

BioControl in the Greenhouse Sponsored by:




2:00 to 2:25 Eastern

PESTICIDES- ARE THEY EVER COMPATIBLE WITH A BIOCONTROL PROGRAM?



Rick Yates
GGSPRO Technical Services
Griffin Greenhouse Supplies
ggspro@griffinmail.com






Pesticides- Are They Ever Compatible with a Biocontrol Program?


Rick Yates
GGSPRO Technical Services Manager
January 30, 2015

 **Altogether. Better.**

Pesticides- Compatible with a Biocontrol Program?

Integrated Pest Management approach implies a variety of tactics that interact with each other.

- Cultural controls- nutrition, bloom date manipulation, optimizing growing environment, sanitation
- Scouting/monitoring- essential!
- BCA's- "Compatible" Pesticides




"Compatible" Pesticides

Just how compatible are they?

Toxicity Legend		
	Toxic	>75% mortality
	Moderately Toxic	50-75% mortality
	Slightly Toxic	25-50% mortality
	Safe	< 25% mortality


What about sub-lethal effects?



Sub-lethal Effects on BCA's


- Residual activity
 - ▶ Residues may have repellent activity thus influencing the ability of parasitoids or predators to locate a food source.
 - ▶ Residues on a potential host may make them unacceptable to a parasitoid or predator.

Adapted from: "Compatibility Conflict: Is the Use of Biological Control Agents with Pesticides a Viable Management Strategy?"- R. Cloyd, Kansas State University



Sub-lethal Effects on BCA's

- ▶ May affect reproduction such as sterilizing females, reducing egg laying or impact the ratio of females vs. males.
- ▶ Foraging behavior may be modified and reduce the ability of a parasitoid or predator to find a host (Elzen 1989).



Compatible Pesticides

Why even use them??

© 2015 Griffin Greenhouse Supplies, Inc.



Why BCA Compatible Pesticides?

- Weather changes abruptly from cool to warm and the pest population ramps up faster than the BCA's.
 - ▶ Ex- aphids, thrips in the typical spring greenhouse.
- BCA suppliers run into shortages and transportation difficulties and miss shipments at crucial times.

© 2015 Griffin Greenhouse Supplies, Inc.



Why BCA Compatible Pesticides?

- Incoming plant material has an unacceptably high level of pests.
- Sometimes there are so many overlapping pests that it is difficult to control all with only BCA's.
- An unanticipated pest arrives.
- Stuff happens!

© 2015 Griffin Greenhouse Supplies, Inc.



Compatible Pesticides- Where are the Resources?

- Biocontrol companies
- University and extension researchers
- Pesticide companies
- Grower anecdotes- Careful with this...

© 2015 Griffin Greenhouse Supplies, Inc.



What are the Challenges?

- So many BCA/pesticide combos to test
 - ▶ Needed data often lacking
- Difference in testing techniques can cause apparent contradictions
 - ▶ Greenhouse vs petri dish?
 - ▶ Was it tested as a spray, drench or both?

© 2015 Griffin Greenhouse Supplies, Inc.



Minimizing Pesticide Risks to BCAs

- Pesticide records available for incoming plant material?
- Use lowest rates and least BCA toxic products that will give effective control
- Spot treat where practical


© 2015 Griffin Greenhouse Supplies, Inc.



Choosing Compatible Pesticides

- Identify compatible pesticides when the crops are being planned. (This is planning to succeed, not planning to fail!)
- Consider all BCA's that might be used in the course of production.
 - ▶ Need ability to react quickly to save the BCA program.
- Determine acute toxicity to BCA's & length of residual.
 - ▶ Don't forget fungicides and PGR's.


© 2015 Griffin Greenhouse Supplies, Inc.



BCA "Hit List"

- **Synthetic pyrethroids:** ≥ 8 wk residual
 - ▶ Ex: Decathlon (cyfluthrin), Talstar (bifenthrin), Tame (fenpropathrin)
- **Organophosphates:** avg 4-8 week residual
 - ▶ Ex: Acephate/Orthene, Dursban/Duraguard (chlorpyrifos)
- **Carbamates:** ≥ 8 wk residual
 - ▶ Ex- Mesuro (methiocarb), Sevin (carbaryl)

© 2015 Griffin Greenhouse Supplies, Inc.



What is a Biorational Pesticide?

- EPA definition for Biorational Pesticide
 - ▶ "Fundamentally different modes of action"


and

- ▶ "Lower risks of adverse effects"

When compared to conventional pesticides (i.e. neurotoxin).

- Exs- IGR's, insecticidal soaps, horticultural oils, microbial insecticides.


© 2015 Griffin Greenhouse Supplies, Inc.



Examples of Biorational Pesticides

Fungicides	Insecticides
• Actinovate SP	• Aria/Endeavor
• Affirm	• Azatin/Azaguard
• Cease	• Botanigard/Mycotrol
• Companion	• Conserve
• Milstop	• Dipel
• Oxidate	• Essential oils
• Rootshield	• IGR's
	• M-Pede


© 2015 Griffin Greenhouse Supplies, Inc.
<http://extension.umass.edu/fruitsadvisor/nc-small-fruit-management-guide/biorational-pesticides>



Examples of Biorational Pesticides

Fungicides	Insecticides
• Actinovate SP	• Aria/Endeavor
• Affirm	• Azatin/Azaguard
• Cease	• Botanigard/Mycotrol
• Companion	• Conserve
• Milstop	• Dipel
• Oxidate	• Essential oils
• Rootshield	• IGR's
	• M-Pede


Red font = known BCA toxicities
<http://extension.umass.edu/fruitsadvisor/nc-small-fruit-management-guide/biorational-pesticides>



Biorational = BCA safe?

- Conserve is a biorational pesticide
 - ▶ Safe for most mites
 - ▶ Toxic to *Aphidius spp.*, *Encarsia formosa*, *Eretmocerus spp.*, and *Orius*
- Pyganic (natural pyrethrin plus PBO)
 - ▶ Toxic to nearly all BCA's with an average one week residual effect


© 2015 Griffin Greenhouse Supplies, Inc.



Caution is needed... **BEWARE**

- PGR's??
 - ▶ Cycocel reduced spider mites for up to 6 months on hibiscus*
- “Inert” ingredients and formulations matter.
 - ▶ Example: *Beauveria bassiana* products


*Osborne and Chase. HortScience 25:648-650



Caution is needed... **BEWARE**

- Milstop fungicide
 - ▶ Labeled in NY to control: aphids, spider mites, mealybugs, whiteflies.
 - ▶ BCA's??
- Surfactants
 - ▶ CapSil gave 53% mealybug mortality in one study*, better than some of the tested insecticides.


*Raymond Cloyd, Pest Management, Vol 26 No2, “Consider Alternative Products for Pest Control”



Things to keep in mind

- Read and follow everything on the pesticide labels!!!
 - ▶ Caution- labels change!
- Not all mentioned pesticides are labeled in every state.
- Products other than those mentioned may be safe and effective.

© 2015 Griffin Greenhouse Supplies, Inc.



Short Residual- “Clean Up” Pesticides



Examples:

Pesticide	Pests Controlled	Comments
Botanigard ES, WP	Aphids, thrips, whiteflies	Toxic to some BCA's. 1 week or less residual
Horticultural oils	Mites, scale, mites, mealybugs, whiteflies	Toxic to many BCA's. 1 week or less residual
Insecticidal soaps	Aphids, mealybugs, mites, many others	Toxic to many BCA's. 1 week or less residual
Floramite	Mites	Toxic to some BCA's. 1 week or less residual
Pyganic	Flying insects, beetles, caterpillars, many others	Toxic to many BCA's. 1 week or less residual


About the Pesticide/BCA Compatibility Tables

- Multiple sources used when available.
- Typically went with the most pessimistic.
- Table is revised as more data is found.
- Time on table refers to persistence.
- Immature life stages noted if different from adult.

© 2015 Griffin Greenhouse Supplies, Inc.

© 2015 Griffin Greenhouse Supplies, Inc.



BCA Compatibility Ratings

Toxicity Legend		
	Toxic	>75% mortality
	Moderately Toxic	50-75% mortality
	Slightly Toxic	25-50% mortality
	Safe	< 25% mortality

“S” on following tables = Safe

© 2015 Griffin Greenhouse Supplies, Inc.

Pest Specific Compatible Pesticides

Crop Key for Pesticide Use	
H	Harvest – Edible crops grown to harvest
T	Transplants – Edible crops as transplants for re-sale
O	Ornamentals – Non-edible crops

Always check the product label for the list of edible crops as included crops vary.

© 2015 Griffin Greenhouse Supplies, Inc.

Pest Specific Compatible Pesticides

Disclaimer-

Recommendations for BCA compatible pesticides are made based on a compilation of published data but cannot be guaranteed under all circumstances. Growers need to test on a small scale before large scale applications.

© 2015 Griffin Greenhouse Supplies, Inc.

Compatible Pesticides- Aphids

Pesticide	<i>Aphidius colemani</i>	<i>Aphidius ervi</i>	<i>Aphidioletes aphidimyza</i>	Lacewing <i>C. carnea</i>	H,T,O	OMRI
Azatin O, Azaguard, Molt-X	S	S	S	S	H,T,O	Yes
Endeavor	Slightly Toxic* 1 wk	Slightly Toxic* 1 wk	Slightly Toxic 1 wk	S	O	No
Flagship (drench only)	S	?	S	?	O	No
Grandevo PTO	S	?	S	?	H,T,O	Yes

* Mummies safe

© 2015 Griffin Greenhouse Supplies, Inc.

Compatible Pesticides- Aphids

Pesticide	<i>Aphidius colemani</i>	<i>Aphidius ervi</i>	<i>Aphidioletes aphidimyza</i>	Lacewing <i>C. carnea</i>	H,T,O	OMRI
Kontos (drench only)	S	S	S	S	T,O	No
Marathon (drench only)	S	S	S	S	T,O	No
Preferal	S	S	S	S	H,T,O	Yes
Safari (drench only)	S	?	S	?	O	No

© 2015 Griffin Greenhouse Supplies, Inc.

Compatible Pesticides- Fungus Gnats

Pesticide	<i>Atheta coriaria</i>	<i>Hypoaspis miles*</i>	<i>Steinernema feltiae</i>	H,T,O	OMRI
Adept	Toxic larvae 2 wks	S	S	O	No
Azatin O, Azaguard, Molt-X	?	S	S	H,T,O	Yes
Citation	Toxic larvae 2 wks	S	S	O	No
Distance	?	S	S	H,T,O	No
Flagship (drench only)	Toxic 1 wk	Toxic	S	O	No
Gnatrol	S	S	S	H,T,O	Yes
Safari (drench only)	Toxic 1 wk	?	S	O	No


* AKA *Stratiolaelaps scimitus*

© 2015 Griffin Greenhouse Supplies, Inc.

Compatible Pesticides- Spider Mites

Pesticide	<i>Amblyseius andersoni</i>	<i>Amblyseius californicus</i>	<i>Amblyseius cucumeris</i>	<i>Phytoseiulus persimilis</i>	H,T,O	OMRI
Floramite	?	S	S	Moderate Toxic 1 week	H,T,O tomato	No
Hexygon	S	S	S	S	O	No
Kontos (drench only)	S	S	S	S*	T,O	No
Ovation	S	S	S	S	O	No
Preferal	?	S	S	S	P,T,O	Yes
Shuttle	?	S	S	Slightly Toxic 1 week	H,T,O tomato	No


* One study indicated slight toxicity but did not specify spray or drench



Compatible Pesticides- Thrips

Pesticide	<i>Amblyseius cucumeris</i>	<i>Amblyseius swirskii</i>	<i>Orius</i>	<i>Steinernema feltiae</i>	H,T,O	OMRI
Aria	S	Slightly Toxic 2 wks	S	S	O	No
Azatin O, Azaguard, Molt-X	S	Slightly Toxic 1 wks	Nymphs Slightly Toxic 2 wks	S	H,T,O	Yes
Botanigard, Mycotrol	S	S	Slightly Toxic 2 wks	S	H,T,O	No Yes
Flagship (drench only)	S	S	Toxic 4 weeks	S	O	No
GRANDEVO PTO	***	***	S	?	H,T,O	Yes


** Slightly toxic to *A. californicus*, unknown for *A. cucumeris* and *A. swirskii*



Compatible Pesticides- Thrips

Pesticide	<i>Amblyseius cucumeris</i>	<i>Amblyseius swirskii</i>	<i>Orius</i>	<i>Steinernema feltiae</i>	H,T,O	OMRI
Kontos (drench only)	S	S	Slightly Toxic* 4 weeks	S	T,O	No
Overture	***	***	S	S	O	No
Pedestal	S	?	S	?	O	No
Preferal	S	S	S	S	H,T,O	Yes
Safari (drench only)	S	Toxic 2 wks	?	S	O	No

*Kontos, 3 sources said safe
** NoFly- currently unavailable
***Overture- safe on predator mites per grower reports, no data



Compatible Pesticides- Whiteflies

Pesticide	<i>Amblyseius swirskii</i>	<i>Encarsia formosa</i>	<i>Eretmocerus spp</i>	H,T,O	OMRI
Aria	Slightly Toxic 2 weeks	S	S	O	No
Azatin O, Azaguard, Molt-X	Slightly Toxic 1 wk	Slightly Toxic 2 wks Larvae Safe	S	H,T,O	Yes
Botanigard	S	Slightly Toxic 1 wk	S	H,T,O	Mycotrol Yes
Kontos-drench only	S	S	?	T,O	No
Pedestal	S	S	S	O	No
Preferal	?	S	S	H,T,O	Yes
Safari-drench only	Toxic	Slightly Toxic 4 wks	S	O	No
Talus	Slightly Toxic 1 wk	Slightly Toxic 1 wk Adults Safe	S	H,T,O Tomato	No

BioControl in the Greenhouse



Coming Up Next:
2:30 to 2:55 Eastern

The Fundamentals of Biocontrol of Fungal and Bacterial Diseases

Margery Daughtrey



Time	Topic
3:00 to 3:25	Case Studies of Using Biocontrol for Disease Control in Greenhouse Crops
3:30 to 3:45	Wrap-up/Questions