

BioControl in the Greenhouse Sponsored by:

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CASE STUDIES OF USING BIOCONTROL FOR DISEASE CONTROL IN GREENHOUSE CROPS

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How You Grow Matters[™]

BioWorks[®] How You Grow Matters[™] **Overview**

Our Goal:

- Learn how to develop your own disease management program with biopesticides
 - Foliar Disease Management
 - Soilborne/Root Disease Management
 - Evaluating Biopesticides in your operation

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Biopesticide Basics

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BioWorks[®] How You Grow Matters[™] **Why Growers Start and Continue to Use Biopesticides**

1. Low REIs and PHIs
2. Safer for workers, consumers, & environment
 - Many exempt from tolerances and MRLs
3. Reduce development of resistance to synthetic pesticides – no known resistance to multiple-MOA biopesticides
4. Improve efficacy of chemical- and bio-pesticides
5. Some can provide cost-effective disease control
6. Improve plant, soil and environmental health over time with continued use

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BioWorks[®] How You Grow Matters[™] **Biopesticide Basics**

What do they do?

1. Suppress plant diseases and pests via one or more of modes of action (MOAs)
2. Act **preventively** rather than curatively (most)
3. Are effective at low to moderate disease pressure
4. Frequently provide other beneficial effects

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BioWorks[®] How You Grow Matters[™] **Biopesticide Basics**

What they don't do

1. Offer 100% protection – no pesticide does
2. Cure diseases (few exceptions)
3. Work in environmental extremes
4. Work at high disease pressure
5. Last indefinitely
 - most have defined shelf lives and storage conditions
 - may require frequent application, especially on foliage
6. Make a bad grower good

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Biopesticide Best-Use Practices for Integrated Disease Management

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General Best-Use Practices

1. Think **proactive** or **preventive**: exclusion, sanitation, environment
2. Obtain **accurate diagnosis** of the problem
3. Select the **right product** for the right disease
4. Follow **label instructions**: rates, safety, storage
5. **Appropriate formulation** for the job:
 - WP, WDG, ES, EC (spray, sprench, dip or drench)
 - Granular or WP (soil or seed treatment)
6. **Test new products** on a smaller scale before going "all out"
 - Set-up a good comparison
 - Integrate vs. replace

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General Best-Use Practices

7. **Proper application**
 - Select the most appropriate application method
 - Select the right equipment for the job
 - Calibration and maintenance of equipment are critical
 - Know when and how often to apply
8. **Pay attention to shelf life and storage conditions/limits** – Many biopesticides are living organisms
9. **Consider compatibility with other products and practices**
 - Tank-mix or rotational compatibility can help economize programs and increase efficacy
 - Find alternatives or time applications to overcome incompatibilities

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Opportunities with Compatibility

Use Compatibility to your advantage

- **Types:**
 - Tank mix: sprays, drenches, dips
 - Short-term post application
 - Rotation/alternation
- **Resistance management** (conventional chemistries and antibiotics)
- **Reduced input programs** (reduced chemical exposure)
- **Clean-up/quick knock-down** of chemical and extended protection by biopesticide
- **Increased efficacy and cost efficiency** (labor)

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Foliar/Fruit Biopesticides

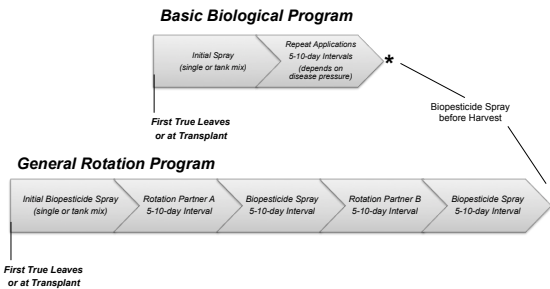
General Characteristics of Foliar Biopesticides

- Act or respond immediately to many fungal and bacterial pathogens
- Good coverage and proper concentration are critical
 - Typically not systemic
- Require frequent reapplication or rotation with other products during disease periods
 - New growth of plant parts
 - Lack nutrients for sustained growth on aerial plant surfaces
 - Environmental degradation or loss (UV, precipitation, etc.)
- Compatible with many chemical- and bio-pesticides

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Foliar Programs (Preventive)



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Soil/Root Biopesticides

General Characteristics of Soil/Root Biopesticides

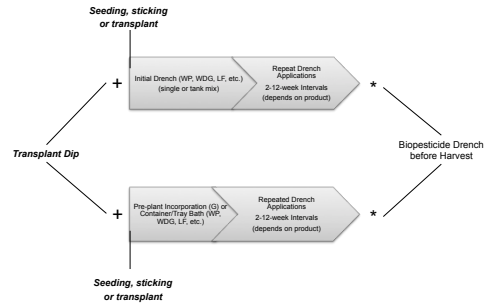
- May act quickly or after a lag period
- Typically act via 2 or more modes of action
- Good distribution and proper concentration are critical – typically not systemic
 - Bacterial require nutrients and free moisture to move, grow
 - Fungal are less dependent on moisture to move but still require nutrients for growth in absence of pathogen
- Activity for 2-12 weeks, depending on the AI
 - Reapplication may still be needed to keep at effective levels
- Compatible with many chemical- and bio-pesticides

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Soilborne Programs (Preventive)

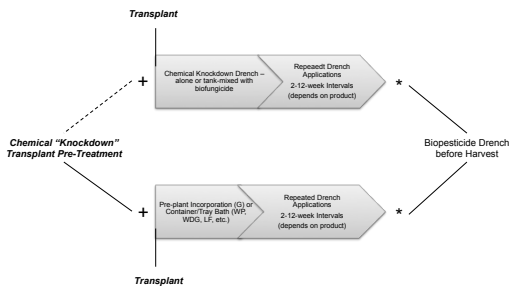


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Soilborne Programs ("Knockdown" + Preventive)



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Tips for Developing Your Own Program

1. Think **proactive or preventive**: exclusion, sanitation, environment
2. Properly identify the disease issues (don't assume)
3. Determine which products, practices, and timings you are currently using for these and their costs in use: be wary of unregistered products
4. Identify gaps in your current program:
 - Efficacy
 - Resistance
 - Compatibility
 - Safety
 - Convenience
 - Market
 - Labor

How do you measure these?

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Tips for Developing Your Own Program

5. Define what success looks like
6. Contact manufacturer and extension for advice: a lot of great application information is not on the label
7. Test new products on a smaller scale before going "all out"
 - Set-up a good comparison
 - Integrate vs. replace
8. Document your tests
 - Keep track of what, how and when
 - Record what you and your staff see and experience
 - Photos: the good, the ugly, and the surprises

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