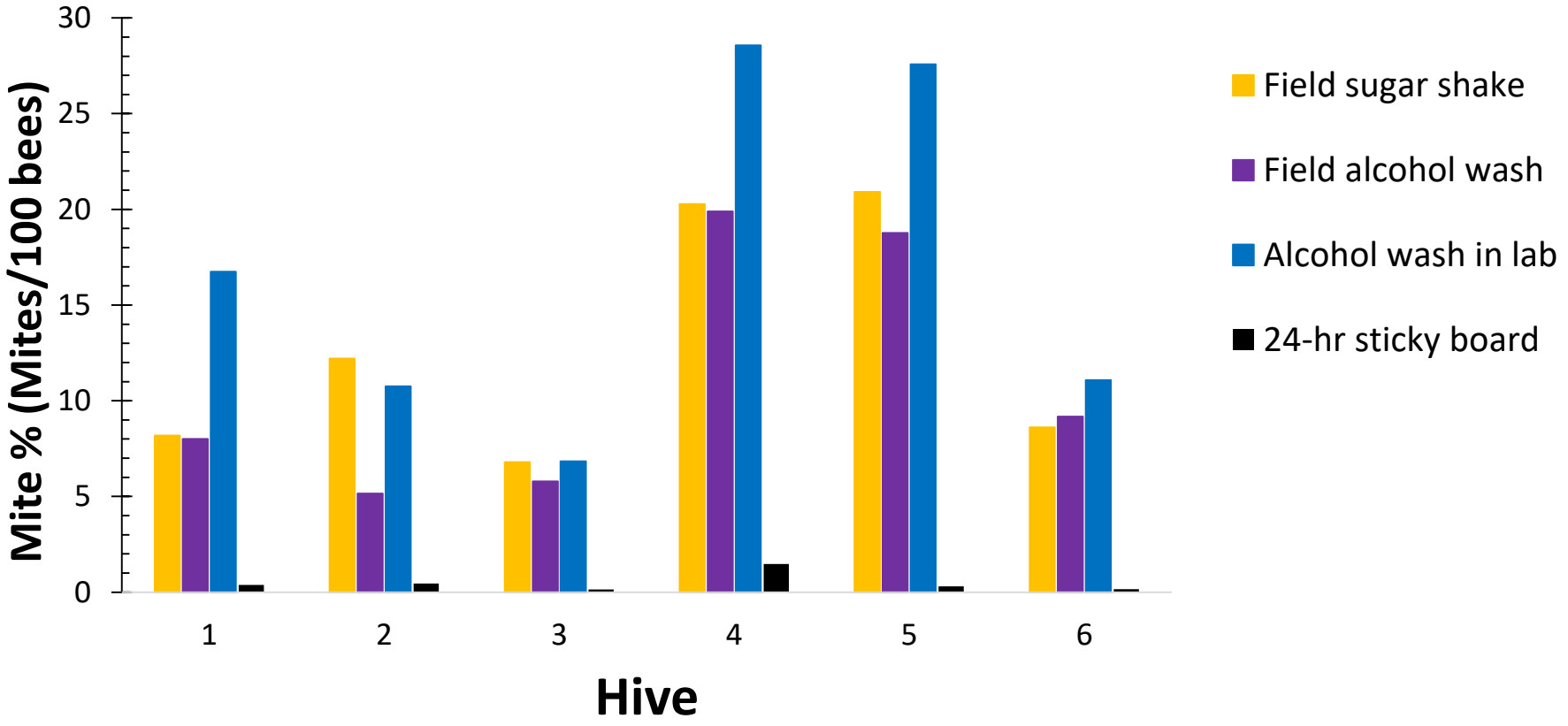
Average number of mites in capped brood cells and on adults



Number of mites in capped brood cells and on adult bees



Varrao estimates (percentage) using four different mite analysis methods



Take Home Message

- More than 50% mites are in the capped brood cells during brood rearing season.
- Keep this fact in mind when using mite treatments to control Varroa.
- Use alcohol wash or sugar shake method for monitoring mite levels.

Current Varroa treatment options

Apivar (Amitraz)

MAQS and Formic PRO (Formic Acid)

Apiguard (Thymol)

Hopguard

Oxalic Acid

Amitraz resistance?


POISON
KEEP OUT OF REACH OF CHILDREN
READ SAFETY DIRECTIONS
FOR ANIMAL TREATMENT ONLY
TAKTIC® EC
ACARICIDAL SPRAY FOR CATTLE AND PIGS
Active Constituent: 125 g/L AMITRAZ
Solvent: 670 g/L Liquid Hydrocarbons
Stabiliser: 10.5 g/L Stabaxol
For the Control of Ticks, including Organophosphate and Synthetic Pyrethroid Resistant Strains, on Cattle in N.S.W. and Qld., Cattle Tick on Sheep, Goats, Deer and Certain Circus Animals in N.S.W. only and Mange on Pigs.
Virbac
ANIMAL HEALTH
400 mL
VIRBAC (AUSTRALIA) PTY. LIMITED
357 Horsley Road, Milperra NSW 2214
Freecall Customer Service Line: 1800 009 847
www.virbac.com.au
READ DIRECTIONS FOR USE BEFORE USING THIS PRODUCT

Potential for Amitraz Resistance

- Off label use of amitraz
- Use of different dosages, frequency, formulations
- It appears that so far we have been lucky that amitraz is still working
- Few studies have alluded to but not conclusively documented amitraz resistance.
- Beekeepers complaints about efficacy of Apivar.

Objective

- **Compare resistance of *Varroa* mites to Amitraz (Apivar) in the USA and Canada (Alberta).**

Methods

- Modified Pettis Assay

- 1x1.5 inch Apivar strip was stapled to an index card in a 500 ml glass jar

- 24 hours incubation period

- Dead mites shaken and counted from jars after 24 h

- Any remaining live mites on the bees were extracted by alcohol wash

SUPPLIES

Ready to Go

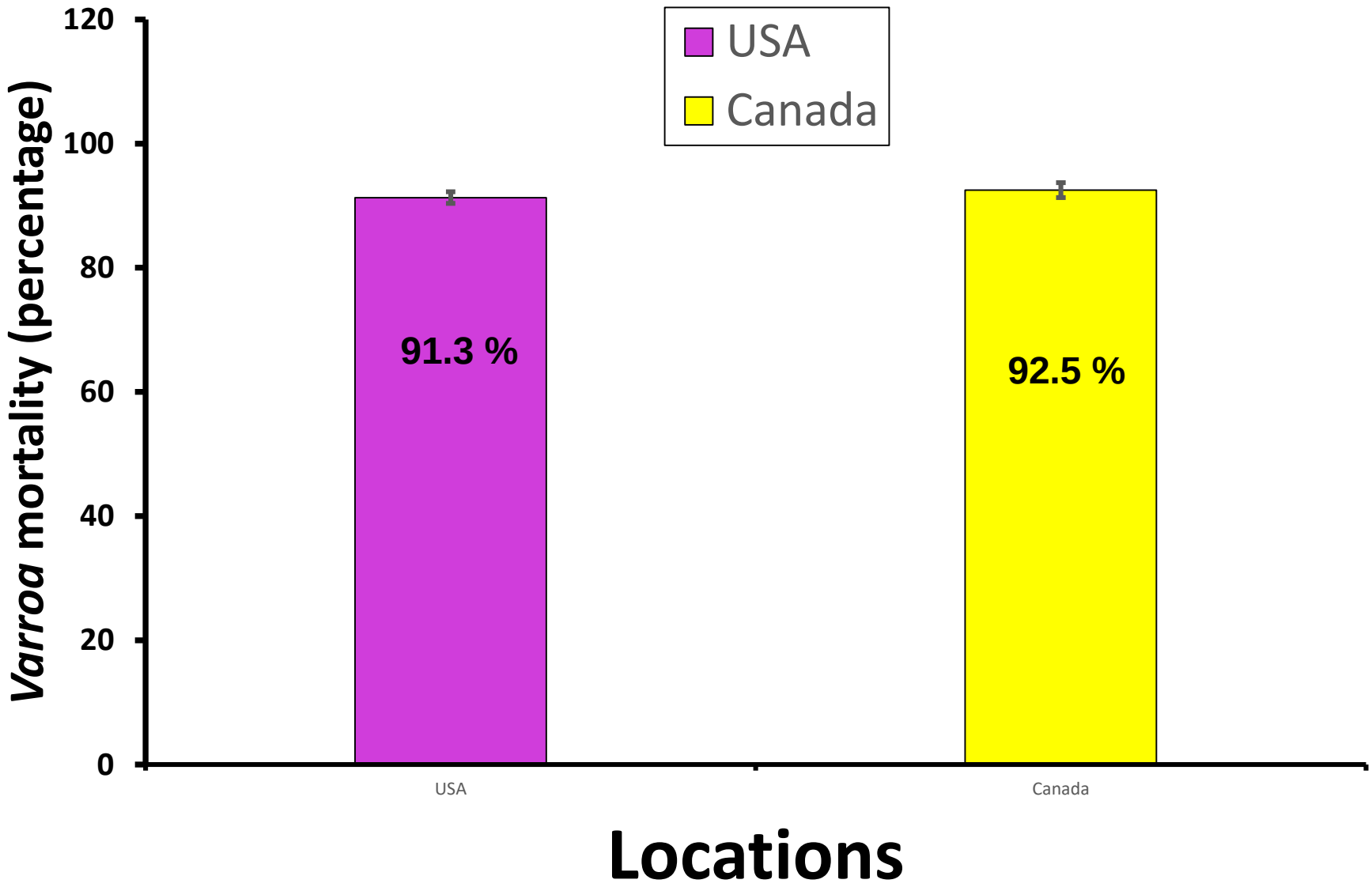

OAKLAND
Ball
HEALTH 0
FLAMMABILITY 3
REACTIVITY 0
FLAMMABLE LIQUID
3

Varroa Resistance Study Sampling

Fun counting mites on the road!!

Results

2019 DATA


120
100
80
60
40
20
0
Varroa mortality (percentage)
USA
Canada
91.3 %
92.5 %
USA
Canada
Locations

Beekeeping Operation	Mean Varroa Mortality	Mortality in Outlier Samples
A	91%	50%
B	92%	50%
C	87%	56%
D	86%	63%
E	90%	63%
F	87%	67%
G	91%	69%

Take Home Message

- **Amitraz (Apivar) appears to be largely effective, but provides sub-optimal mite control in some hives.**

- **Amitraz (Apivar) appears to be more effective when used in spring than in fall.**

Oxalic Acid Sublimation Study

Objectives

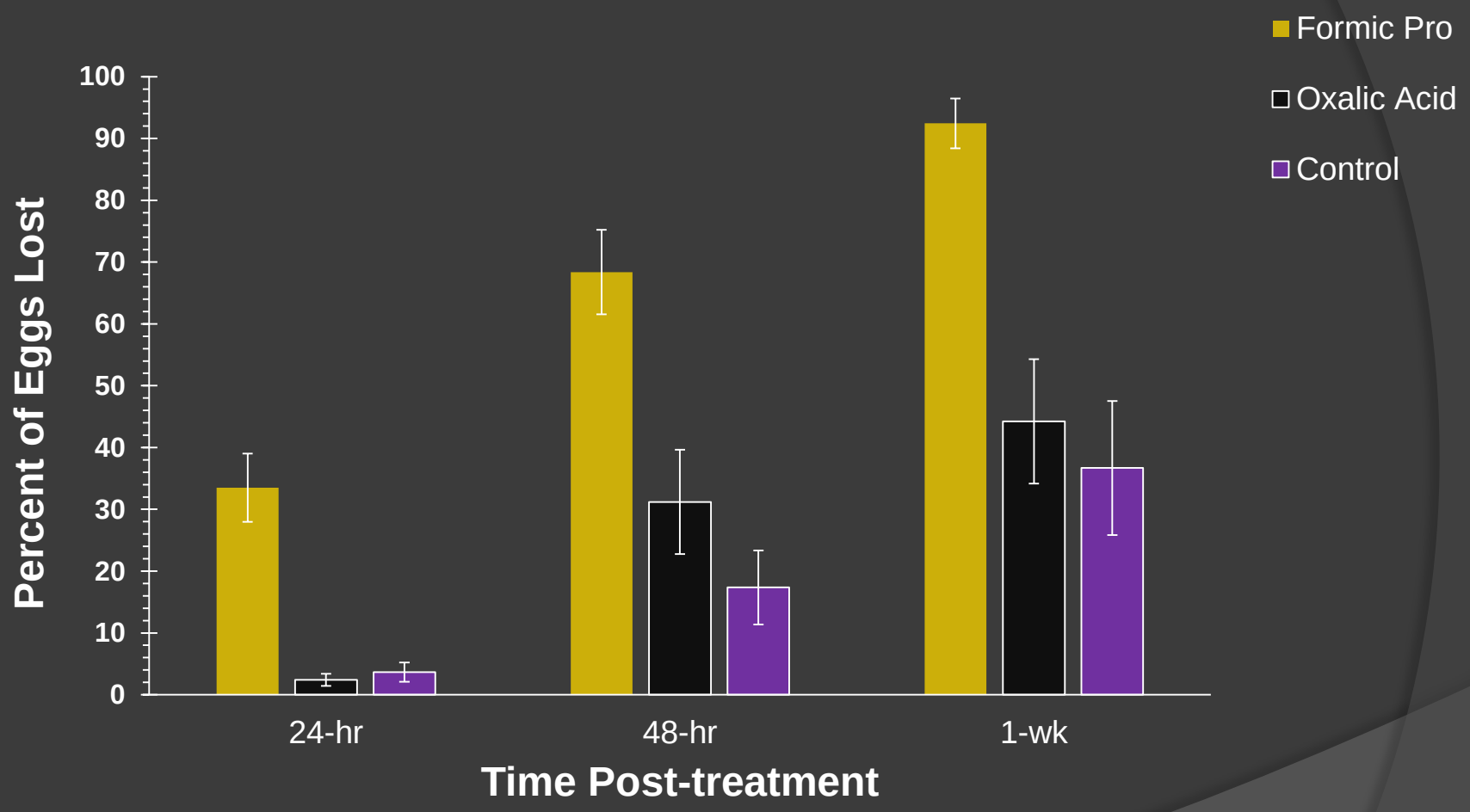
- **Evaluating brood mortality (eggs, larvae) when using oxalic acid sublimation method for Varroa control.**

- **Comparing varroa control efficacy of oxalic and formic acid treatments.**

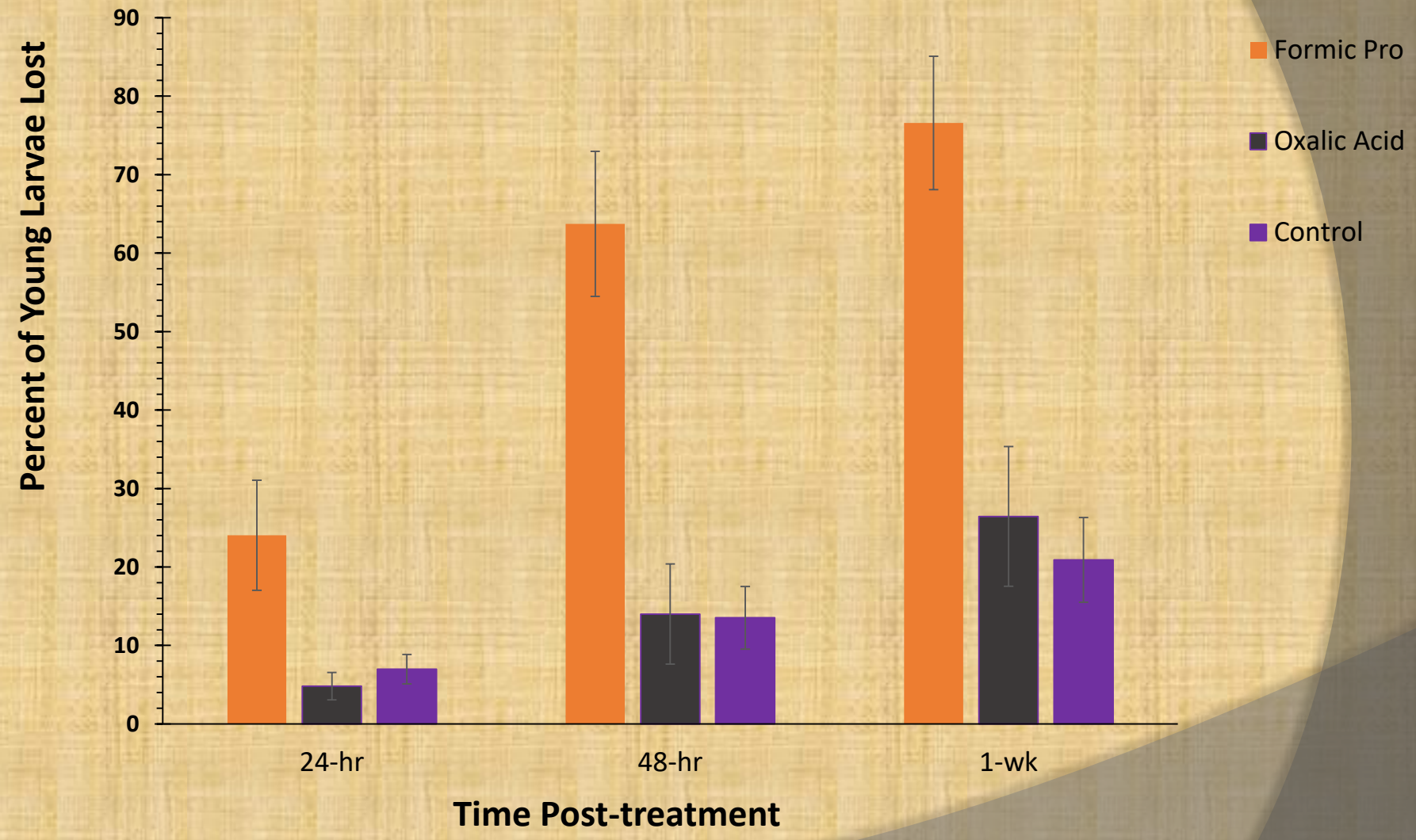
Monitoring fate of brood using acetate sheets


SUCRETS

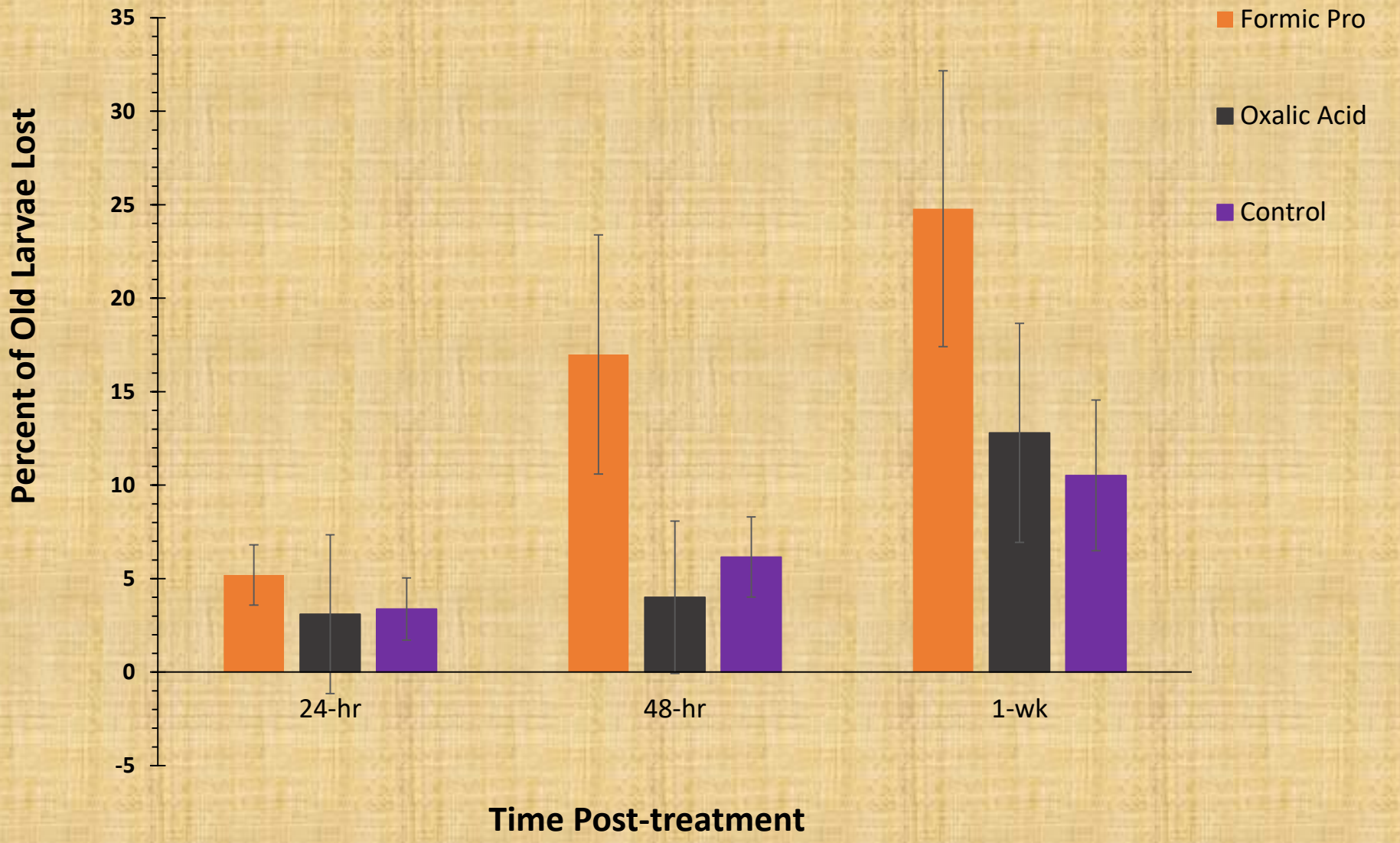
Fate of Eggs


Formic Pro
Oxalic Acid
Control
Percent of Eggs Lost
100
90
80
70
60
50
40
30
20
10
0
24-hr
48-hr
1-wk
Time Post-treatment

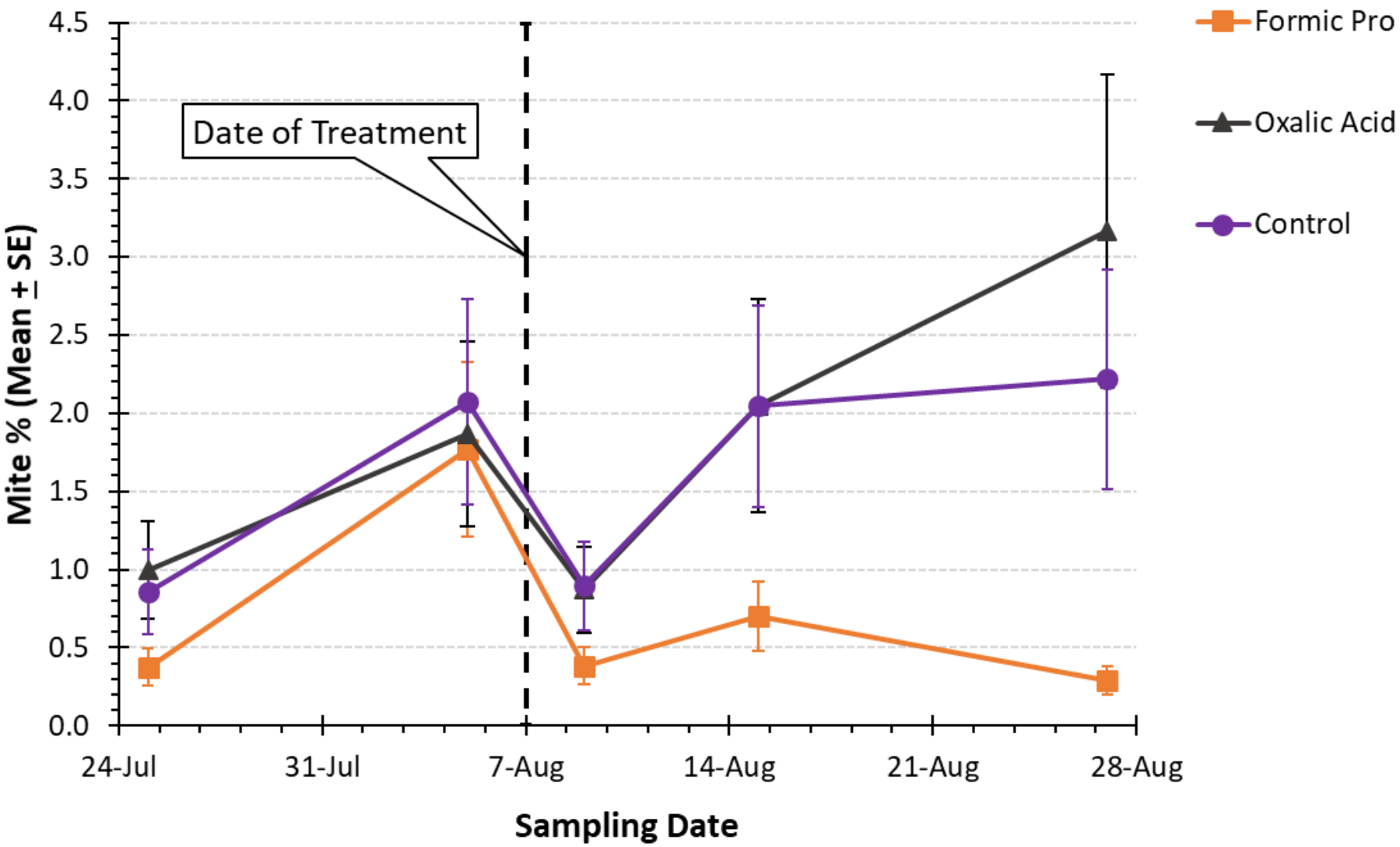
Fate of Young Larvae



Fate of old larvae



Efficacy of oxalic acid and formic acid treatments



Take Home Message

- Oxalic acid sublimation at recommended dose appears safe to the brood
- Formic acid treatment has negative impact on the brood.

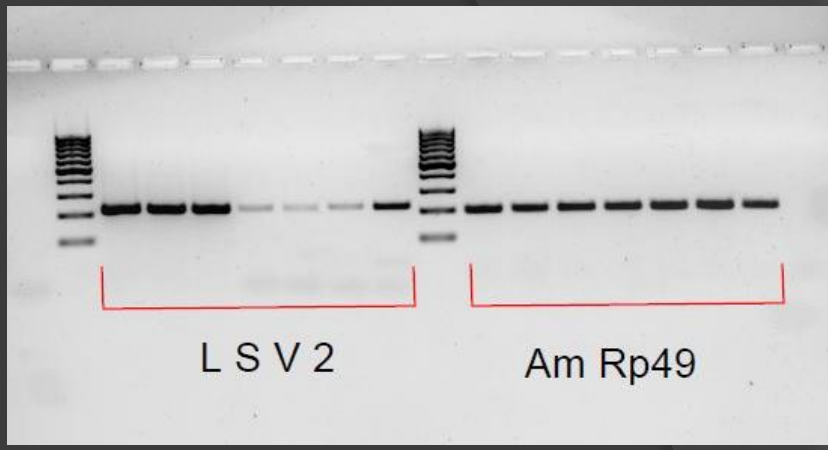
Important Points in Varroa Control

- Continuously monitor mite levels and don't allow mite numbers to get too high.
- Monitor mite levels after treatment.
- Even a two week delay in applying mite treatments can cause significant damage.
- Colonies may look robust with large bee population in Fall even with high mite infestation……this could be misleading.

Other Studies / Recent Issues

European Foulbrood

- Unusually high incidence of EFB past spring and summer.
- VFD / Prescription challenges for EFB.
- In 2020 we plan to conduct a study to understand the EFB dynamics.



Honey Bee Diagnostics (Viruses, bacterial diseases)

Asian Giant Hornet (*Vespa mandarina*)

QUESTIONS ???