The IR-4 Biopesticide Workshop

September 21, 2016

Michael Braverman

Handouts

- Agenda
- Priorities by discipline (Entomology, Pathology, Weed Science)
- Report results, Potential products, Decline curves, (Distributed electronically-Limited)
- Later- Voting ballots and Workshop Survey

The IR-4 Biopesticide Workshop

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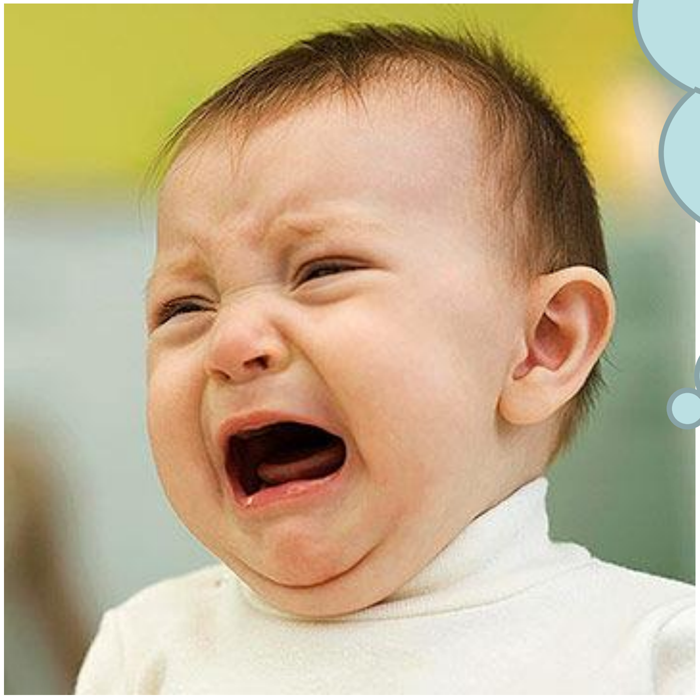
Michael Braverman

Biopesticide Workshop



Workshop every other year.
See you in 2018!

Results 2015 Biopesticide Workshop

Priority	Fruit	Organic	Ornamental	Other	Vegetables
#1	Spotted wing drosophila/ All crops (Also organic)	Fire blight (Erwinia amylovora) / Organic Pome fruit(other than apple- AND Apple)	*Cryphonectria parasitica* (Chestnut blight) / American Chestnut	Weeds/ All crops	Bacterial Diseases Fruiting Veg. - field & GH
#2	Black sigatoka / banana	Diabrotica spp. / Organic vegetables CUCURBITS-NE	*Fusarium, Pythium, Cylindrocarpon* / Douglas fir bareroot forestry seedlings	Varroa mite / honey bees	Whitefly, Aphid, Psyllids/GH tomato And Mites, Thrips, Aphids, whiteflies / vegetables SE
#3	Stem gall wasp / Blueberry	Cercospora and Cladosporium leaf spot / Organic leafy greens (Spinach, Chard)	*Botrytis* leaf spot/blight / Bulb cut flowers (field & postharvest)	Public Health / Mosquito	Downy Mildew / Basil (field & GH) and basil and cucurbits SPINACH-West
#4	Botrytis / strawberry, raspberry	Monilinia corymbosum (mummy berry disease) / Organic Blueberry (bushberry)	Thrips, whiteflies / Roses, Gerbera	Public health/ Tick	Pepino Mosaic Virus / Tomato (GH)

Ginseng-Root and foliar diseases- NC

2015 Workshop- Results 2016 Field Trials

Priority	Fruit	Organic	Ornamental	Other	Vegetables
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Ginseng-Root and foliar diseases- NC

IR-4 National Pesticide Clearance
Biopesticide Efficacy And Performance Protocol 2016

Efficacy and Phytotoxicity of Biopesticides for management of Spotted Wing Drosophila (SWD) in blueberry and caneberries

Elena M. Rhodes, Postdoctoral Associate
Oscar E. Liburd, Principle Investigator

UF | UNIVERSITY of FLORIDA

TRT #	Product	AI	Rate	Timing
1	untreated	/	/	/
2	Entrust® SC	spionsad	6 floz / acre	every 7 days
3	Grandevo®	*Chromobacterium subtsugae* strain PRAA4-1	3 lb / acre	every 3 - 5 days
4	Veretran D™	sabadilla alkaloids	15 lb / acre	every 3 - 5 days
5	Entrust® SC	spionsad	6 floz / acre	every 7 days
	Grandevo®	*Chromobacterium subtsugae* strain PRAA4-1	3 lb / acre	every 3 - 5 days
6	Entrust® SC	spionsad	6 floz / acre	every 7 days
	Veretran D™	sabadilla alkaloids	15 lb / acre	every 3 - 5 days
7	Entrust® SC	spionsad	6 floz / acre	every 7 days
	Grandevo®	*Chromobacterium subtsugae* strain PRAA4-1	3 lb / acre	every 3 - 5 days
	corn syrup	corn syrup	12.5% by volume	/
8	Entrust® SC	spionsad	6 floz / acre	every 7 days
	Veretran D™	sabadilla alkaloids	15 lb / acre	every 3 - 5 days
	corn syrup	corn syrup	12.5% by volume	/
9	Azera®	Azadirachtin and Pyrethrins	2.5 pts / acre	every 3 - 5 days
	corn syrup	corn syrup	12.5% by volume	/
10	VST - 006330 EP	/	4 lb / acre	every 3 - 5 days
	corn syrup	corn syrup	12.5% by volume	/

Results/Conclusion SWD

Grandevo® and Entrust® were effective and reduced SWD population below the control

The addition of corn syrup did not appear to increase efficacy

Veratran D™ did not demonstrate efficacy and clogged the small CO_2 sprayed that was used

VST-006330 EP + corn syrup was not efficacious

Conclusions: natural enemies

None of the treatments negatively impacted parasitoid numbers. ID to family in process

None of the treatments negatively impacted overall predator numbers

Veratran D™, VST-006330 EP, and Azera® may reduce Anthrocoridae populations

Spotted Wing Drosophila Blueberries and Brambles

Across multiple locations and years Entrust alone and in rotation with Grandevo has provided the best overall control in organic production.

Future work may focus on extension demonstration trials and possibly attract and kill techniques.

Sterile insect technique.

George Sundin MSU Fireblight Organic Apples

	Blossom blight	Shoot blight
Fire Quencher UV-A 2 pt + Serenade Optimum 20 oz………………	4.5 cde	6.3 abc
Cueva 2 qt……………………………..	6.8 cde	6.0 abc
Blossom Protect 1.25 lb +Buffer Protect 8.75 lb Oxidate 1 gal per 100 gal……………………………	3.0 de	3.0 abc
Blossom Protect 1.25 lb + Buffer Protect 8.75 lb….4 hr after oxidate;	4.3 cde	4.3 abc
Untreated control……………………………………….	17.8 abc	8.5 abc
Untreated control, non-inoculated………………………..	0.0 e	1.0 d

Ken Johnson Oregon OSU Fireblight Organic Apples

Treatment	Blighted clusters Per tree	Percent blighted floral clusters***
Water	**315 a#**	**55.0 ab**
Blossom Protect	194 abc	31.5 cde
Blossom Protect +Buffer protect	131 abcd	23.6 def
Blossom Protect Buffer Protect (twice)	38 d	6.7 g
Blossom Protect Buffer Protect then OxiDate (1%)	89 bcd	16.0 efg

Field inoculation of two T1 siblings

(~6 weeks post inoculation)

Oxalate oxidase Chestnut
Blight resistant

−OxO

+OxO

Powell SUNY Syracuse

Field inoculation of two T1 siblings
(~6 weeks post inoculation)

−OxO

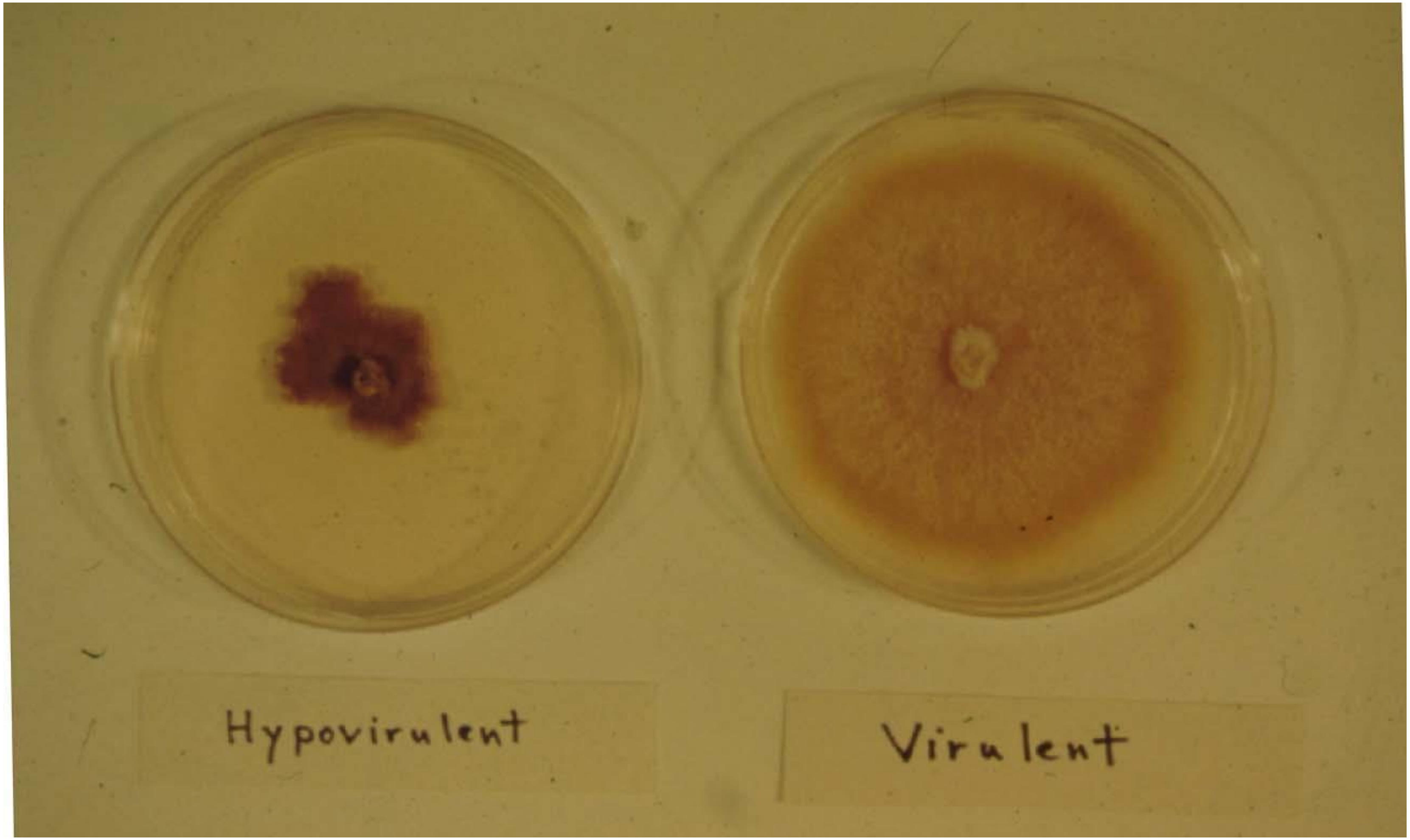
Pending studies bees and forest seed germination to confirm no anticipated adverse effects. Progress with regulatory agencies.

+OxO

Efficacy and Phytotoxicity of Hypovirulent CHV3-GH2 on Chestnut for the Control of Chestnut Blight

Dennis W. Fulbright
Andrew M. Jarosz
Joshua C. Springer
Carmen Medina-Mora
<u>Michigan State University</u>

Virus to weaken a fungi (Make it hypovirulent) <u>CHV3 (GH2)</u>



2016 experimental design to understand if longer term storage affected efficacy of hypovirulence slurry

- Virulent and Hypovirulent controls were used again this season (N=10)
- Fresh-made slurry (N=10)
- Fresh-made but frozen for 90 days (N=5)
- Fresh-made on biopolymer material, dried, then reconstituted with water (90 days in freezer after dried) (N=5)
- Fresh-made, dried (stored for 90 days in freezer), ground, and reconstituted with water (N=5)

5 cc of HV inoculum ‘goop’ to treat each canker

Control of Chestnut Blight using Hypovirulence as a Biopesticide

Dennis Fulbright, Michigan State

	CHESTNUT BLIGHT CANKER RATINGS			
	1 Good	**2**	**3**	**4 Bad**
Control				
V	0	0	2	8
HV	9	1	0	0
Treated				
Frozen	0	0	4	1
Fresh	0	9	1	0
Biopolymer	0	2	3	0
Dried/ reconstituted	0	0	5	0

Future Studies - Hypovirulent

We would like to test polymer material again.

We would like to test a powder that was refrigerated but not not frozen as it appears freezing kills the biopesticide.

Diabrotica- Organic Cucurbits. Brian Nault and Abby Seaman- Cornell

Weed control- Organic sweet potato

Mark VanGessel- Univ. Delaware

Ammonium nonanoate

- Ammonium nonanoate had much more activity on Palmer amaranth than Avenger AG when applied with painter rollers
- Ammonium nonanoate is OMRI approved but NOT approved for organic production

Observations

First Trial

- Minimal leaf burn
- <20% leaf burn and injury on Palmer amaranth with wick wiper
- Volume of application difficult to control with either applicator
  - painter roller was excessive volume

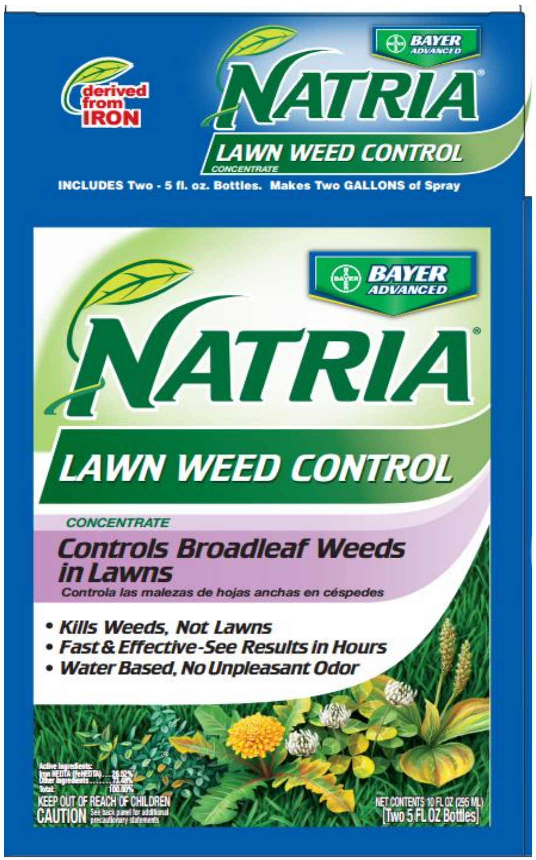
Second trial

- Compared Avenger AG 1:1 and ammonium nonanoate
- First application with wick applicator and observed minimal leaf burn and so followed with two applications using painter rollers
- Ammonium nonanoate was ~80% leaf burn

Crop Safety of Over-the-top Herbicide Application in Woody Ornamental Crops (– Fiesta (FeHEDTA)

FeHEDTA

Labelled in turf- Expand to ornamental crops



Crop Safety of Over-the-top Herbicide Application in Woody Ornamental Crops (– Fiesta (FeHEDTA)

Ben Fraelich, USDA-ARS

Buxus x 'Green Velvet'
No injury. No significant difference in plant growth or marketability.

Fiesta (product per acre)	June 2, 2016 (8 WAT)	June 3, 2016 (8 WAT)	
	Phytotoxicity	Plant Height	Plant Width
Untreated	0.0 a	16.5 a	14.1 a
4.3 gal Turf rate	0.0 a	15.6 a	12.6 a
8.6 gal	0.0 a	15.3 a	12.8 a
17.0 gal	0.0 a	13.3 a	11.2 a
34.0 gal	0.0 a	14.9 a	11.2 a

Pinus taeda
Very slight leaf burn at 4X and 8X rates. No significant difference in plant growth or marketability.

Fiesta (product per acre)	June 2, 2016 (8 WAT)	June 3, 2016 (8 WAT)	
	Phytotoxicity	Plant Height	Plant Width
Untreated	0.0 c	36.7 a	25.8 a
4.3 gal Turf rate	0.0 c	37.3 a	25.7 a
8.6 gal	0.0 c	35.7 a	26.3 a
17.0 gal	1.3 b	36.5 a	23.9 a
34.0 gal	2.3 a	35.3 a	23.3 a

Cheryl Wilen, UC Extension, San Diego

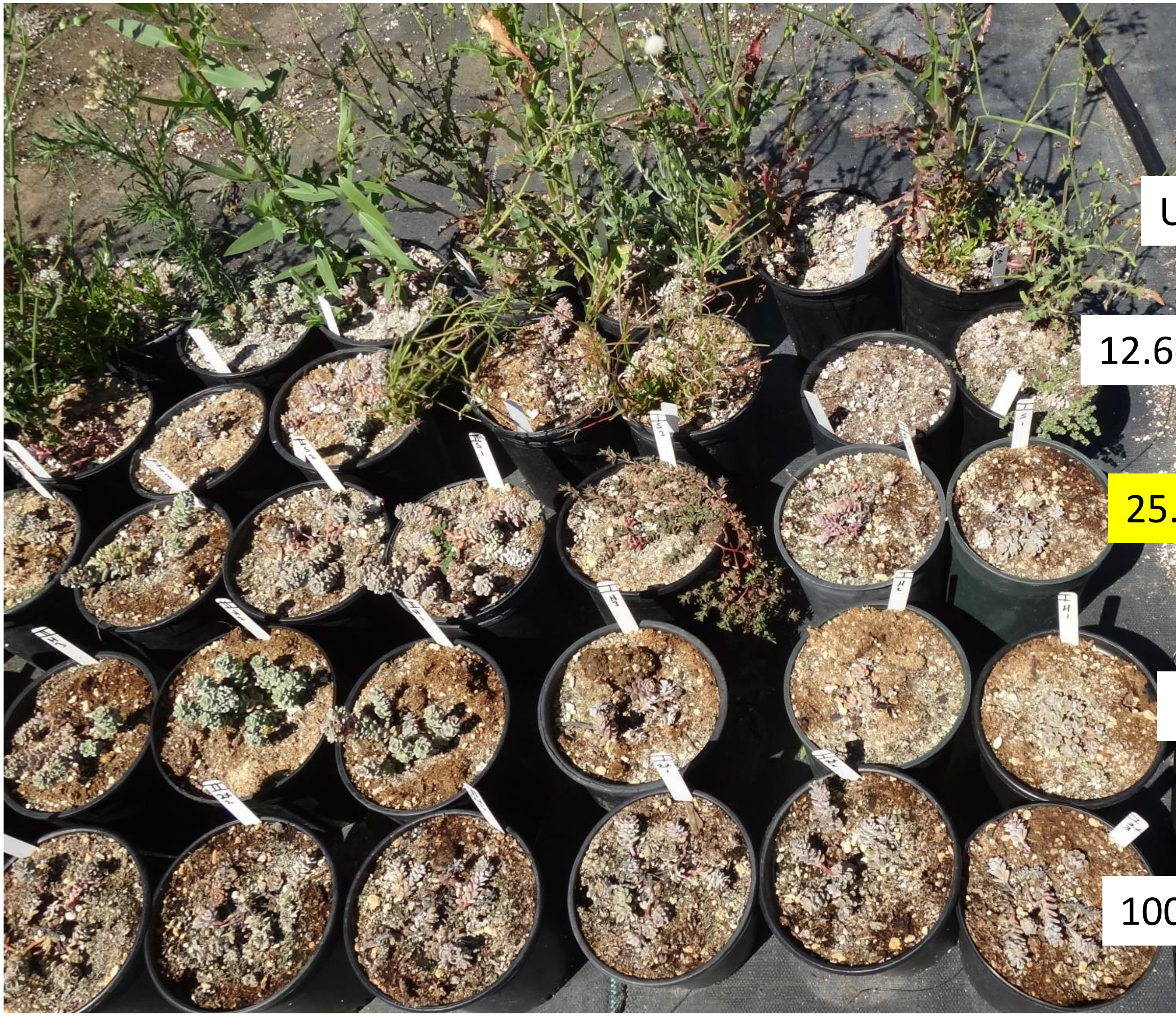
Species tested*

Sedum	'Touchdown Flame‘
Sedum	‘Cape Blanco’
Liriope	‘Silver Dragon’
Lavender	'Otto quast'
Agapanthus	‘Blue Yonder’

*Blue fescue ‘Elijah blue’ is currently being studied; photos not included here

Cheryl Wilen, UC Extension, San Diego

Cape Blanco Sedum-Rate



UTC

12.6oz/1000ft2

25.2oz/1000ft2

50.4oz/1000ft2

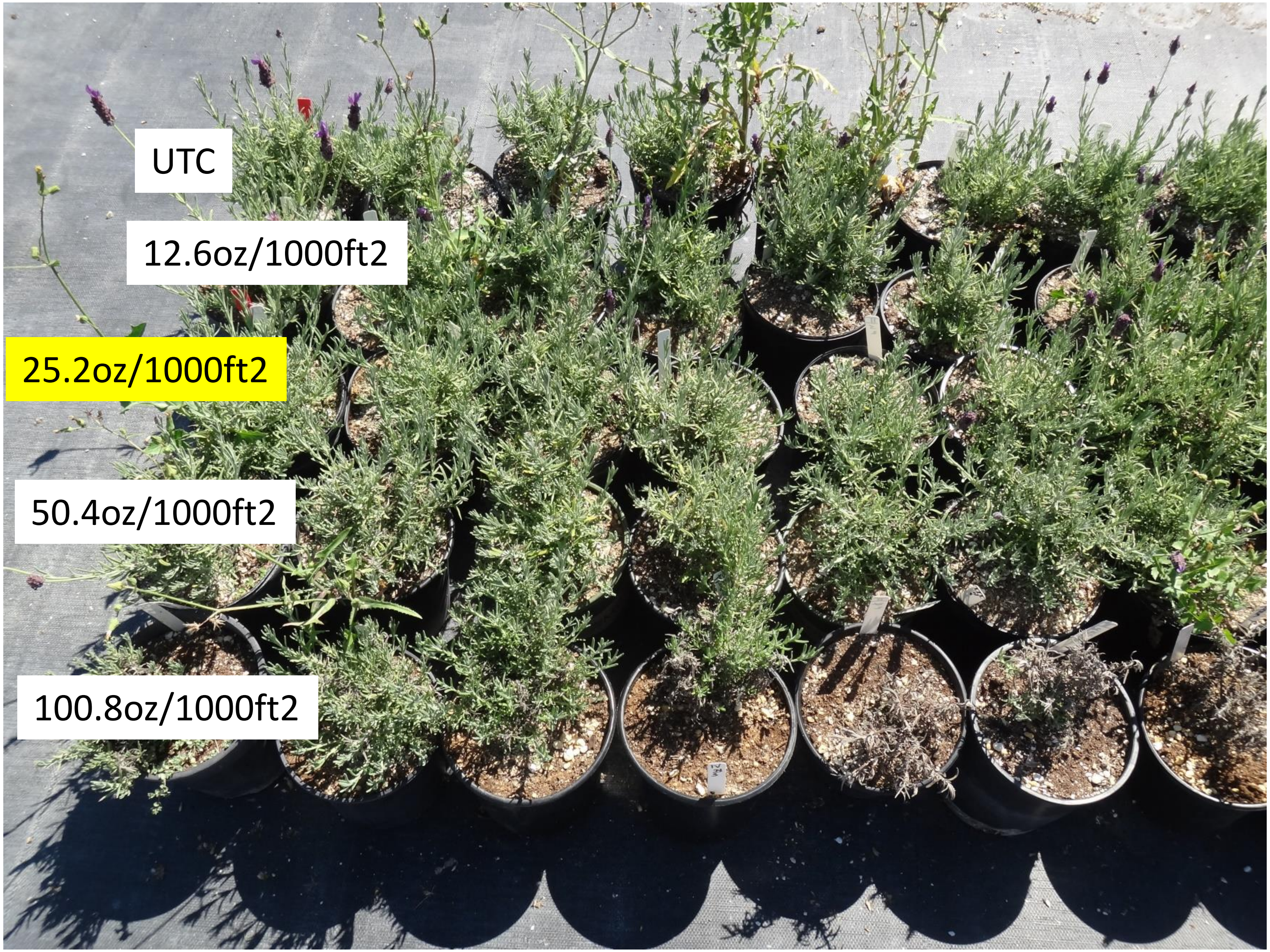
100.8oz/1000ft2

Cheryl Wilen, UC Extension, San Diego

Liriope - Rate

Cheryl Wilen, UC Extension, San Diego

Lavender - Rate



Joe Neal NC State

Fiesta severely damaged: 2 species of sedum and sempervivum

Dormant daylily and dormant hosta uninjured but injury upon growing. Injury to hosta was severe.

Dormant woody plants were uninjured.

Injury to all actively growing broadleaf plants; No injury to Junipers, and some ornamental grasses. The ornamental grasses did have discoloration on the foliage but they grew out of the injury.

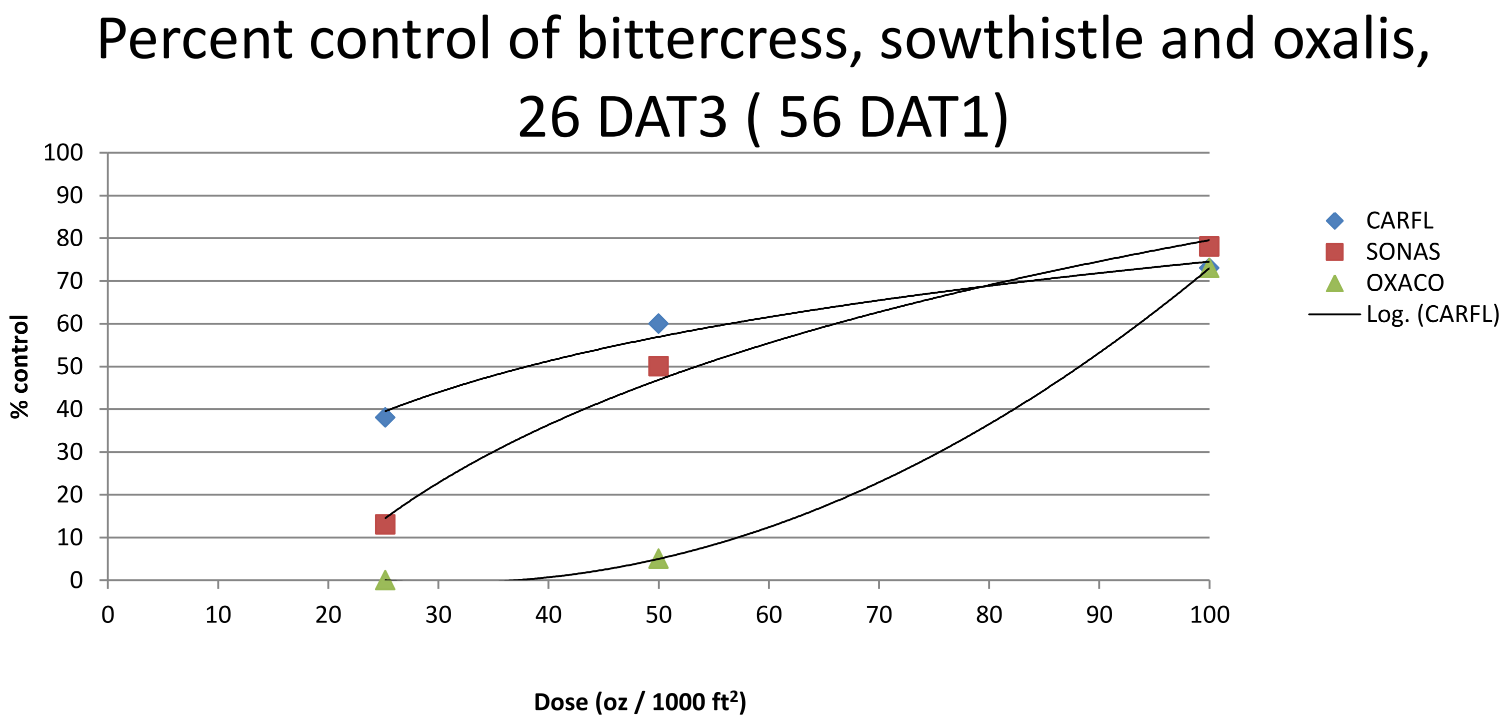
Joe Neal NC State

Dormant treatments for winter annual broadleaf weeds is possible.

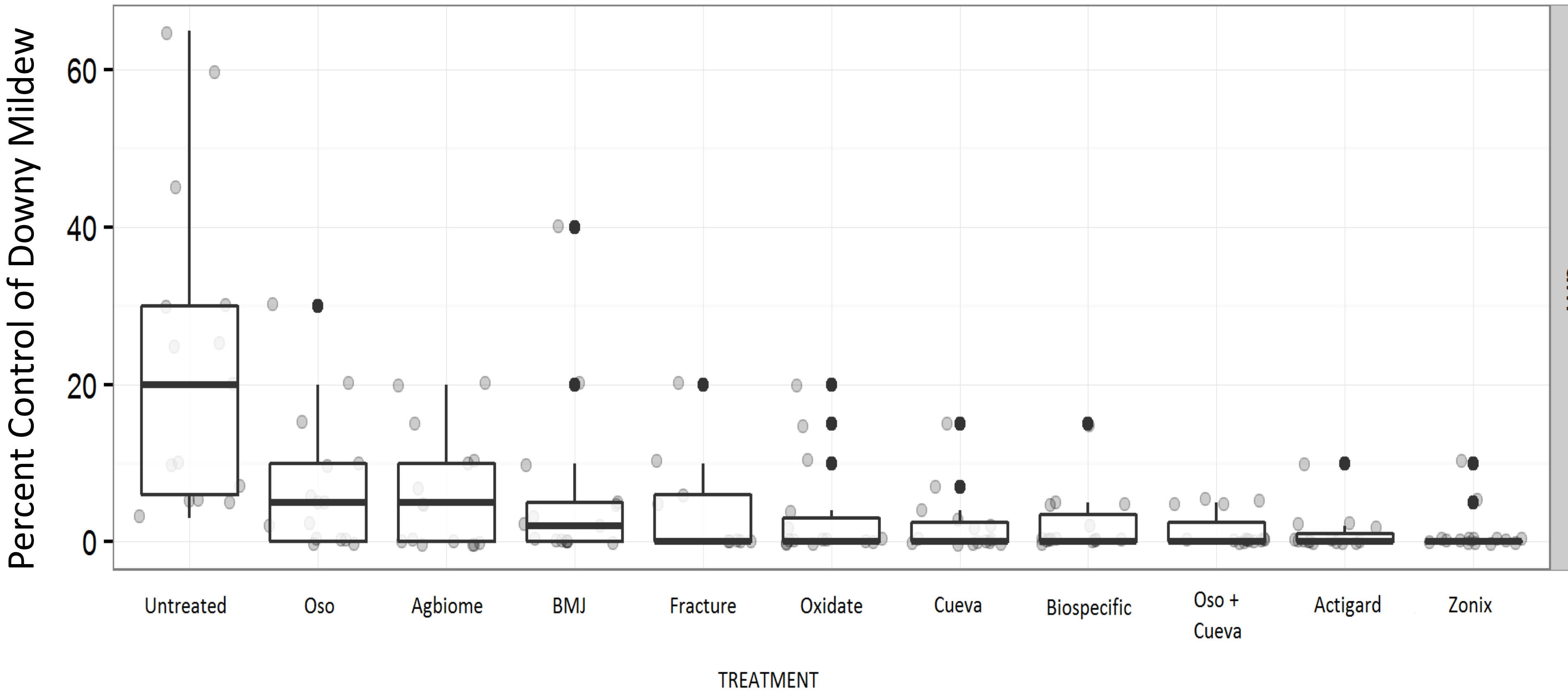
Directed applications around woody plants would be safe.

More information on safety to ornamental grasses is needed.

Should expand testing arborvitae, taxus, cephalataxus, fir and spruce.



Downy Mildew in Organic Spinach

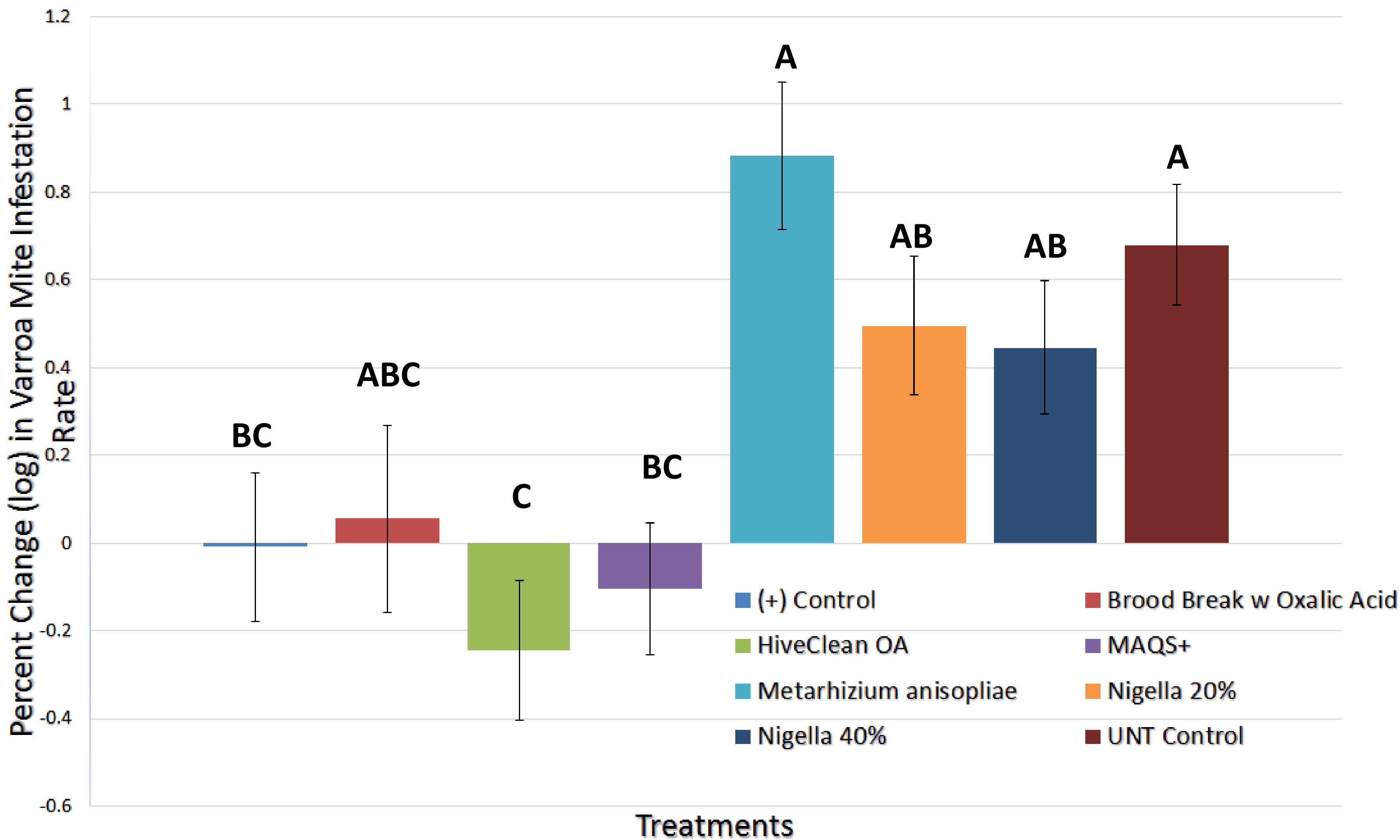


Neil McRoberts

University of CA, Davis

Several successful products, but might be some need for dose/application adjustment

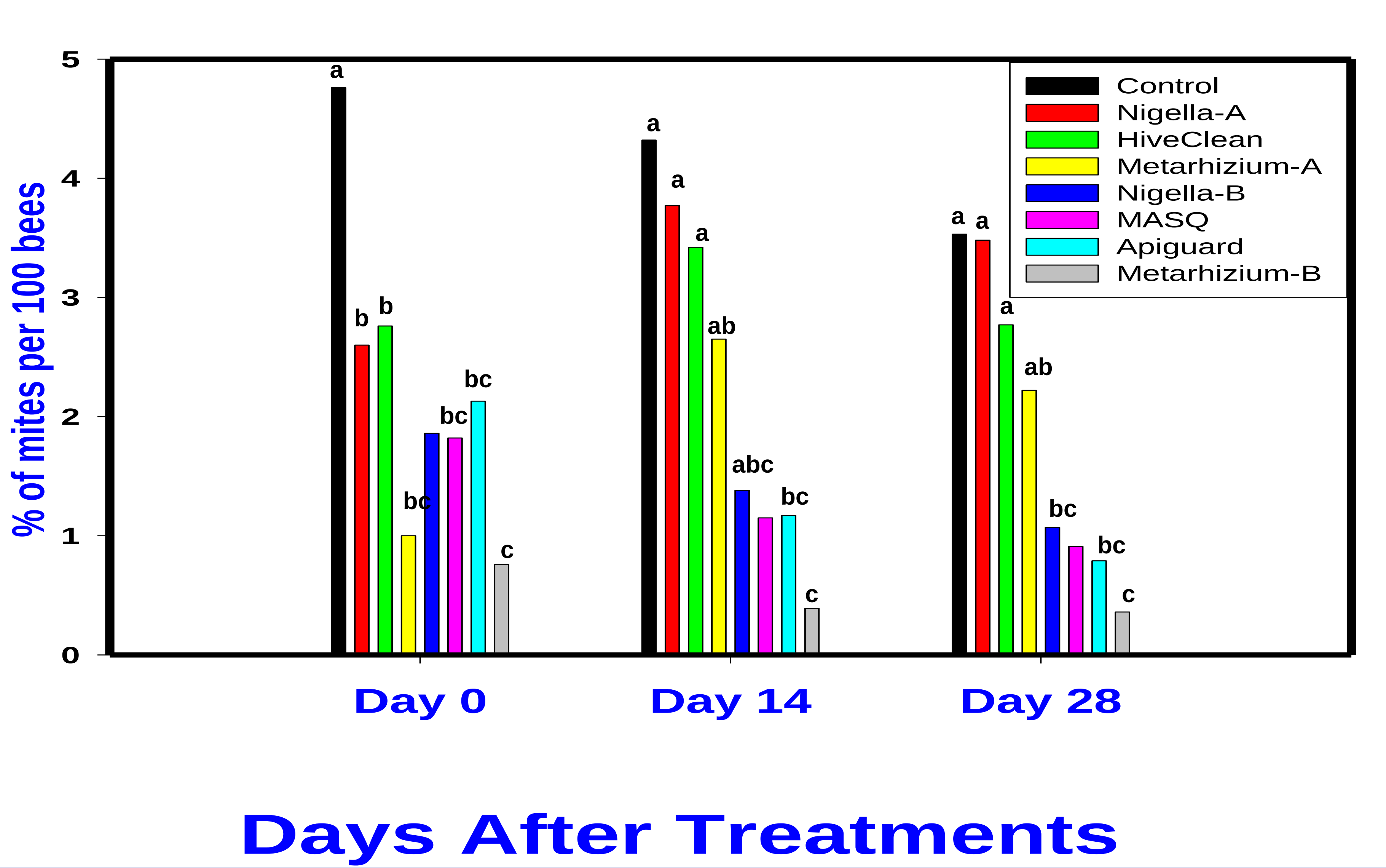
Nino- UC Extension



Mean mite % infestation at 8 weeks post initial treatment (data transformed for graphical purposes)

Mite Infestations of Adult Bees Post-Treatments

L. Kanga Florida A&M



- Overall several miticides tested could provide suscessful control of Varroa mites

- **Needs**
  - Improve formulations
  - Consistency
  - Delivery systems
  - Time of applications

Mean *Bemisia tabaci* 1st thru 4th instar nymphal densities (± SE). Summer 2016.

Formulation	Amt/100 gal	*Bemisia tabaci* 1st thru 4th instar nymphs (±SE) per 10 leaflets 25 Jul
Water-treated	--	191.3 ± 63.0a
Botanigard 22W	1.0 lb	19.0 ± 11.5bc
PFR-97 20% WDG	28.0 oz	21.0 ± 7.3bc
Requiem Prime EC	3.0 qt	85.5 ± 38.1ab
M-Pede	2.0% vol/vol	22.5 ± 13.6bc
Sivanto Prime (once)	14.0 fl oz	0.0 ± 0.0c
VST-006330	4.0 lb	94.5 ± 31.1ab
P-value<0.0001		

Whitefly total- all life stages

Treatment	Pre-treatment	Week 4
Non-treated Control	16.40±4.02	66.70±11.38ab
Botanigard	13.55±2.98	80.25±16.50a
PFR-97	13.00±3.72	95.5±17.22a
Requiem Prime	15.55±4.88	52.6±10.21ab
M-Pede	21.75±6.45	52.20±7.51ab
Sivanto	6.90±2.16	3.5±1.30cd
Sivanto	10.00±3.86	10.95±3.1c
Sivanto + Botanigard	13.40±4.71	4.60±1.69c
Sivanto + PFR-97	14.10±4.06	5.95±1.06c
Sivanto + Requiem Prime	10.35±6.33	2.15±0.42d
Sivanto + M-Pede	7.75±2.11	3.60±2.20cd
VST-006330	11.70±3.65	8.70±1.75c
Statistics	Df=11; F=0.96	Df=11; F=7.59
P value	0.4822	<0.0001

Rajagopalbabu Srinivasan, University of Georgia, Tifton

Clavibacter- Tomato. Sally Miller OSU

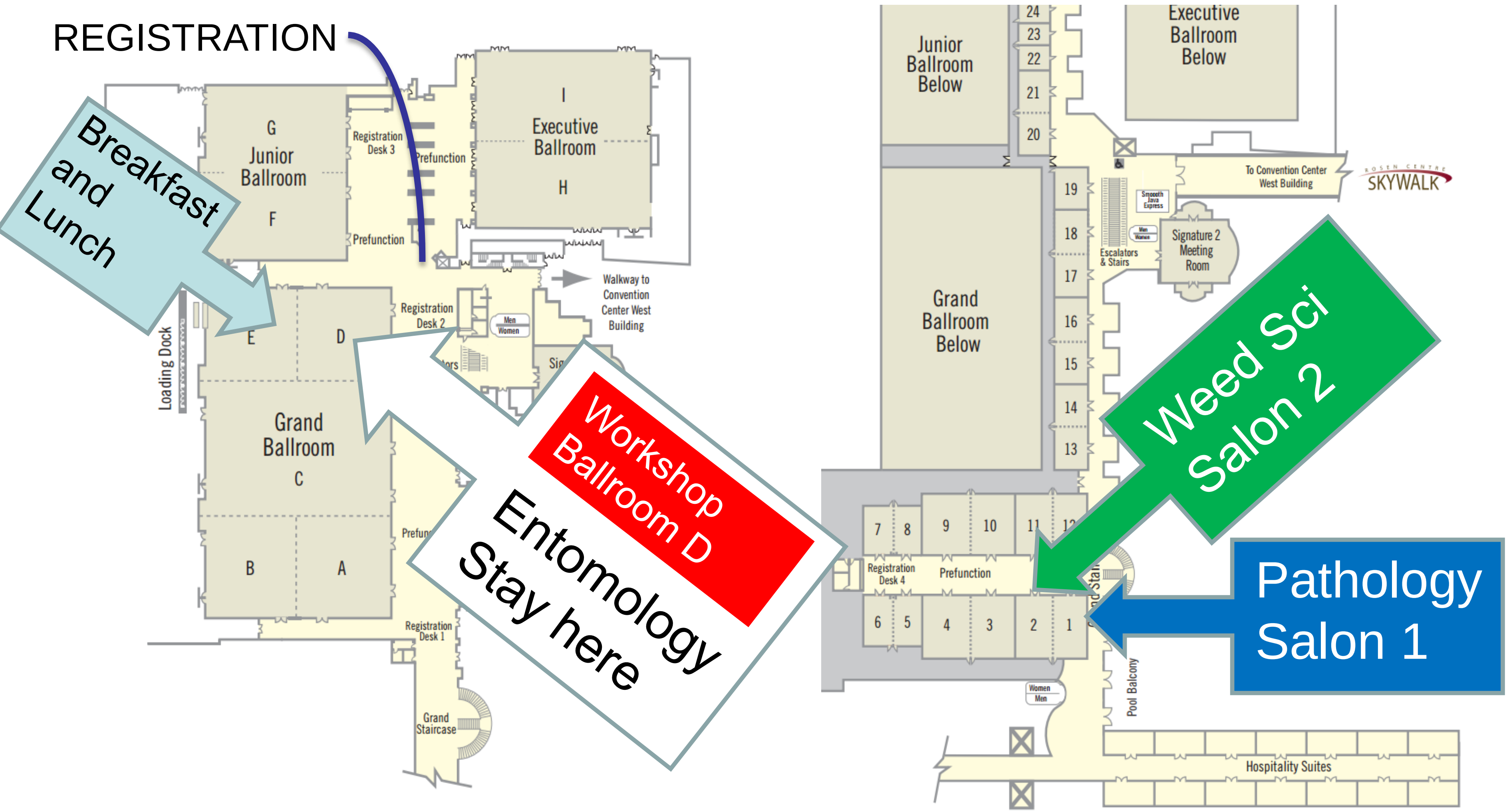
Gray- Similar to non-inoculated control

Treatment and rate	19 Aug		26 Aug	
	severity (%)	incidence (%)	severity (%)	incidence (%)
(1) Non-treated non-inoculated	6.3 ef	37.7 cd	13.0 d	54.2
(2) Non-treated inoculated	15.5 a	66.2 ab	28.8 a	85.2
(3) Actigard 50WG 0.25 oz/100 gal drench (6,7)[y] fb K-Phite 7LP 3.0 qt/A (1-12)[x]	6.0 ef	41.3 bcd	11.8 d	58.8
(4) CEASE 4 qt/100 gal + MilStop 2 lb/100 gal (2-5)[z] Serenade Opti 20.0 oz/A + Milstop 2.0 lb/A (1-12)[x]	9.8 c-f	47.9 a-d	16.3 bcd	59.9
(5) Double Nickel LC 1.0 qt/100 gal drench (1-5,7)[y] Double Nickel LC 1.0 qts/A (1-12)[x]	14.3 ab	68.2 a	28.8 a	77.0
(6) K-Phite 7LP 3.0 qt/A + AgriPhage CMM 1 pt/50 gal/A (1-5)[z] + Actigard 50WG 0.25 oz/100 gal drench (6,7)[y] fb K-Phite 7LP 3.0 qt/A + AgriPhage CMM 1 pt/50 gal/A (1-12)[x]	6.8 ef	43.7 a-d	15.3 cd	64.5
(7) K-Phite 7LP 3.0 qt/A + AgriPhage CMM 1 pt/50 gal/A (1-5)[z] K-Phite 7LP 3.0 qt/A + AgriPhage CMM 1 pt/50 gal/A (1-12)[x]	7.5 ef	50.8 a-d	16.8 bcd	71.5
(8) Cueva 2.0 qt/A (1-5)[z] Cueva 2.0 qt/A (1-12)[x]	10.3 b-e	58.0 abc	17.5 bcd	66.7
(9)Manzate ProStik 75DF 2.0 lbs/A foliar (1-5)[z] Actigard 50WG 0.25 oz/100 gal drench (6,7)[y] fb Manzate ProStik 75DF 2.0 lb/A (1-12)[x] + Actigard 50WG 0.33 oz/A (1,3)[x] + Actigard 50WG 0.50 oz/A (5,7)[x] + Actigard 50WG 0.75 oz/A (9,11)[x]	7.0 ef	52.5 a-d	17.5 bcd	70.7
(10)	12.5 abc	69.0 a	24.5 ab	76.9
(11)	5.5 f	27.9 d	13.8 d	38.5
(12)	11.5 a-d	64.2 ab	24.0 abc	76.0
P value	0.0001	0.0450	0.0128	0.1686

Rosen Hotel – Meeting registration and breakout

Level 1

Level 2 Upstairs



Breakout discussion

Group discussion leaders

- Entomology- Hugh Smith, Doug Walsh, Oscar Liburd, Keith Dorschner, Bill Barney, Dan Kunkel
- Plant Pathology- Gary Vallad, Sally Miller, Meg McGrath, Joe DeFrancesco, Michael Braverman
- Weed Science- Cheryl Wilen, Krista Coleman, Marija Arsenovic, Jerry Baron

Breakout Groups

Guidance/Goals of the Biopesticide Workshop Breakout Groups:

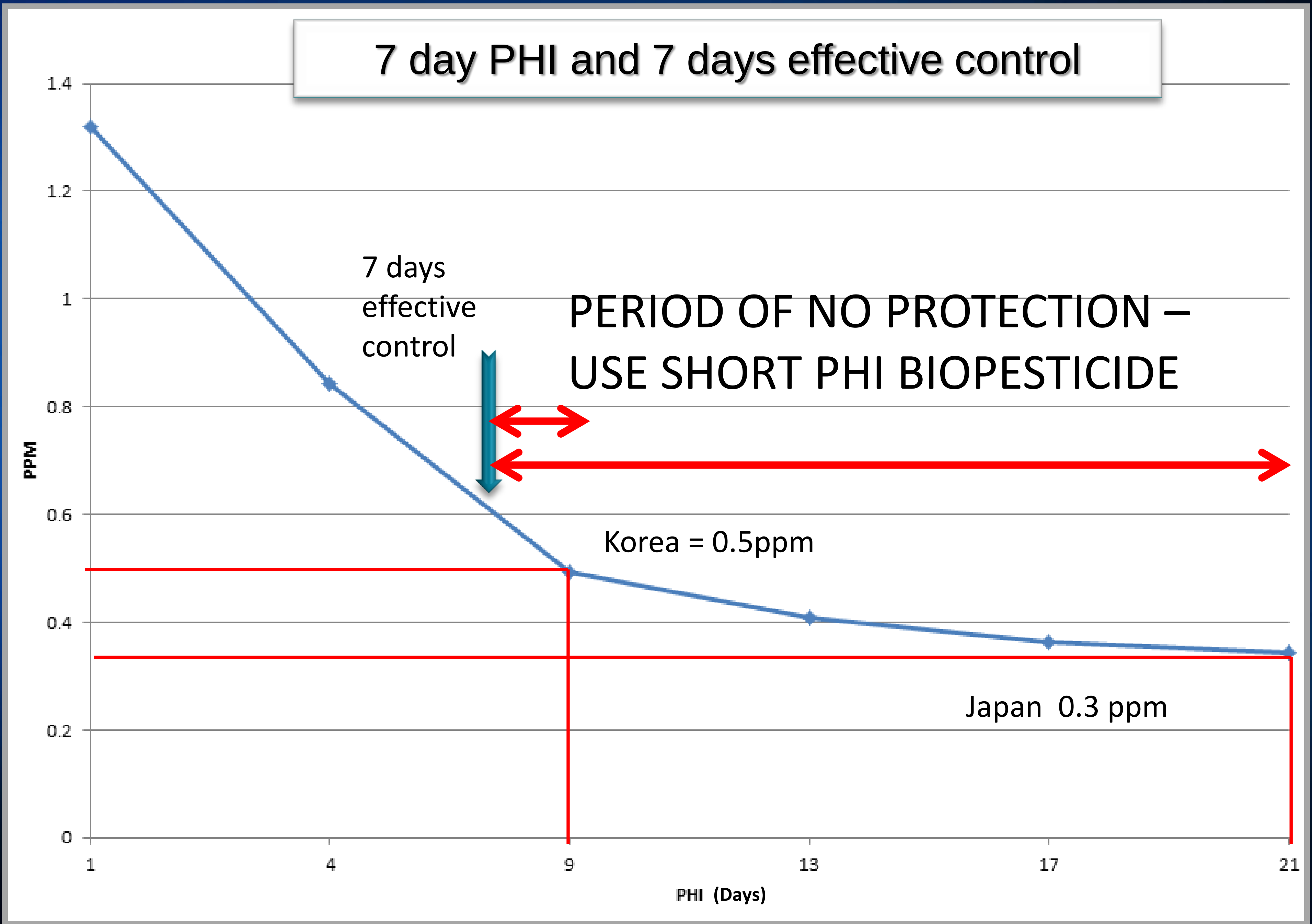
1. What are the greatest pest management needs?
2. Results from last year- Encouraging, need repeating, new products to evaluate, integration?
3. Availability of existing conventional and biopesticide tools.
4. Additional factors such as -Resistance management, IPM, pending losses of registered products, Section 18s
5. Needs of organic agriculture
6. Are there biopesticide products to test (Early, Advanced, Demonstration Stage)?

2016 Biopesticide Workshop

Fruit	Organic	Orn Hort	Other	MRL-Residue mitigation	Vegetables
Spotted wing drosophila/ All cr	Fire blight	*Cryphonectria parasitica* (Chestnut	Weeds/ A cro		Bacterial Diseases Fruiting Veg. - field & GH
Bl ba			arroa m / hone		Whitefly/ vegetables
St Bl		nt d	Public Health / Mosquito		Downy Mildew / Basil (field & GH) and basil and cucurbits
B / strawberry, raspberry	corymbosum (mummy berry disease) / Blueberry (	Roses, Gerbera	Public health/ Tick		Pepino Mosaic Virus / Tomato (GH)

Top conventional pesticide trade irritants with decline curves conducive to mitigation with biopesticides- Extend the PHI of the conventional and fill the pest control void with biopesticide products

Pesticide Degradation – Decline curve



MRL- Pesticide Residue Mitigation

1. Crop export concerns- What are the conventional products causing trade irritants?
2. Differences in MRLs between US and export countries
3. Decline curves/persistence
4. PHI, retreatment interval
5. Target pests in last application
6. Biopesticides available to impact late season pests

How important and how wide is the gap in MRLs/tolerances?

GOAL- Suggest top 3 per research category

	Fruit	Organic	Other	Orn Hort	Residue	Vegetable
Ent	1.)	1.)	1.)	1.)	1.)	1.)
	2.)	2.)	2.)	2.)	2.)	2.)
	3.)	3.)	3.)	3.)	3.)	3.)
Path	1.)	1.)	1.)	1.)	1.)	1.)
	2.)	2.)	2.)	2.)	2.)	2.)
	3.)	3.)	3.)	3.)	3.)	3.)
Weeds		1.)	1.)	1.)	1.)	1.)
		2.)	2.)	2.)	2.)	2.)
		3.)	3.)	3.)	3.)	3.)

Jerry Baron

IR-4 Biopesticide Program

Future Plans

Jerry Baron
Executive Director
The IR-4 Project

Where Are We Coming From

- Storied History (pre-1982)
- Biopesticide Program 1.0
  - Regulatory Support & Research Grants
- Biopesticide Program 2.0
  - Organic Support & Demonstration
- Limited human and financial investment
- Biopesticide Program 3.0
  - Respond to research priorities

Dedicated resources to help develop technology

Trends with Biopesticides

Significant involvement in pest management

↓

Snake oils/farmers “burned”

↓

New technology/small business

↓

Large scale adaption of products that work

↓

Major new investments

IR-4's Future with Biopesticides

- Expansion of activities to answer numerous requests - $ dependent
- Vision of reorganization of IR-4's Food Program priority setting with integration of biopesticides
  - Prioritize most critical pest management needs
  - Look at all types of solutions
  - Develop appropriate data to support solutions
  - Concerns?

IR-4 Biopesticide Workshop

Office of Pesticide Programs Perspectives

Linda Hollis, Chief
Biochemical Pesticides Branch
Biopesticides and Pollution Prevention Division

The Office of Pesticide Programs Considered Biopesticide Efficacy Trial Priorities

- Various Office of Pesticide Program staff provided input on biopesticide efficacy trial priorities.

The Office of Pesticide Programs Considered Biopesticide Efficacy Trial Priorities

Priorities were primarily based on:

(1) products that might be able to address public health concerns - such as mosquito or tick products

(2) products that might become an alternative or mitigate a pest which was responsible for any section 18 emergency exemption and

(3) any new technology or pesticide that might address pest problems in managed bees, such as Varroa mites, or small hive beetles.

OPP Priorities

<u>Bees</u>

- Small hive beetle / Honey bee B00118
- Tracheal mite/ honeybees B00014
- Varroa mite / honey bees B00015

<u>Citrus Greening</u>

- Asian Citrus Psyllid / Citrus B00086
- Citrus canker/ citrus B00020
- Citrus greening/ citrus B00019

OPP Priorities

Public Health

- Mosquito B00075
- Tick B00001

Chestnut

- Chestnut Blight B00064 *via virus and transgenic chestnut PIP*

OPP Priorities

<u>Others</u>

- Green mold (Trichoderma) / mushroom houses B00042
- Brown Marmorated Stink Bug B00028, B00029
- Hop Downey Mildew B00254, B00232, B00233, B00239, B00240, B00258, B200251, B00231, B00256, B00237, B00242
- Aflatoxin B00036, B00037, B00038, B00288
- Cabbage maggot/Brassica crops (Not on IR-4 List)
- Methyl bromide replacements / tree fruit B00155
- Glyphosate resistant weeds B00002

Comments & Discussion

Ideal Project?

Guidance/Goals of the Biopesticide Workshop Breakout Groups:

1. Severe pest problem-
2. Efficacy potential very high
3. New tools –Not yet registered
4. Organic problem and organic approach
5. IPM, Environmental issue, Section 18, Resistance

6 All 4 regions US

7 Solves Export problem

	SWD	Fire Blit	Cuke Beetl	CNut	Weed Org Sweet Potato	Weed Orn	VMite	Bact FVeg	Clavi	White Fly Fruit Veg	Downy Org	Ginseng
Severe	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Efficacy	Y	Y	N	Y	N	Y	N	N	Y	N	N	N
New BP	N	N	N	Y	N	Y	Y	N	N	N	N	N
Organic	Y	Y	Y	N	Y	N	N	N	N	N	Y	N
IPM Resist	Y	Y	Y	N	N	N	Y	Y	N	Y	Y	Y
4 Region	Y	Y	N	N	Y	Y	Y	Y	N	Y	Y	N
Export	Y	N	N	N	N	N	Y	Y	N	Y	Y	Y

Break time. Yeah !

IR-4 Regional Coordinator Comments

2017 IR-4 NCR Biopesticides Priority Needs

Satoru Miyazaki
IR-4 NCR Field Coordinator
Michigan State University

Entomology

Blueberry Stem Gall wasp B00119

- PPWS
- The gall that is formed retards and distorts current season growth which reduces the number of floral buds for the next season's crop.
- Affecting over 30,000 acres
- Spreading into the main region

Blueberry Stem Gall Wasp

- Some cultivars are highly susceptible, accounting for over 30% of Michigan acreage.
- Growers need a bee-safe approach to protect blueberry shoots from stem gall wasp.
- Application at timings outside bloom could also provide control if product can penetrate young blueberry shoots

Blueberry stem gall wasp

This native wasp pest lays eggs in young blueberry shoots <u>during bloom</u>, leading to a galling response from the bushes. Galls grow as green kidney-shaped structures during summer then harden around harvest time. Galls can also be found in clusters leading to contamination risk.

MICHIGAN STATE UNIVERSITY

Slides prepared by Rufus Isaacs – isaacsr@msu.edu

Blueberry Stem Gall Wasp

Blueberry Stem Gall Wasp

Entomology

Spotted Wing Drosophila

- Still causing losses to berry growers in NCR
- Had to stop picking their fields prematurely this summer
- Restrictions on reapplication
- Not enough effective biopesticides to get growers through the growing season

Entomology

Ornamental Horticulture

- Greenhouse B00152 and B00133
- Spider mites, also Thrips and Whiteflies on Gerbera

Label Expansions for Insecticidal Soap, Horticultural Oil and *Beauveria bassiana* Products to Allow Dip Treatments for Cuttings to control thrips

Pathology

Fruit

- Grape/Fruit rot complex B00052; B00063; B00061
- Blueberry/ Mummy berry, Anthracnose B00062

Vegetables

- Carrot/Cavity spot, forking and stubbing caused by Pythium spp. B00284

Pathology

Ornamental Horticulture

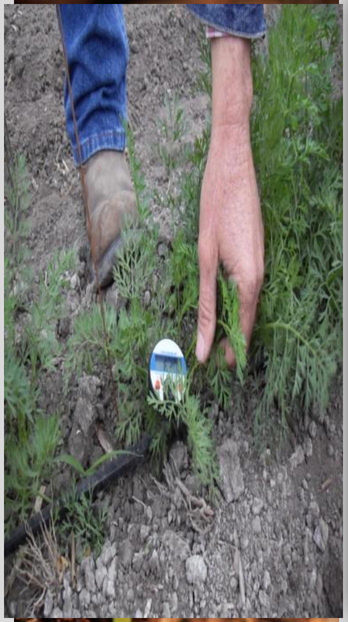
American Chestnut/Chestnut Blight B00064

- caused by the fungus *Cryphonectria parasitica*.
- a virus disease severely weakening the pathogenic fungus allowing the tree to prevent further infection
- need to develop protocols that will allow us to register the material for commercial use.

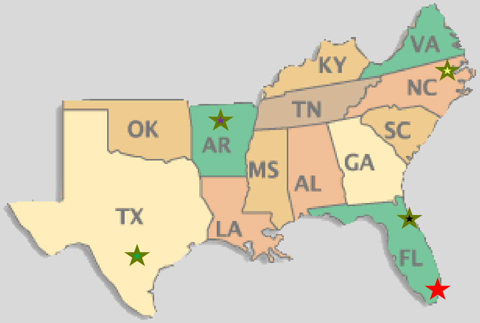
Thank You!

Southern Region Biopesticides Priorities

Michelle Samuel-Foo, PhD
IR-4 Regional Field Coordinator
UF UNIVERSITY of FLORIDA IFAS



How Were Priorities Gathered?



- 2015 IR-4 Southern Region Priority Setting Workshop in Coconut Grove, FL
- Emails to Southern Region Stakeholders seeking input.
- Direct communication with university faculty and researchers.

The IR-4 Project

Post Harvest Disease Control in Sweet Potato

Courtesy Dr. Lina Maria Quesada, NCSU

Background:

- Sweet Potatoes: 7th most important food crop in the world!
- North Carolina responsible for >50% of U.S. production
- In 2014 NC had 72,000 acres harvested, valued at $355 million
- 15


Getty Images North America

Issue:

- Acreage and exports are quickly expanding but disease mgmt tools are not keeping pace
- Not enough clean seed available for acreage
- Less land for rotations and fields becoming infested with soilborne pathogens
- Cultural management not enough
- Few chemical control options


Mississippi Sweet Potato Council

Rhizopus Soft Rot

- Caused by *Rhizopus stolonifer*
- Necrotrophic fungus → entire root can rot in as little as 3 days
  - Export roots can be at sea 7-14 days
- Pathogen is ubiquitous
- Was mainly controlled with dichloran (Botran) but export markets do not allow it anymore
- Need more options to help the industry!

Courtesy Dr. Lina Maria Quesada, NCSU

Target Spot & Early Blight of Tomato

Courtesy Dr. Gary Vallad, UF-GCREC

Background

- Target spot caused by *Corynespora cassiicola* and early blight by *Alternaria tomatophilia* and *A. solani*.
- Both are aggressive pathogens of foliage and fruit.
- Pathogens produce airborne conidia that cause premature defoliation and fruit losses under favorable weather conditions that can dramatically reduce marketable yields.
- Fruit infections can lead to rapid breakdown of ripening fruit during delivery.

Target Spot & Early Blight of Tomato

Courtesy Dr. Gary Vallad, UF-GCREC

- Issues:
- Contact fungicides give best control early in the season when canopy is not dense.
- As canopy density increases, current labelled fungicides (even systemic fungicides) give unsatisfactory levels of control. Little control of fruit infection.
- Fungicide resistance is also becoming a big issue for the tomato industry.
- Small fruit lesions are easy to overlook in packing lines. These small lesions cause post-harvest breakdown of fruit that can lead to rejected shipments.
- Growers are looking for products with minimal post-harvest intervals for mitigating harvest and post-harvest fruit losses.

Michelle Samuel-Foo

Anthracnose of Pomegranate

Courtesy Dr. Gary Vallad, UF-GCREC

Background

- Anthracnose, caused by *Colletotrichum* spp. cause defoliation and fruit rot.
- Pathogen is common on pomegranate throughout Southeast.
- Pathogen produces windborne ascospores and conidia that are splash dispersed during rain events. Pathogen causes premature defoliation and fruit losses under favorable weather conditions.
- Pathogen is often recovered from flower buds and blooms early in the season.

Michelle Samuel-Foo

Anthracnose of Pomegranate

Courtesy Dr. Gary Vallad, UF-GCREC

Issues:

- New industry in the Southeast, with few conventional products and little efficacy data available for labelled biopesticides.
- Fruit loss is a major limitation to increased commercial production.
- Residue testing performed for two effective fungicides. Both products are high-risk for resistance. Resistant isolates already identified in research trials.
- Growers are looking for products with minimal post-harvest intervals for protecting foliage mitigating fruit losses.
- Growers have expressed interest in organic pomegranate production.

Michelle Samuel-Foo

Bacterial Blight of Snap Beans in Florida

Courtesy Dr. Shouan Zhang, UF

Background

- Florida is ranked No. 1 in the US production, acreage, and total value of fresh market snap beans
- Florida growers harvested 32,000 acres of snap beans with $135 million in 2009-2010
- South Florida produces 100% of US fresh market snap beans during winter months
- Miami-Dade County ranks No. 1 in FL and USA in production of fresh market snap beans.

Bacterial Blight of Snap Beans in Florida

Courtesy Dr. Shouan Zhang, UF

Background:

- Common bacterial blight is caused by *Xanthomonas campestris* pv. *phaseoli*, in snap beans in Florida.
- Severity increases when there is higher rainfall during the winter months
- The bacterium is known to be seed borne
- Up to 100% of plants can be infected, with up to 43% reductions in total yield and further losses occurring due to the poor quality of infected pods

Issues:

- Copper application is the major control strategy however, control is often unsatisfactory.
- Lack of efficacy appears to be related to the frequent occurrence of copper-resistant strains of bacterial pathogens, therefore others need to be evaluated

Weed Management in Row Middles in Organic Production

Background:

Courtesy Dr. Nathan Boyd, UF

- Organic growers have limited to no management options for row middles where weeds can compete with the crop and host pests and diseases
- Broadleaf weeds are the easiest to kill but most bioherbicides are weak on grasses

Issue:

- Weed management in row middles. Use of Bioherbicides in combination with conventional herbicides for resistance management is needed
- Need a bioherbicide that moves in the plant as there are no effective management options for perennial weeds such as nutsedge
- Many bioherbicides would be excellent tank mix partners on conventional farms for resistance management but the price of most products is the limiting factor.


thank you!