Living and thriving in a world without Bravo

Erika Saalau Rojas
Sr. Agricultural Scientist
Ocean Spray Cranberries

WA & OR Winter Meeting

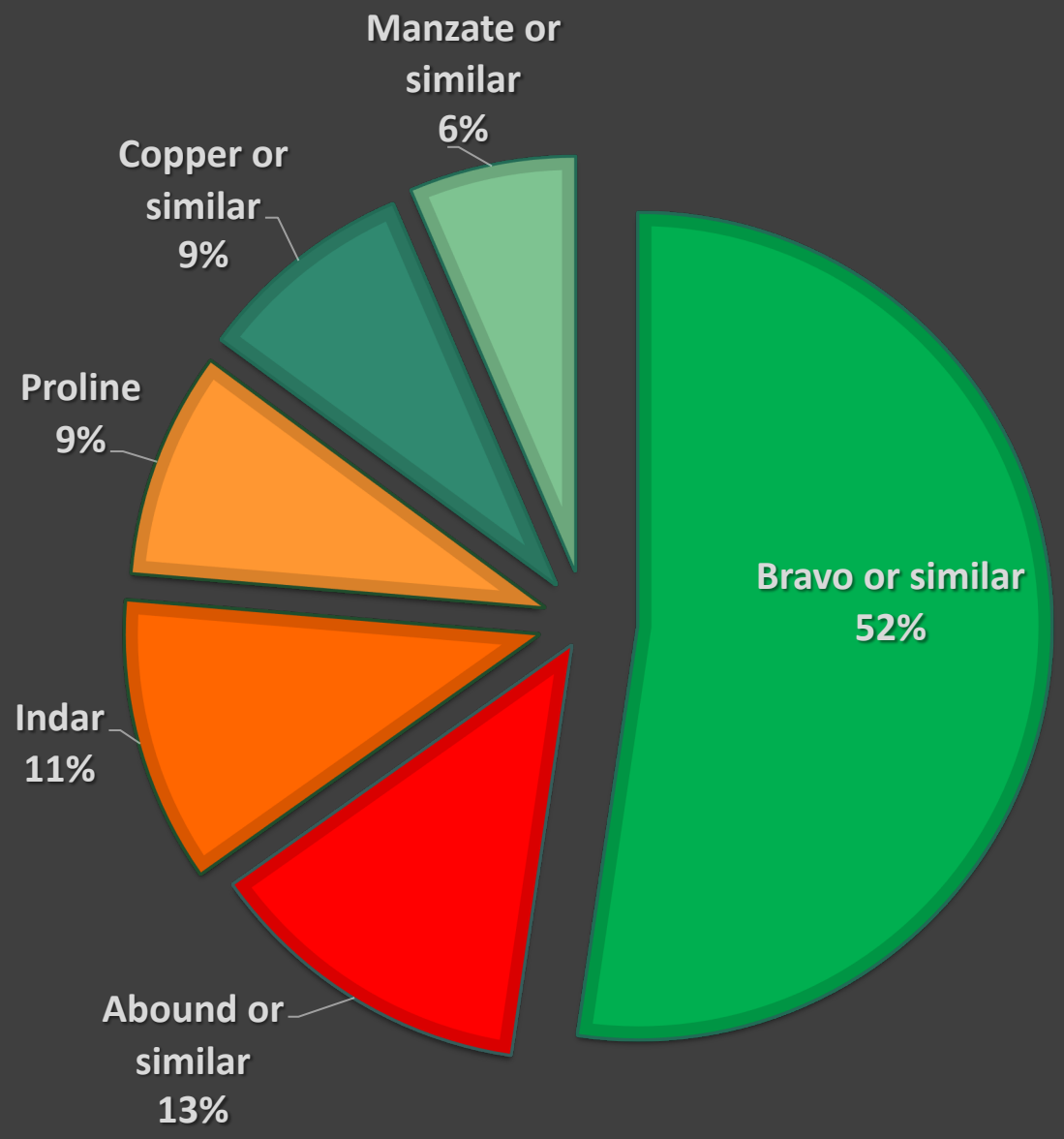
Plant Pathology Extension

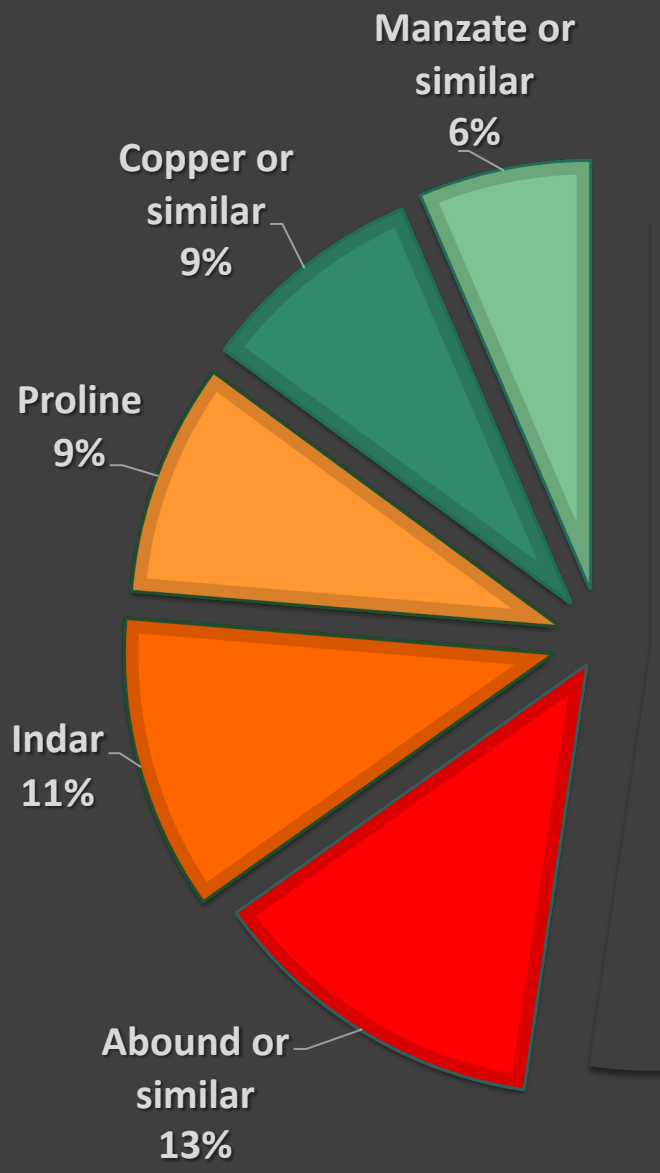
2008-2014 Plant Pathology- Iowa State

2014 Extension Plant Pathology- UMass

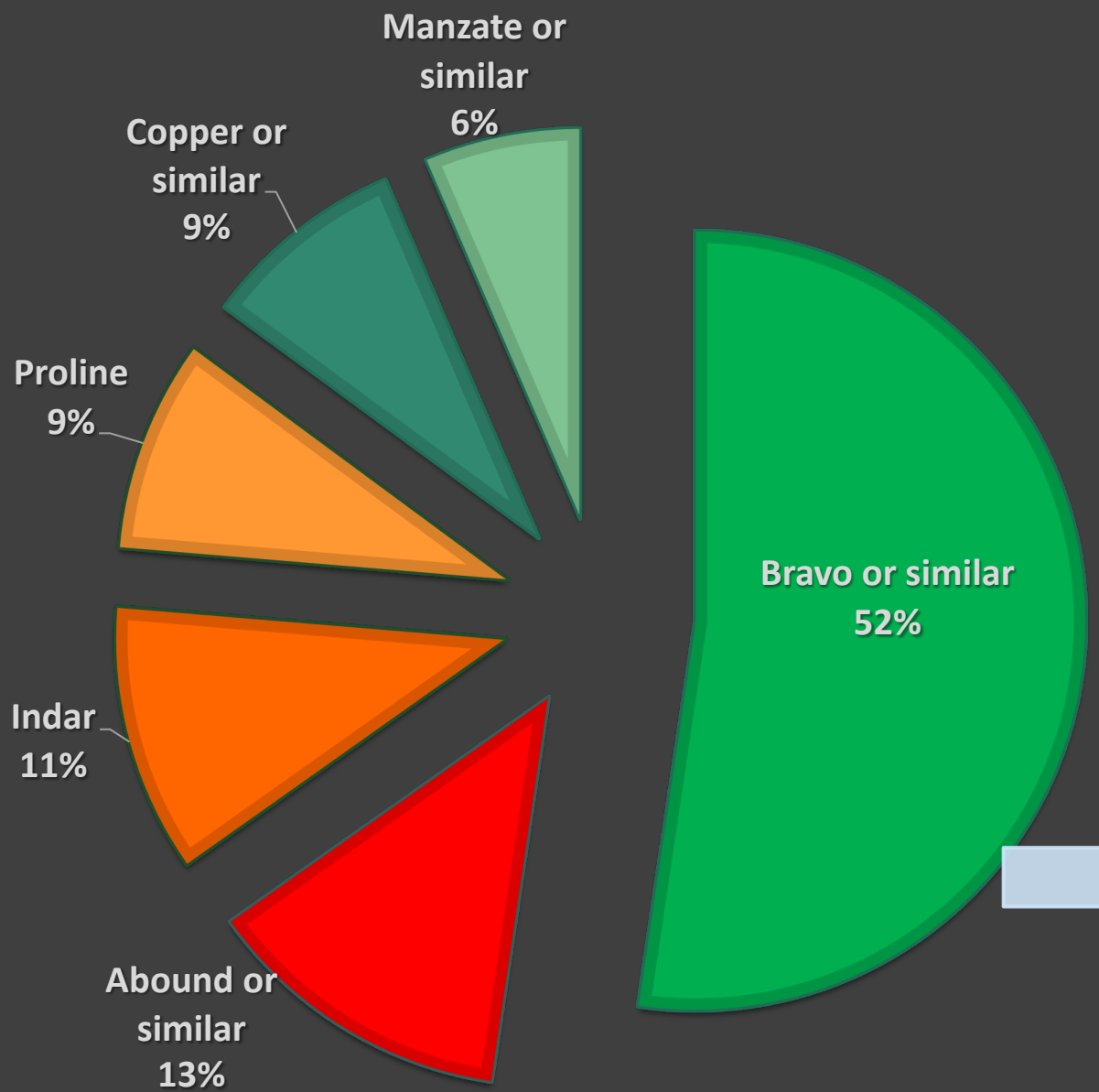
OSC Agricultural Scientist in MA ~2 years

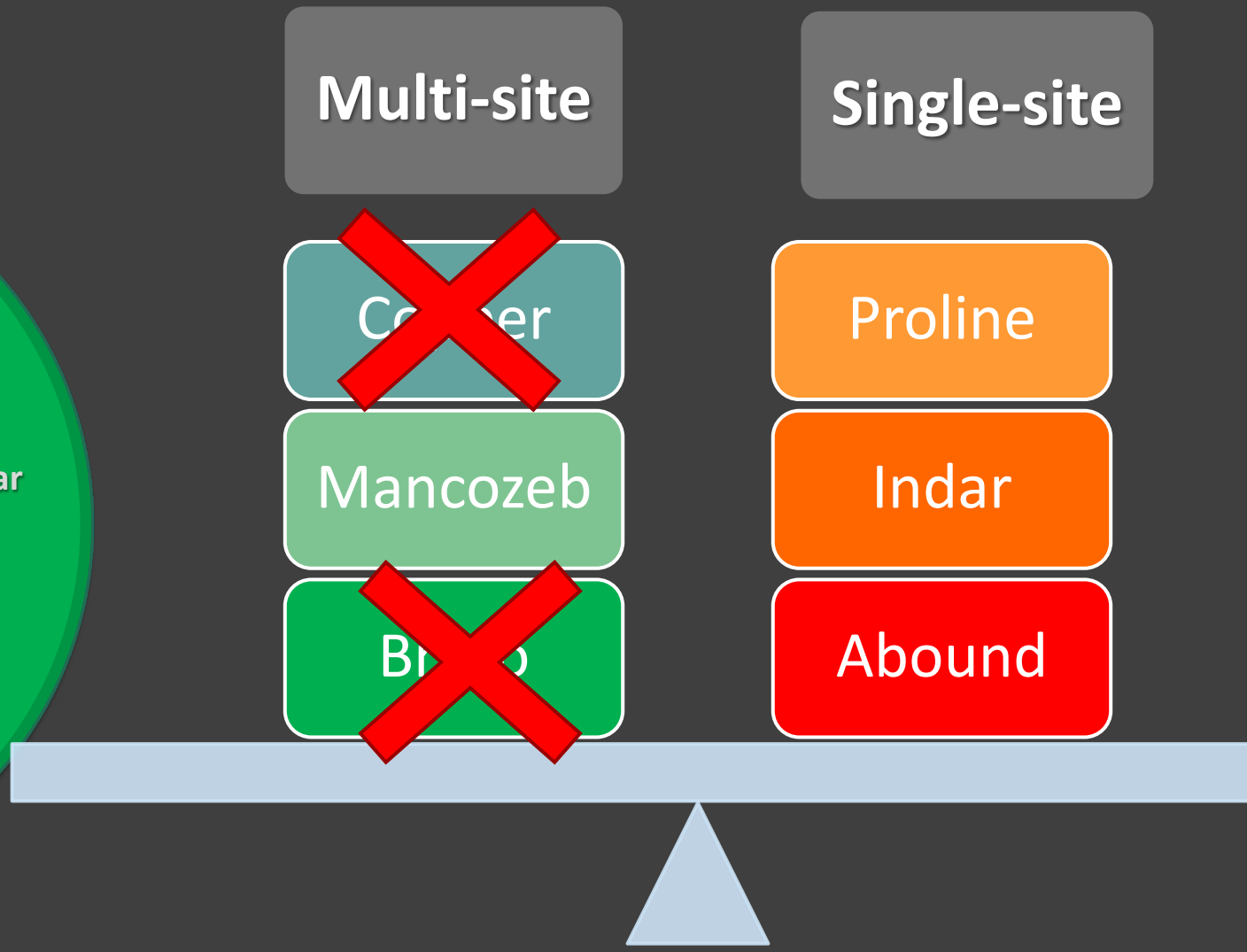
Pesticide records WA & OR 2019





Opportunity to diversify our portfolio


Manzate or similar 6%
Copper or similar 9%
Proline 9%
Indar 11%
Abound or similar 13%
Bravo or similar 52%


Multi-site
Single-site
Mancozeb
Proline
Indar
Abound

Group	FRAC Code	Risk Resistance
DMI	3	Med
Qol	11	High
Polyo	19	Med
chloro	M5	Low
dithio	M3	Low

Indar Proline

Abound

Oso, Ph-D

Bravo Manzate

BAYER

PROLINE® 480 SC Fungicide

3

Net Contents:
2.5 Gallons

GROUP 3 FUNGICIDE

For control of specified diseases on listed crops.

AZOXYSTROBIN | GROUP 11 FUNGICIDE

Aframe™

Broad spectrum fungicide for control of plant diseases

Active Ingredient:
Azoxystrobin: methyl (*E*)-2-{2-[6-(2-cyanophenoxy) pyrimidin-4-yloxy]phenyl}-3-methoxyacrylate* 22.9%

KEEP OUT OF REACH OF CHILDREN.

CAUTION

See additional precautionary statements and directions for use inside booklet.

DOW Dow AgroSciences

Indar® 2F

FUNGICIDE

3

®Trademark of The Dow Chemical Company ("Dow") or an affiliated company of Dow

Group	3	FUNGICIDE

Active Ingredient

11

AZOXYSTROBIN | GROUP 11 FUNGICIDE

3

DIFENOCONAZOLE | GROUP 3 FUNGICIDE

PULL HERE TO OPEN

Quadris Top®

Fungicide

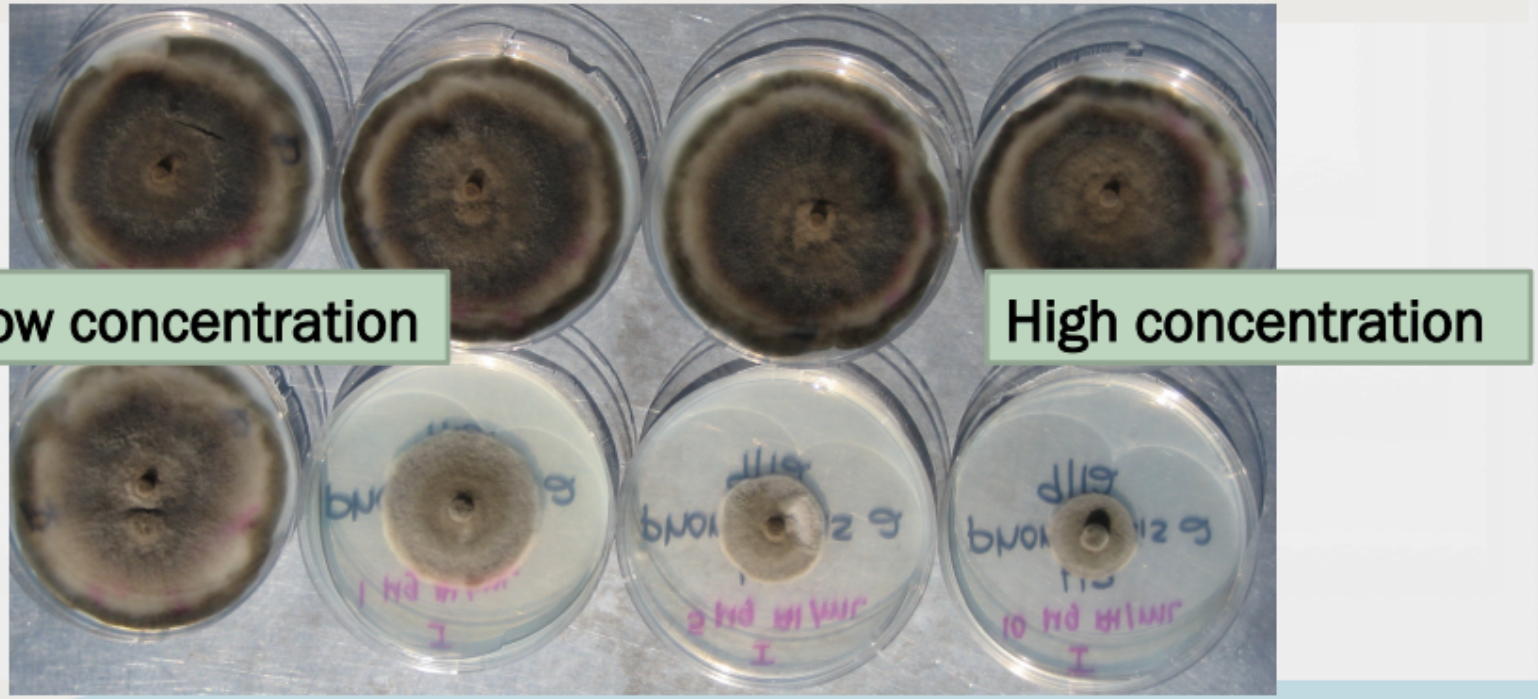
syngenta®

Active Ingredients:
Azoxystrobin* 18.2%
Difenoconazole** 11.4%

FUNGICIDE RESISTANCE *IN VITRO* ASSAYS

F. CARUSO, 2012

- 2 different locations in MA
- Indar and Abound
- 4 major fruit rot pathogens

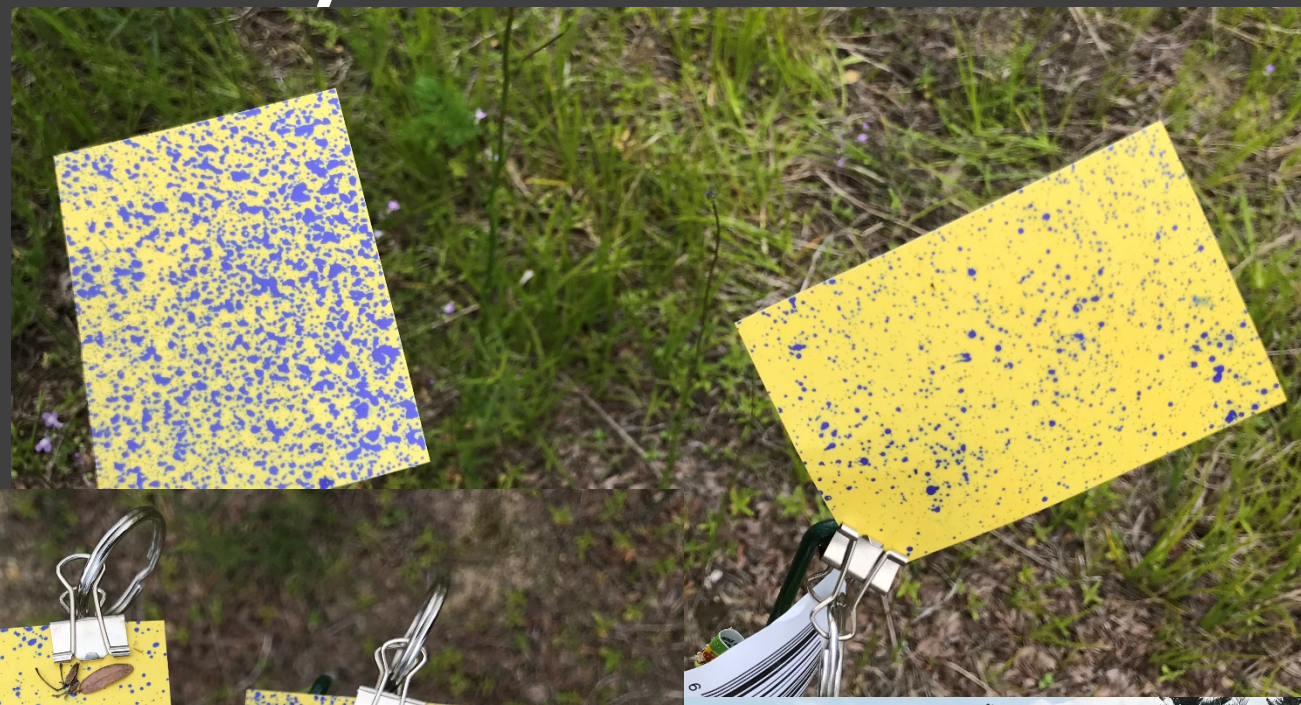


Abound use in MA ~2009

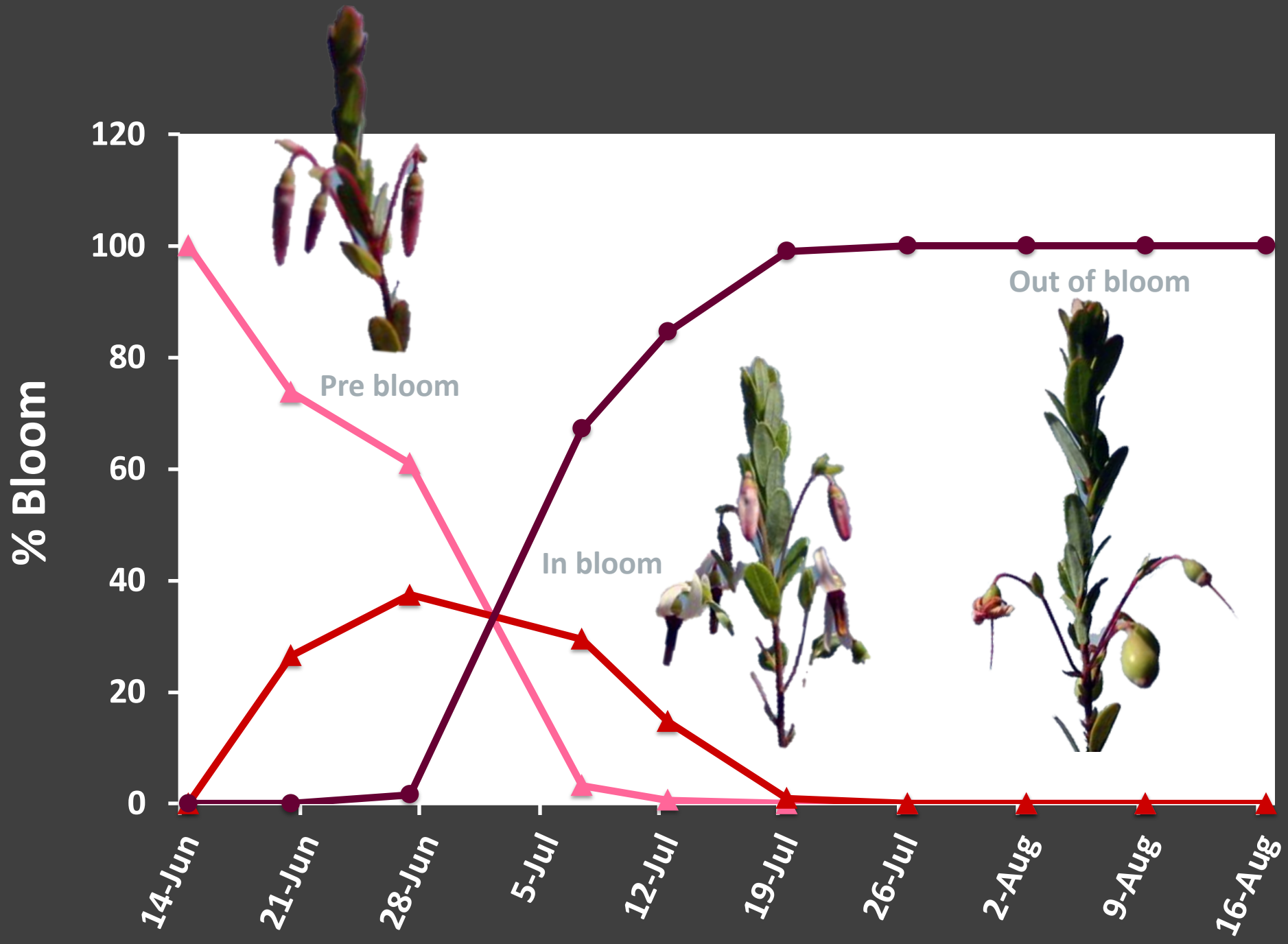
Maximize fungicide efficacy

Coverage

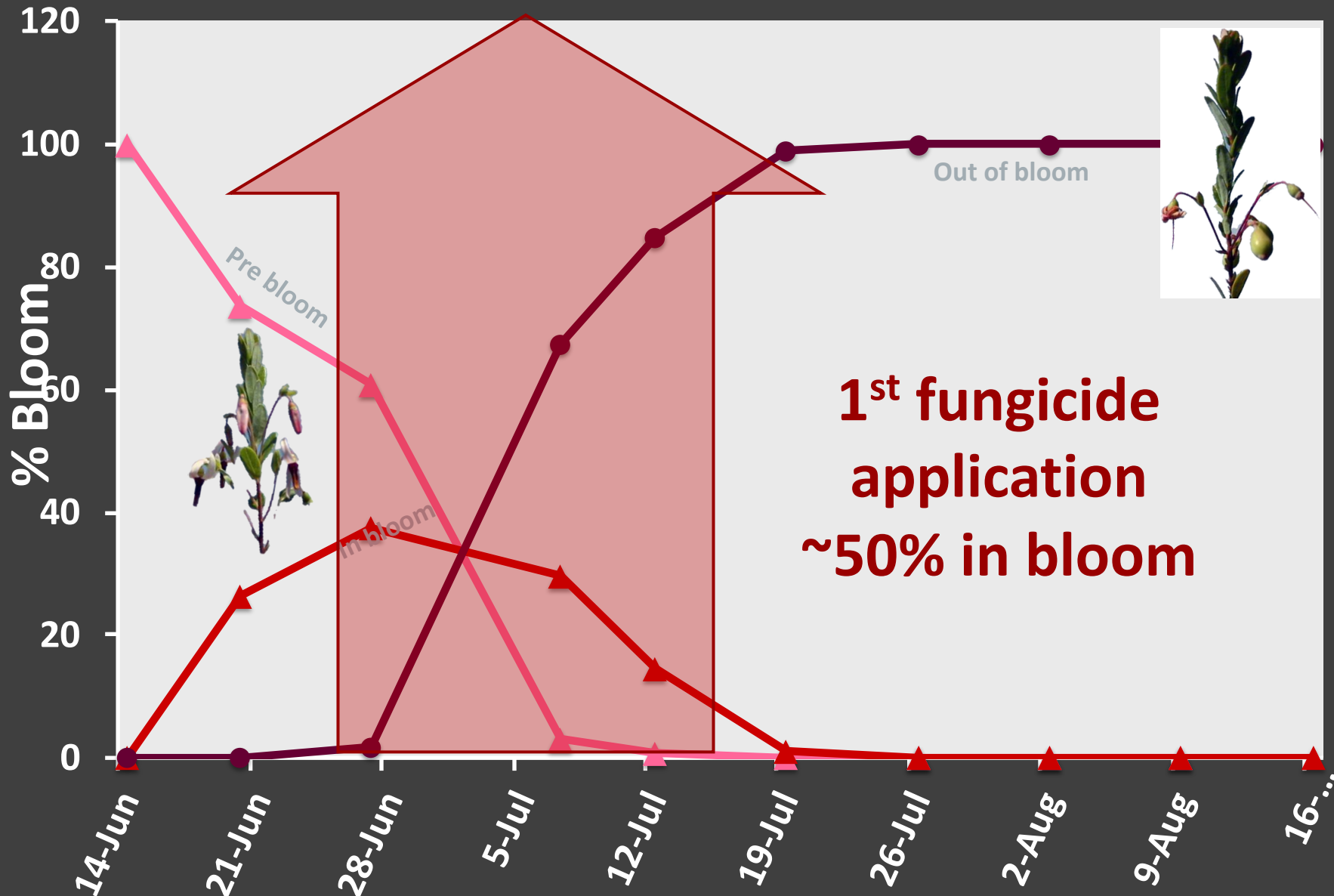
- Application system
- Even canopy?
- Spreaders/stickers?



Maximize fungicide efficacy

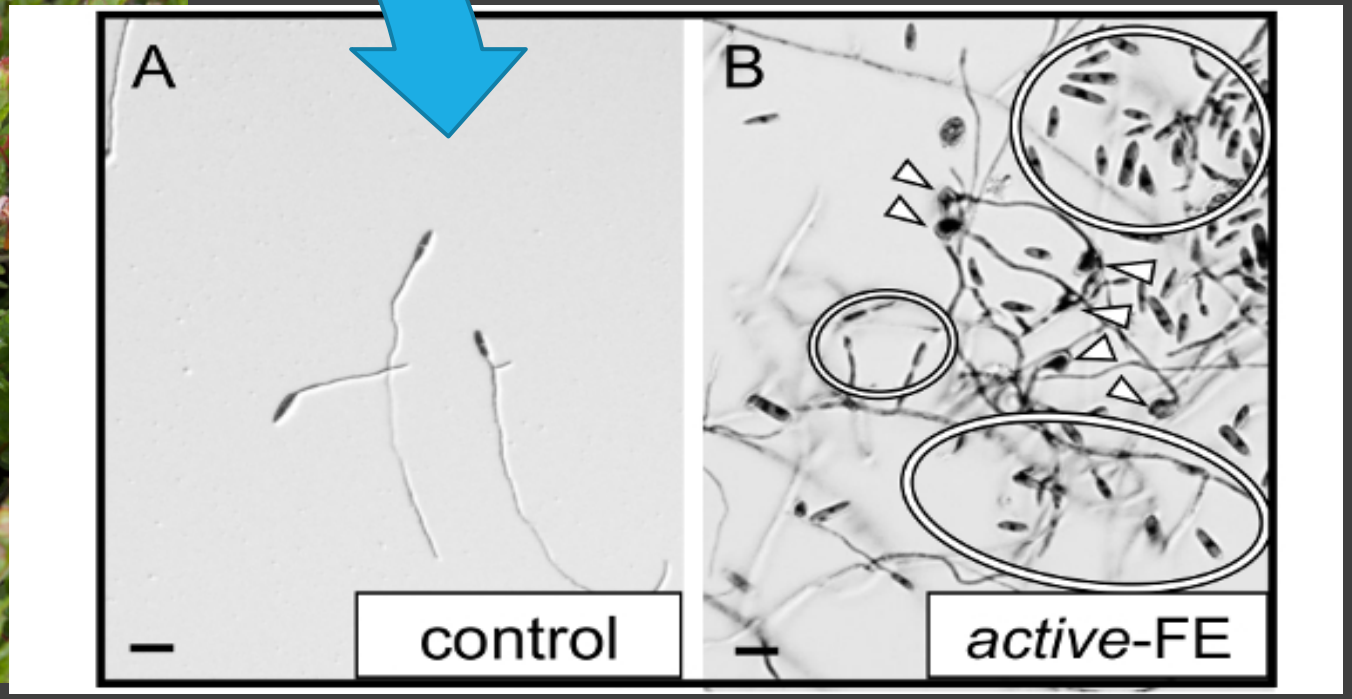

% Bloom
120
100
80
60
40
20
0
14-Jun
21-Jun
28-Jun
5-Jul
12-Jul
19-Jul
26-Jul
2-Aug
9-Aug
16-Aug
Pre bloom
In bloom
Out of bloom

Critical period



Tim Waller,
Rutgers University

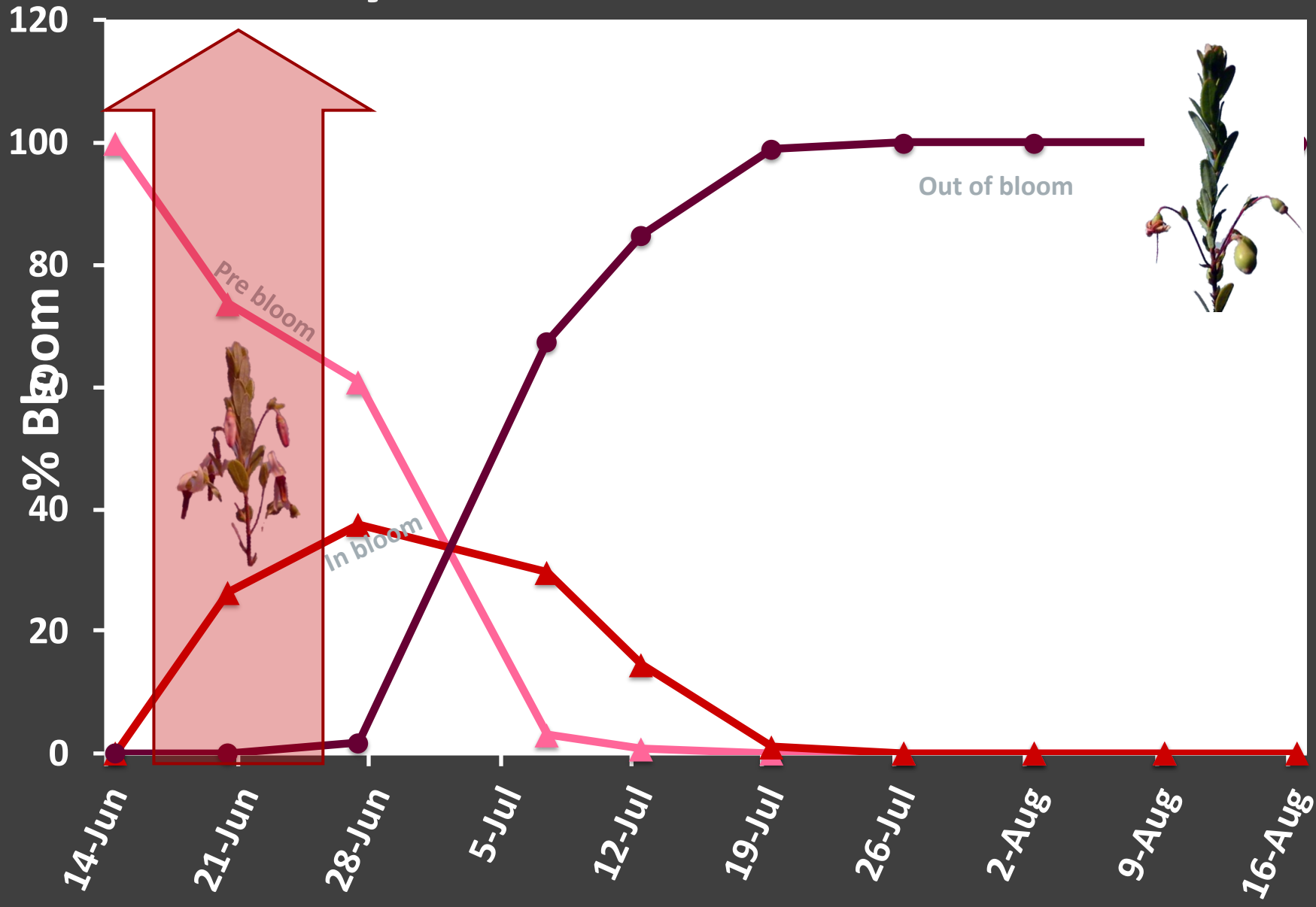
Added floral extracts to
bitter rot pathogen



Dramatic increase in spore production
“Weaponized” fungus
Shortened time required for infection

Very short window for fungicide app!

Too early!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Pre bloom
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Out of bloom
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26-Jul
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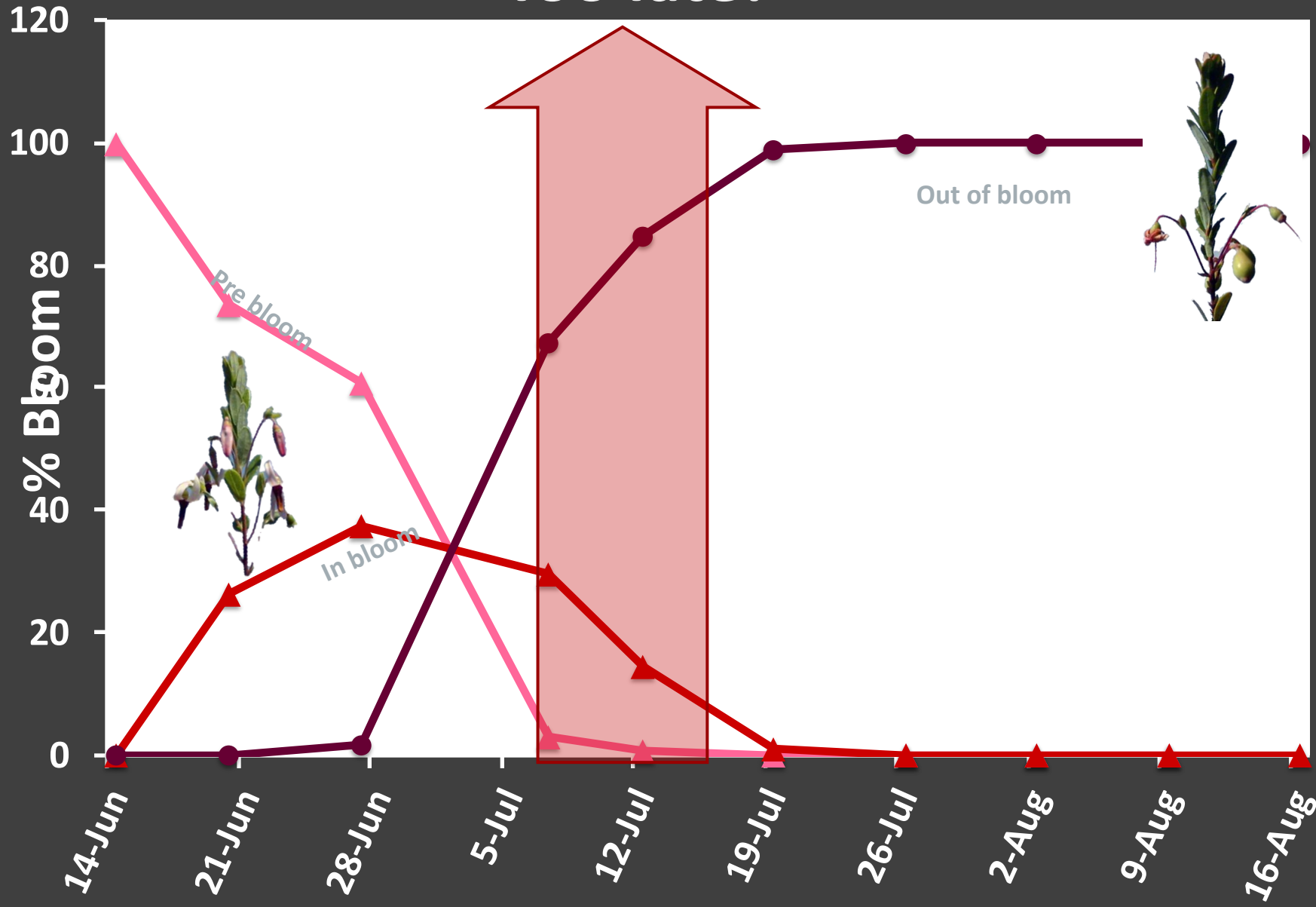
16-Aug

Too late!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Late water flood = maximize efficacy and less apps needed

Fungicide Trials, 2019

Fungicide Program example

In bloom	In bloom	Late Bloom	Late Bloom
Indar/Abound	Indar/Abound	Bravo	Bravo
Indar/Abound	Indar/Abound	Bravo	
Indar/Abound	Bravo		

- Bravo replacements
- How is fruit quality affected?
- Efficacy across regions
- Fungicide resistance is a concern.

In bloom	In bloom	Late Bloom
Bravo	Bravo	Bravo
Manzate	Manzate	Manzate
Manzate	Manzate	Quadris Top
Manzate	Quadris Top	Quadris Top
Quadris Top	Manzate	Manzate
Quadris Top	Quadris Top	Manzate
Untreated	Untreated	Untreated

Massachusetts 2019

- Does mancozeb decrease color and/or fruit size?
- How is quality affected?
- Is Quadris Top effective against fruit rot?

In bloom	In bloom	Late Bloom
Bravo	Bravo	Bravo
Manzate	Manzate	Manzate
Manzate	Manzate	Quadris Top
Manzate	Quadris Top	Quadris Top
Quadris Top	Manzate	Manzate
Quadris Top	Quadris Top	Manzate
Untreated	Untreated	Untreated

Early Bloom	Mid-Bloom	Late Bloom
Quadris Top	Quadris Top	
Bravo	Bravo	
	Quadris Top	Quadris Top
	Bravo	Bravo
	Manzate	
		Manzate
	Manzate	Manzate
Untreated	Untreated	Untreated

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Manzate	Quadris Top	Quadris Top
Quadris Top	Manzate	Manzate
Quadris Top	Quadris Top	Manzate
Untreated	Untreated	Untreated

Massachusetts

Sai Sree Uppala
UMass, MA

- No statistical differences:
  - Fruit rot incidence
    - Control= 4.38%
  - Fruit size between 1.9-1.7g
  - Color
    - Good year in MA
    - Canopy may be an issue

Early Bloom	Mid-Bloom	Late Bloom
Quadris Top	Quadris Top	
Bravo	Bravo	
	Quadris Top	Quadris Top
	Bravo	Bravo
	Manzate	
		Manzate
	Manzate	Manzate
Untreated	Untreated	Untreated

Wisconsin

Lindsay Wells-Hansen
Ag. Scientist, OSC

- No statistical differences:
  - Fruit rot incidence
    - Control= 3%
  - Fruit size ~1.5g
- Statistical difference in color:
  - No fungicide= 23 TACY
  - Late manzate app= 19 TACY

Early vs. late Manzate

Treatment	1st app	2nd app	3rd app	4th app
1. Late manzate (2 apps)	Quadris Top	Quadris Top	Manzate	Manzate
2. Early manzate (2 apps)	Manzate	Manzate	Quadris Top	Quadris Top

3-yr old DM bed
Spray boom

Early vs. late Manzate

	Weight berry (g)	% Rot (g)	% Uncolored (g)	TACY
Early manzate	2.5	23.5	2.5	30.3
Late manzate	2.1	31.7	10.9	30.9

Manzate & Quadris Top 2019

- No differences observed in field rot (MA, WI).
- Manzate did not affect berry size, TACY, or % uncolored in MA plot trials.
  - Field trials- Size and % uncolored may have been affected by late manzate apps.
- In WI, late manzate treatments had lower TACY.
- Multiple years needed to confirm efficacy and against fruit rot.
  - Quadris Top effective in NJ plot trials

2018 –Studies on fungicide effects on fruit rot & yield
Kim Patten - WSU

The newer cranberry fungicide		
Trade Name	Active ingredient	FRAC group(s)
Indar	fenbuconazole	3
Abound	azoxystrobin	11
Proline	prothioconazole	3
Quadris Top	azoxystrobin + difenoconazole	11 & 3
QuiltXcel	azoxystrobin + propiconazole	11 & 3

Objectives:

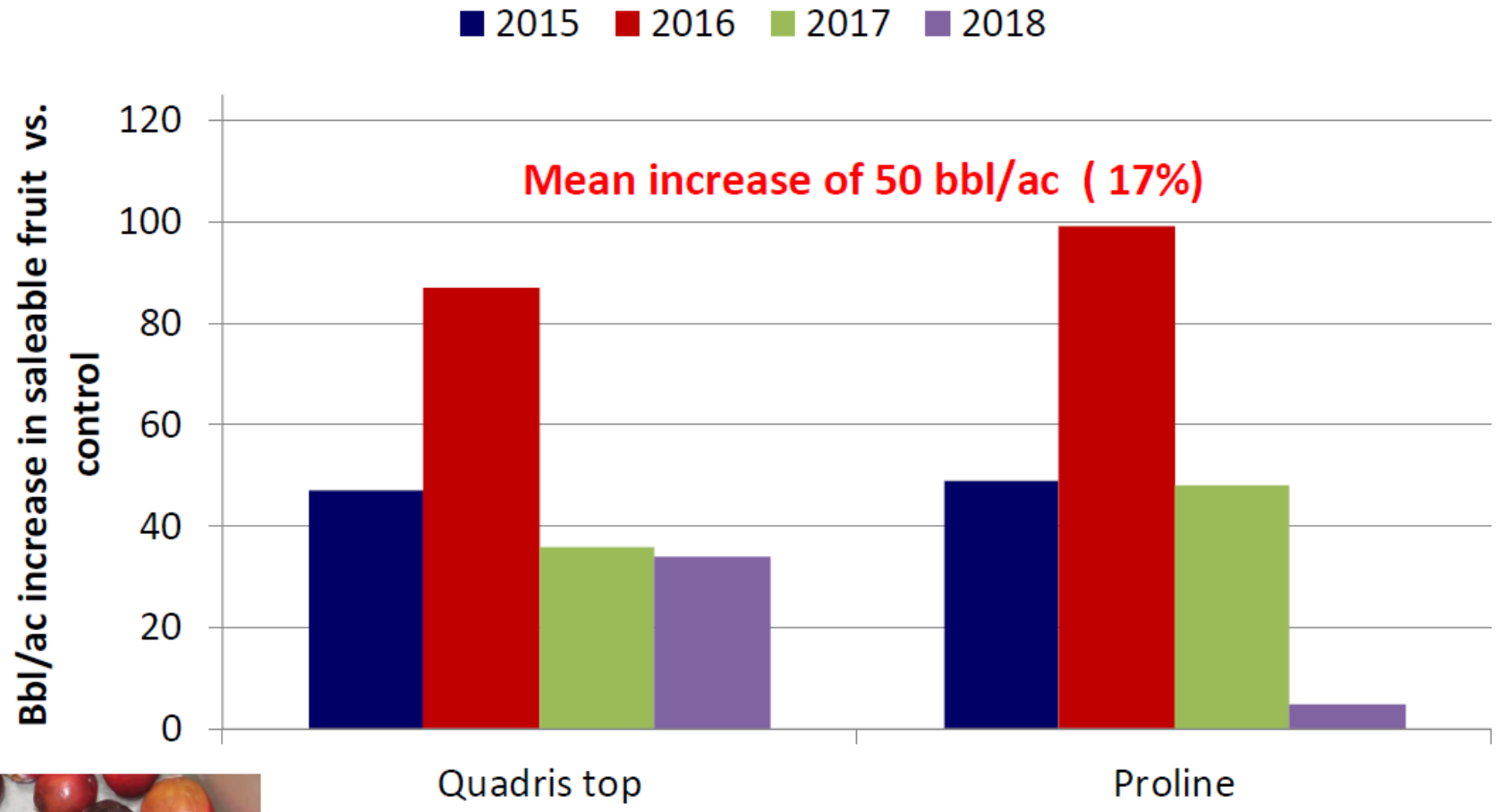
- Screening of newer fungicides
- Do fungicide affect pollination and bee foraging

Findings:

- New fungicide are very effective
- Use of Quadris Top or Proline during bloom may increase marketable yield in years with high rot. Averaged over time ~17% increase in yield over no fungicides.
- No deleterious effects of any of the fungicides applied during bloom on yield.
- Didn't see any deleterious or positive effects of fungicides on honey bee or bumble foraging behavior

Do 2 to 3 in-bloom fungicides pay for themselves?

Increase in Yield of “good” Stevens



Yield of control was 196 , 146, 180 & 207 bbl/ac in 2015, 2016, 2017 & 2018 respectively

Fungicide Summary

- Bee health needs to be considered when timing fungicides apps
- Timing of application during bloom more important than product

Potential three- point revolution?

The loss of Bravo is an opportunity to strategize and incorporate new and old players.

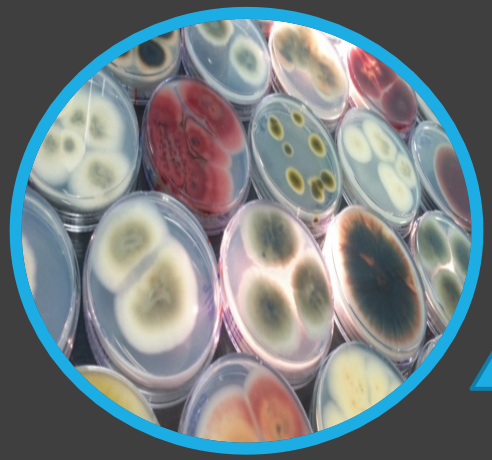
1

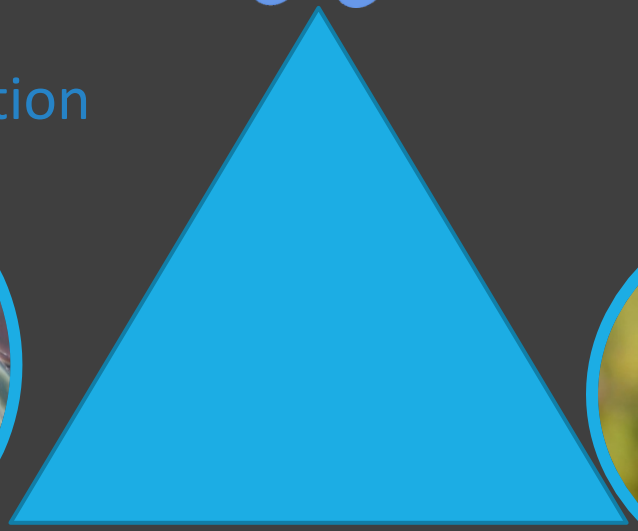
Disease management = multi-pronged approach

Environmental conditions

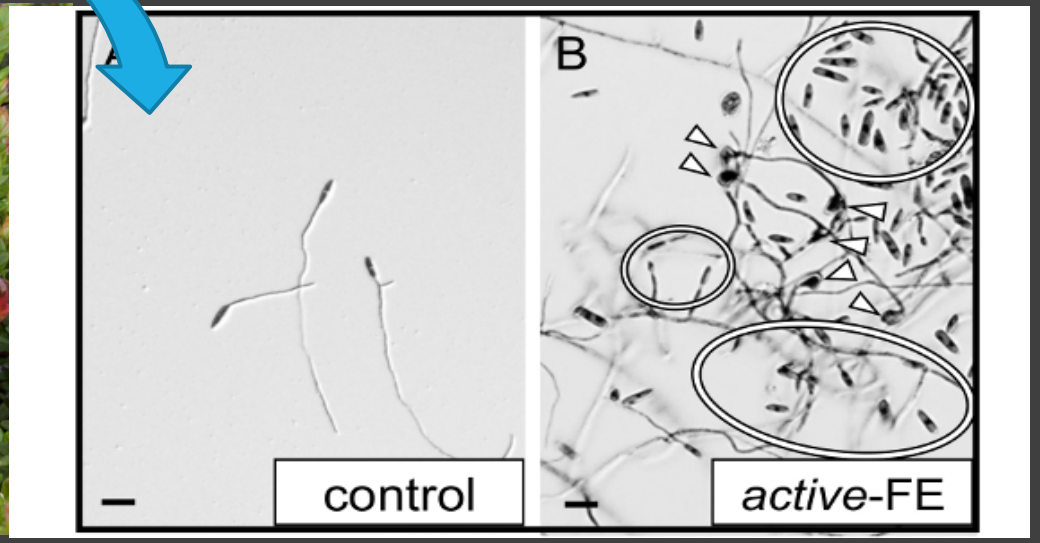
Think about the bed microclimate

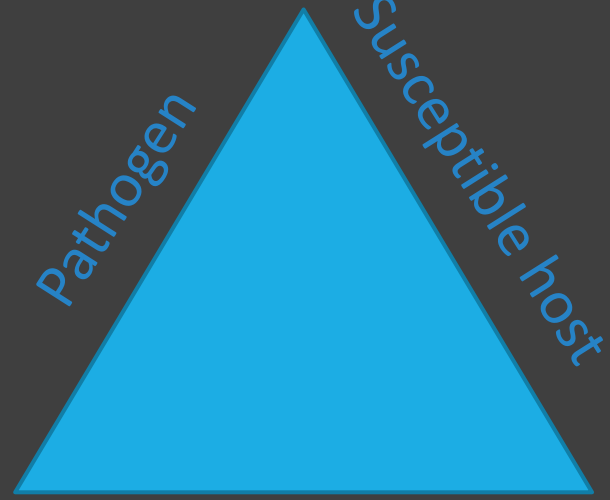
Pathogen/source of infection

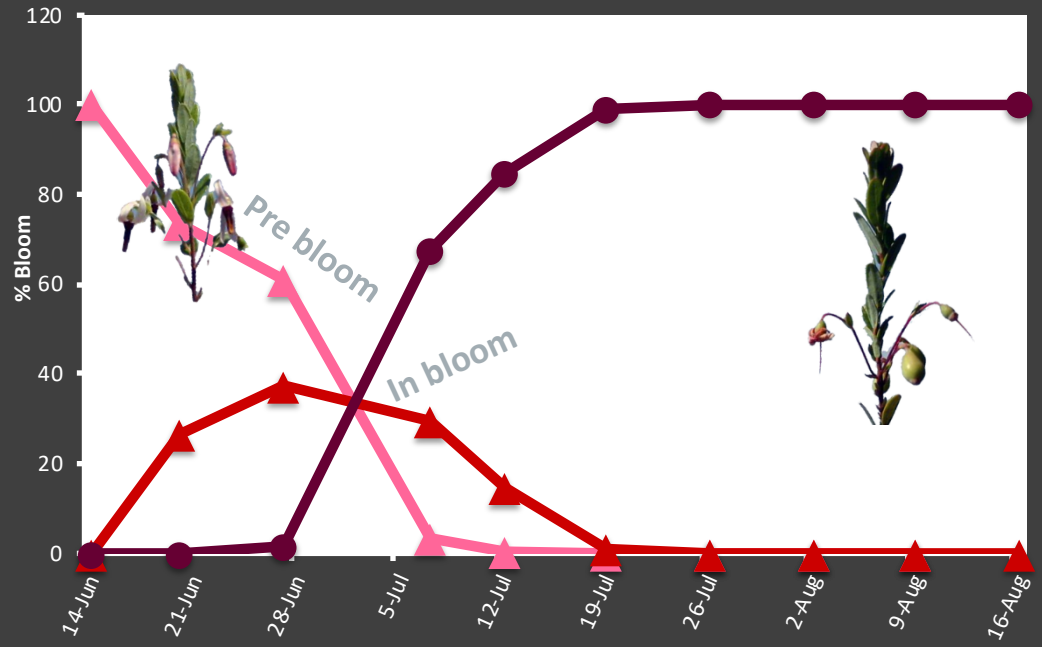




Susceptible host







Monitor bloom progression, closely.

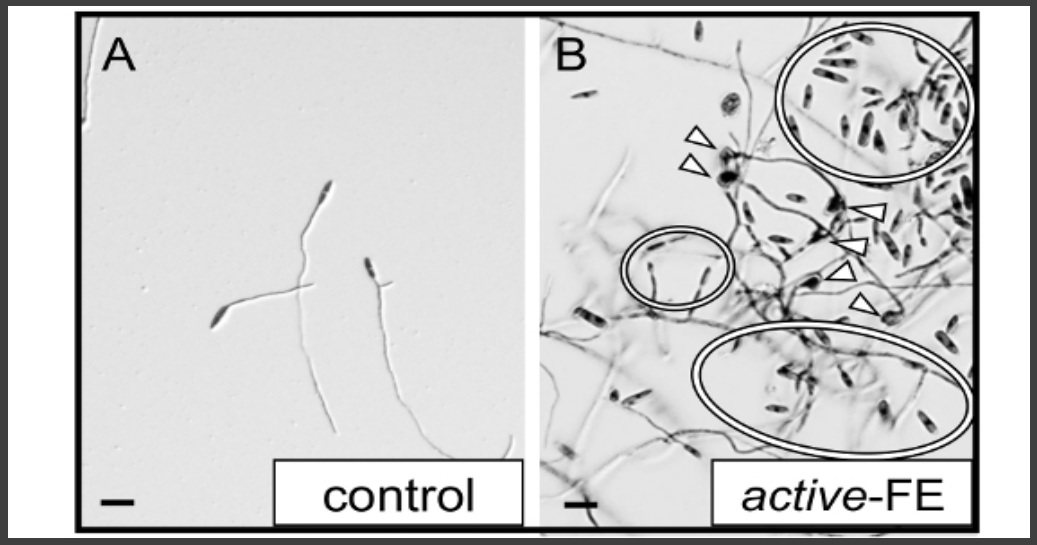
Time your applications accordingly

Can we predict peak bloom?

OSC Ag scientists are collecting data across all regions

Susceptible host

Pathogen



Short- and long-term actions

Fungicide programs

- Incorporate new products
- Application method
- Timing is everything!

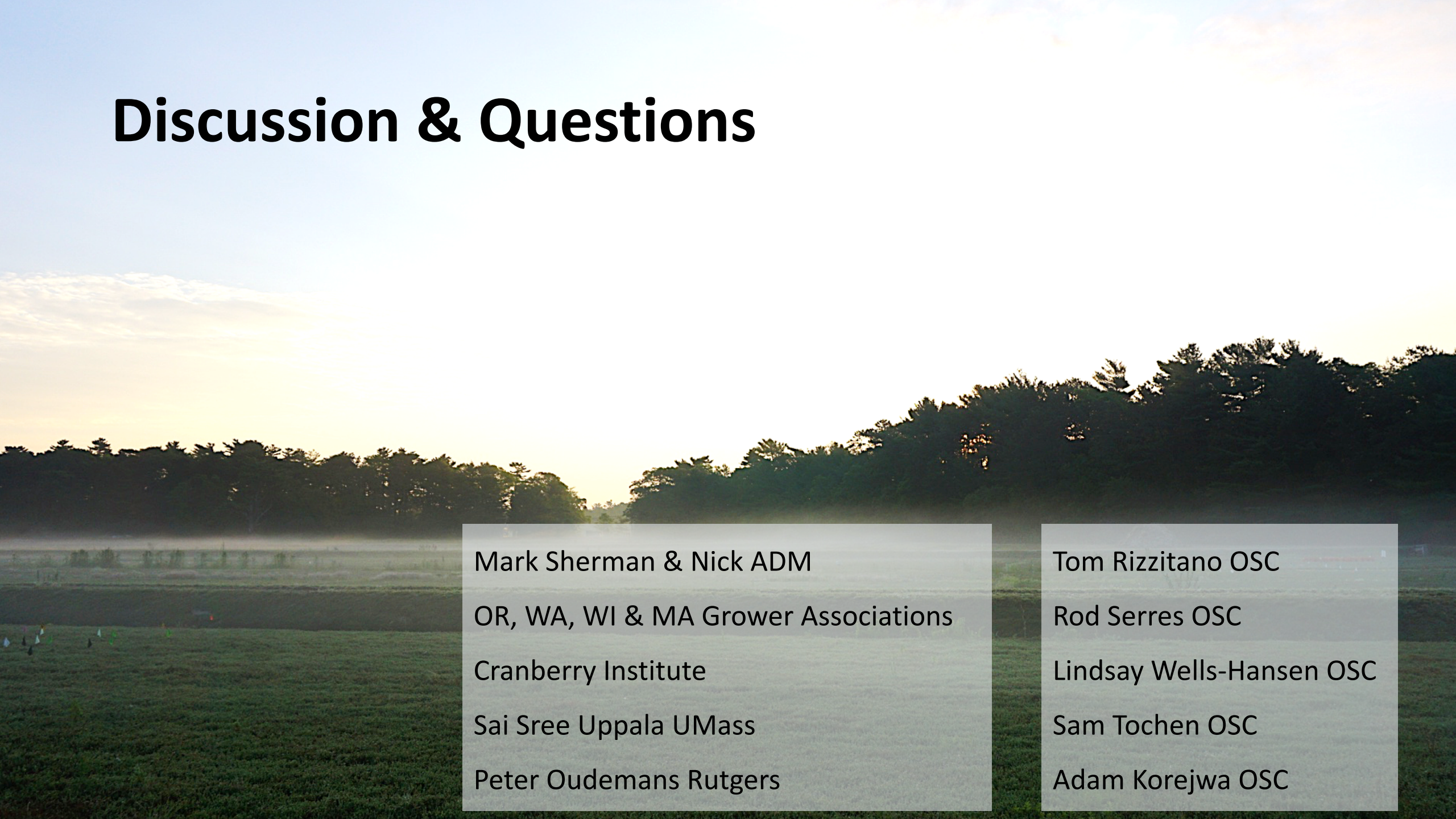
Cultural

- Disease suppression by pruning, sanding, trash flood
- Irrigation and fertilization practices
- Think long-term

Innovation

- Observational science (plot versus bed)
- Network w/ researchers and growers across regions
- Stay tuned and bee-aware!

Discussion & Questions



Mark Sherman & Nick ADM

OR, WA, WI & MA Grower Associations

Cranberry Institute

Sai Sree Uppala UMass

Peter Oudemans Rutgers

Tom Rizzitano OSC

Rod Serres OSC

Lindsay Wells-Hansen OSC

Sam Tochen OSC

Adam Korejwa OSC

Fungicide program example in WA

5/12	6/1	6/16	6/16	6/30	7/7
NU Crop	Proline	Indar/Abound	Indar/Abound	Proline	Bravo

5/12	6/1	6/16	6/16	6/30	7/7
NU Crop	Proline	Indar/Abound	Indar/Abound	Proline	Manzate