



BioWorks®

How You Grow Matters™

Responsible

| Economical

| Proven

Biological Disease Control – Grow your Own

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IPPS Western Region Meeting San Diego, CA

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The Grow Your Own Concept

- By “planting” or applying very small dormant propagules of beneficial microbes to your rooting medium the result is a population of organisms that provide many benefits including protecting your plant roots from disease. While the “crop” doesn’t produce a plant of aboveground beauty or utility, some biological fungicides can result in hairy, disease-free, vigorous roots which to a grower are beautiful things!

Table 1. List of Some Biological Fungicides

Product/Type/REI	Source	Organism	Formulation/ Reapp
Actinovate® (bacterium) [REI-1]	Natural Industries, Inc.	<i>Streptomyces lydicus</i> (WYEC 108)	Powder (season long)
Actino-Iron (bacterium) [REI-4]	Natural Industries, Inc.	<i>Streptomyces lydicus</i> (WYEC 108)	Granular (season long)
CEASE® (bacterium) [REI-4]	BioWorks, Inc.	<i>Bacillus subtilis</i> (QST 713)	Liquid (3 – 4 weeks)
Companion® (bacterium) [REI-4]	Growth Products, Inc	<i>Bacillus subtilis</i> (GB03)	Liquid (2 – 4 weeks)
Mycostop® (bacterium) [REI-4]	Verdera Oy	<i>Streptomyces griseoviridis</i> (K61)	Powder (2-6 weeks)
PlantShield® HC (fungus) [REI-0]	BioWorks, Inc.	<i>Trichoderma harzianum</i> strain T-22	Powder (10 – 12 weeks)
RootShield® (fungus) [REI-0]	BioWorks, Inc.	<i>Trichoderma harzianum</i> strain T-22	Powder or granules (10 – 12 weeks)
SoilGard 12G (fungus) [REI-0]	Certis USA, LLC	<i>Gliocladium virens</i> strain GL-21	Granules (1 – 4 weeks as needed)

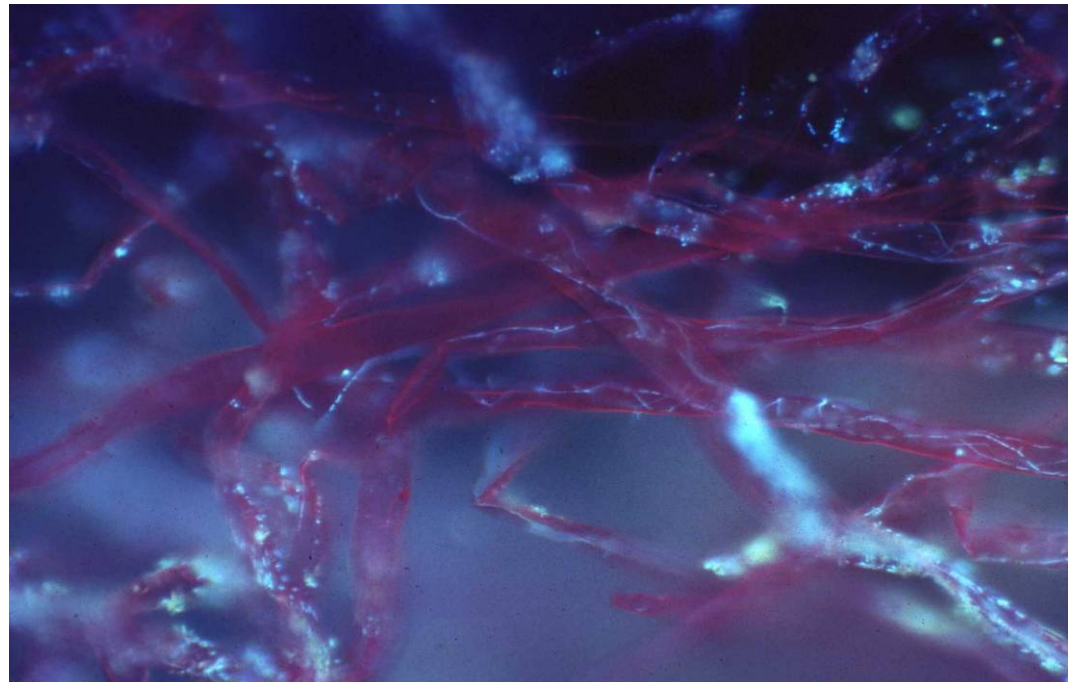
Strengths & Weaknesses

(Vary by product)

- Frequency of application
- Sensitivity to other inputs (Cu, H₂O₂, etc.)
- Mixing and prep complexity
- Disease spectrum
- Solubility or practicality of rate
- Shelf life, storage conditions

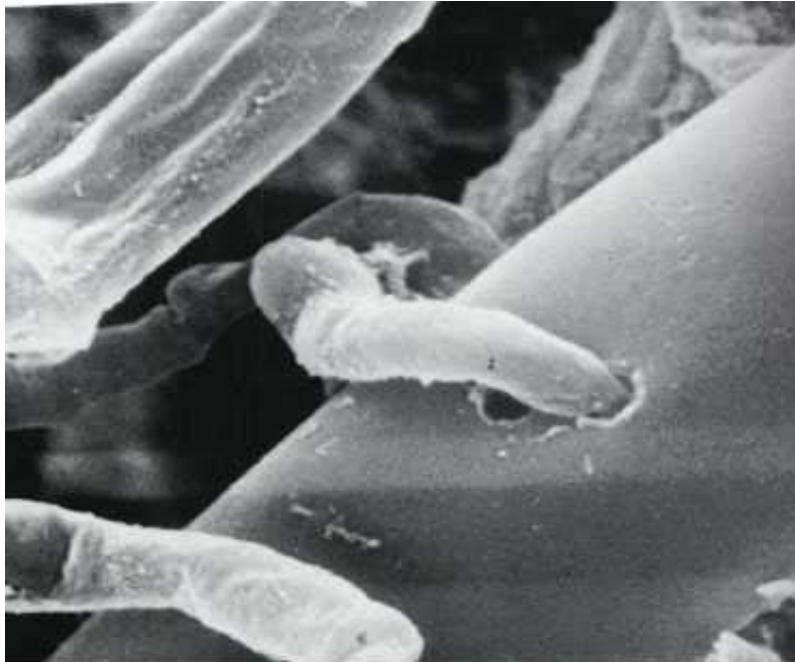
- The main principle is numbers. Introduce a high enough population of good organisms to overwhelm the bad or ineffective organisms.

Competitive
exclusion
(competition for
nutrients and
space)



HOW DO THEY WORK? (2)

- Mycoparasitism (one organism eating the other)



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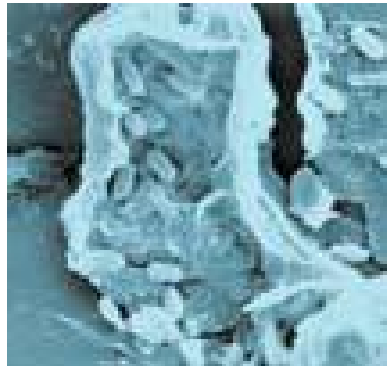
HOW DO THEY WORK? (3)

- Antagonism



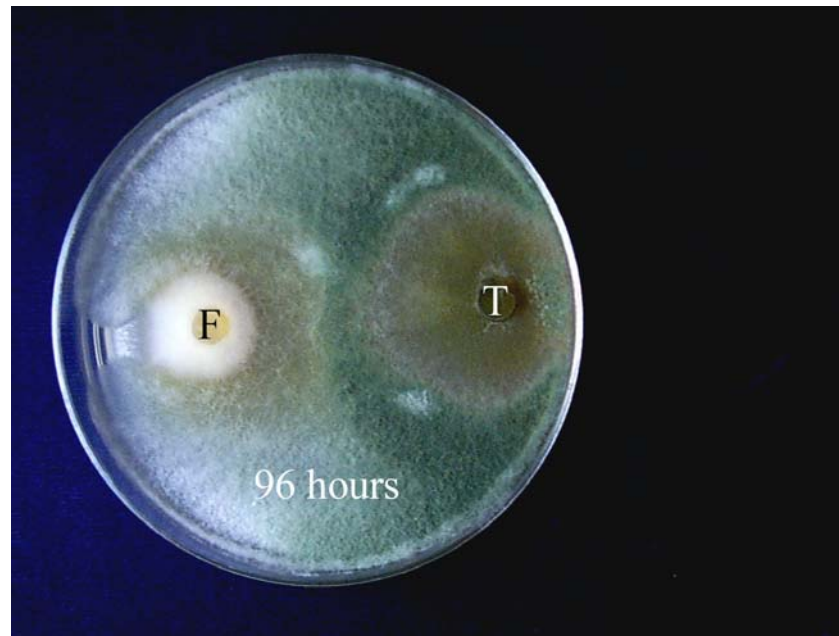
HOW DO THEY WORK? (4)

Disruption of pathogen cell membranes with metabolites, including lipopeptides



HOW DO THEY WORK? (5)

Production of antibiotic agents, anti-fungal enzymes



WHY CONSIDER BIOLOGICAL FUNGICIDES?

- An effective part of overall root disease program
- Eliminate or reduce use of chemical fungicides
- Integrates well into sustainability efforts
- Can be softer on tender plant material

WHY CONSIDER BIOLOGICAL FUNGICIDES? (2)

- Use to break disease resistance potential
- Many labeled for edible crops (vegetables, herbs)
- Short or no Restricted Entry Interval (REI)
- Compatible with biocontrols agents (BCAs) (predatory mites, insects)
- Fit well into the “Clean Plants” concept of history or pedigree of the crop (start to finish)

FACTORS FOR SUCCESSFUL USE

- Preventative only – Apply early!
- Use throughout the propagation/production cycle starting with stock plants
- Be sure you use a living biological fungicide product – observe expiration dates
- Apply appropriate rates (get enough on)

FACTORS FOR SUCCESSFUL USE (2)

- Be aware of chemical compatibilities – what can be applied without impacting the biological fungicide
- Compare to standard practice at first (with no, or reduced chemical fungicide applications)
- Match the product's labeled diseases to the potential crop diseases

FACTORS FOR SUCCESSFUL USE (3)

- Observe reapplication intervals (Careful of “season long” claims)
- Maintain proper storage conditions for the biological fungicide
- Consider combinations to broaden control
- Remember that like chemical fungicides biological fungicides are not a “silver bullet”, nor “bullet-proof”

WHY DON'T RESEARCHERS ALWAYS GET GREAT RESULTS?

- Many researchers have applied a chemical eradicator protocol to a preventative product:
- Artificially high pathogen inoculant load (to show kill in control plants)
- Not enough time given to allow the biological fungicide to adequately colonize the root system
- Worst case testing which favors the pathogen, often overwhelming the biological fungicide

(Complexity varies by product)

- Media incorporation
- Media drench
- Wet dip (usually trays, flats, cuttings)
- Dry dip into powder (usually cuttings before sticking)



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Cost Effectiveness

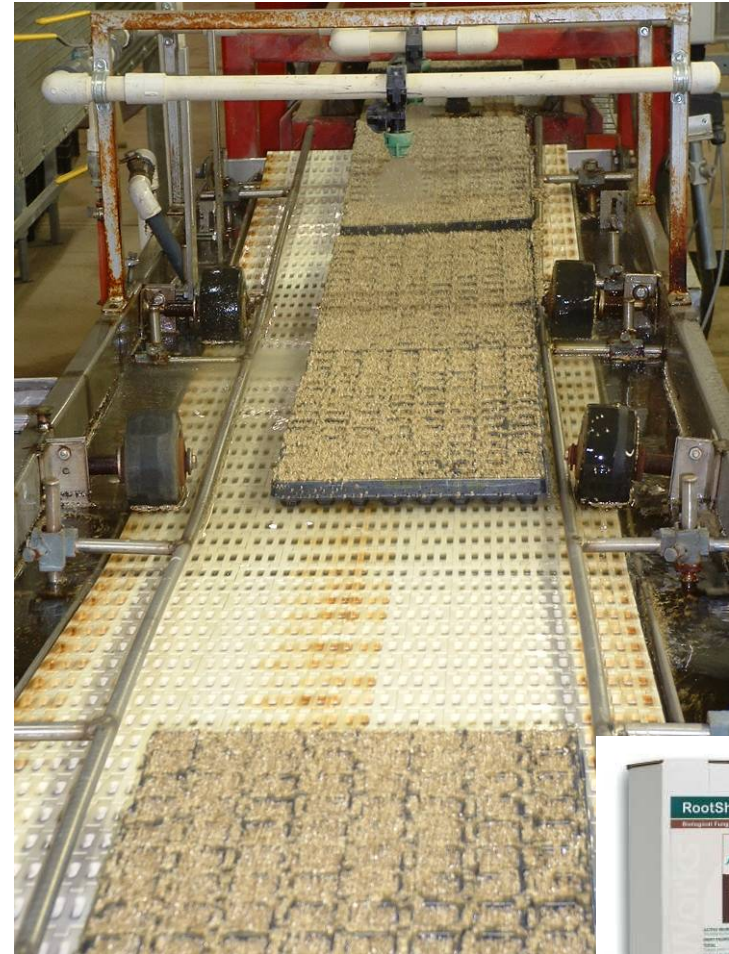
- Depends on product
- Application frequency is significant (material + labor)
- Cost per production unit
- Cost of present program
- Cost of ineffectiveness
- Other issues: Labor costs, sustainability, worker safety, plant establishment

CASE STUDY

- Large Midwestern greenhouse with 35 acres of seeded plug production
- Was subirrigating each tray with Cleary's 3336 at ½ rate
- Problems with phytotoxicity in some crops, short residual control, concern over worker safety

CASE STUDY (2)

- For several years now uses PlantShield HC/ RootShield WP subirrigated on every tray
- Results: No phytotoxicity, 0-hour REI, no worker concerns, long term disease control, cost-effective, clean, well-rooted product



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Summary

- The careful selection of a biological fungicide, being aware of the product's characteristics and proven track record, and understanding the factors for effective use, excellent root disease control can be maintained in all types of propagation where roots need protection from diseases.



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Questions? Contact John Francis at 800-877-9443
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RootShield®, PlantShield® HC, MilStop®, CEASE®, SuffOil-X™,
BotaniGard®, Mycotrol O®, NemaShield™

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