2016

Fruit Rot Management

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FRUIT ROT MANAGEMENT

A year without Bravo

ERIKA SAALAU ROJAS
PLANT PATHOLOGY
UMASS CRANBERRY STATION
WINTER 2016

TOPICS

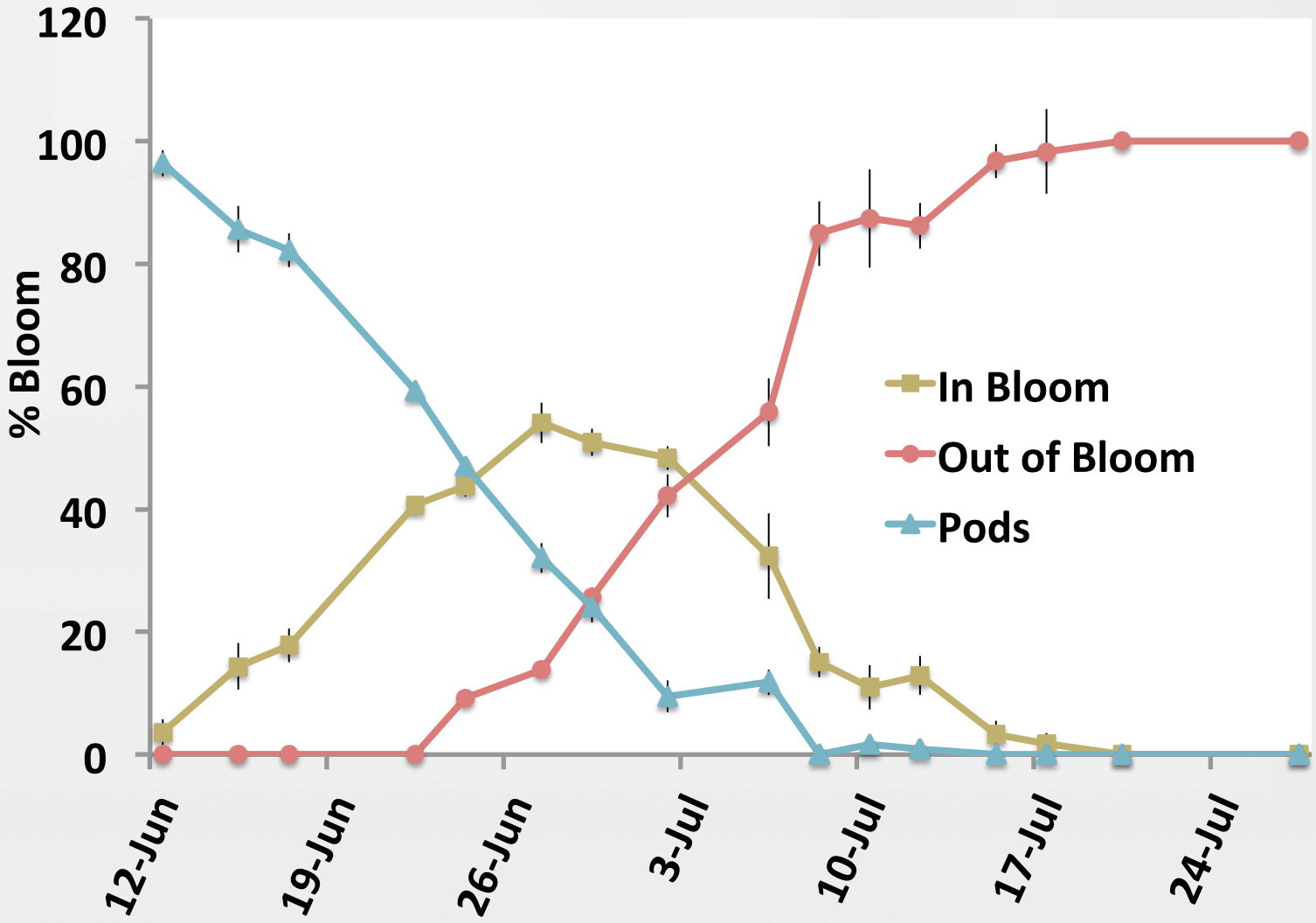
- **Fungicide field trials**
  - Timing of applications
  - Efficacy trials
- **Fungicide resistance screening**
- **Fruit quality**
- **Conclusions**

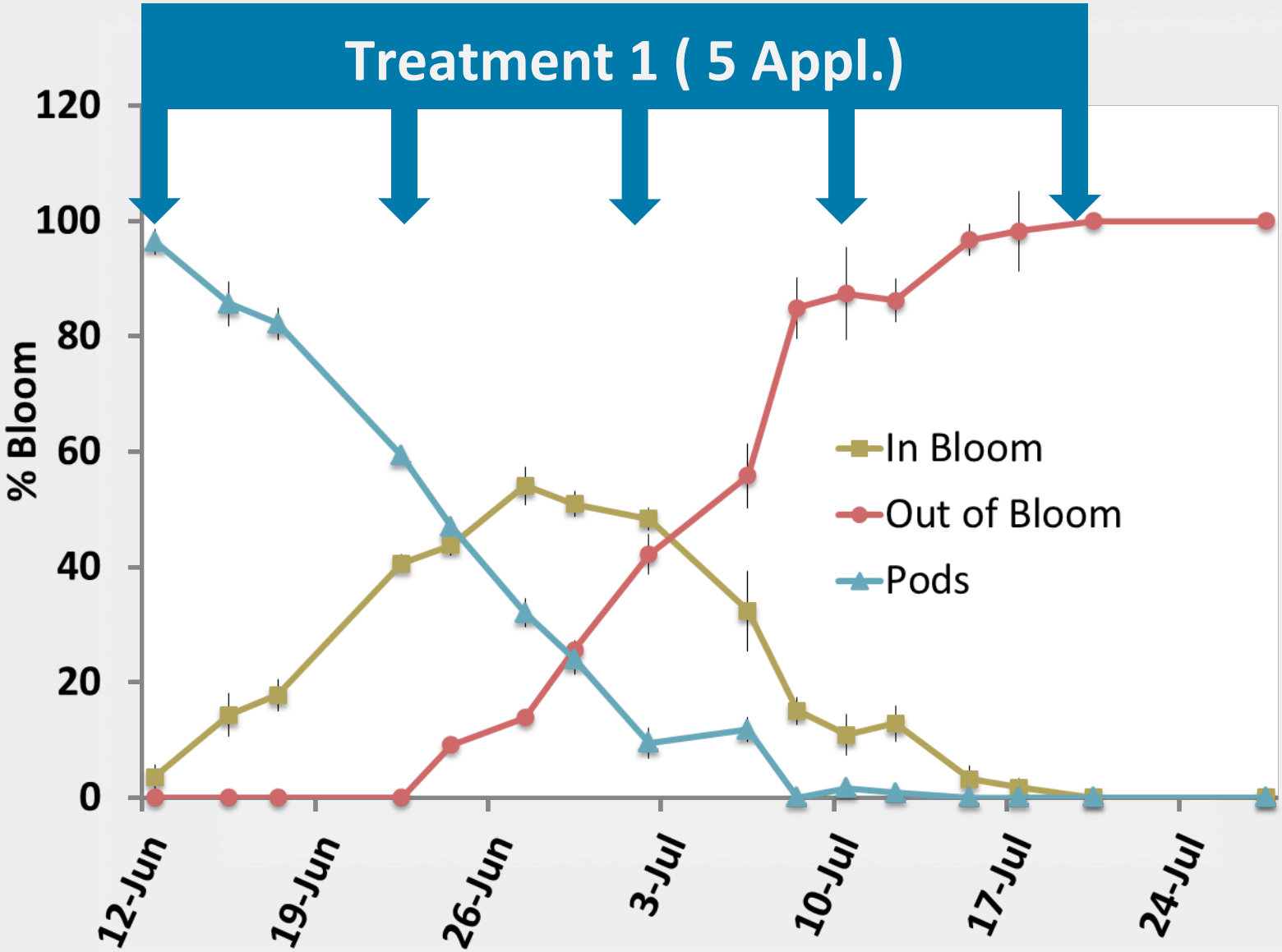
TIMING OF FUNGICIDE APPLICATIONS

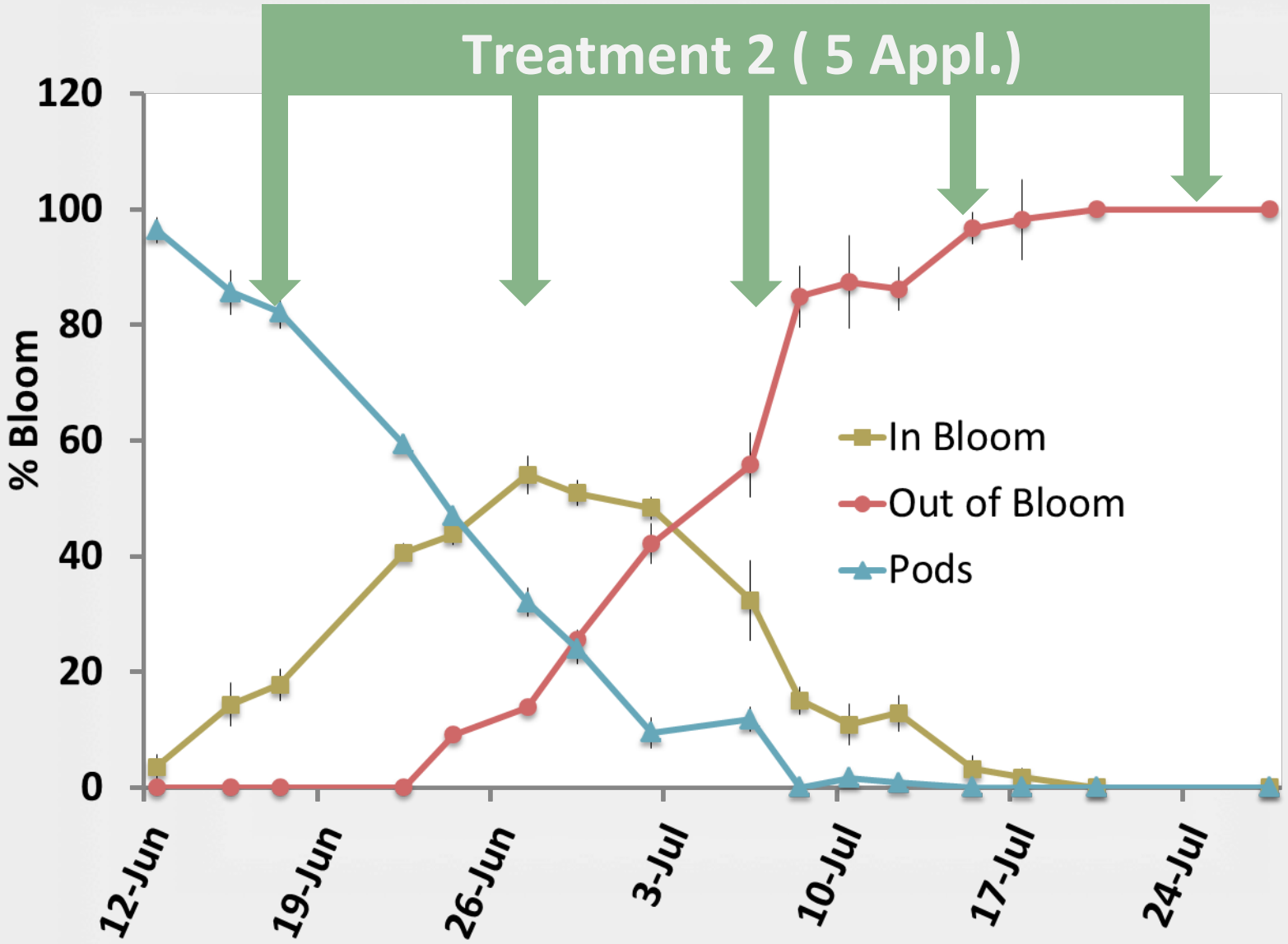
- Determine the impact of delayed applications on field rot.
- Early Black
- 8 treatments
- Manzate Max 4.8 qt/A

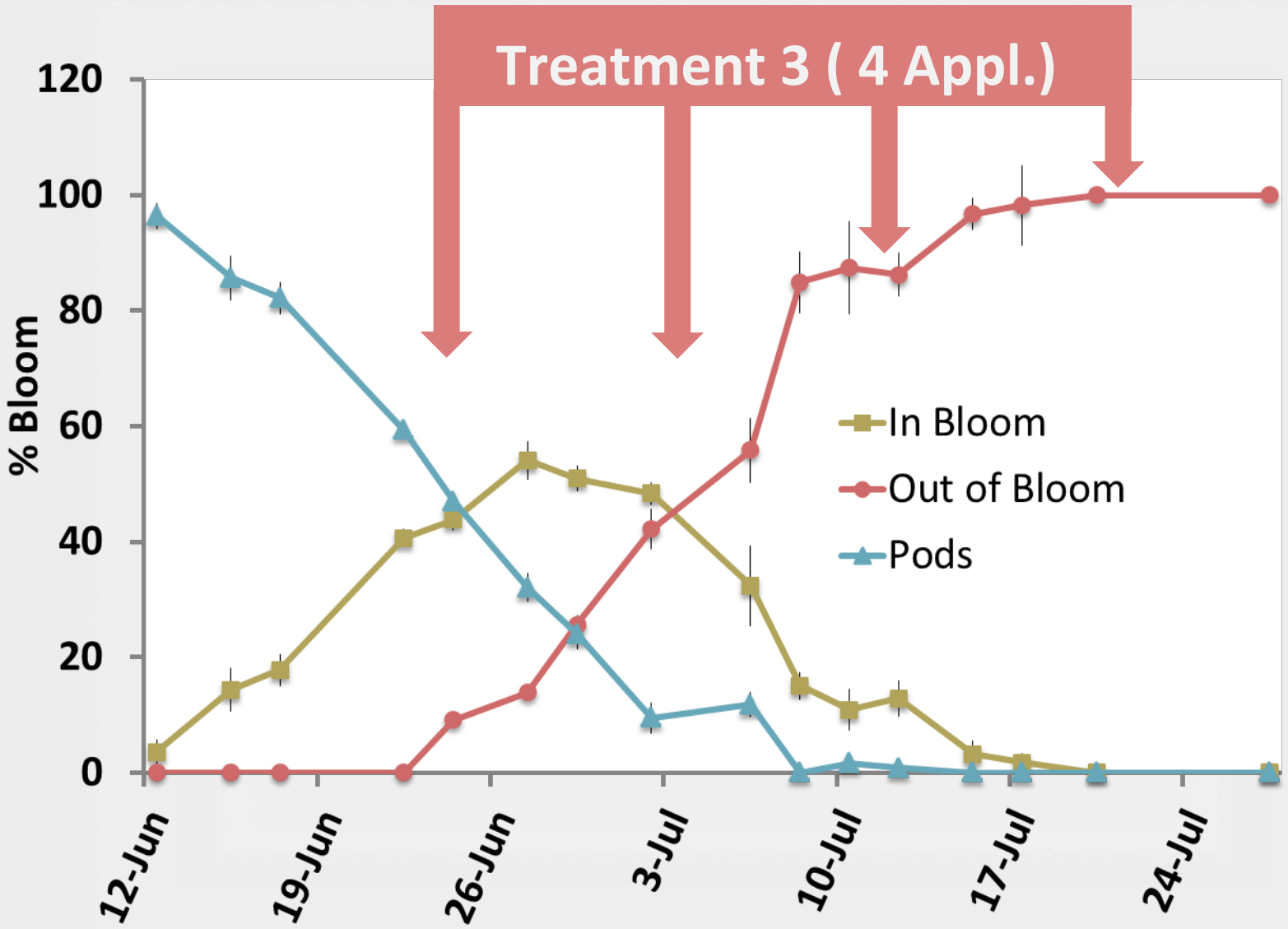
TRT	12-Jun	17-Jun	22-Jun	27-Jun	2-Jul	7-Jul	10-Jul	17-Jul	20-Jul	27-Jul	Apps.
1	x		x		x		x		x		5
2		x		x		x		x		x	5
3			x		x		x		x		4
4				x		x		x		x	4
5					x		x		x		3
6						x		x		x	3
7							x		x		2
8	Untreated										0

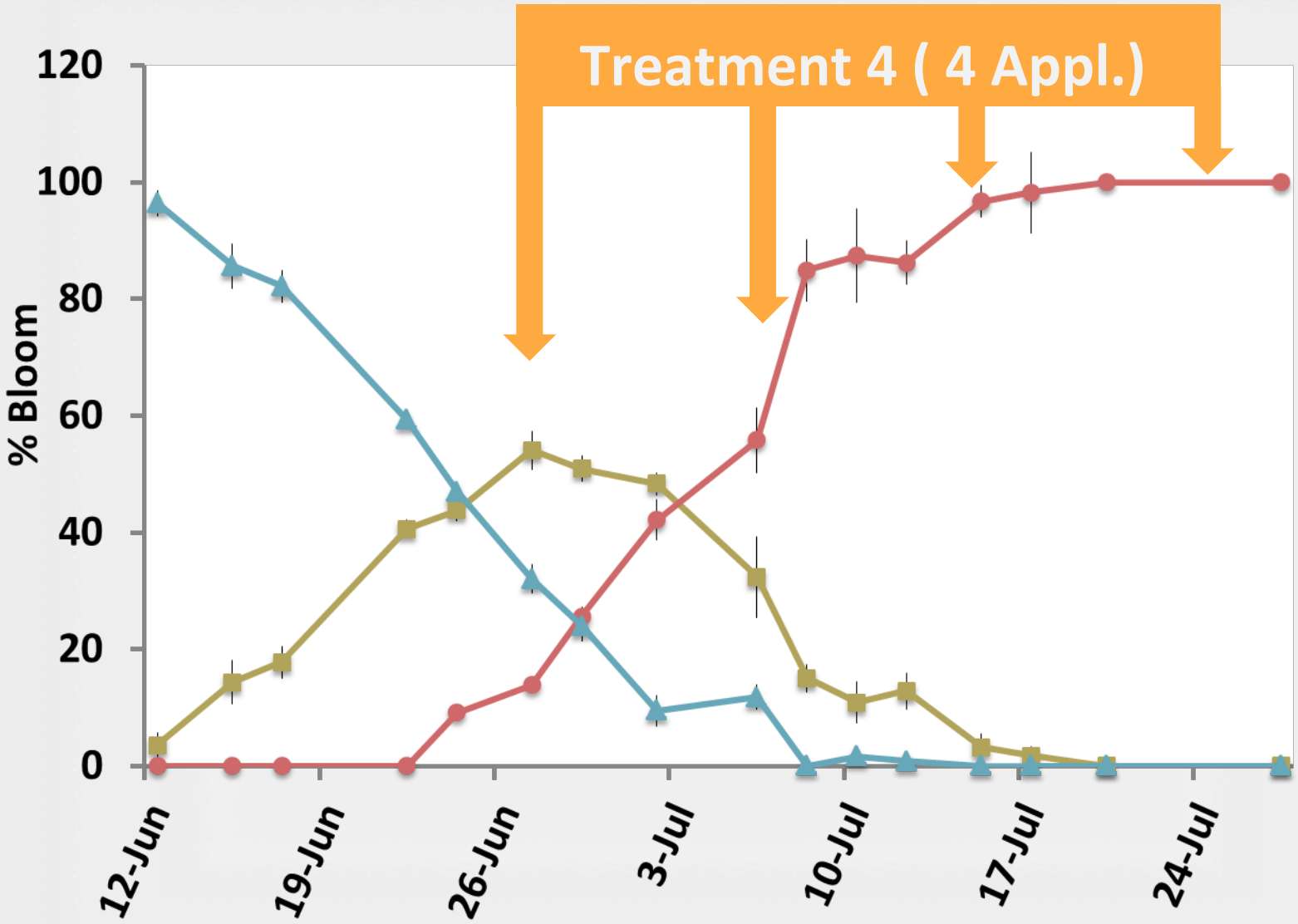
TIMING OF FUNGICIDE APPLICATIONS

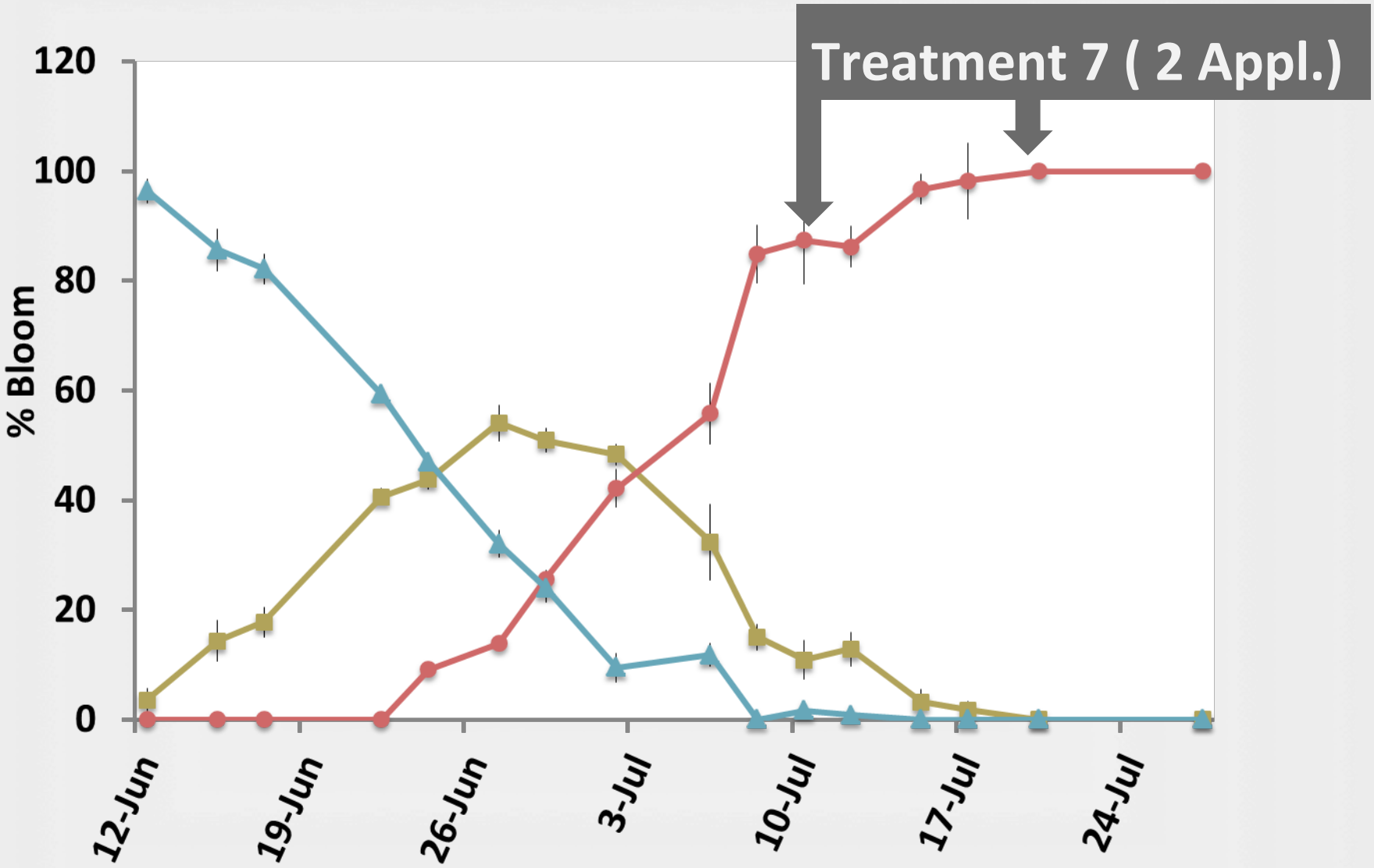



Treatment 1 (5 Appl.)
120
100
80
60
40
20
0
% Bloom
In Bloom
Out of Bloom
Pods
12-Jun
19-Jun
26-Jun
3-Jul
10-Jul
17-Jul
24-Jul

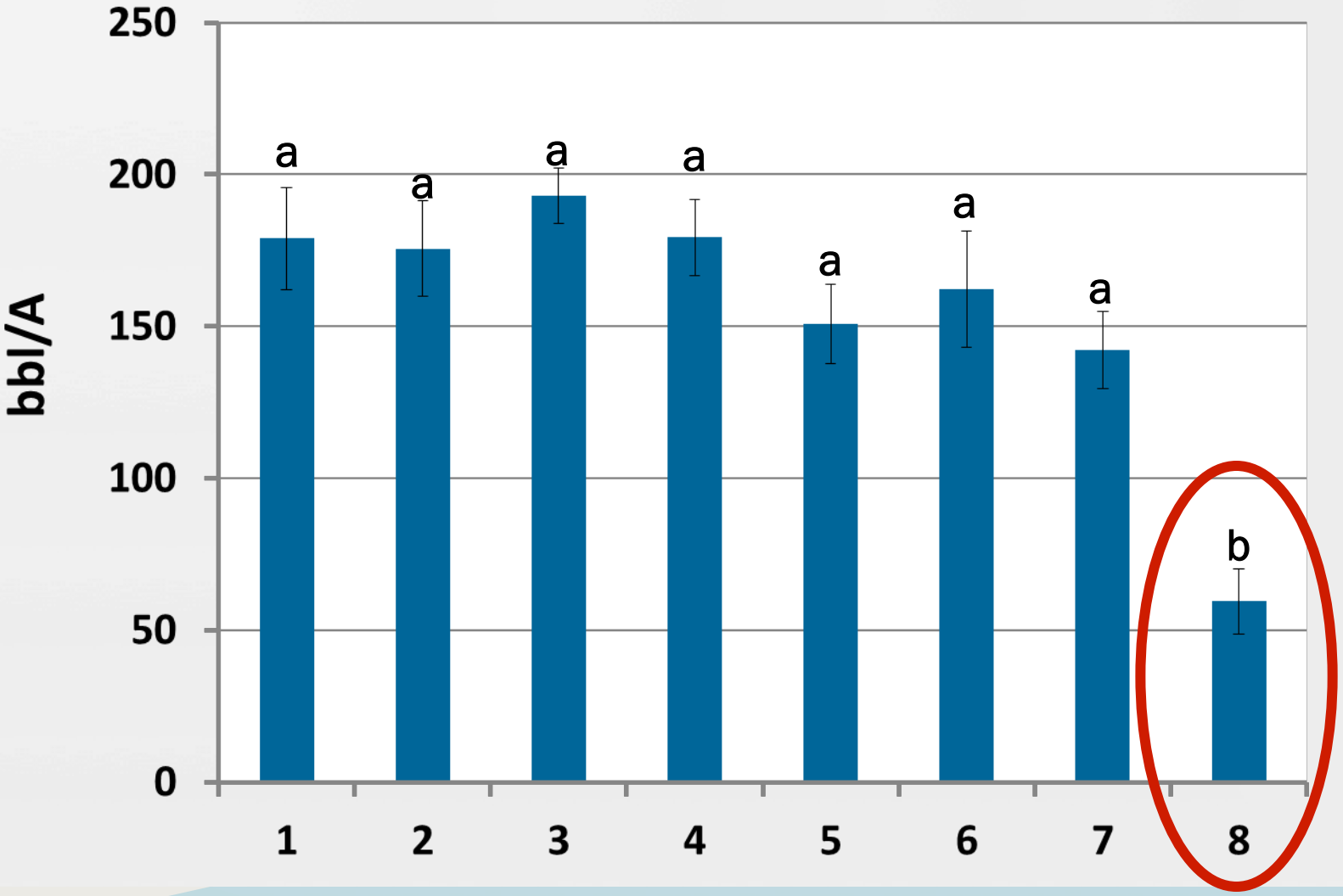

Treatment 2 (5 Appl.)
120
100
80
60
40
20
0
% Bloom
In Bloom
Out of Bloom
Pods
12-Jun
19-Jun
26-Jun
3-Jul
10-Jul
17-Jul
24-Jul


Treatment 3 (4 Appl.)
120
100
80
60
40
20
0
% Bloom
In Bloom
Out of Bloom
Pods
12-Jun
19-Jun
26-Jun
3-Jul
10-Jul
17-Jul
24-Jul

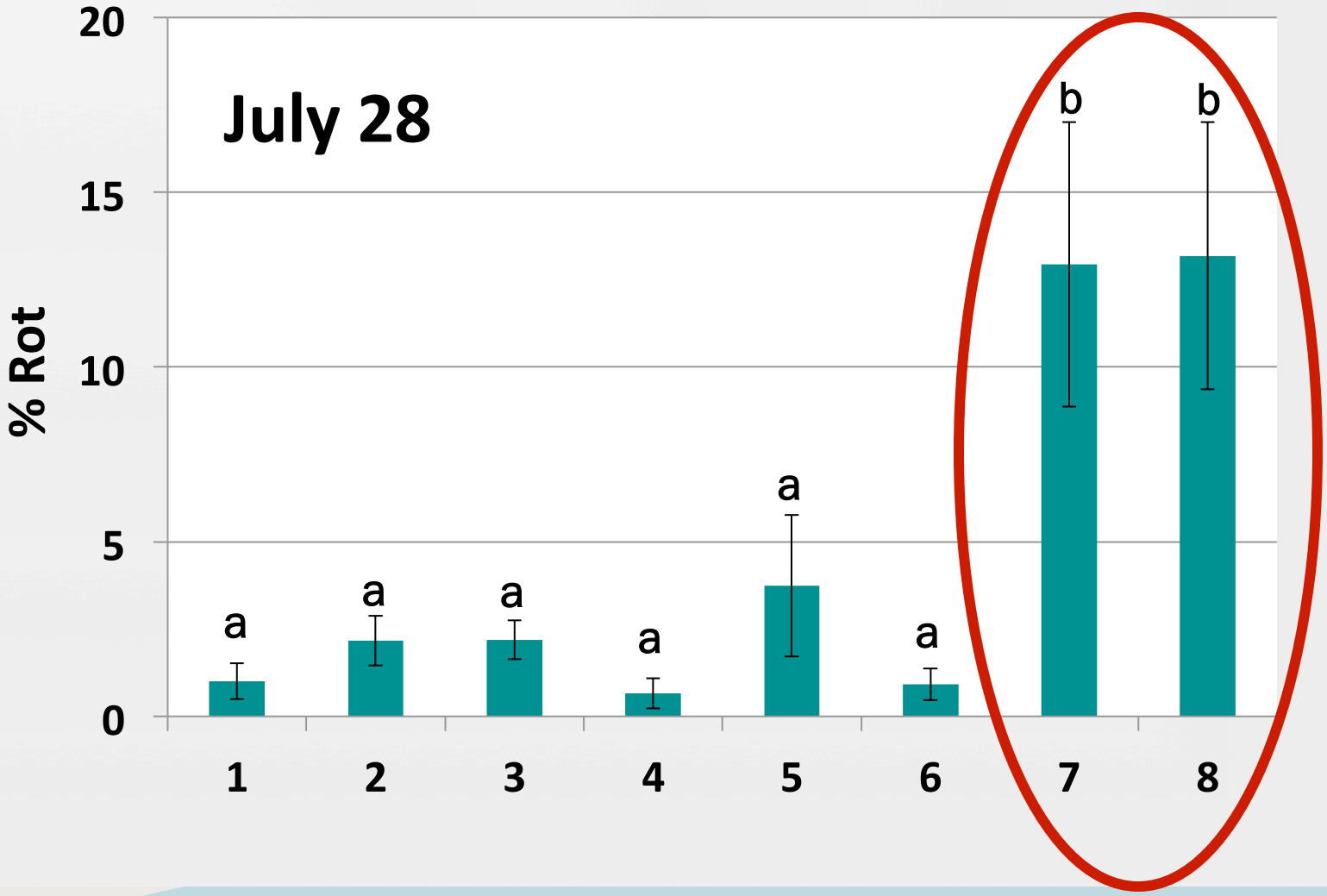

Treatment 4 (4 Appl.)
120
100
80
60
40
20
0
% Bloom
12-Jun
19-Jun
26-Jun
3-Jul
10-Jul
17-Jul
24-Jul


Treatment 7 (2 Appl.)
120
100
80
60
40
20
0
% Bloom
12-Jun
19-Jun
26-Jun
3-Jul
10-Jul
17-Jul
24-Jul

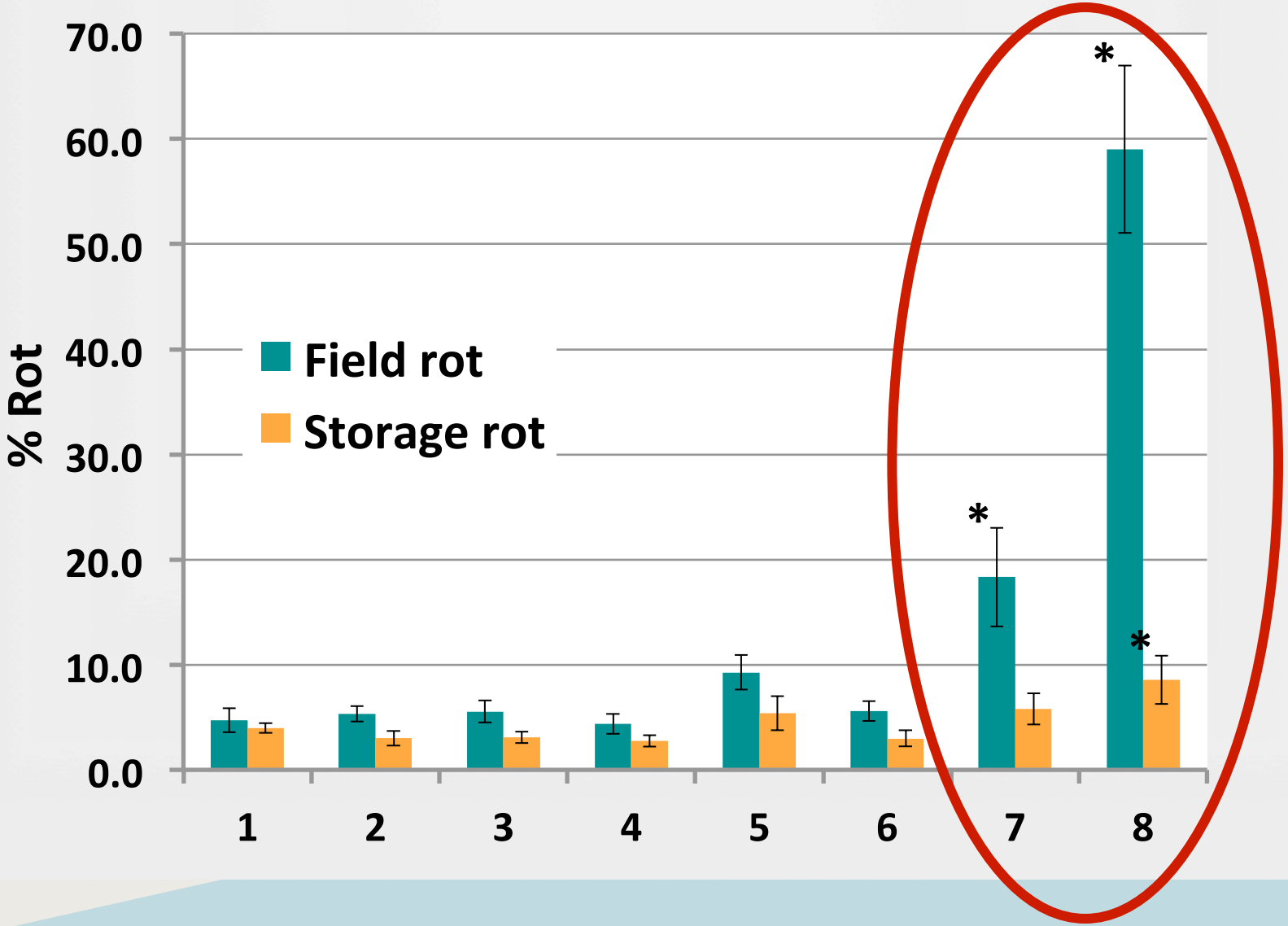
USABLE WEIGHT



EARLY ROT

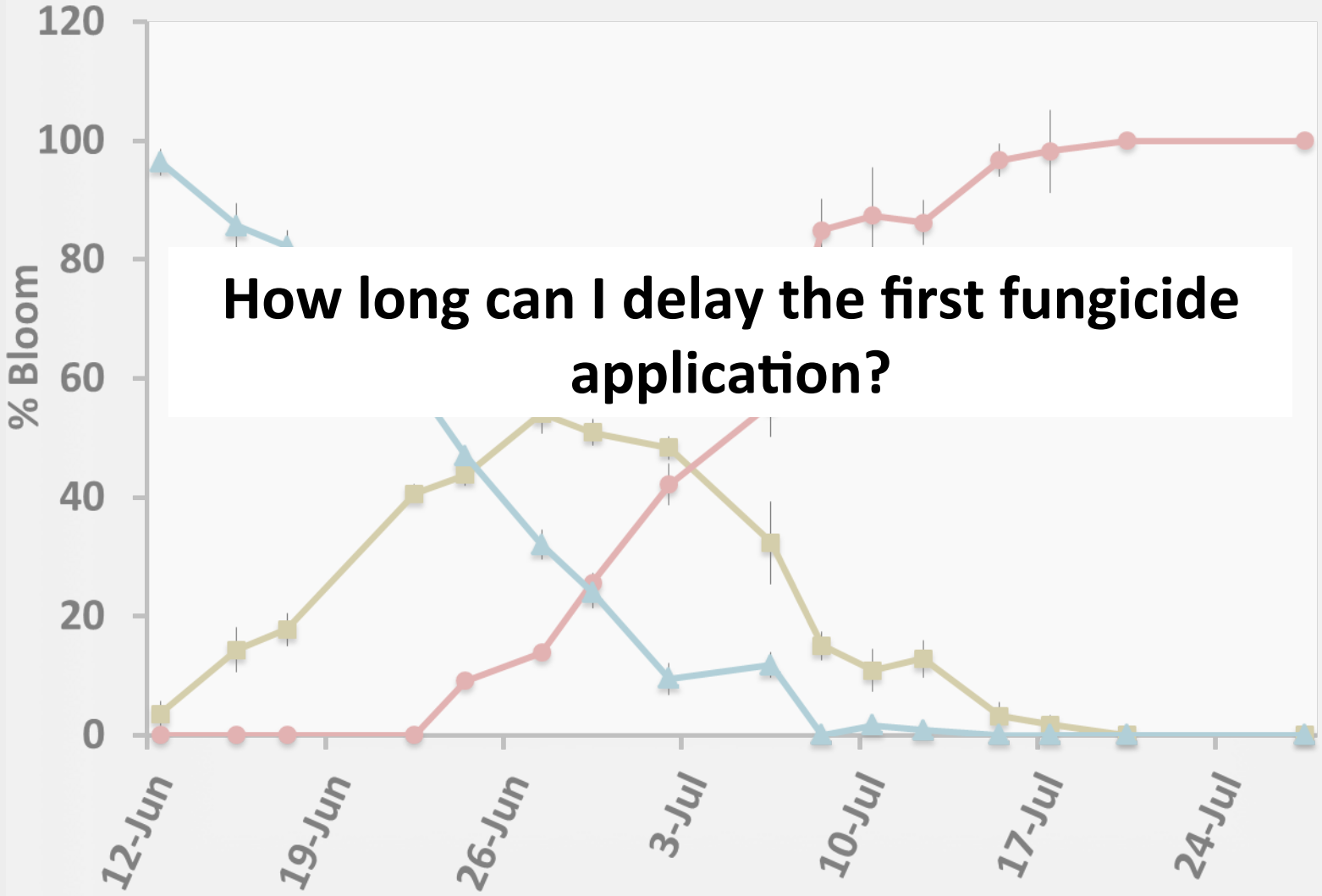


FIELD AND STORAGE ROT

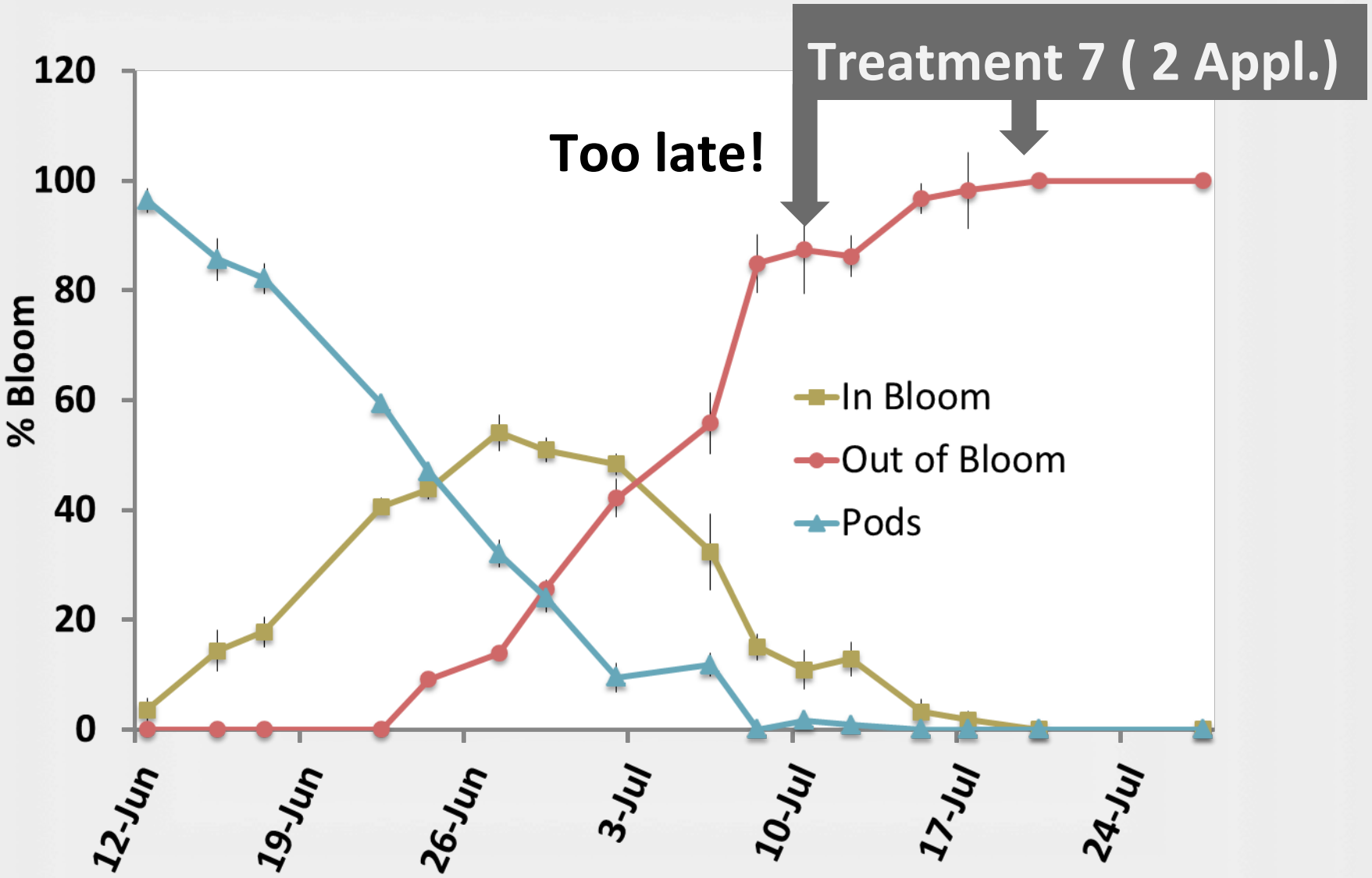


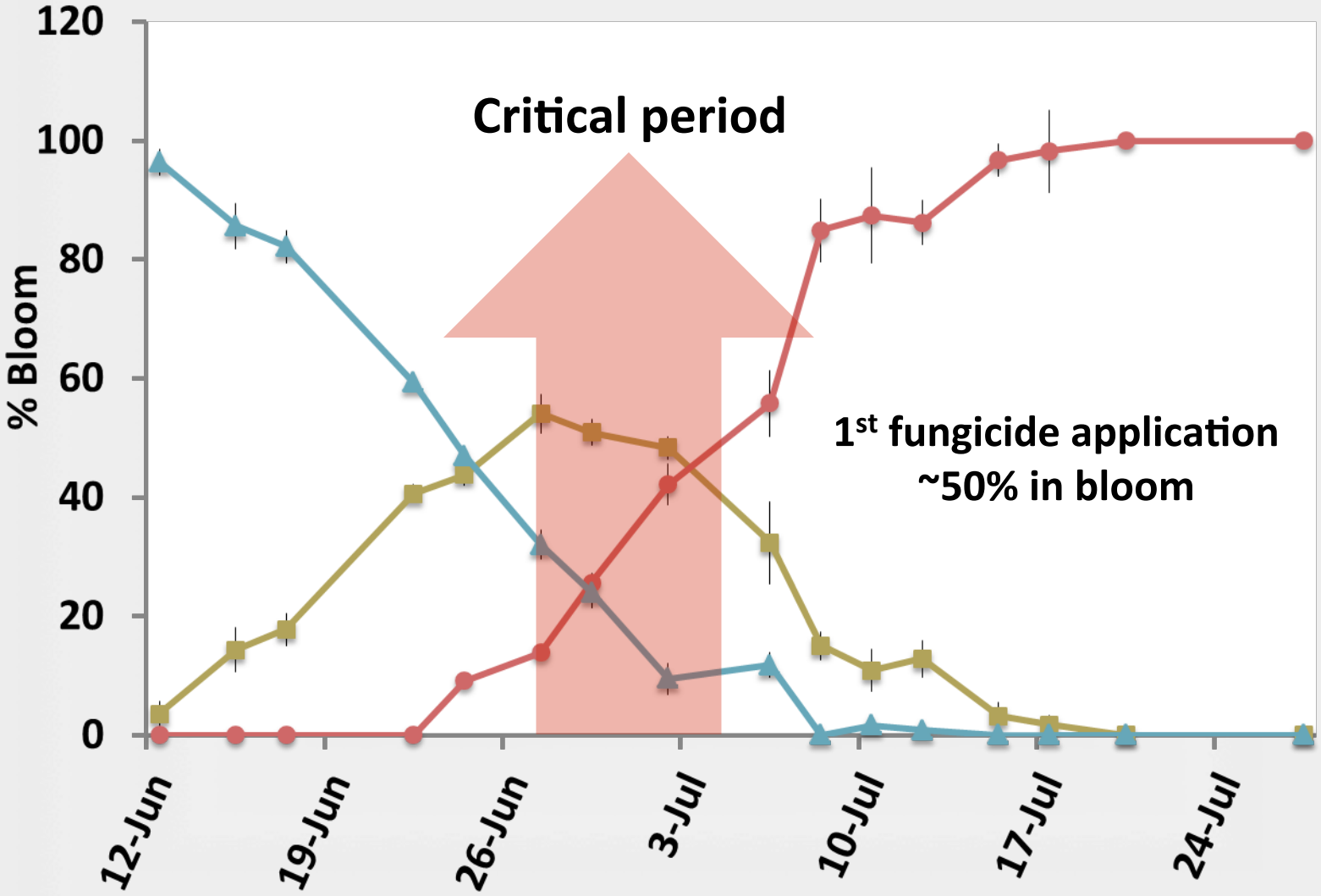
SUMMARY

TRT	FUNGICIDE # Appl.	DATE 1st Appl.	PERCENTAGE (%)			
			In Bloom	Out Bloom	Field rot	Storage rot
1	5	12-Jun	> 10	0	4.7 c	4.0 b
2	5	17-Jun	17	0	5.3 bc	3.0 b
3	4	22-Jun	40	0	5.6 bc	3.1 b
4	4	27-Jun	43	9	4.3 c	2.7 b
5	3	2-Jul	54	14	9.3 bc	5.4 ab
6	3	4-Jul	50	25	5.6 bc	3.0 b
7	2	10-Jul	48	42	18.3 b	5.8 ab
8	0	N/A	N/A	N/A	**59.0 a**	**8.6 a**



How long can I delay the first fungicide application?


Treatment 7 (2 Appl.)
Too late!
% Bloom
120
100
80
60
40
20
0
12-Jun
19-Jun
26-Jun
3-Jul
10-Jul
17-Jul
24-Jul
In Bloom
Out of Bloom
Pods


Critical period
1st fungicide application
~50% in bloom
% Bloom
120
100
80
60
40
20
0
12-Jun
19-Jun
26-Jun
3-Jul
10-Jul
17-Jul
24-Jul

FUNGICIDE EFFICACY TRIAL

- **Stevens**
- **3 fungicide applications**
- **Fungicide resistance management**
  - Rotate/alternate chemicals
  - Mix modes of action
  - Broad spectrum end of season

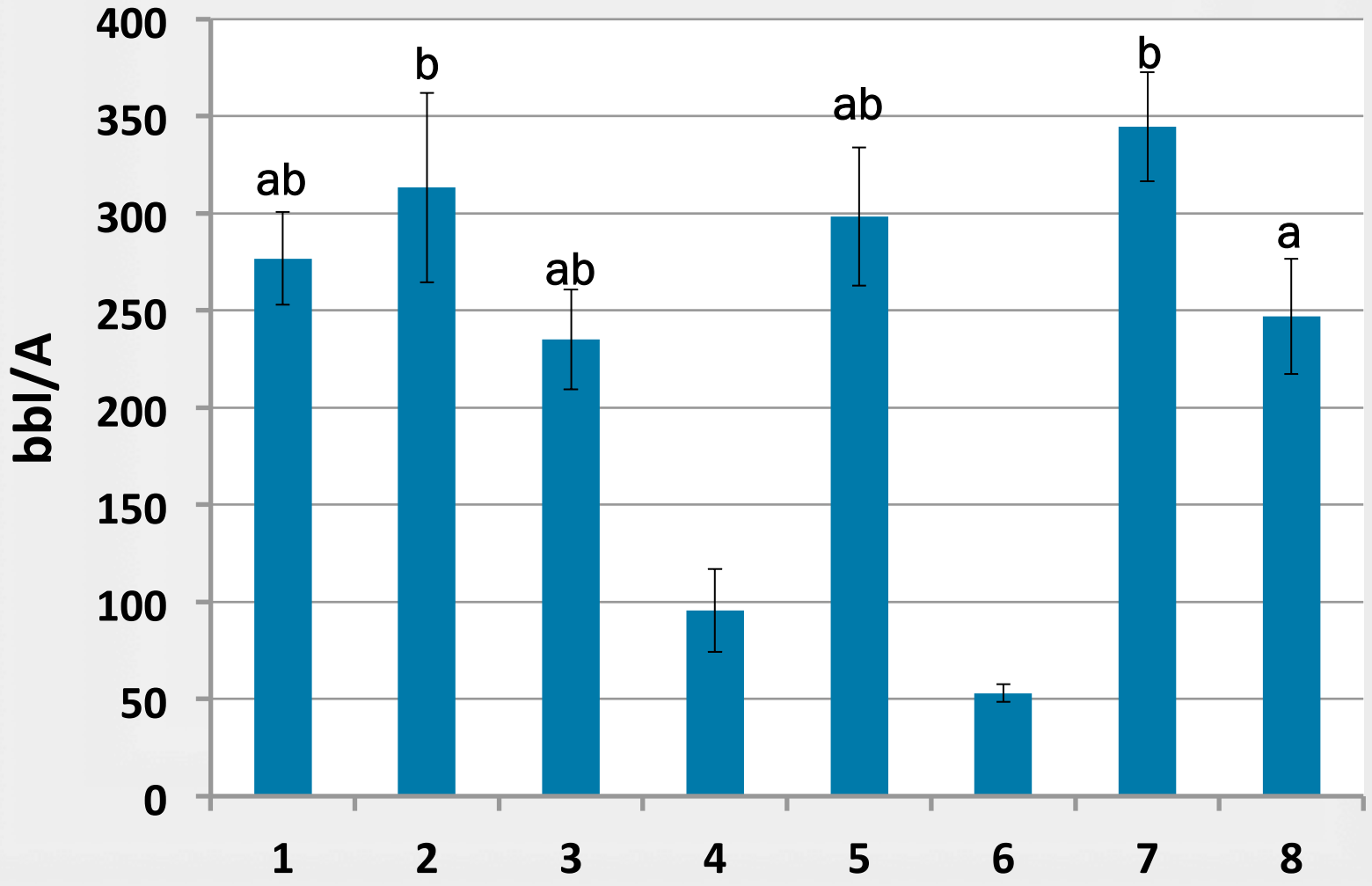
FUNGICIDE EFFICACY

TREATMENT	19-Jun	29-Jun	9-Jul
1	Indar/Abound	Indar/Abound	Manzate
2	Proline/Abound	Proline/Abound	Manzate
3	Proline/Abound	Proline/Abound	Oso
4	Proline/Abound	Oso	Oso
5	Proline/Abound	Proline/Abound	ManKocide
6	Oso	Oso	Oso
7	Manzate	Manzate	Manzate
8	Untreated		

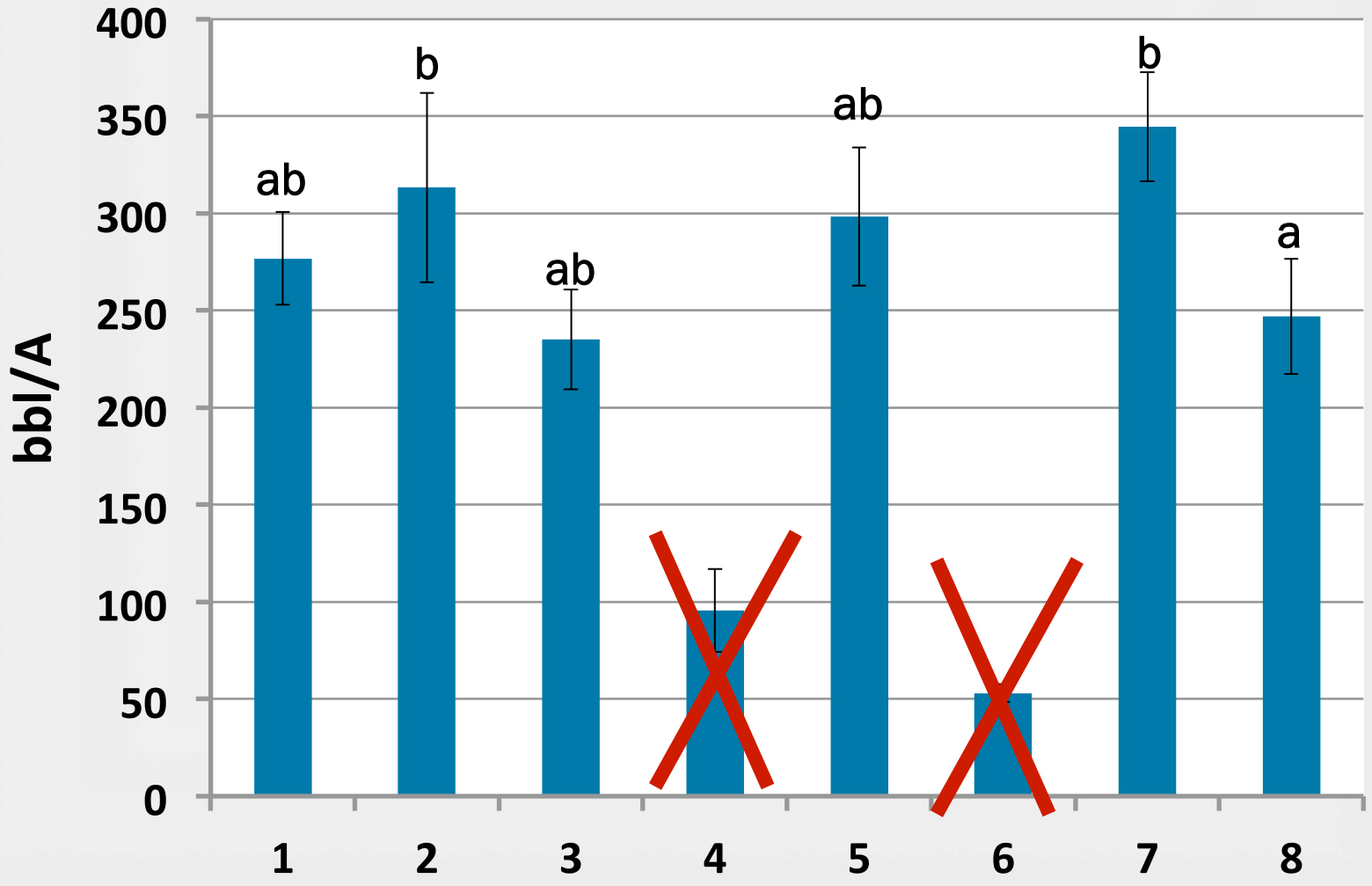
Rate (per Acre)

- Indar: 12 oz
- Abound: 15.5 oz
- Manzate: 14.8 qt
- Proline: 5 oz
- Oso: 13 oz
- ManKocide: 7 lb

USABLE WEIGHT



USABLE WEIGHT

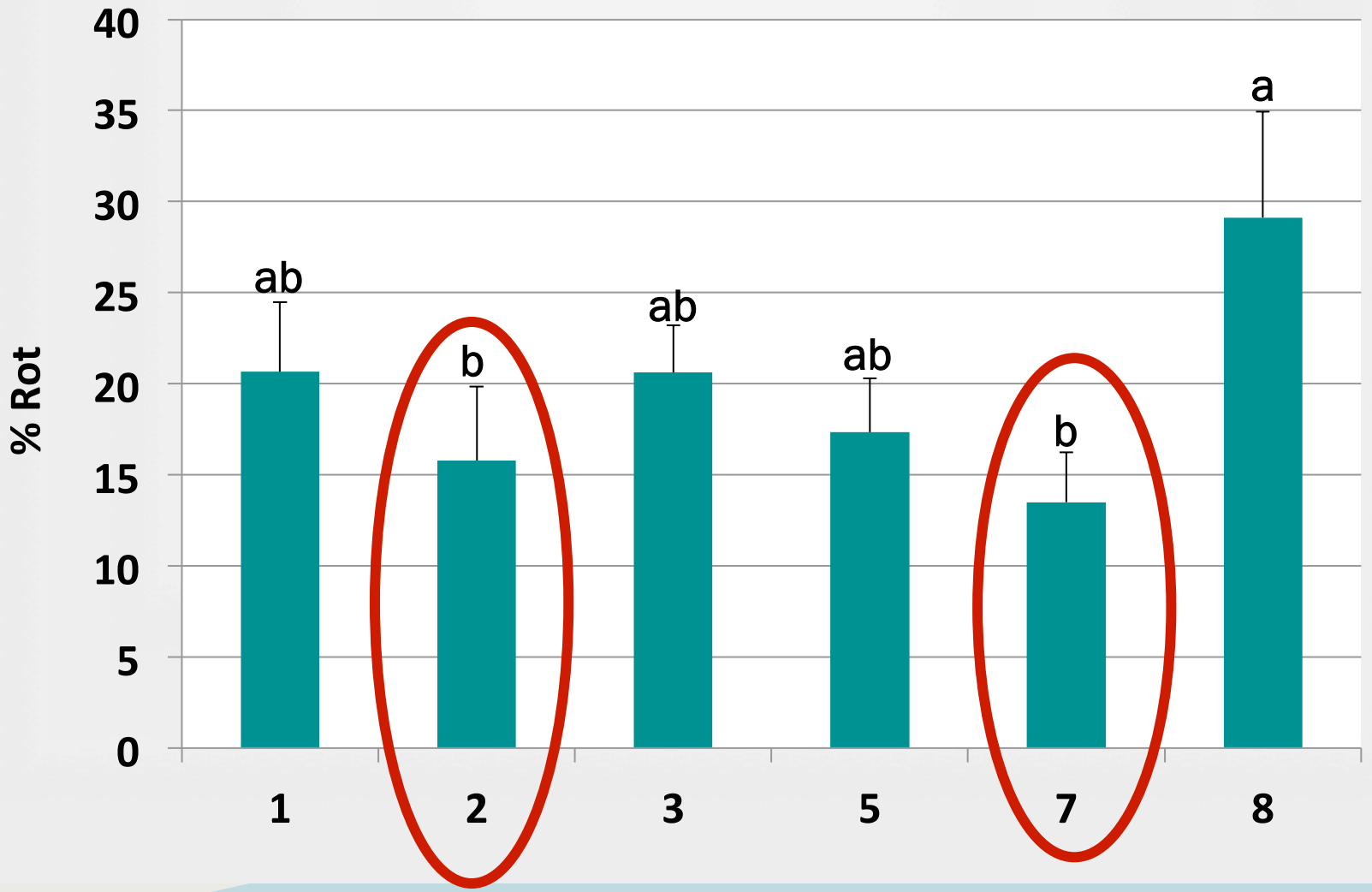


FIRST LESSON OF THE SEASON…

Blighted flowers
Scalded berries

Oso + surfactant (Silwet 77)

FIELD ROT



SUMMARY

TRT	FUNGICIDE PROGRAM	Field rot (%)
1	Indar/Abound + Indar/Abound + Manzate	20.7 ab
2	Proline/Abound + Proline/Abound + Manzate	15.8 b
3	Proline/Abound + Proline/Abound + Oso	20.6 ab
5	Proline/Abound + Proline/Abound + ManKocide	17.3 ab
7	Manzate + Manzate + Manzate	13.5 b
8	No Fungicide	**29.1 a**

SUMMARY

TRT	FUNGICIDE PROGRAM	Field rot (%)
1	Indar/Abound + Indar/Abound + Manzate	20.7 ab
2	Proline/Abound + Proline/Abound + Manzate	15.8 b
3	Proline/Abound + Proline/Abound + Oso	20.6 ab
5	Proline/Abound + Proline/Abound + ManKocide	17.3 ab
7	Manzate + Manzate + Manzate	13.5 b
8	No Fungicide	**29.1 a**

SMALLER TRIAL

TRT	FUNGICIDE PROGRAM	Field rot (%)
1	Indar/Abound + Indar/Abound + Manzate + Manzate+ Manzate	14.5 b
5	Indar/Abound + Indar/Abound + Manzate + Manzate	14.5 b
7	Indar/Abound + Indar/Abound + ManKocide + ManKocide	10.7 b
8	No Fungicide	**28.8 a**

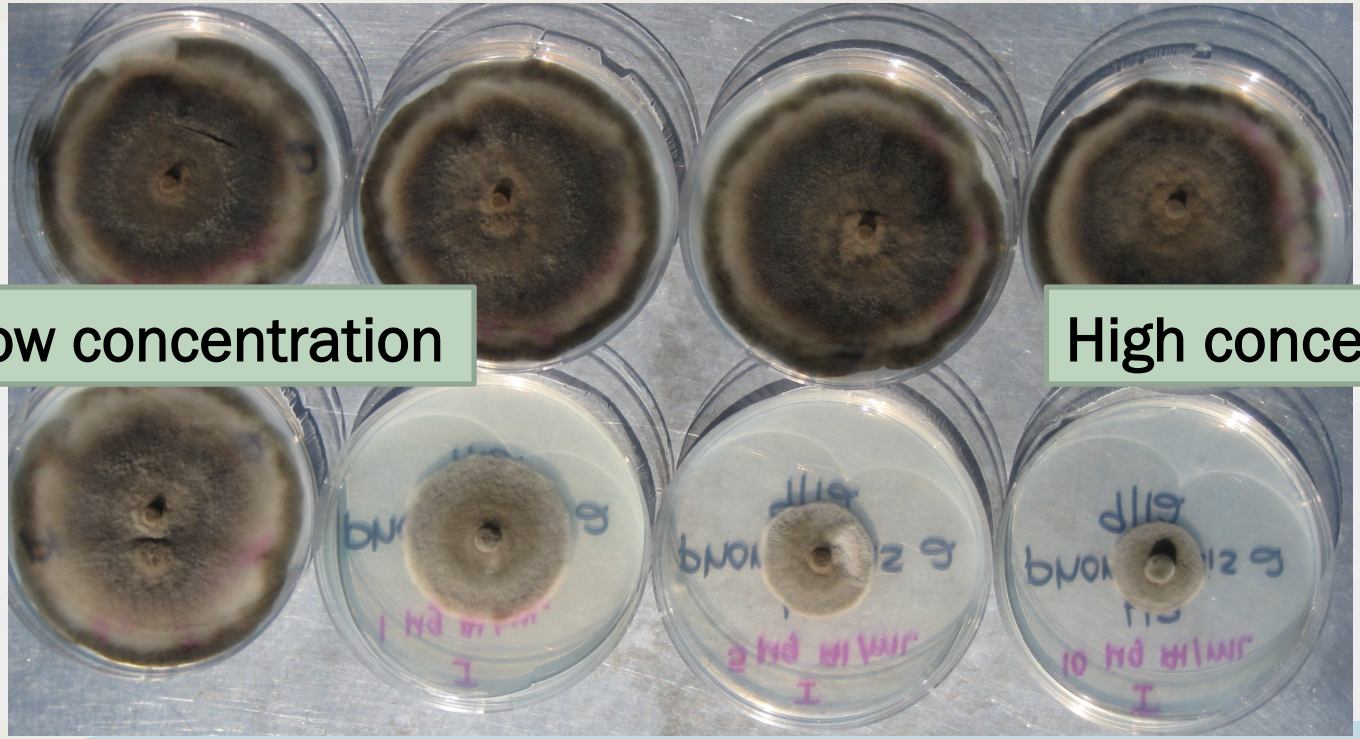
TRT	FUNGICIDE PROGRAM	Field rot (%)
1	Indar/Abound + Indar/Abound + Manzate + Manzate+ Manzate	14.5 b
5	Indar/Abound + Indar/Abound + Manzate + Manzate	14.5 b
7	Indar/Abound + Indar/Abound + ManKocide + ManKocide	10.7 b
8	No Fungicide	**28.8 a**

WHAT'S WITH ALL THESE FUNGICIDE COMBINATIONS?

FUNGICIDE RESISTANCE *IN VITRO* ASSAYS

F. CARUSO, 2012

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



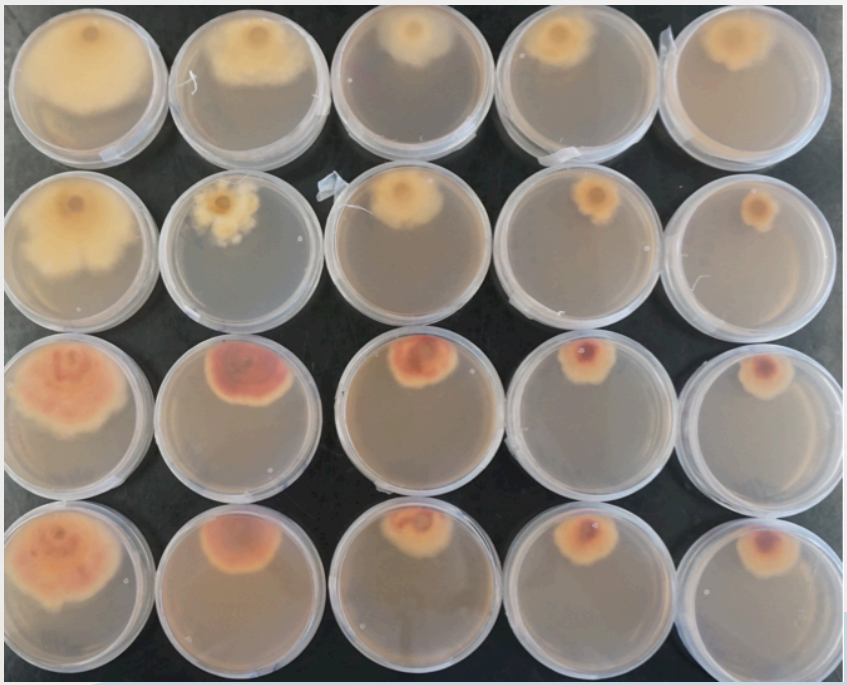
Fungicide resistance monitoring

- *Colletotrichum* sp.
  - Bitter rot
- >40 isolates (2014)
- High risk sites
- Baseline sensitivity

Abound (Azoxystrobin)

Resistance can develop in 2-3 seasons.

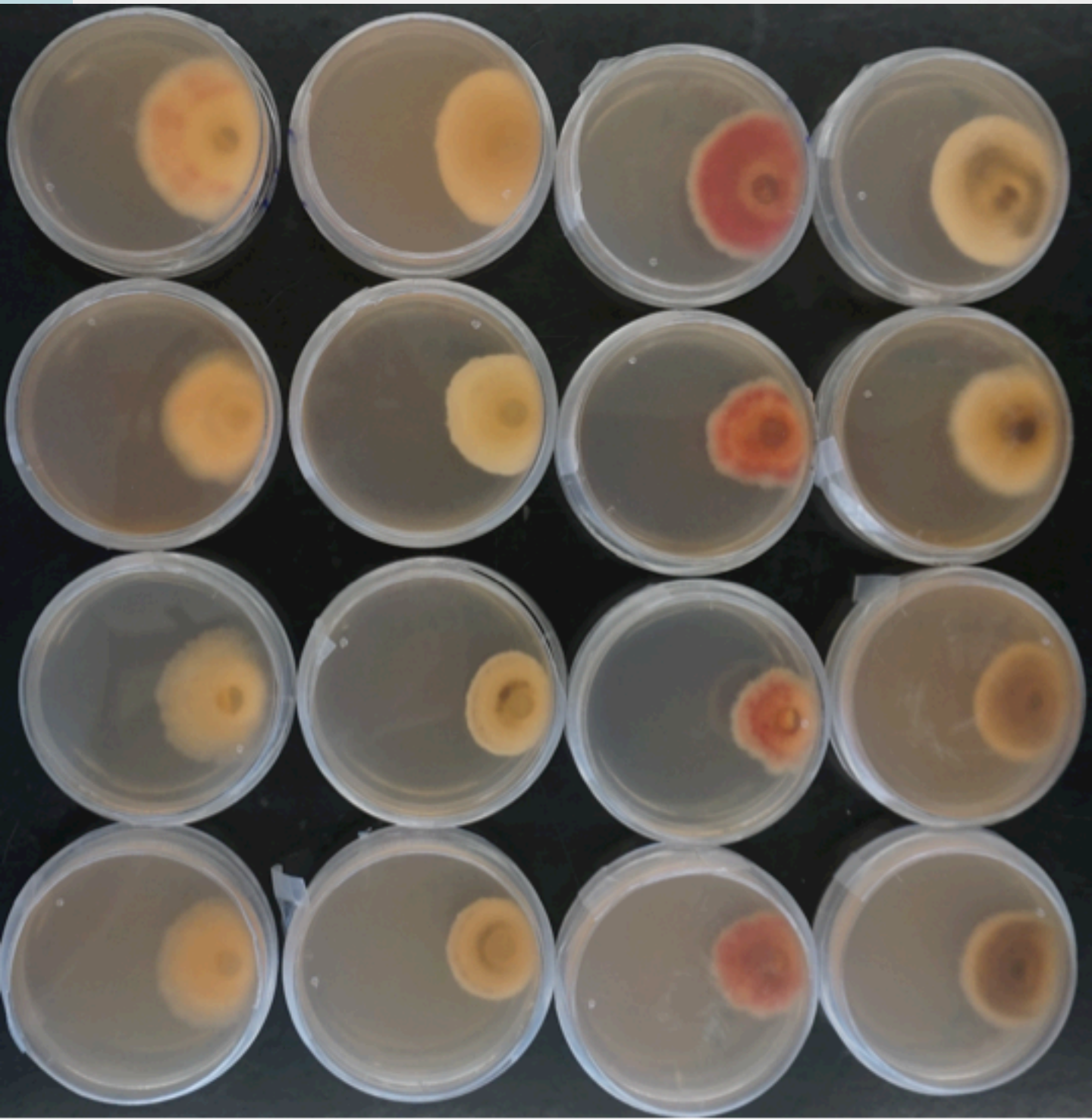
In vitro screening of isolates (from rotten fruit).



Fungicide-amended media

- 0 to 2.5 µg/ml fungicide
- Measure growth on plate

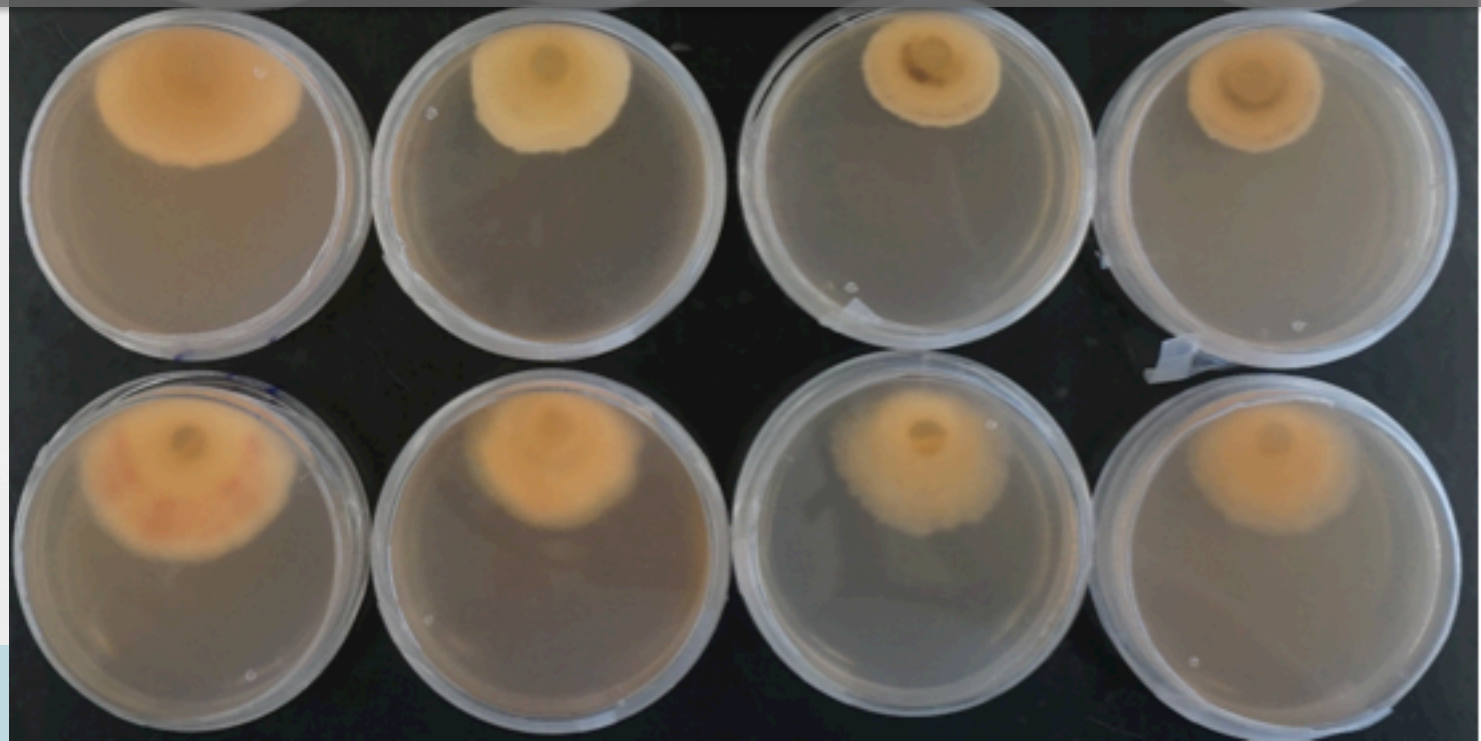
Abound



Fungicide resistance:

Inhibition of > 50% growth

Abound



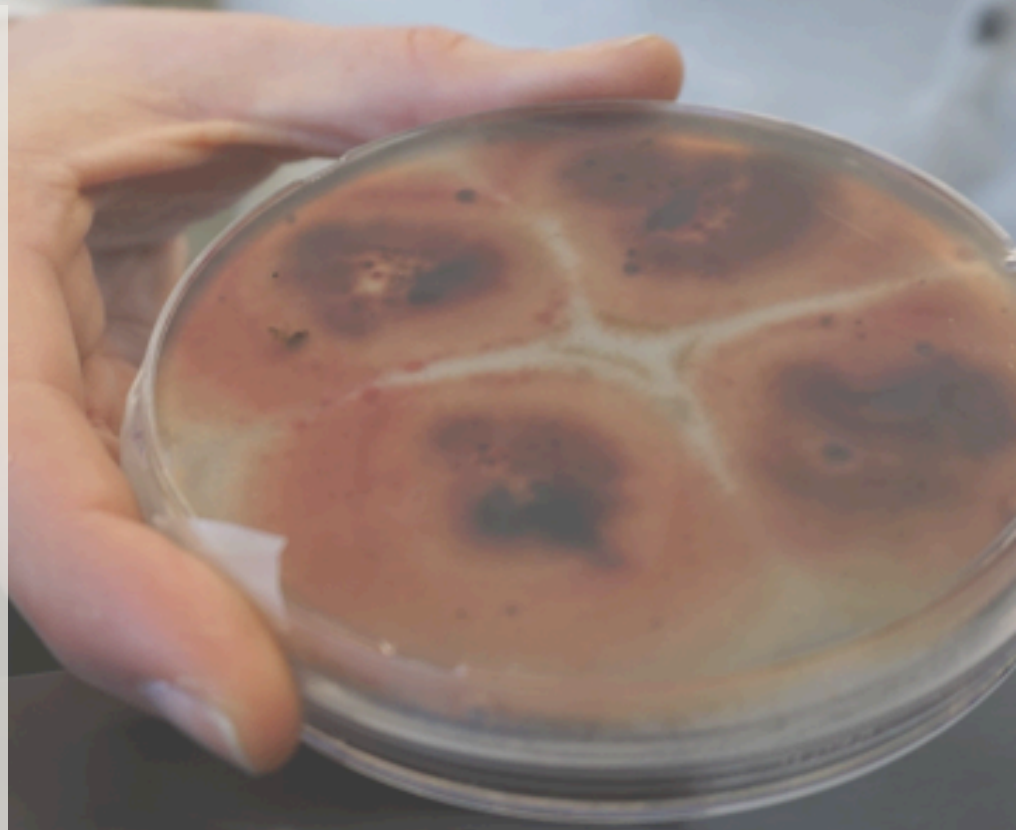
FUNGICIDE RESISTANCE?

FUNGICIDE RESISTANCE?

Reduced sensitivity

(Abound)

- 9 isolates
- 2 sites



FUNGICIDE RESISTANCE?

Group	FRAC Code	Risk Resistance
DMI (Indar, Proline)	3	Med
QoI (Abound)	11	High
Polyo (Oso, Ph-D)	19	Med
chloro (Bravo, Manzate)	M5	Low
dithio (Bravo, Manzate)	M3	Low

FRUIT QUALITY

- Sweetened Dried Cranberries (SDC)
- Berry firmness = fruit quality parameter
- Incentive?

How do harvest practices affect berry firmness?

How do harvest practices affect berry firmness?

Collaborators:

Rod Serres

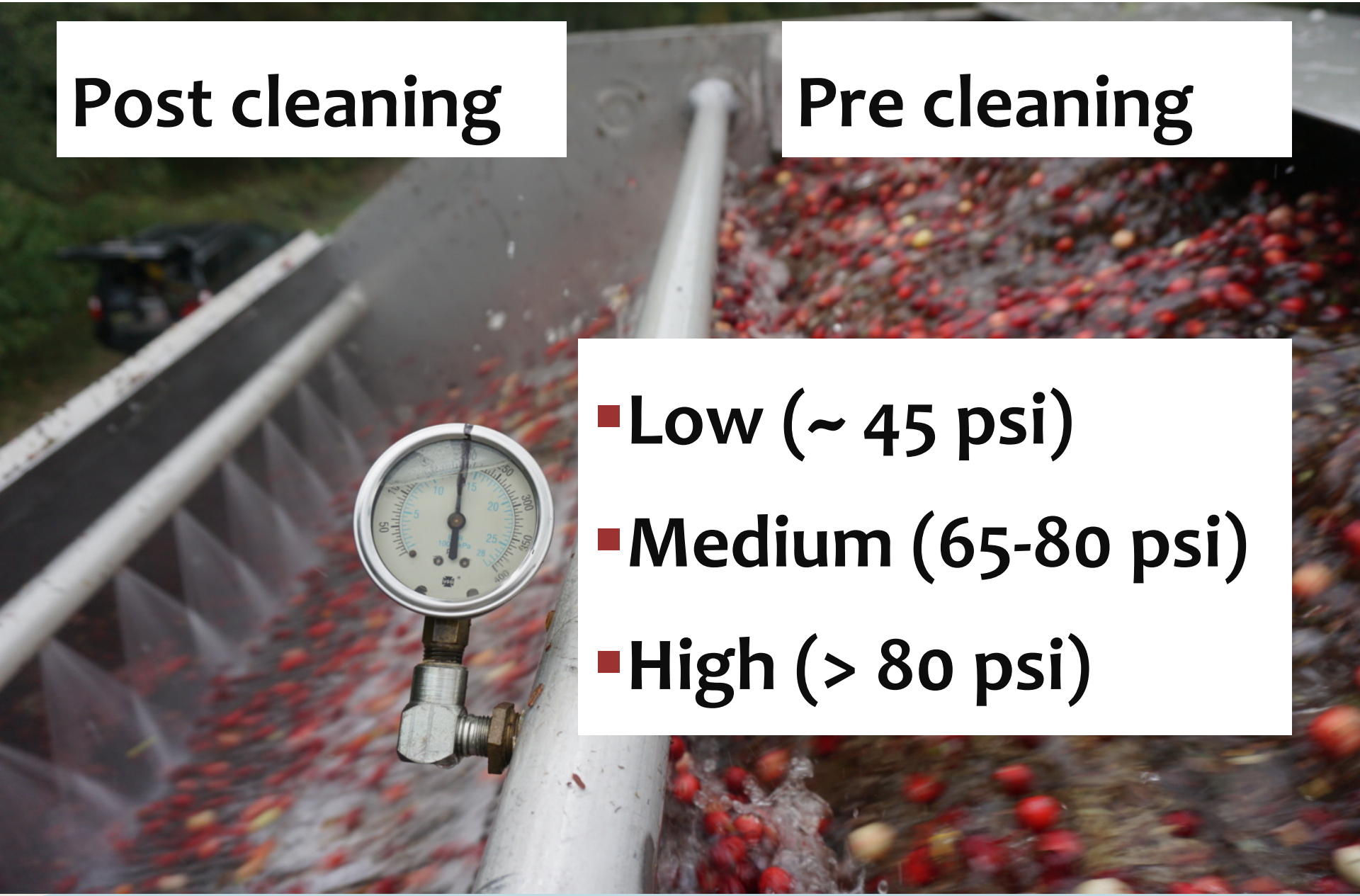
David Nolte

Sampling

- Pre reel
- Post reel

Sampling

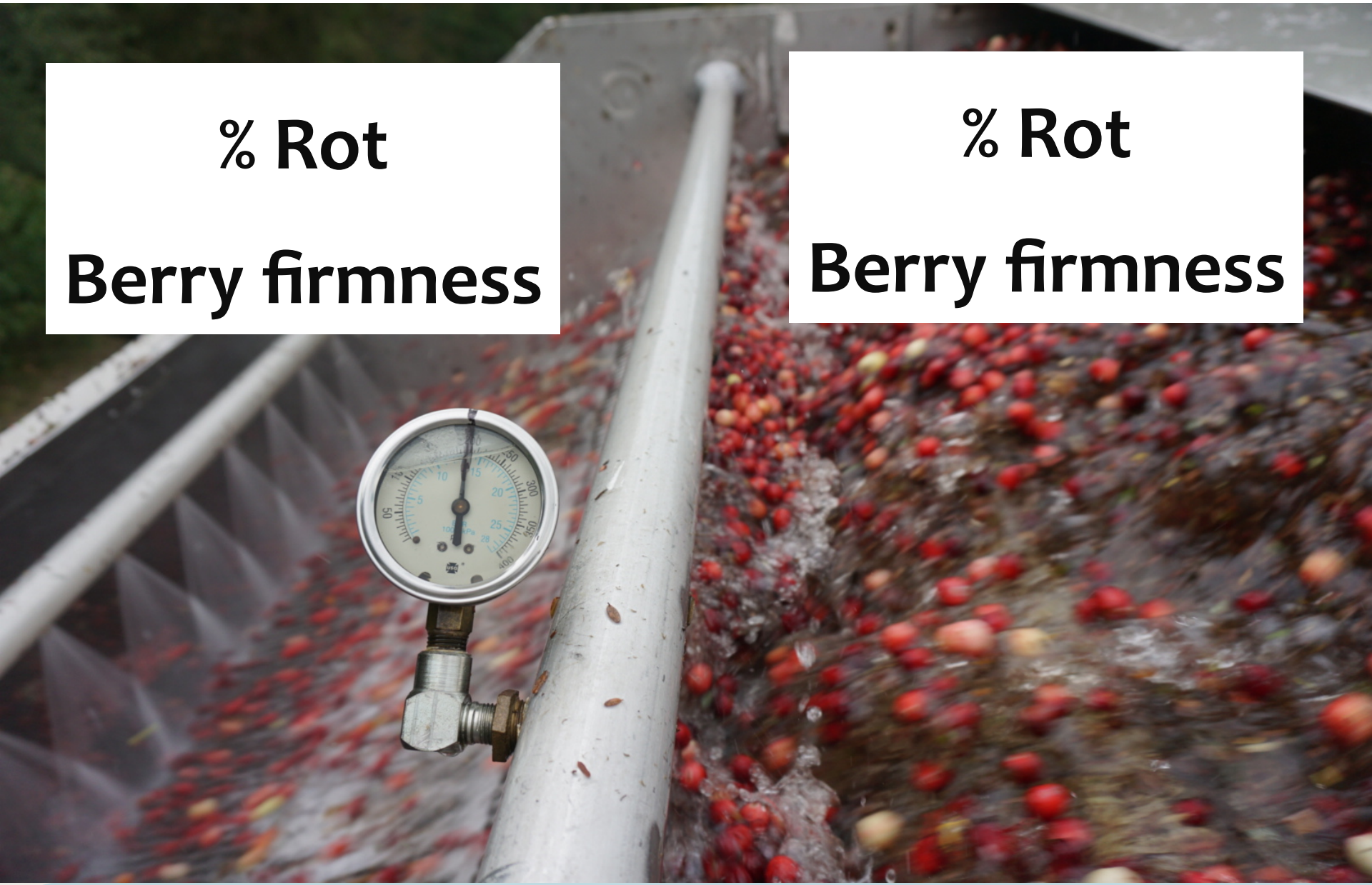
Sampling



Post cleaning

Pre cleaning

- Low (~ 45 psi)
- Medium (65-80 psi)
- High (> 80 psi)

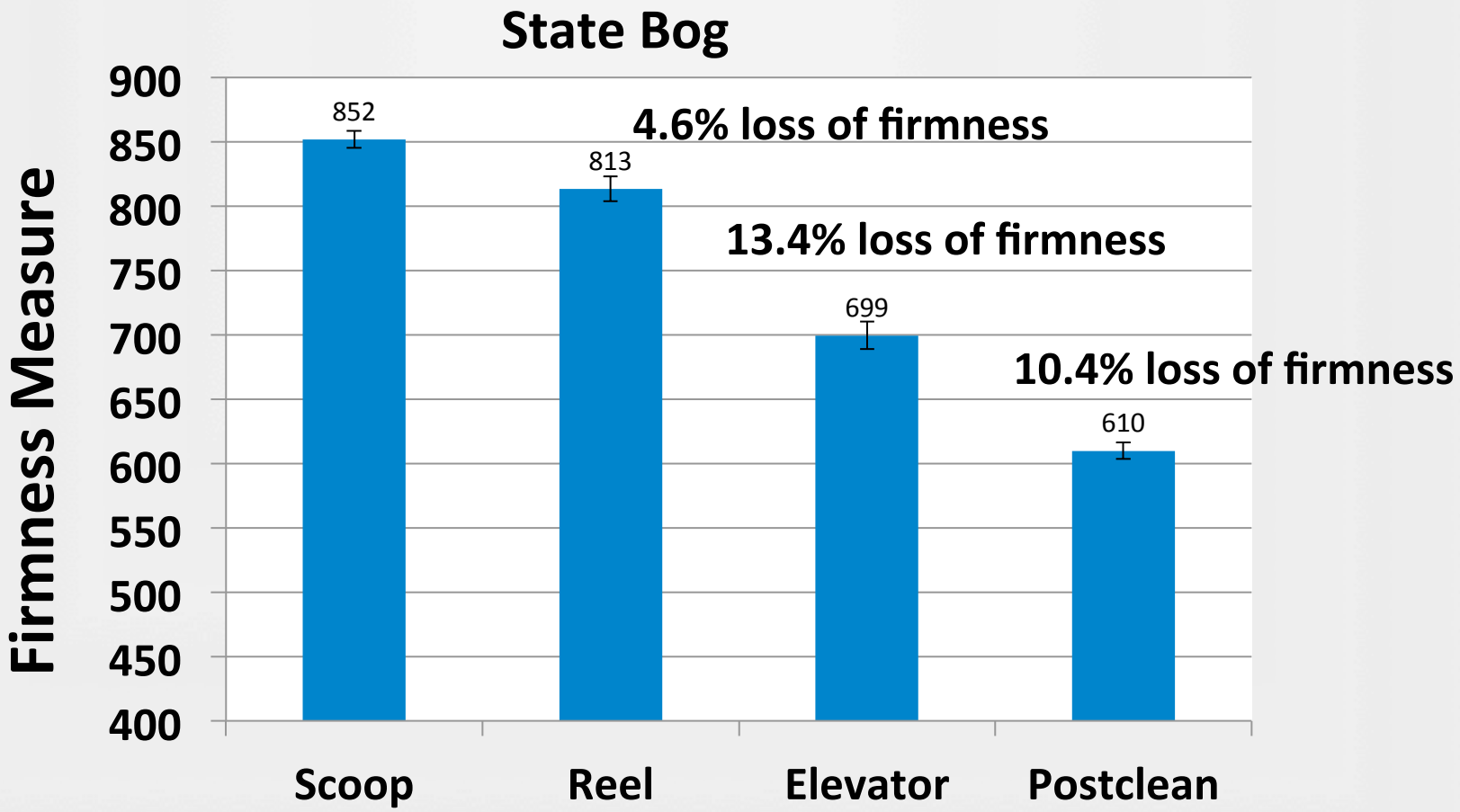

Post cleaning
Pre cleaning
% Rot
Berry firmness
% Rot
Berry firmness

Berry firmness

Healthy berries

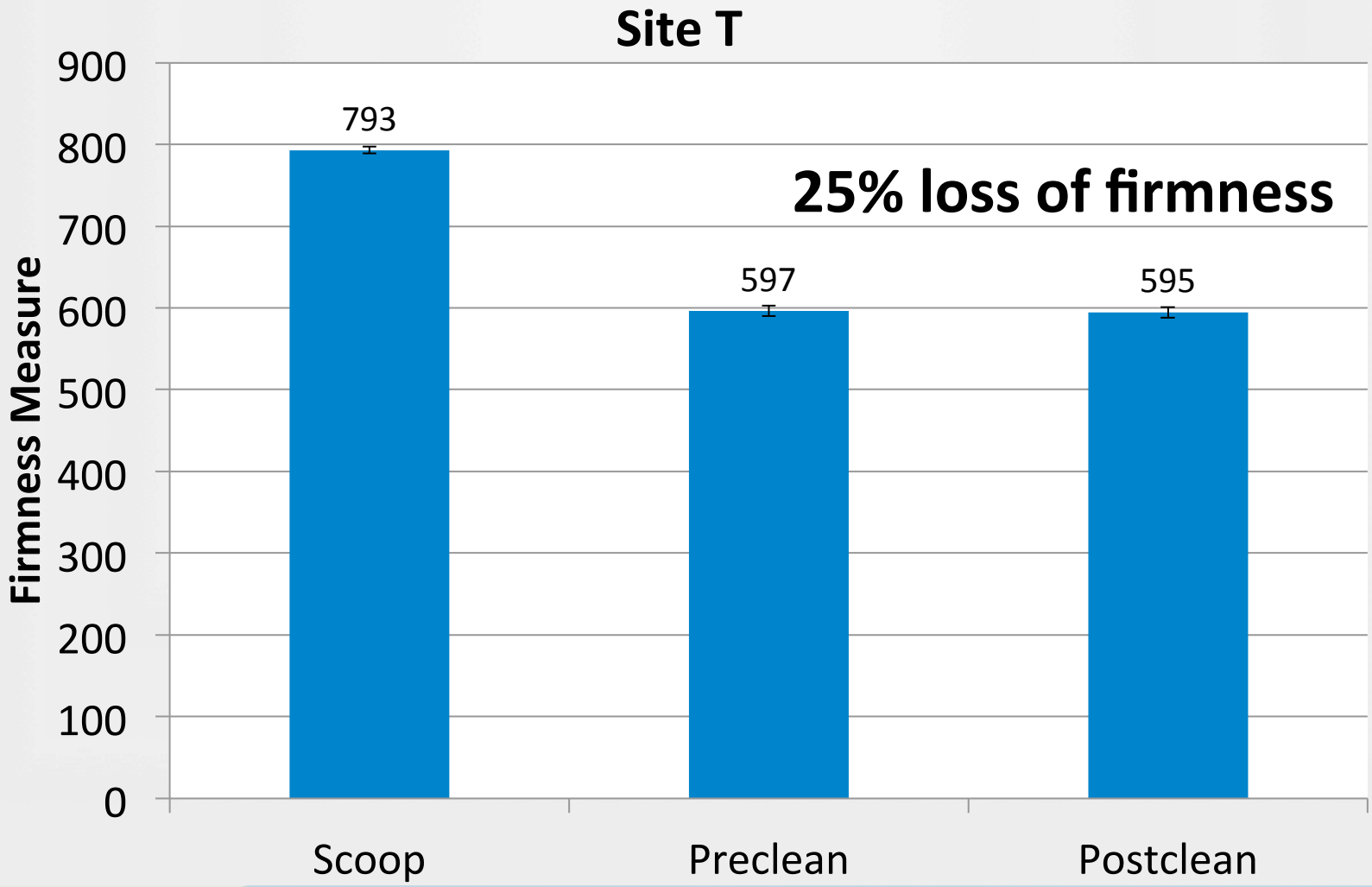
n= 100 berries/sample

PRELIMINARY RESULTS- HARVEST



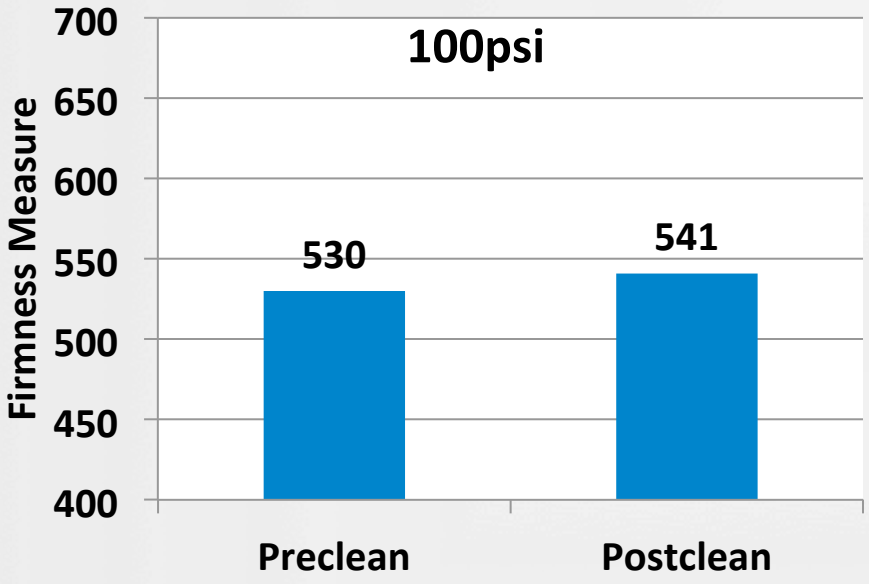
DATA ANALYSES AND SUMMARY CREDIT: JOE DEVERNA AND ROD SERRES, OCEAN SPRAY

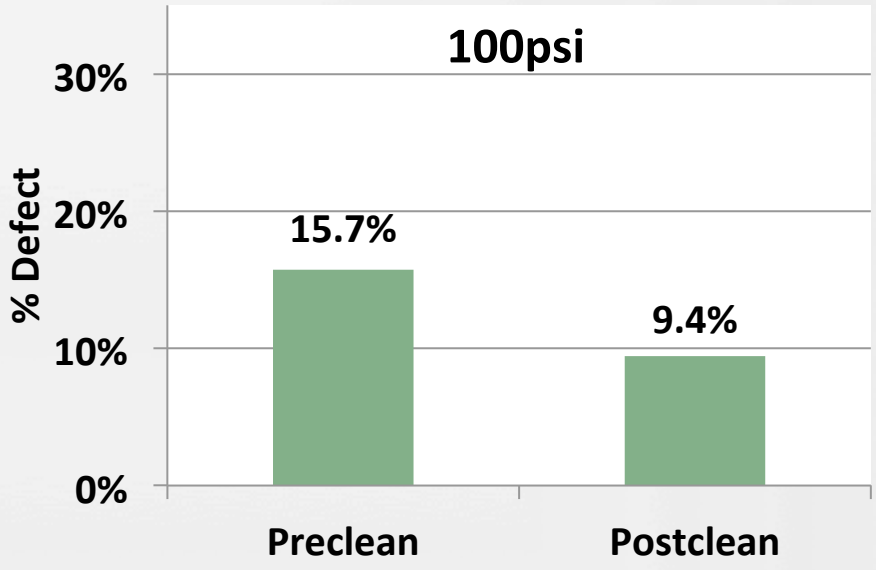
PRELIMINARY RESULTS - HARVEST



DATA ANALYSES AND SUMMARY CREDIT: JOE DEVERNA AND ROD SERRES, OCEAN SPRAY

CLEANING

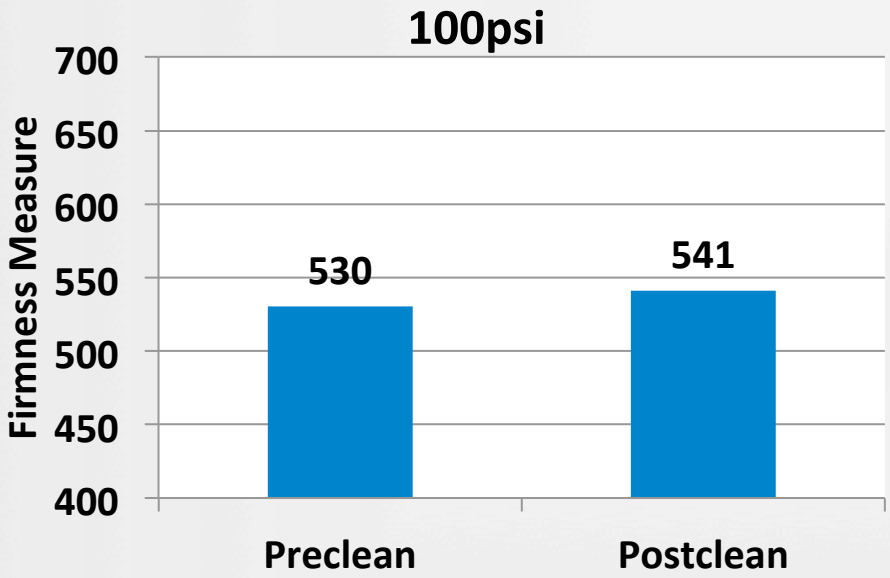


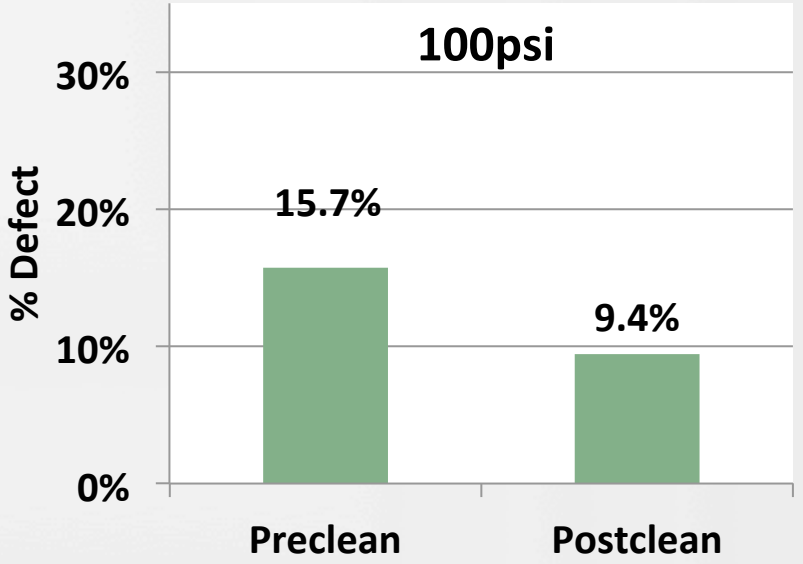


Large fruit
Early-mid season harvest

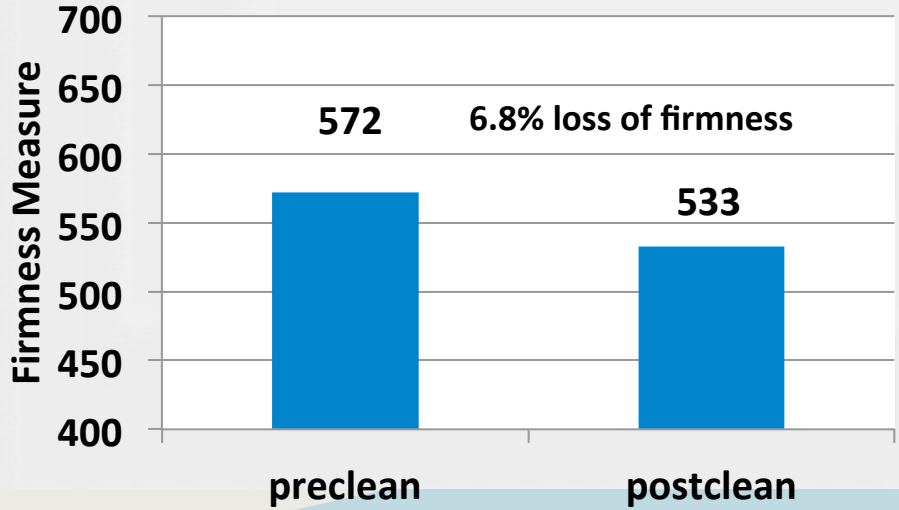
DATA ANALYSES AND SUMMARY CREDIT: JOE DEVERNA AND ROD SERRES, OCEAN SPRAY

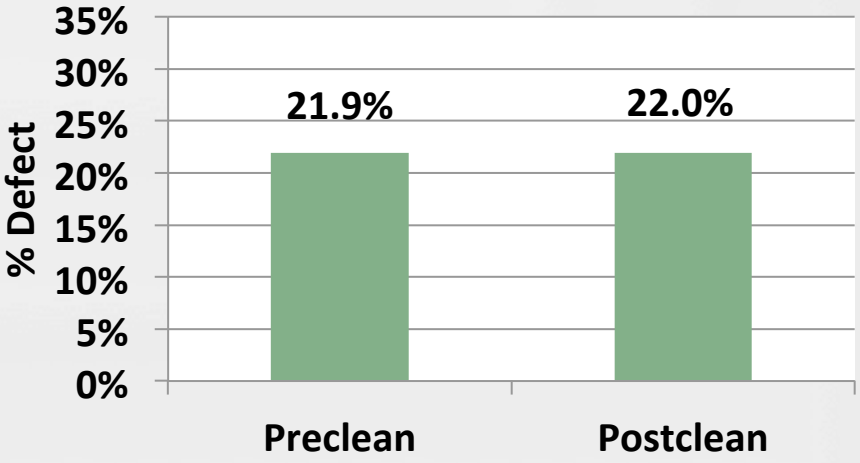
CLEANING





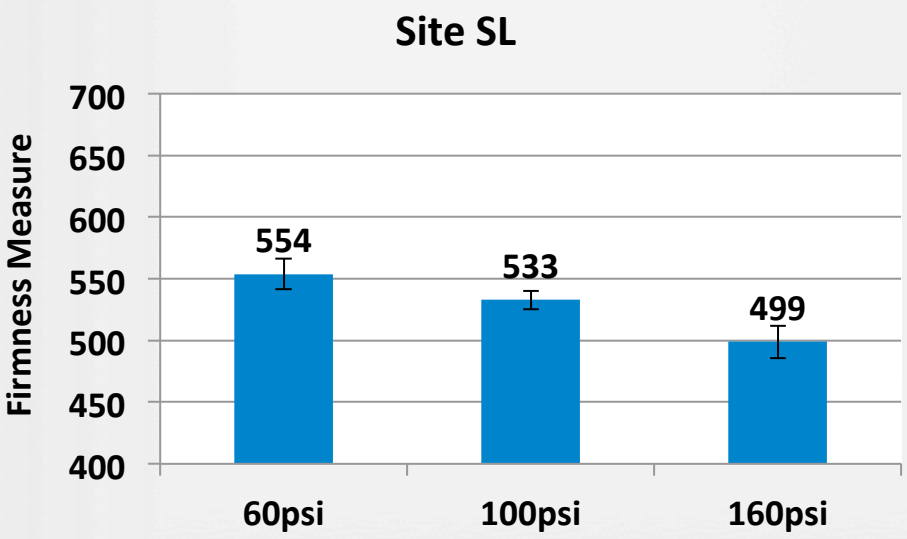
*over-ripe EB

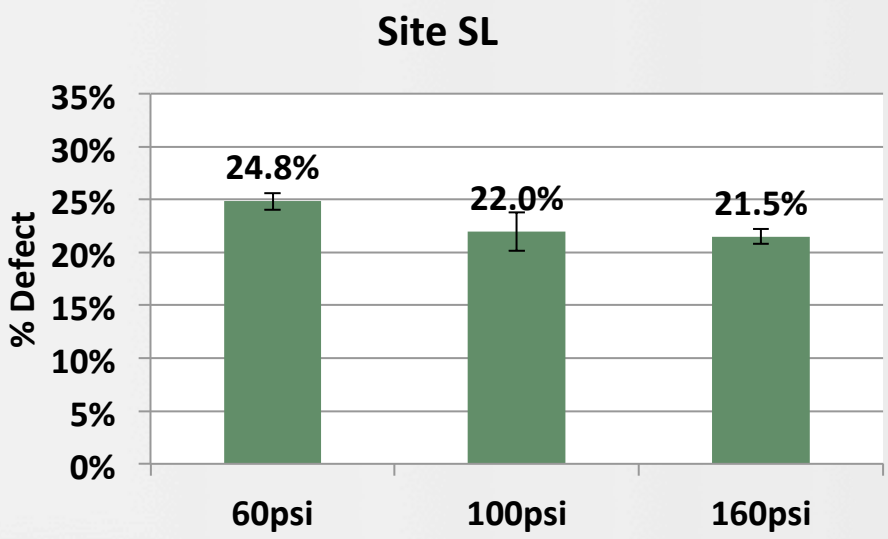


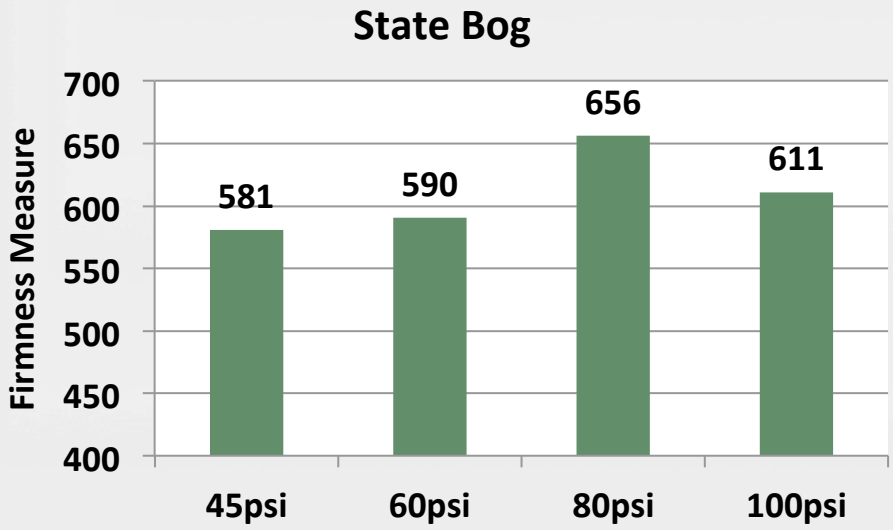


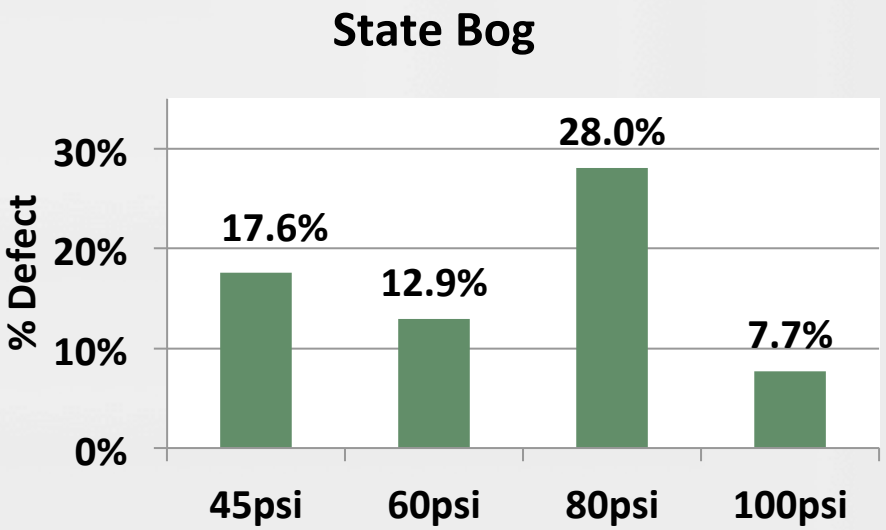
DATA ANALYSES AND SUMMARY CREDIT: JOE DEVERNA AND ROD SERRES, OCEAN SPRAY

PRESSURE









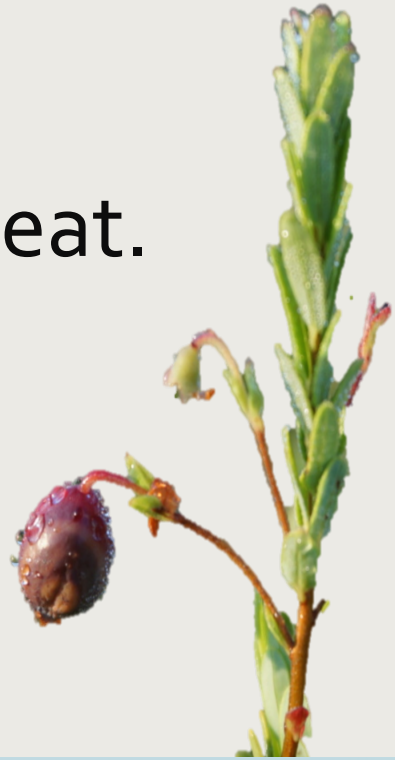
DATA ANALYSES AND SUMMARY CREDIT: JOE DEVERNA AND ROD SERRES, OCEAN SPRAY

TAKE-HOME MESSAGES

- 1st fungicide appl. no later than 50% in bloom
- Accurate % bloom may help save 1-2 sprays?

TAKE-HOME MESSAGES

- Bravo alternatives = adequate control
- Oso= feasible option to control fruit rot
  - In combination with other fungicides
- Fungicide resistance is a serious threat.
- Make every spray count!



TAKE-HOME MESSAGES

- **Future of fruit rot management?**

  Cultural practices

  Irrigation, canopy management, sanding, trash flood, late water, etc.

  Understanding pathogen biology

TAKE-HOME MESSAGES

- Fruit firmness= this is just the beginning!
  - Fruit maturity, size, environmental conditions, harvest practices and equipment.
- Need to improve sampling method (2016).
- Preliminary study= firmness can be managed

ACKNOWLEDGEMENTS

2015 Summer Crew

- Tom Giorgio
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- Colman Burns-Takki
- Jessica Braley
- Chris Copeland

Collaborators Fruit Firmness

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- Peter Beaton
- Rob Rubini
- Gary Garretson and John Mason
- Keith Mann
- Glenn Reid & A.D. MakePeace
- Rod Serres, David Nolte, Joe DeVerna (OS)

Cranberry Station team

Funding and Resources

Cape Cod Cranberry Growers' Association

THE CRANBERRY INSTITUTE

Ocean Spray®