

# Optimization of Microbial Control Applications for CBB Management

(Beauveria Persistence & Efficacy)



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# Involved PBARC Scientists

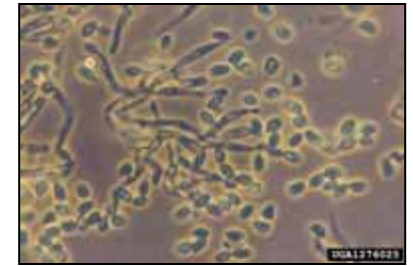


Lisa Keith  
Tracie Matsumoto  
Robert Hollingsworth  
Eric Jang  
(Nicholle Konanui, Lionel Sugiyama, John Ross, Glenn Asmus)

- \* Integrated Management for control of coffee berry borer (CBB)
- \* PBARC working cooperatively with CTHAR, HDOA and others
- \* Participation as key members of the CBB Task Force, SHAC and many farming groups

# *Beauveria bassiana* – What is it?

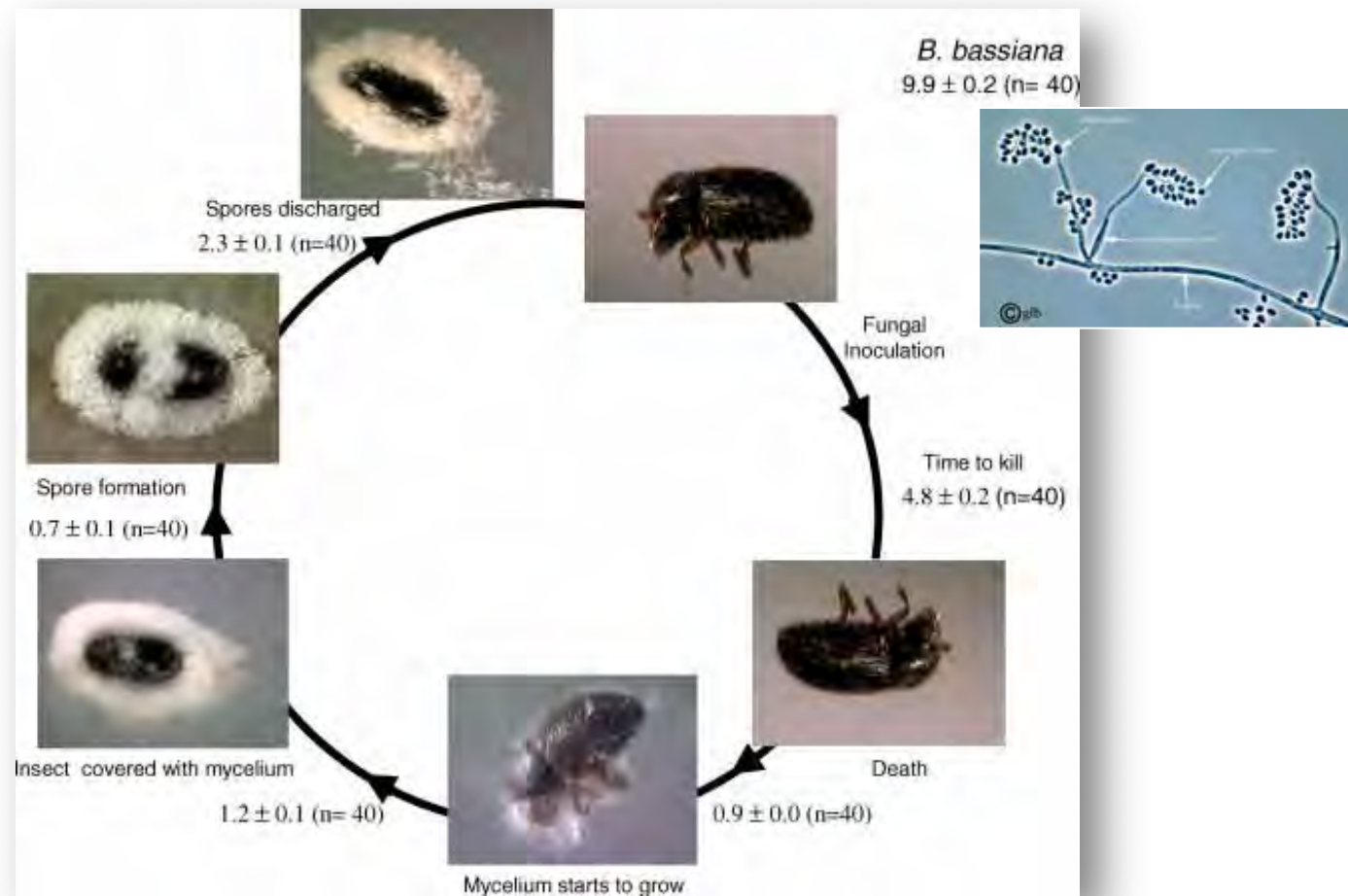
- **A fungal pathogen of insects** that causes disease and death of CBBs and other insects
- **Thousands of strains** from around the world and used to help control many insect pests
- **BotaniGard** (conventional) and **Mycotrol** (organic) products are available commercially in USA; USDA-ARS helped develop this product
- For most insect pests affected: works well in the **lab or greenhouse**; frequently does not work in the field; **Needs high humidity**; broken down by **UV** light
- **Hawaii-based studies needed** to optimize effectiveness and economics for farmers



BioWorks

# Life Cycle of *Beauveria bassiana* on CBB

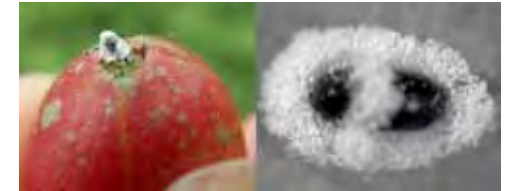
(Posada and Vega, 2005)



On average, it takes *Beauveria* **5 days to kill** and **10 days to sporulate** after beetles are infected



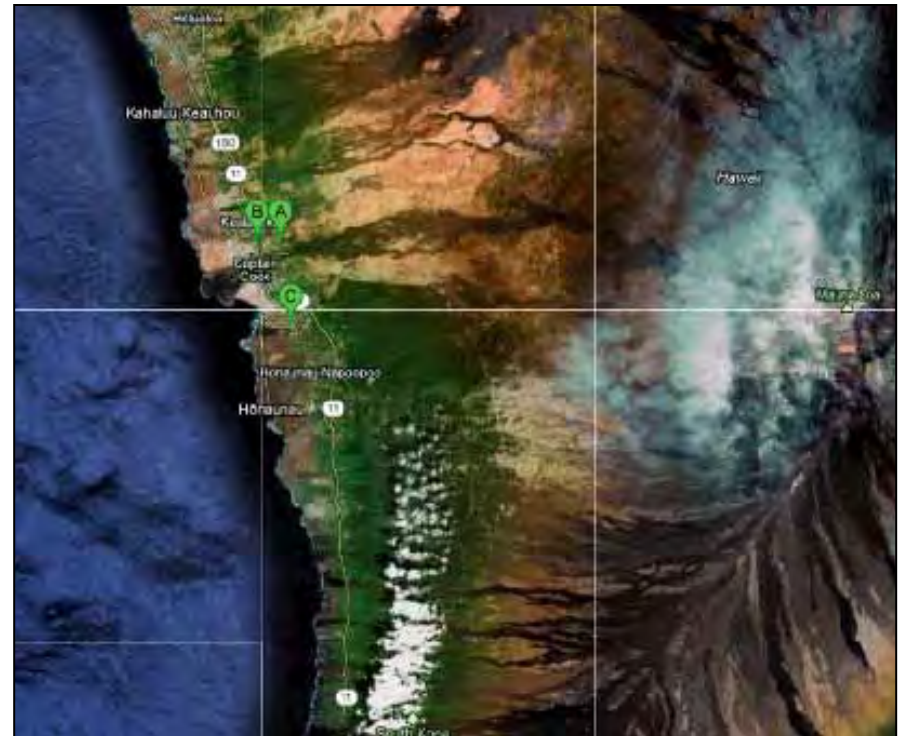
# What Environmental Factors Affect Efficacy of *Beauveria* Applications?



- **Time** after flowering
  - Up to 80% mortality can be achieved in sprays when CBB are attacking young berries (Duque-O and Baker, 2003)
- **Place** where majority of beetle population is found
  - Beetles deep within the berry will not be affected
- Other factors
  - Spray **rates**, use of surfactant, **weather** conditions (UV intensity, humidity) and fungus **strain**

# Goals for 2012

- Test frequency of application and environment on persistence and efficacy
- Temp, %RH, Rainfall



Elevation:  
A. 1700 ft  
B. 1639 ft  
C. 535 ft

# Field Application of Beauveria



1.5 qt/acre



# Field Sample per Tree



high



middle



low

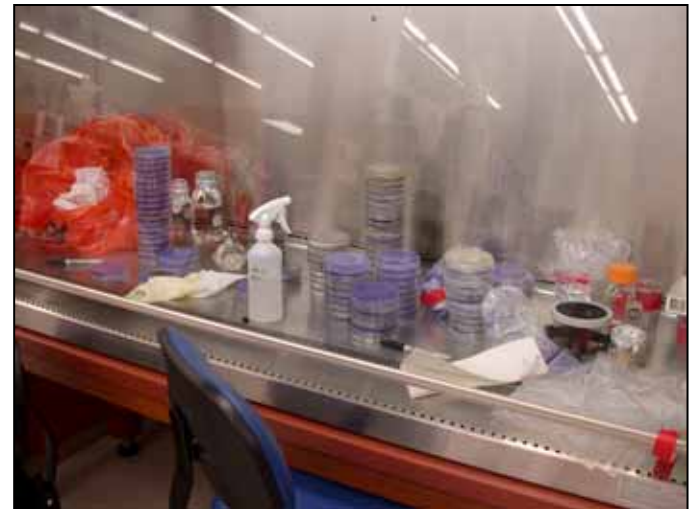
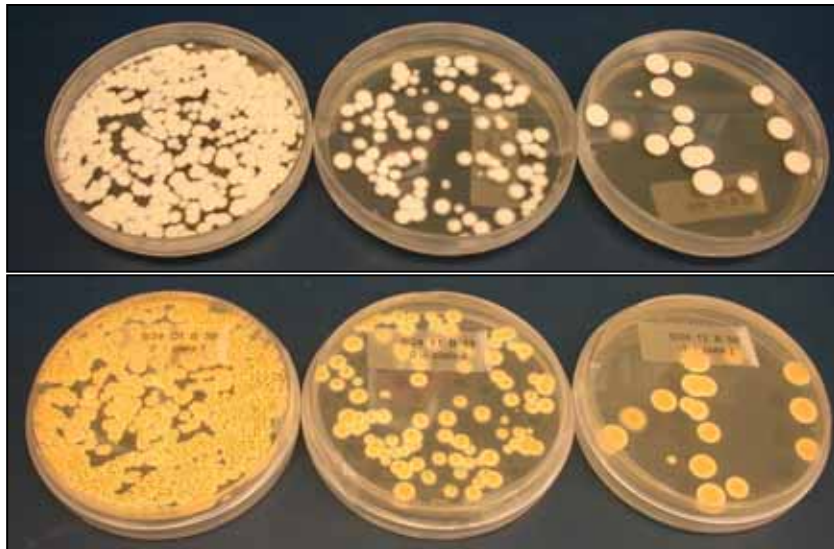


1 sample = 15 berries  
5 berries/branch

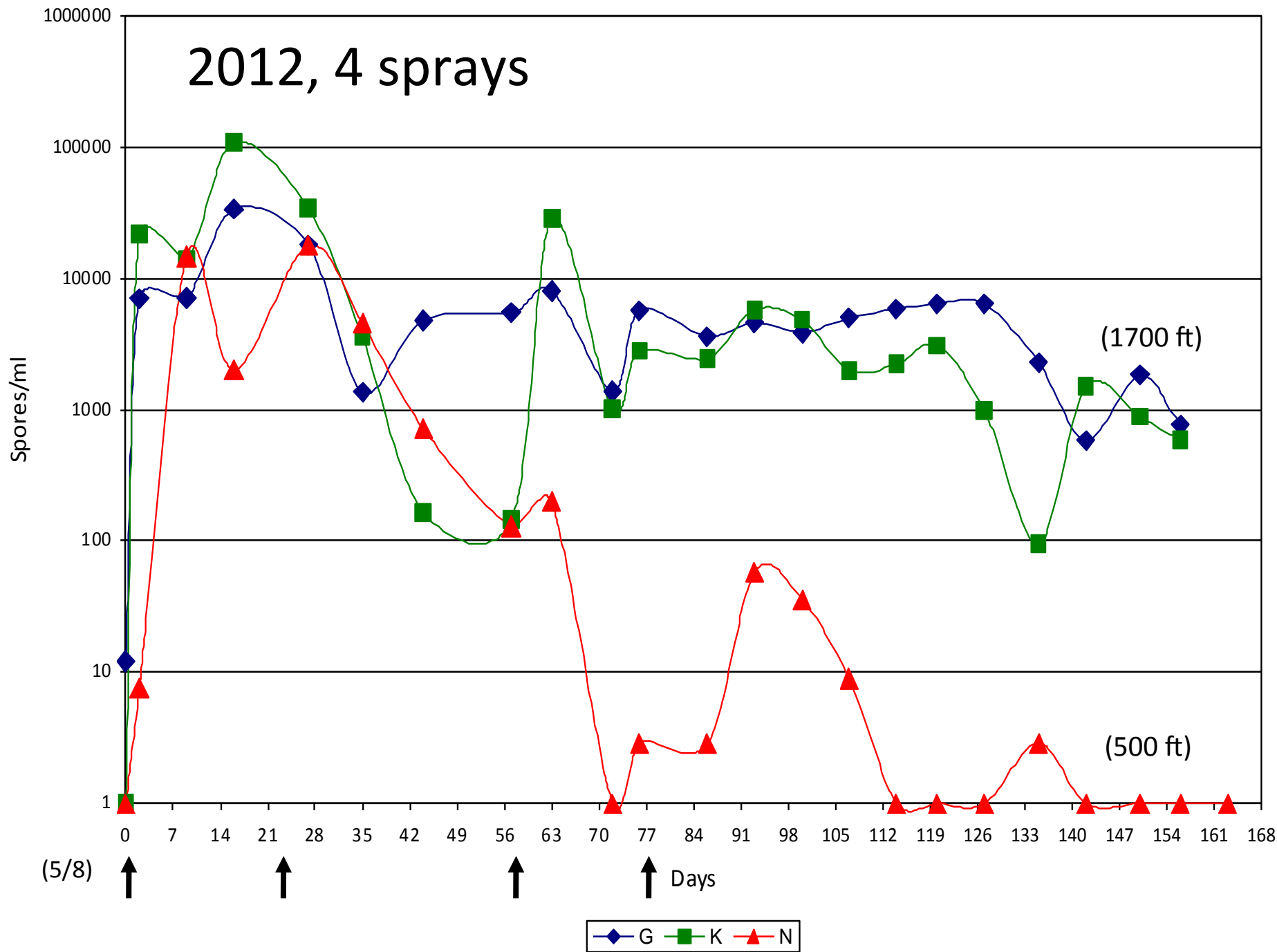


# Laboratory Results

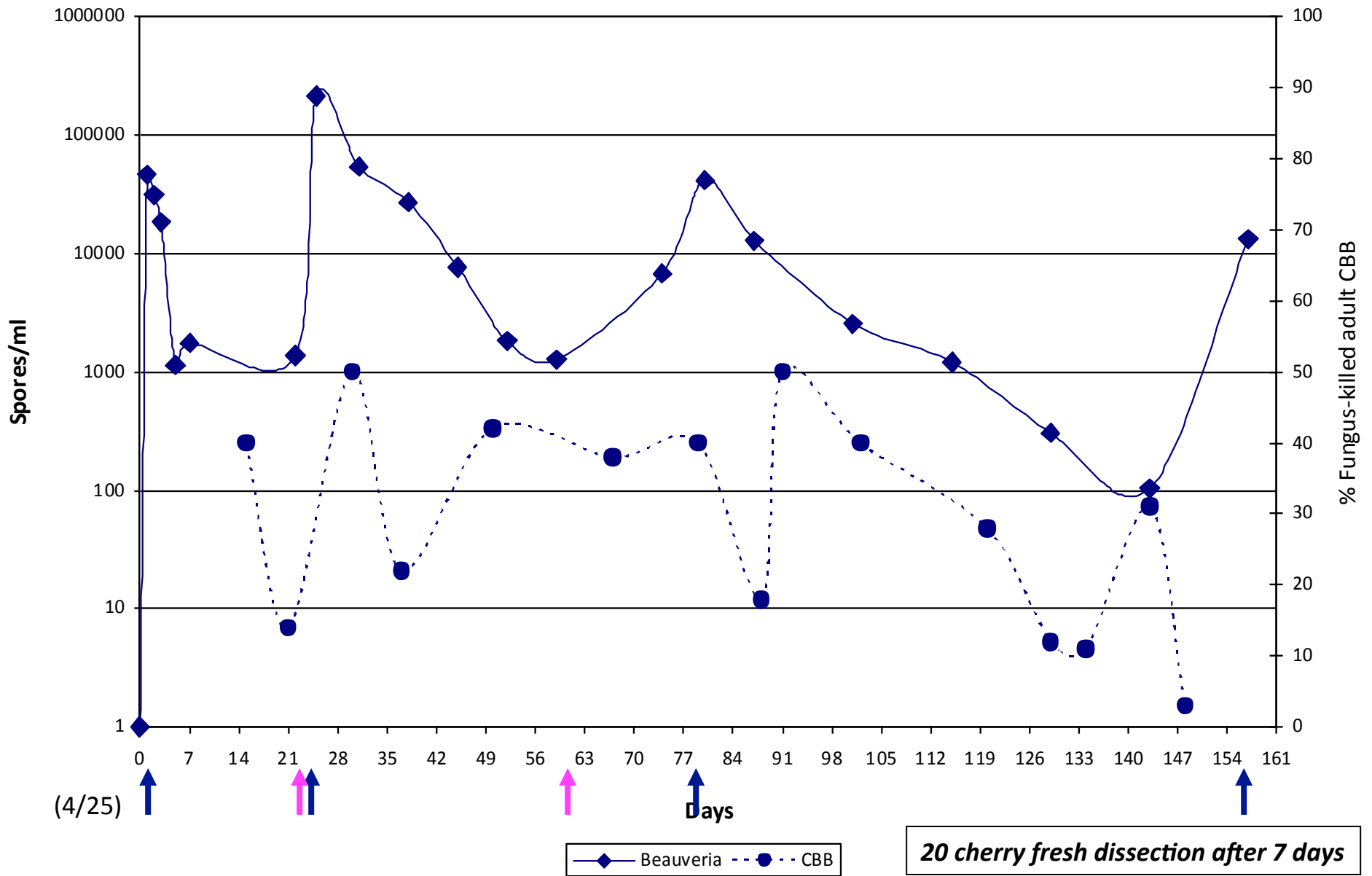
**Weigh  
Wash  
Dilute  
Plate  
Count**



# 2012, 4 sprays

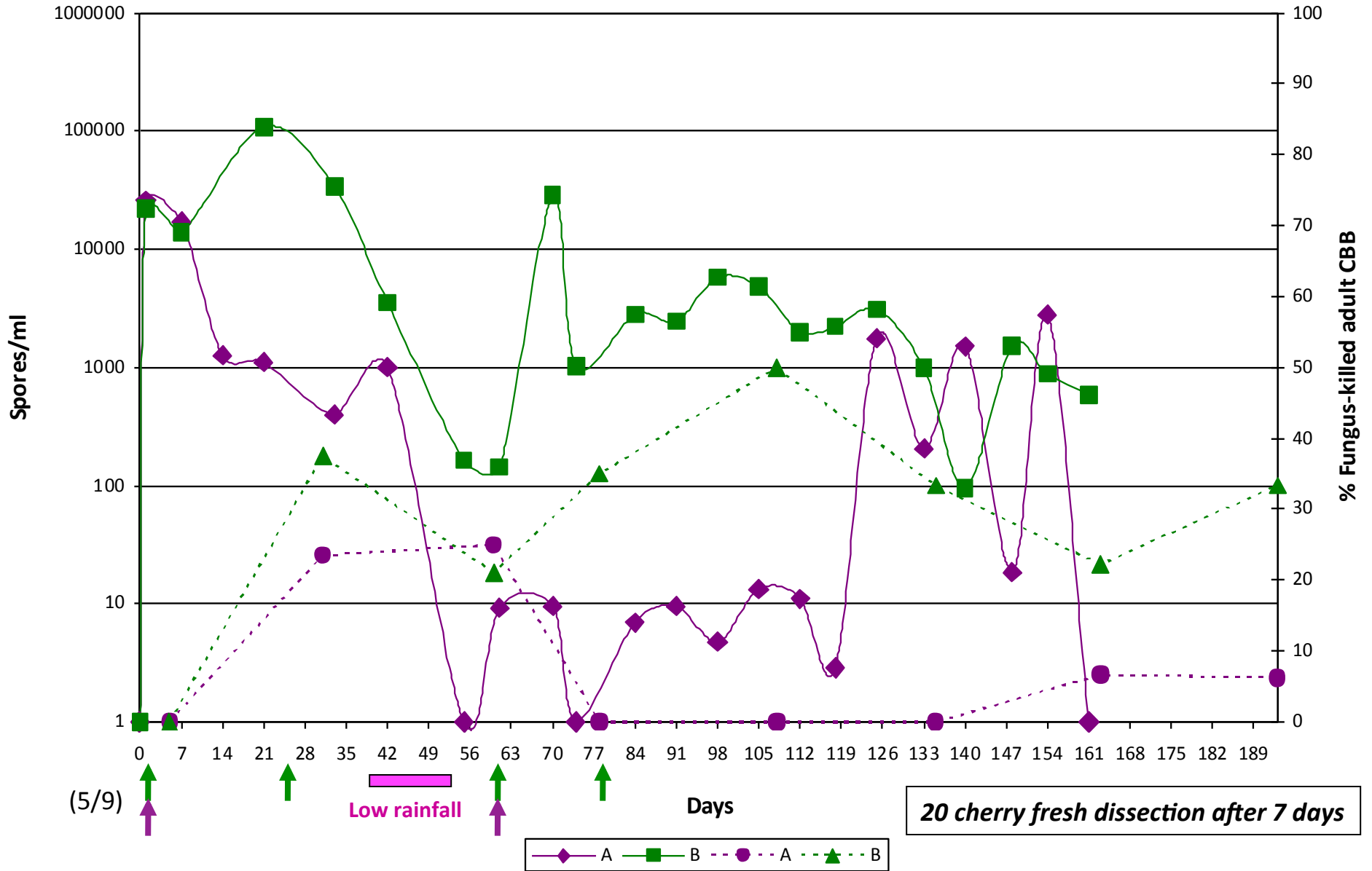


***B. bassiana* GHA field persistence and % fungus-killed CBB**  
**Elevation 1639 ft**





***B. bassiana* GHA field persistence and % fungus-killed CBB,  
Elevation 1700 ft.**



# Goals for 2013

- Determine how timing and frequency of application effects persistence and efficacy
- How does it effect bean quality?



Elevation:

A. 1869 ft

B. 535 ft

C. 450 ft

# 2013 Spray Schedule

	Napoopoo Low		Honaunau Low			Honaunau High	
	#1	#2	#1	#2	#3	#1	#2
April 8, 2013	✓	✓	✓	✓	✓		
April 15, 2013	✓	✓	✓	✓			
April 22, 2013	✓	✓	✓	✓			
May 6, 2013						✓	✓
May 13/14 2013	✓	✓	✓	✓	✓	✓	✓
May 20, 2013						✓	✓
May 28, 2013		✓		✓			
June 10, 2013	✓	✓	✓	✓	✓	✓	✓
June 24, 2013		✓		✓			✓
July 8, 2013	✓	✓	✓	✓		✓	✓
July 22, 2013		✓		✓			✓
August 5, 2013	✓	✓	✓	✓		✓	✓
August 19, 2013		✓		✓			✓
September 3, 2013	✓	✓	✓	✓		✓	✓
September 16, 2013		✓		✓			✓
September 30, 2013	✓	✓	✓	✓		✓	✓
October 14, 2013		✓		✓			✓
October 28, 2013	✓	✓	✓	✓		✓	✓
November 11, 2013		✓		✓			✓
November 25, 2013	✓	✓	✓	✓		✓	✓



**Spray late afternoon/early evening; once versus twice/month**



# Field Samples per Tree

## Persistence

high



middle



low



1 subsample = 15 berries  
10 trees

## Efficacy



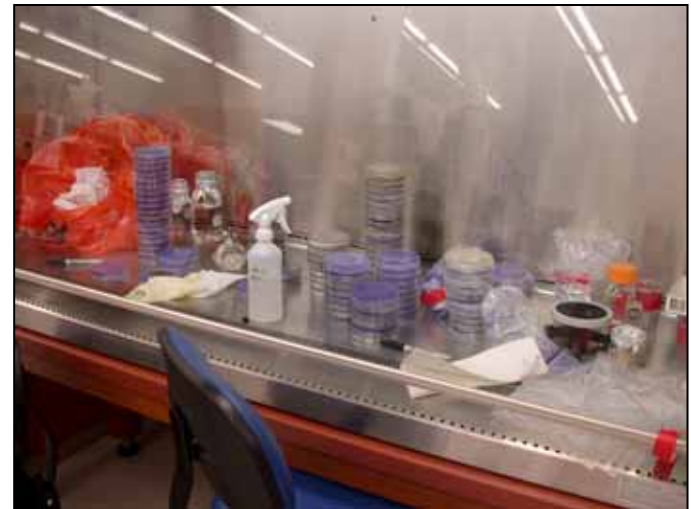
middle



1 subsample = 10 green berries  
4 trees

# Laboratory Results - Persistence

Weigh  
Wash  
Dilute  
Plate  
Count Beauveria





# Laboratory Results - Efficacy

**Dissect berries  
Count beetles**

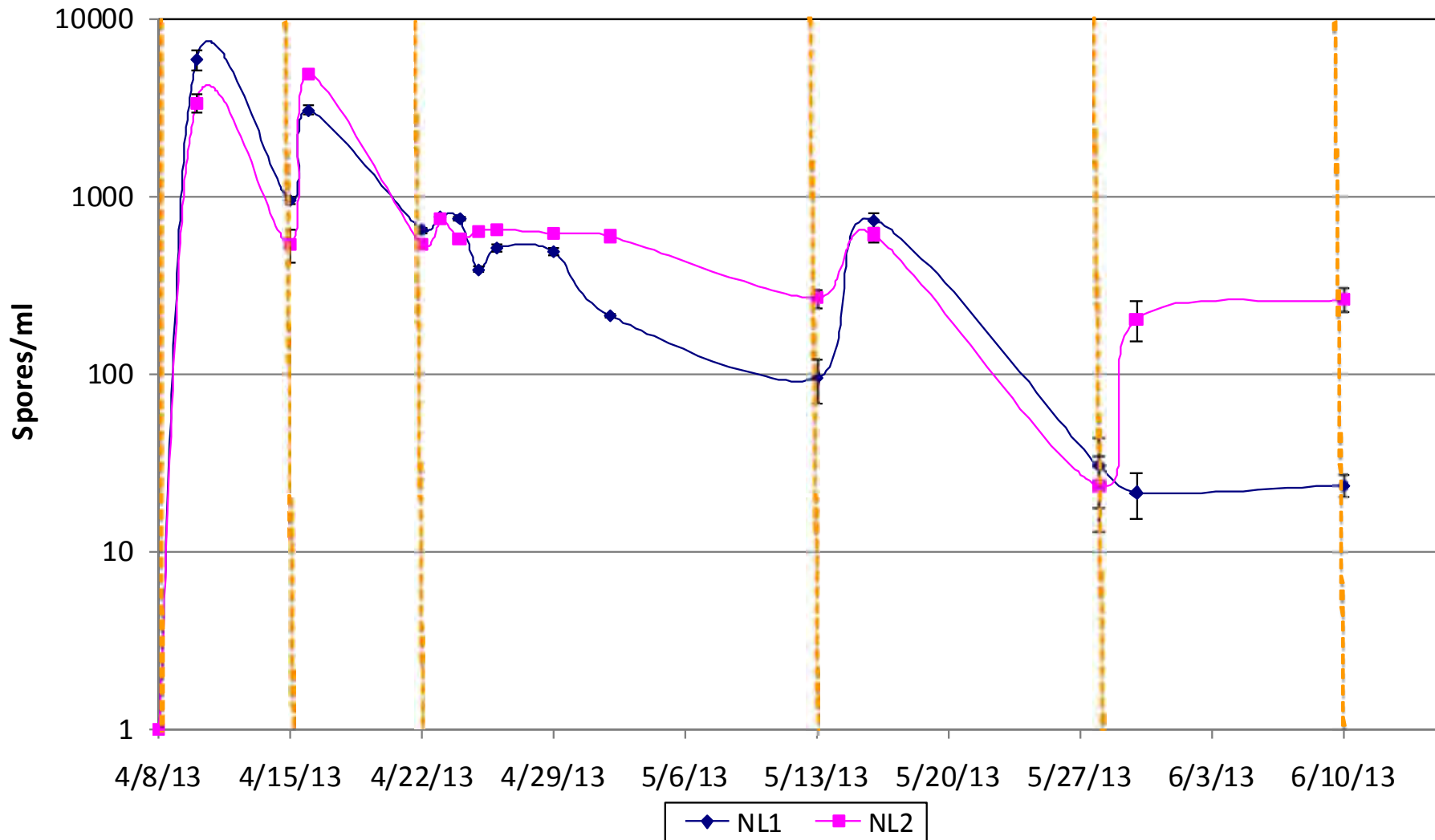


**AB alive/dead  
CD  
Beauveria**



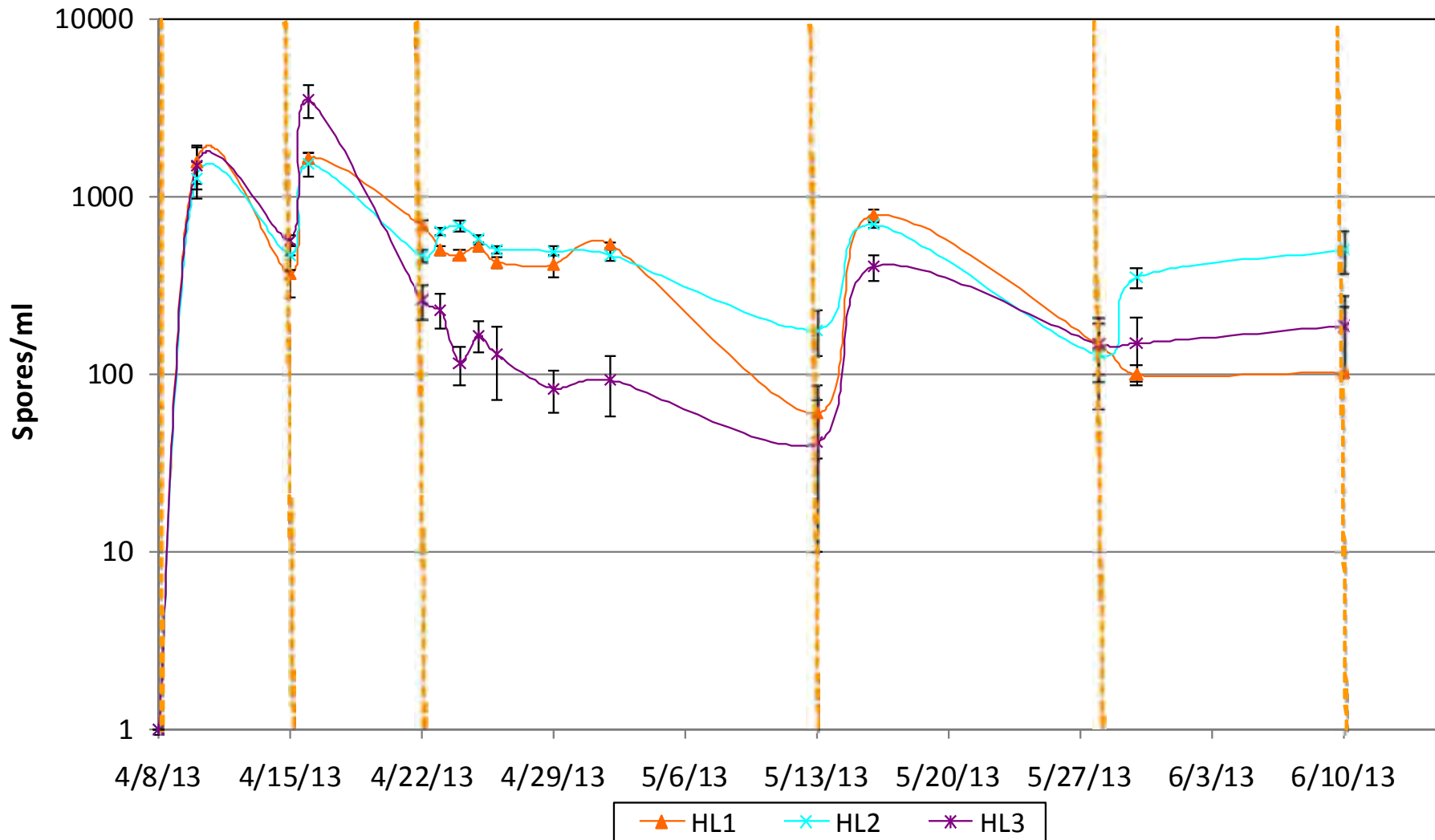
### B. bassiana GHA field *persistence* on coffee berries, 2013

Low Sprayed on Day 0 (4/8), 7 (4/15), 14 (4/22), 35 (5/13), 50 (5/28), 63 (6/10)



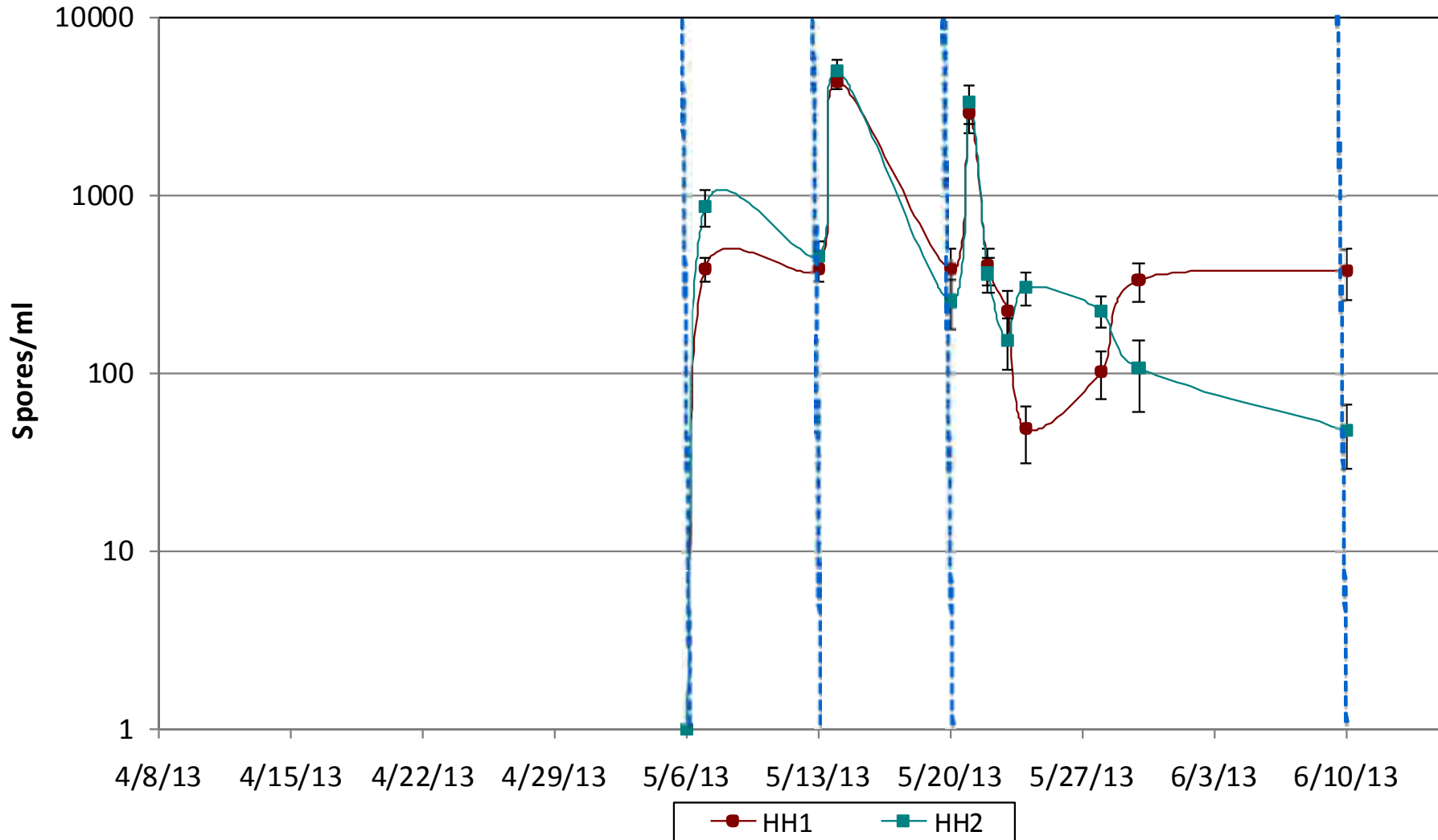
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**B. bassiana GHA field *persistence* on coffee berries, 2013**

High Sprayed on Day 0 (5/6), 7 (5/13), 14 (5/20), 35 (6/10)

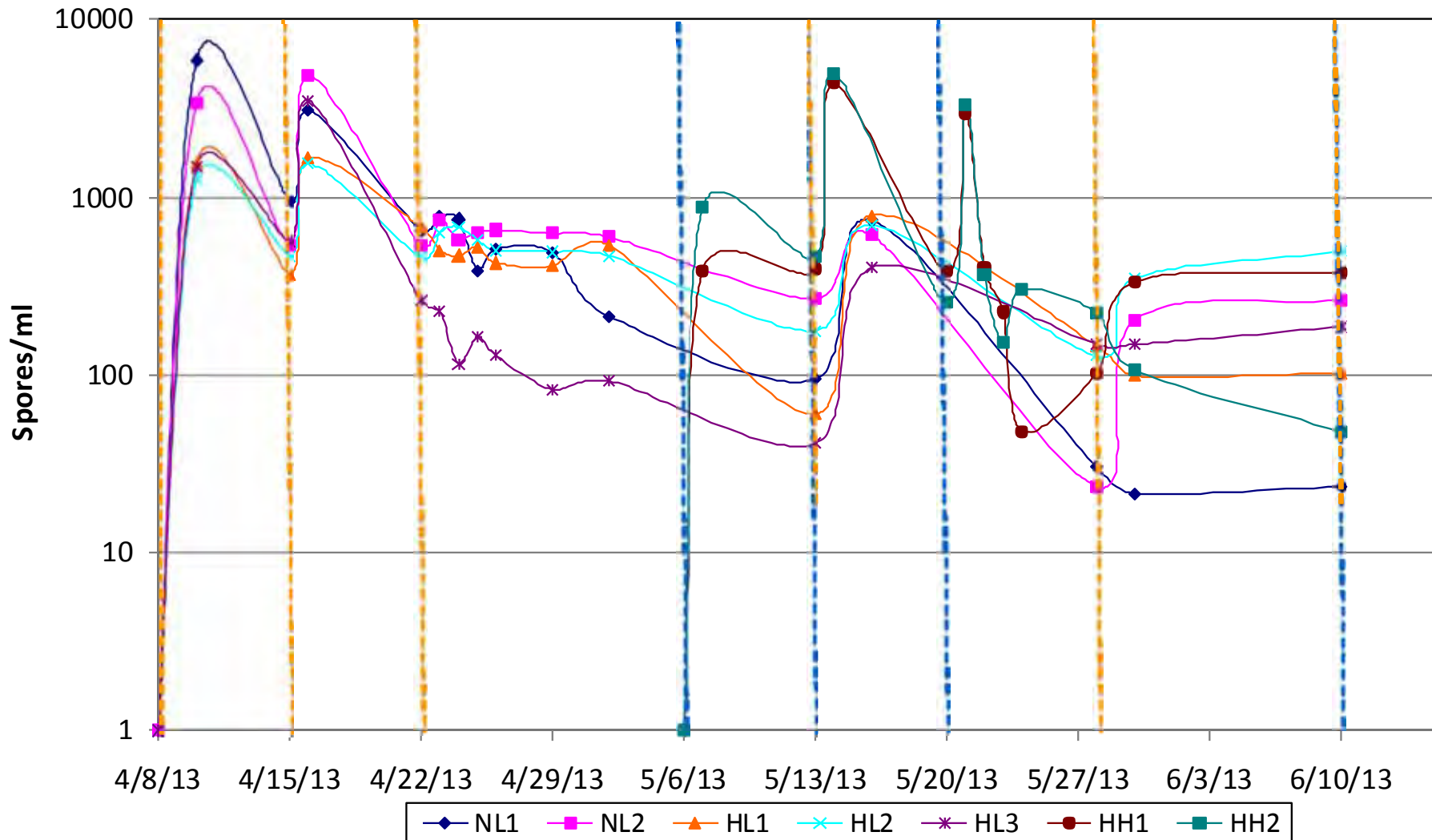




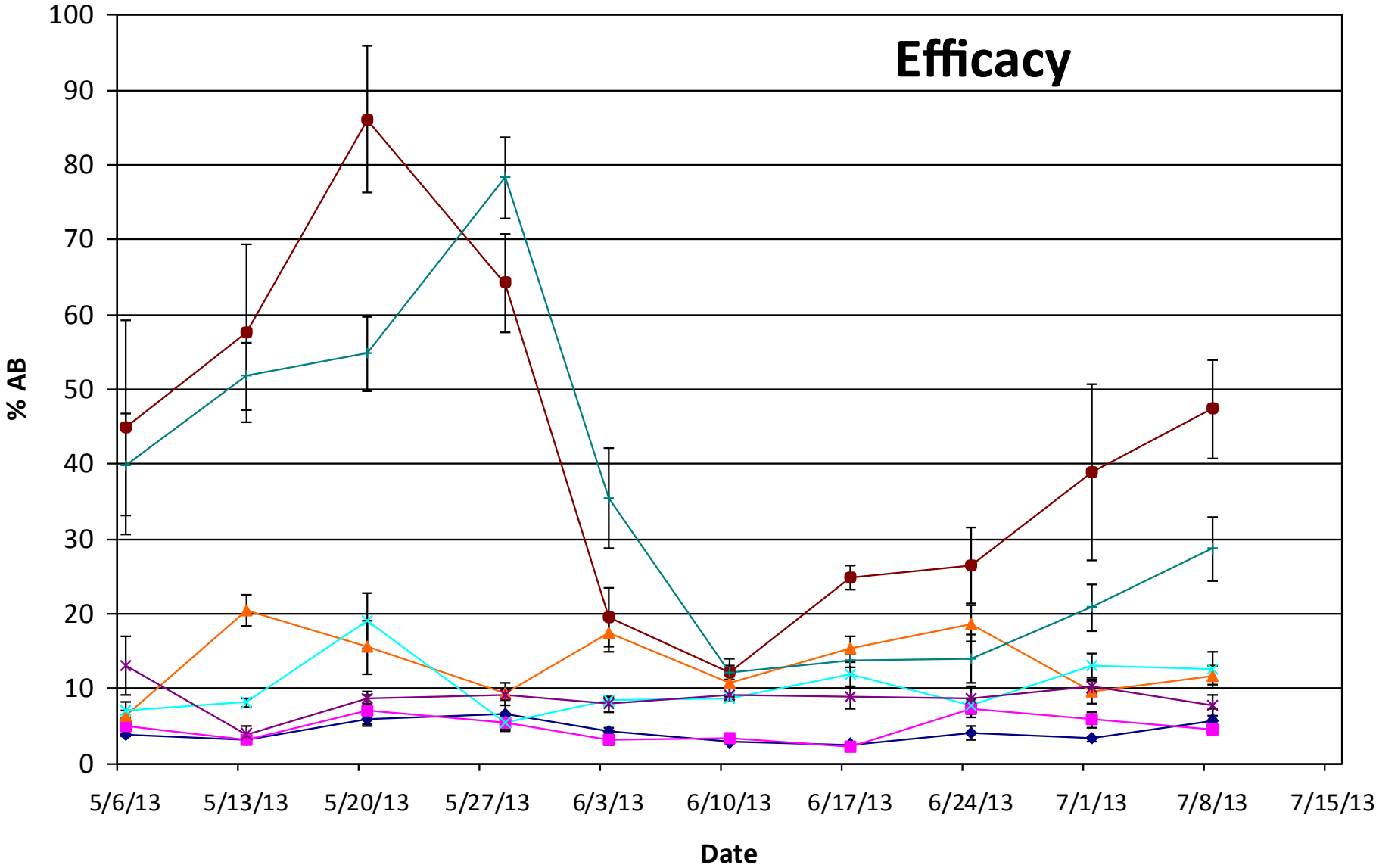
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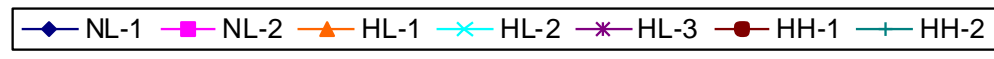
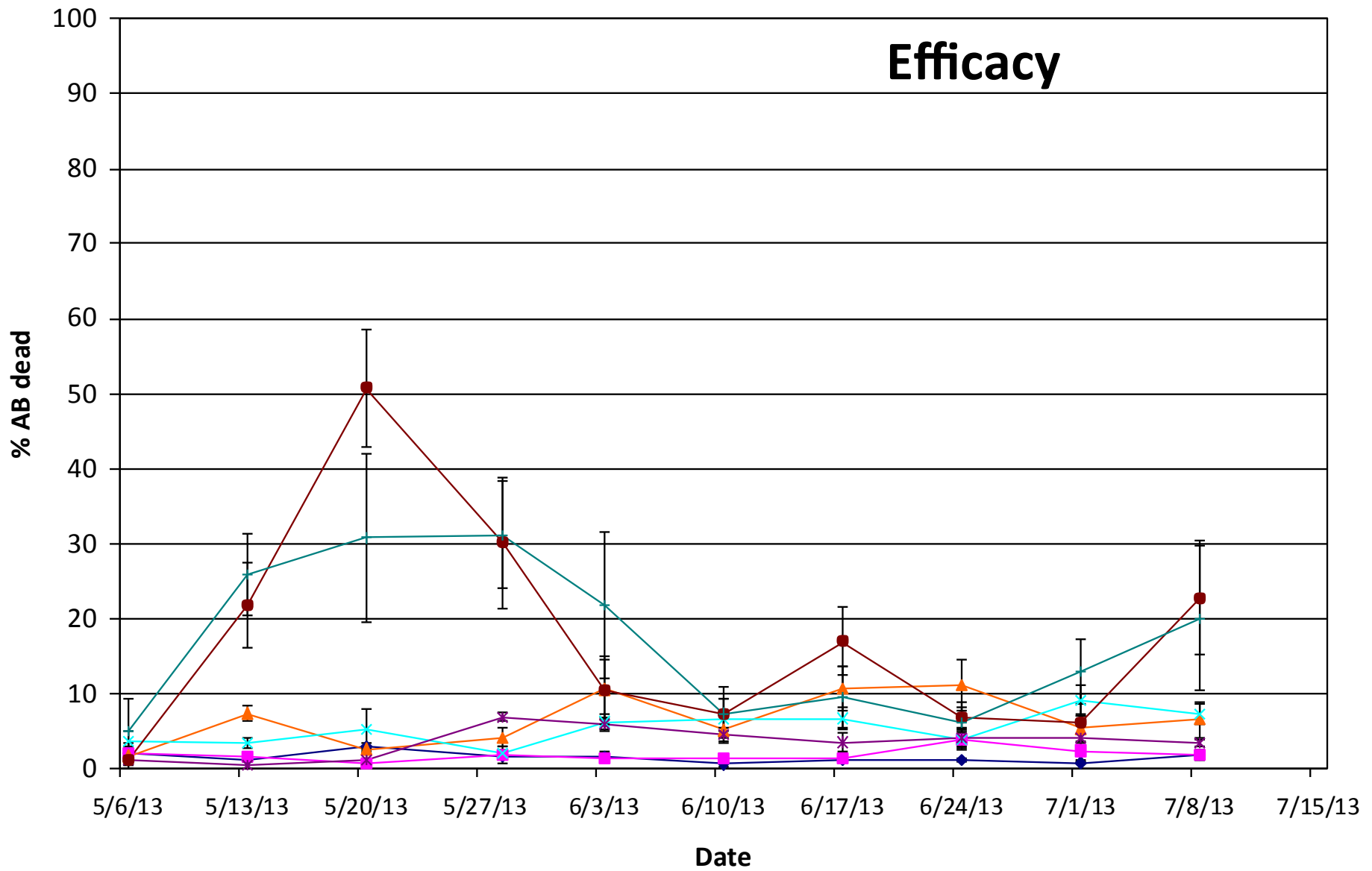
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# Efficacy

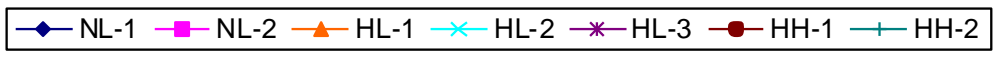
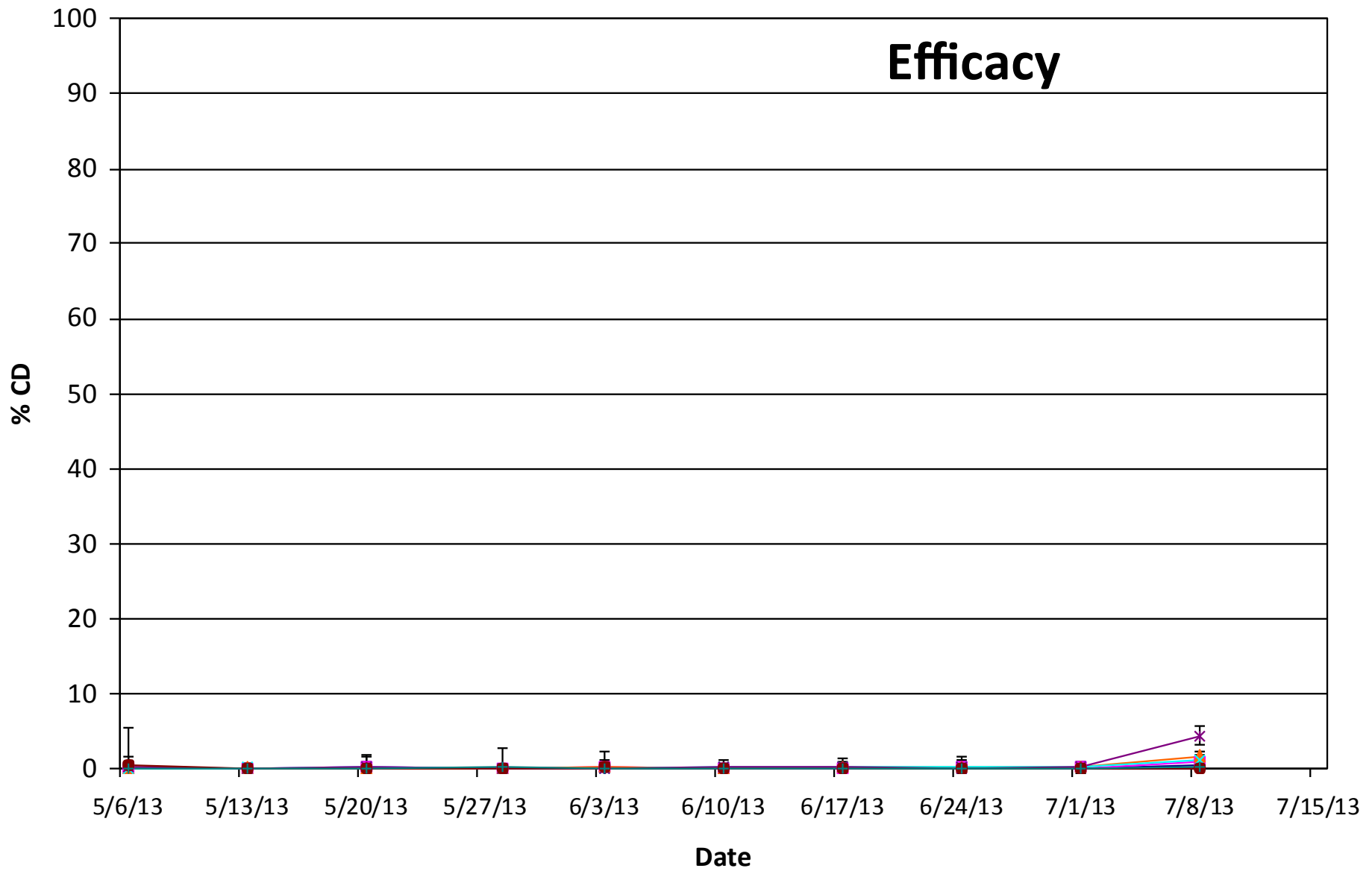


# Efficacy





# Efficacy



# Conclusions/Observations

- Temp/%RH/Rainfall
- UV
- Locations are unique
- Years can vary
- % fungus-killed adults
  - Preventative v. Therapeutic
- Timing and number of applications
  - Not a substitute for sanitation



**Thank You Field Cooperators!**

**Questions?**