

Managing Botrytis Fruit Rot with Chemical and Biological Fungicides: A 2021 Field Study

Surendra Dara PhD, DAIT
Cooperative Extension Advisor-Entomology and Biologicals
University of California Cooperative Extension
skdara@ucdavis.edu

Santa Maria Strawberry Field Day, 14 July 2021

 @calstrawberries @calveggies

 strawberriesvegetables

eJournals: ucanr.edu/JEB 

and ucanr.edu/pestnews 



Botrytis fruit rot or gray mold caused by *Botrytis cinerea*



- Location: Manzanita Berry Farms
- Treatments: 25
- Replications: 4
- Plot size: 15' X 64"
- Four spray applications were made at 7–10-day interval between 4/22/2021 and 5/17/2021
- Fruit was harvested before the first spray and after each spray and infection levels were measured 3 and 5 days after each harvest

Treatments				
	1 st spray	2nd spray	3 rd spray	4th spray
	1 UTC	UTC	UTC	UTC
	2 Switch	Captan	Switch	Captan
	3 Switch	Switch	Switch	None
	8 Switch	None	Switch	None
	22 NSTKI-14-L	NSTKI-14-L	NSTKI-14-L	NSTKI-14-L
	23 NSTKI-14-H	NSTKI-14-H	NSTKI-14-H	NSTKI-14-H
	4 Switch	Switch	A22613-L	A22613-L
	5 Switch	Switch	A22613-H	A22613-H
	9 Switch	A22613-L	Switch	A22613-L
	6 Switch	Switch	Regalia	Regalia
	10 Switch	Regalia	Switch	Regalia
	25 Switch	EXP14	Captan	EXP14
	7 A22613-H	A22613-H	A22613-H	A22613-H
	24 EXP14	EXP14	EXP14	EXP14
	11 Gargoil	Gargoil	Gargoil	Gargoil
	12 Dart 0.2	Dart 0.2	Dart 0.2	Dart 0.2
	13 Dart 0.35	Dart 0.35	Dart 0.35	Dart 0.35
	14 Howler	Howler	Howler	Howler
	15 ProBlad Verde	ProBlad Verde	ProBlad Verde	ProBlad Verde
	16 Kiplant	Kiplant	Kiplant	Kiplant
	17 Film P	ProBlad V+ Nu Film P	ProBlad V+ Nu Film P	ProBlad V+ Nu Film P
	18 Theia	Theia	Theia	Theia
	19 Esendo	Esendo	Esendo	Esendo
	20 Thyme	AgriCell Fun Thyme	AgriCell Fun Thyme	AgriCell Fun Thyme
	21 AS-EXP Thyme	AS-EXP Thyme	AS-EXP Thyme	AS-EXP Thyme

Product

**Captan
Switch 62.5 WG**

NSTKI-14

A22613

Regalia

EXP14

Gargoil

Dart

Howler

ProBlad Verde

Kiplant VS-04

Nu Film P

Theia

Esendo

AgriCell Fun Thyme

AS-EXP Thyme

Active ingredient(s)

Captan
Cyprodinil + fludioxinil

Potassium carbonate 58.04% + thyme oil 1.75%

Botanical extract

Giant knotweed extract

Protein

Cinnamon oil 15% + garlic oil 20%
Caprylic acid 41.7% + capric acid 28.3%

Pseudomonas chlororaphis strain AFS009
Banda de *Lupinus albus doce* – BLAD, a polypeptide from sweet lupine

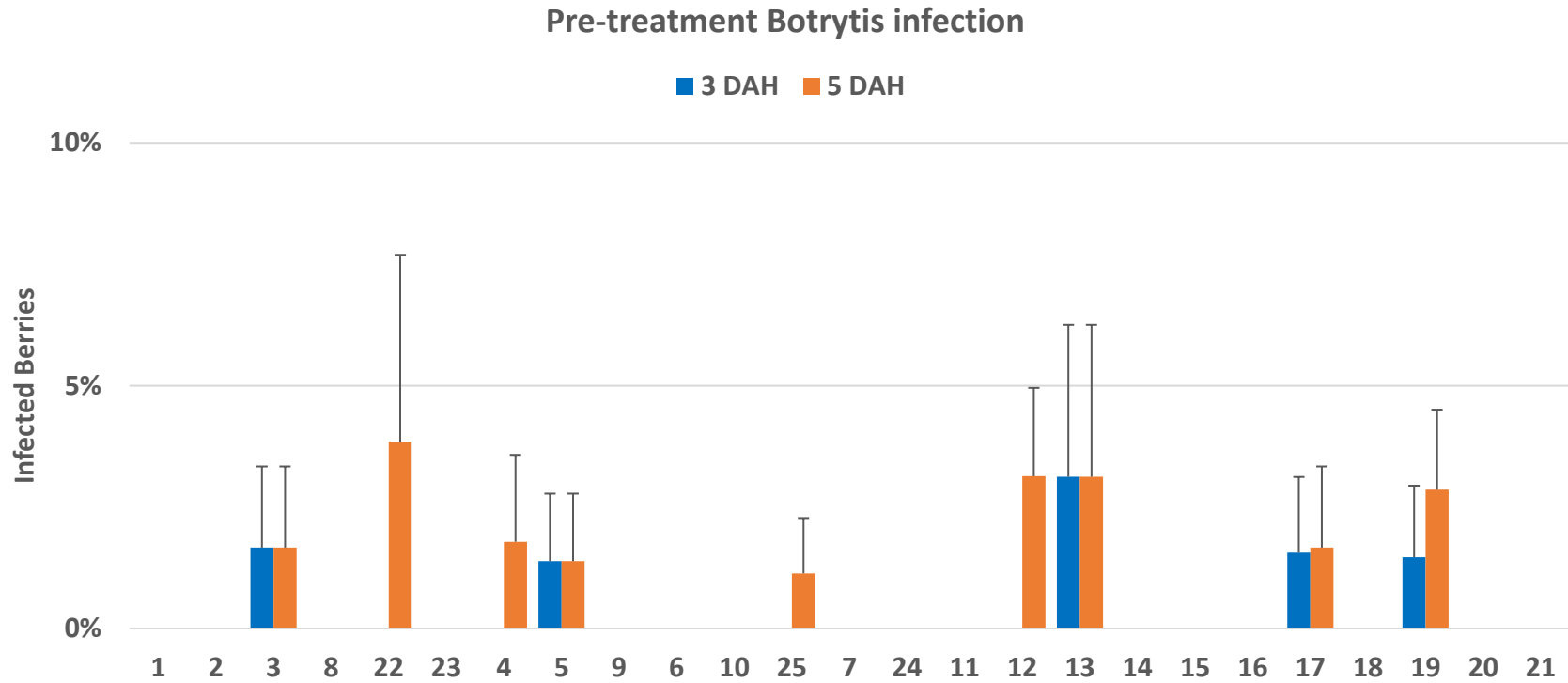
Chitosan
Pinene (polyterpenes) polymers, petrolatum, alkyl amine ethoxylate

Bacillus subtilis strain AFS032321
Pseudomonas chlororaphis strain AFS009 44.25% + azoxystrobin... 5.75%

Thyme oil

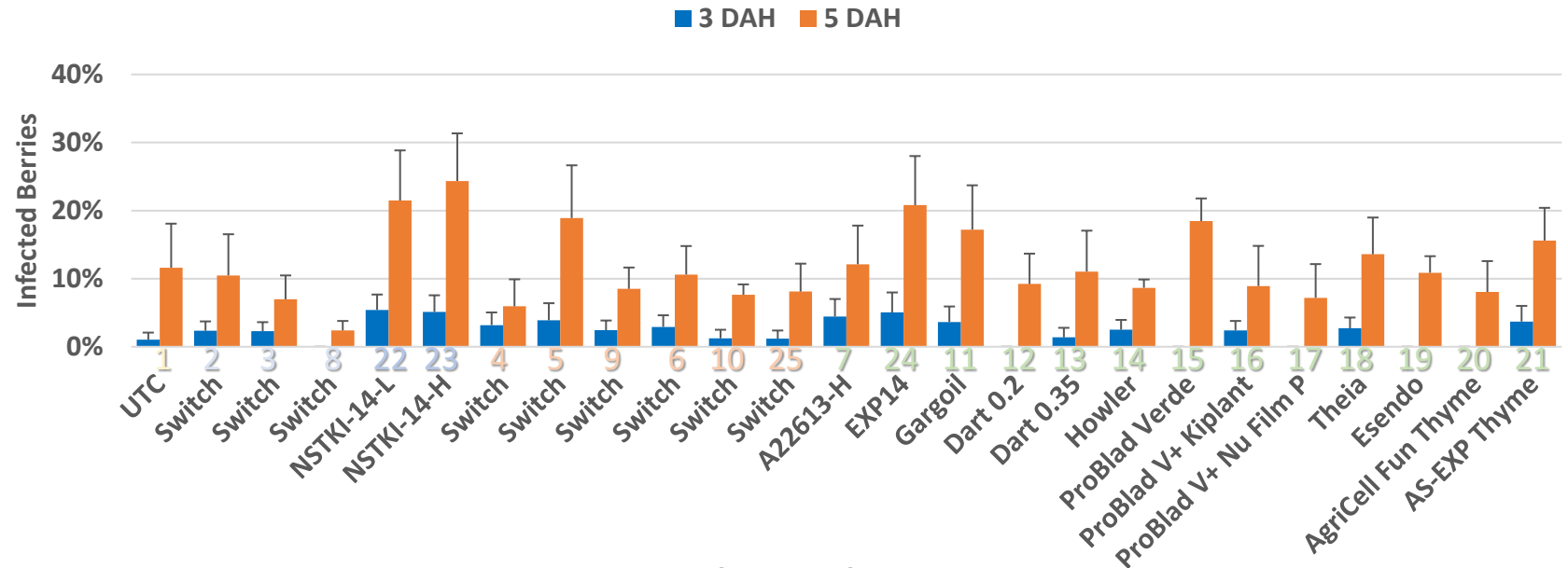
Thyme oil

Treatments				
	1 st spray	2nd spray	3 rd spray	4th spray
1	UTC	UTC	UTC	UTC
2	Switch	Captan	Switch	Captan
3	Switch	Switch	Switch	None
8	Switch	None	Switch	None
22	NSTKI-14-L	NSTKI-14-L	NSTKI-14-L	NSTKI-14-L
23	NSTKI-14-H	NSTKI-14-H	NSTKI-14-H	NSTKI-14-H
4	Switch	Switch	A22613-L	A22613-L
5	Switch	Switch	A22613-H	A22613-H
9	Switch	A22613-L	Switch	A22613-L
6	Switch	Switch	Regalia	Regalia
10	Switch	Regalia	Switch	Regalia
25	Switch	EXP14	Captan	EXP14
7	A22613-H	A22613-H	A22613-H	A22613-H
24	EXP14	EXP14	EXP14	EXP14
11	Gargoil	Gargoil	Gargoil	Gargoil
12	Dart 0.2	Dart 0.2	Dart 0.2	Dart 0.2
13	Dart 0.35	Dart 0.35	Dart 0.35	Dart 0.35
14	Howler	Howler	Howler	Howler
15	ProBlad Verde	ProBlad Verde	ProBlad Verde	ProBlad Verde
16	ProBlad V+ Kiplant	ProBlad V+ Kiplant	ProBlad V+ Kiplant	ProBlad V+ Kiplant
17	ProBlad V+ Nu Film P	ProBlad V+ Nu Film P	ProBlad V+ Nu Film P	ProBlad V+ Nu Film P
18	Theia	Theia	Theia	Theia
19	Esendo	Esendo	Esendo	Esendo
20	AgriCell Fun Thyme	AgriCell Fun Thyme	AgriCell Fun Thyme	AgriCell Fun Thyme
21	AS-EXP Thyme	AS-EXP Thyme	AS-EXP Thyme	AS-EXP Thyme

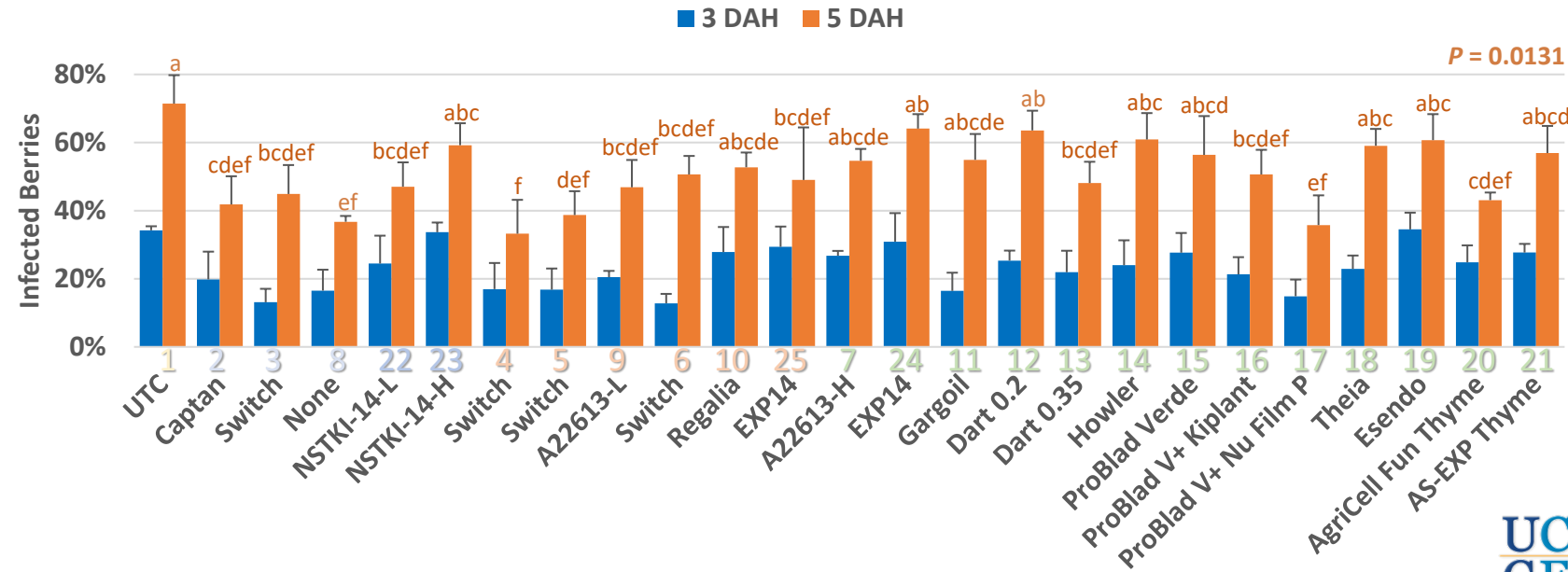


Treatments				
	1 st spray	2 nd spray	3 rd spray	4 th spray
1	UTC	UTC	UTC	UTC
2	Switch	Captan	Switch	Captan
3	Switch	Switch	Switch	None
8	Switch	None	Switch	None
22	NSTKI-14-L	NSTKI-14-L	NSTKI-14-L	NSTKI-14-L
23	NSTKI-14-H	NSTKI-14-H	NSTKI-14-H	NSTKI-14-H
4	Switch	Switch	A22613-L	A22613-L
5	Switch	Switch	A22613-H	A22613-H
9	Switch	A22613-L	Switch	A22613-L
6	Switch	Switch	Regalia	Regalia
10	Switch	Regalia	Switch	Regalia
25	Switch	EXP14	Captan	EXP14
7	A22613-H	A22613-H	A22613-H	A22613-H
24	EXP14	EXP14	EXP14	EXP14
11	Gargoil	Gargoil	Gargoil	Gargoil
12	Dart 0.2	Dart 0.2	Dart 0.2	Dart 0.2
13	Dart 0.35	Dart 0.35	Dart 0.35	Dart 0.35
14	Howler	Howler	Howler	Howler
15	ProBlad Verde	ProBlad Verde	ProBlad Verde	ProBlad Verde
16	ProBlad V+ Kiplant	ProBlad V+ Kiplant	ProBlad V+ Kiplant	ProBlad V+ Kiplant
17	ProBlad V+ Nu Film P	ProBlad V+ Nu Film P	ProBlad V+ Nu Film P	ProBlad V+ Nu Film P
18	Theia	Theia	Theia	Theia
19	Esendo	Esendo	Esendo	Esendo
20	AgriCell Fun Thyme	AgriCell Fun Thyme	AgriCell Fun Thyme	AgriCell Fun Thyme
21	AS-EXP Thyme	AS-EXP Thyme	AS-EXP Thyme	AS-EXP Thyme

Botrytis infection after I spray

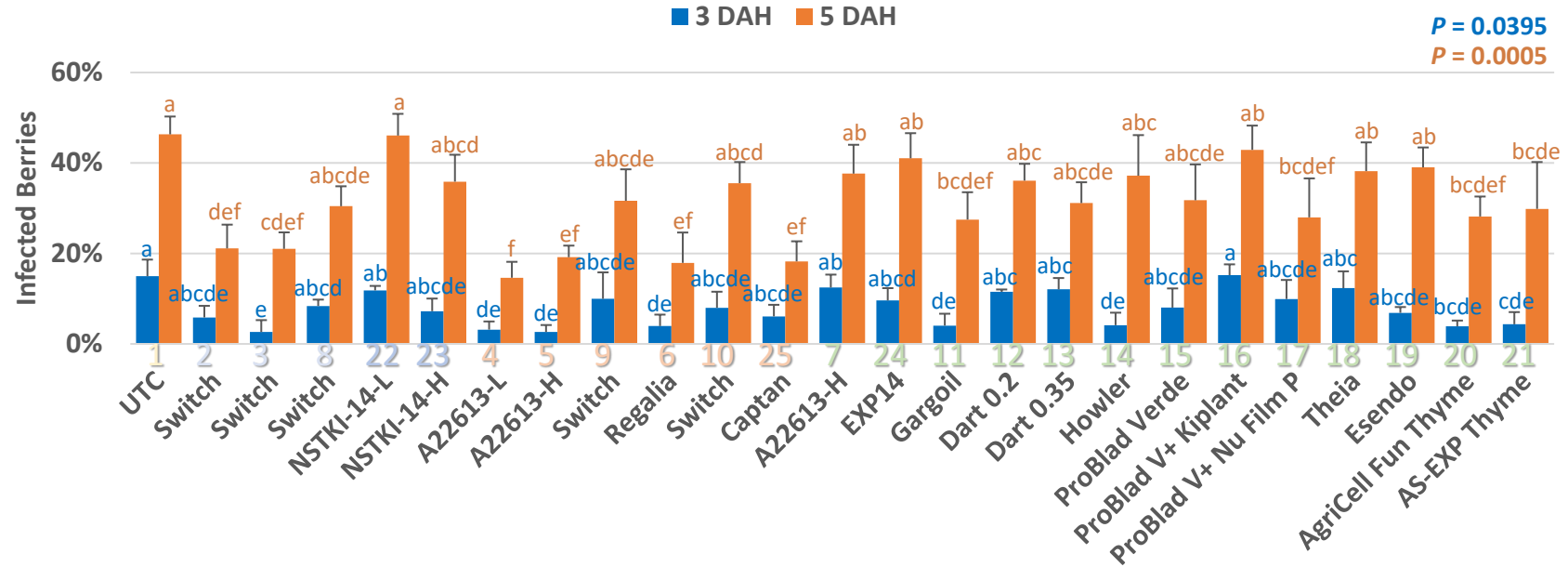


Botrytis infection after II spray

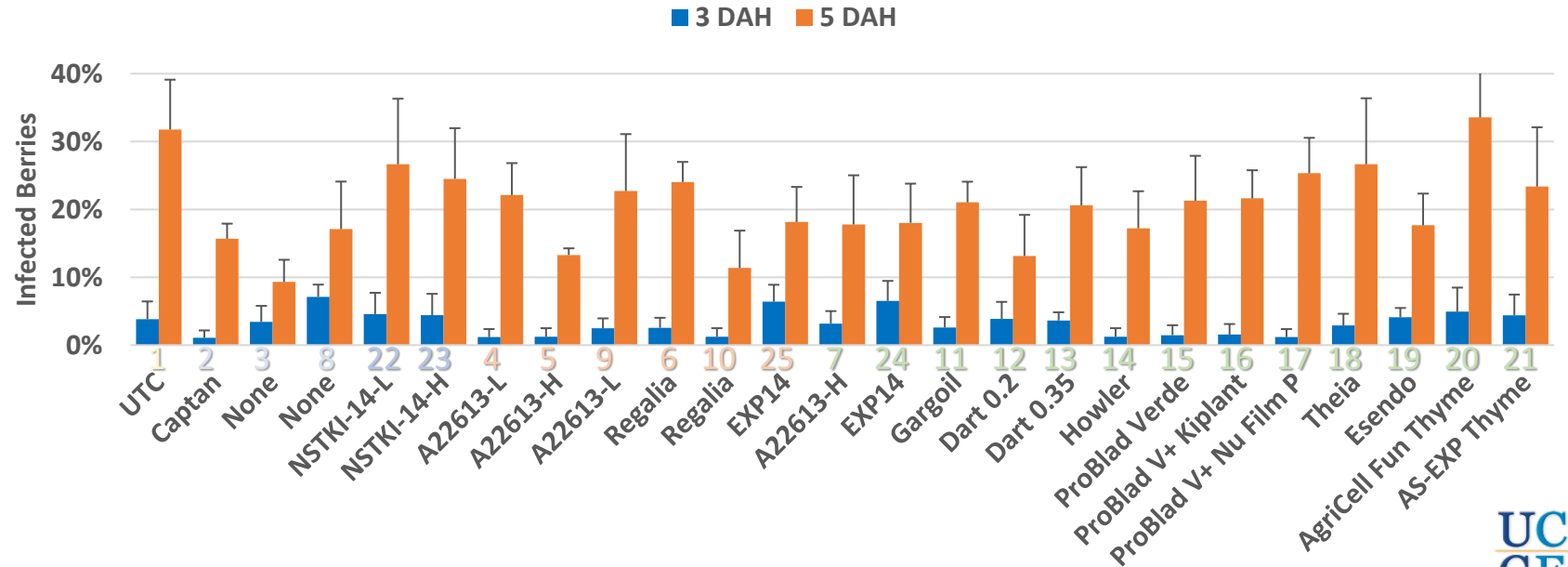


Treatments				
	1 st spray	2 nd spray	3 rd spray	4 th spray
1	UTC	UTC	UTC	UTC
2	Switch	Captan	Switch	Captan
3	Switch	Switch	Switch	None
8	Switch	None	Switch	None
22	NSTKI-14-L	NSTKI-14-L	NSTKI-14-L	NSTKI-14-L
23	NSTKI-14-H	NSTKI-14-H	NSTKI-14-H	NSTKI-14-H
4	Switch	Switch	A22613-L	A22613-L
5	Switch	Switch	A22613-H	A22613-H
9	Switch	A22613-L	Switch	A22613-L
6	Switch	Switch	Regalia	Regalia
10	Switch	Regalia	Switch	Regalia
25	Switch	EXP14	Captan	EXP14
7	A22613-H	A22613-H	A22613-H	A22613-H
24	EXP14	EXP14	EXP14	EXP14
11	Gargoil	Gargoil	Gargoil	Gargoil
12	Dart 0.2	Dart 0.2	Dart 0.2	Dart 0.2
13	Dart 0.35	Dart 0.35	Dart 0.35	Dart 0.35
14	Howler	Howler	Howler	Howler
15	ProBlad Verde	ProBlad Verde	ProBlad Verde	ProBlad Verde
16	ProBlad V+ Kiplant	ProBlad V+ Kiplant	ProBlad V+ Kiplant	ProBlad V+ Kiplant
17	ProBlad V+ Nu Film P	ProBlad V+ Nu Film P	ProBlad V+ Nu Film P	ProBlad V+ Nu Film P
18	Theia	Theia	Theia	Theia
19	Esendo	Esendo	Esendo	Esendo
20	AgriCell Fun Thyme	AgriCell Fun Thyme	AgriCell Fun Thyme	AgriCell Fun Thyme
21	AS-EXP Thyme	AS-EXP Thyme	AS-EXP Thyme	AS-EXP Thyme

Botrytis infection after III spray

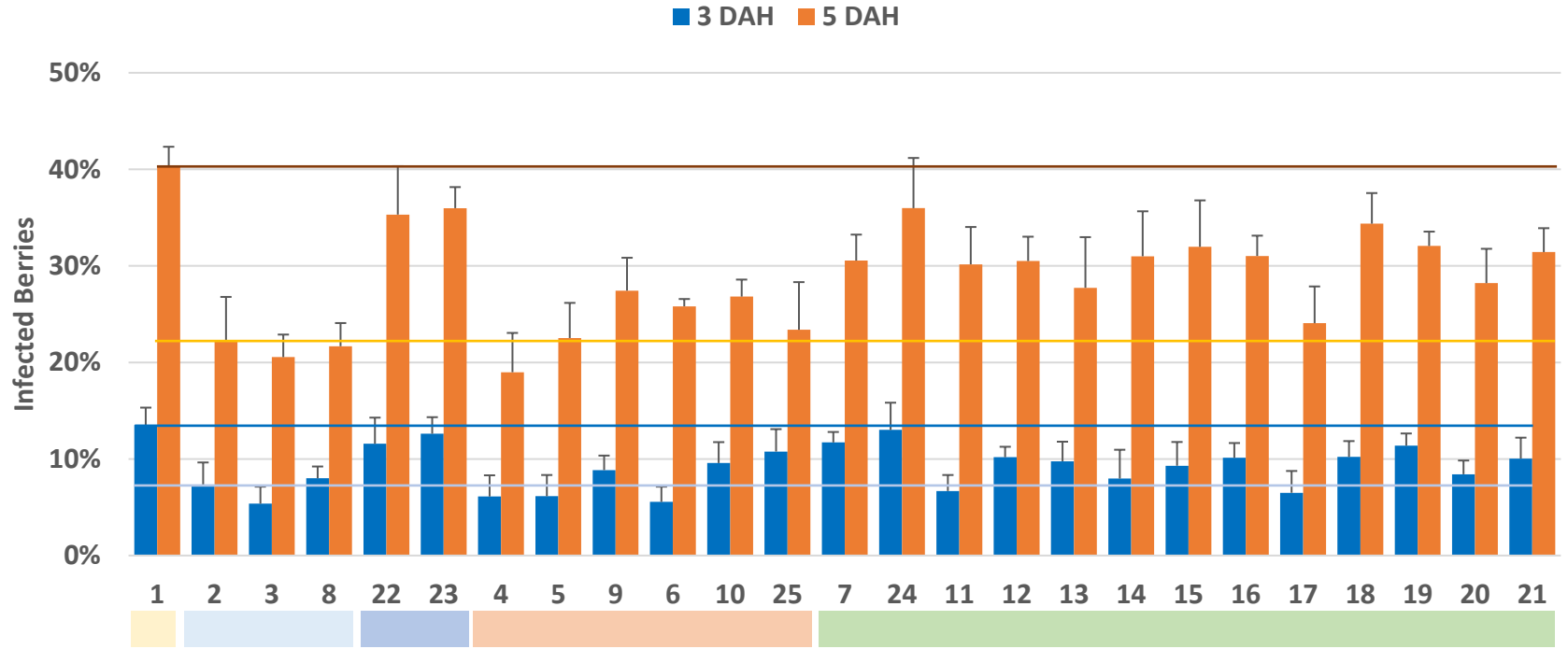


Botrytis infection after IV spray



Treatments				
	1 st spray	2 nd spray	3 rd spray	4 th spray
1	UTC	UTC	UTC	UTC
2	Switch	Captan	Switch	Captan
3	Switch	Switch	Switch	None
8	Switch	None	Switch	None
22	NSTKI-14-L	NSTKI-14-L	NSTKI-14-L	NSTKI-14-L
23	NSTKI-14-H	NSTKI-14-H	NSTKI-14-H	NSTKI-14-H
4	Switch	Switch	A22613-L	A22613-L
5	Switch	Switch	A22613-H	A22613-H
9	Switch	A22613-L	Switch	A22613-L
6	Switch	Switch	Regalia	Regalia
10	Switch	Regalia	Switch	Regalia
25	Switch	EXP14	Captan	EXP14
7	A22613-H	A22613-H	A22613-H	A22613-H
24	EXP14	EXP14	EXP14	EXP14
11	Gargoil	Gargoil	Gargoil	Gargoil
12	Dart 0.2	Dart 0.2	Dart 0.2	Dart 0.2
13	Dart 0.35	Dart 0.35	Dart 0.35	Dart 0.35
14	Howler	Howler	Howler	Howler
15	ProBlad Verde	ProBlad Verde	ProBlad Verde	ProBlad Verde
16	ProBlad V+ Kiplant	ProBlad V+ Kiplant	ProBlad V+ Kiplant	ProBlad V+ Kiplant
17	ProBlad V+ Nu Film P	ProBlad V+ Nu Film P	ProBlad V+ Nu Film P	ProBlad V+ Nu Film P
18	Theia	Theia	Theia	Theia
19	Esendo	Esendo	Esendo	Esendo
20	AgriCell Fun Thyme	AgriCell Fun Thyme	AgriCell Fun Thyme	AgriCell Fun Thyme
21	AS-EXP Thyme	AS-EXP Thyme	AS-EXP Thyme	AS-EXP Thyme

Botrytis infection after four spray applications



Conclusions

- Chemical fungicides/standards varied in their efficacy
- Biological fungicides varied in their efficacy
- Compared to untreated control, average infection for the study period was less in all treatments
- Some biological fungicides were equal to chemical standards when used alone or when rotated with a chemical fungicide
- Additional research can help optimize the rates and use strategies
- Botanical, microbial, or protein-based fungicides can be effectively used for botrytis control in strawberry
- Using both chemical and non-chemical control options is important for integrated disease management and reducing the risk of resistance development

Acknowledgements

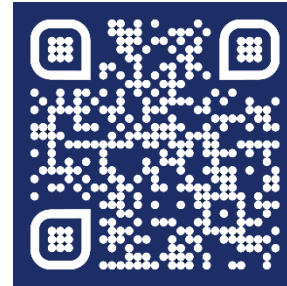
- Dave Peck, Manzanita Berry Farms
- Bryan Johnston and Chris Martinez
- AgBiome, AgroSpheres, Biotalys, NovaSource, Sym-Agro, Syngenta, and Westbridge



Thank you!



Download free **IPMinfo** app



Surendra Dara's Profile:

eJournals:

<http://ucanr.edu/JEB>

<http://ucanr.edu/pestnews>

Meeting presentations:

<http://ucanr.edu/meetingpresentations>

Meeting handouts:

<http://ucanr.edu/meetinghandouts>

Strawberry manuals:

<http://ucanr.edu/strawberrymanual>

Spider mite management:

<http://ucanr.edu/spidermiteguide>

Twitter:

@calstrawberries and @calveggies

Facebook:

@strawberriesvegetables

YouTube

<http://ucanr.edu/SDYouTube>