Grimm Family
Center for Organic
Production & Research

Enhancing sustainable Californian organic agriculture through research & education

Strengths and Weaknesses of Fungicide and Insecticide Biocontrol Products for Organic Growers

Presented by:
Gina Bella Colfer
Matthew J. Grieshop PhD

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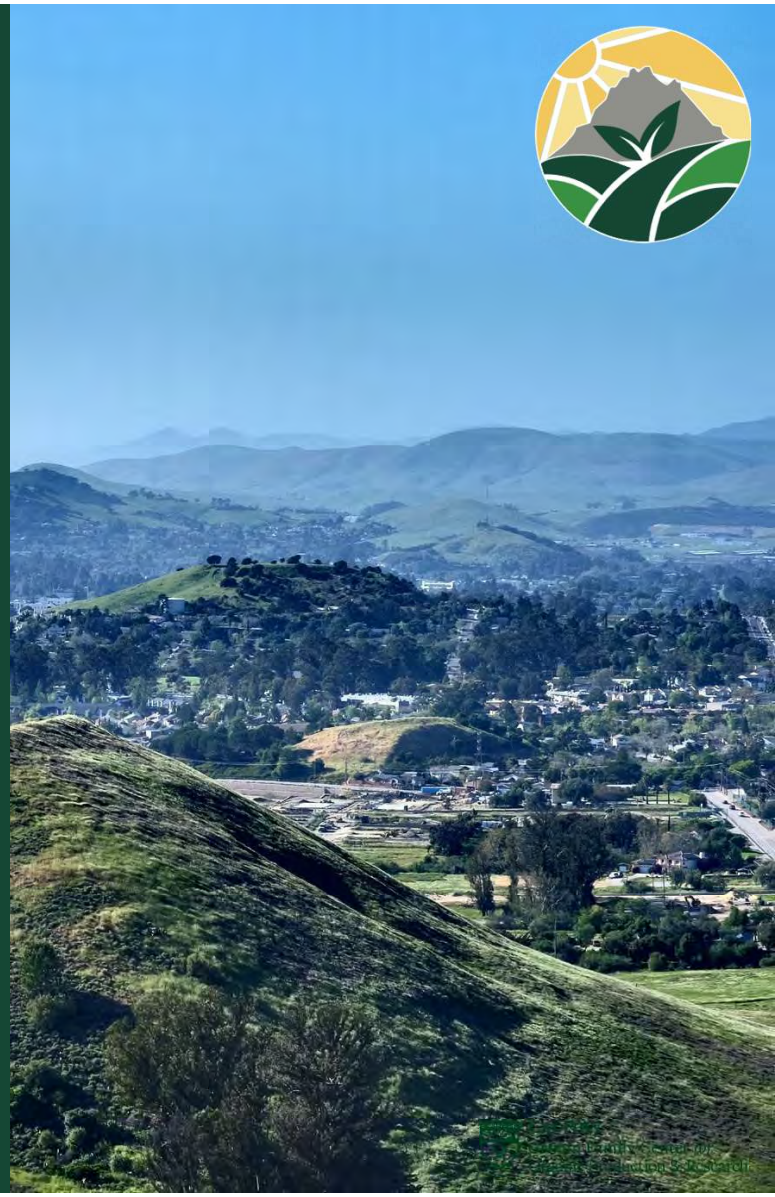
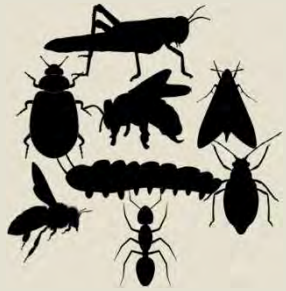


Contents

Insecticide Performance Characteristics

- Spectrum of activity
- Speed of action and potency
- Delivery pathway
- Residual
- Cost

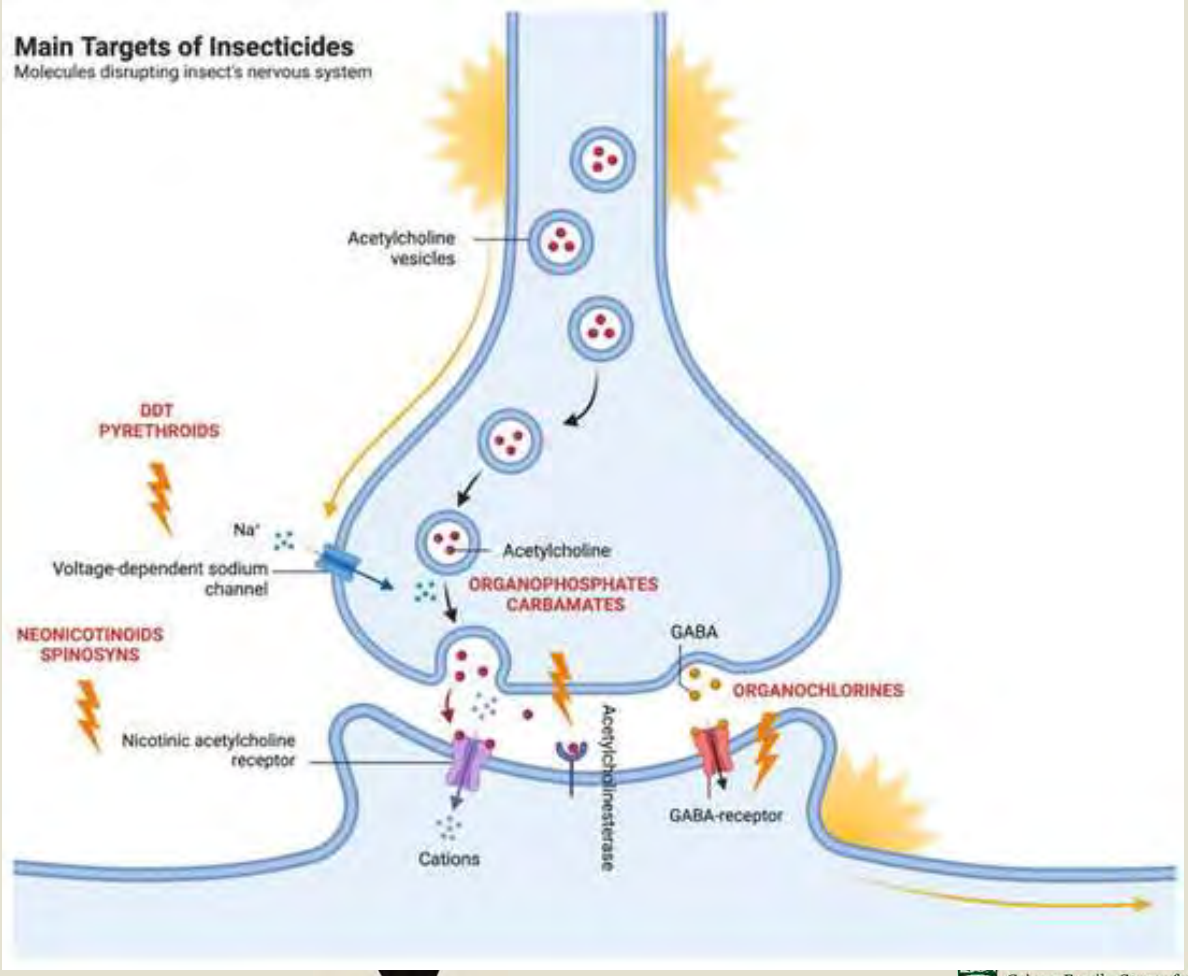


Insecticide Performance Characteristics

- **Broad Spectrum**
- Speed of action and potency
- Delivery pathway
- Residual
- Cost

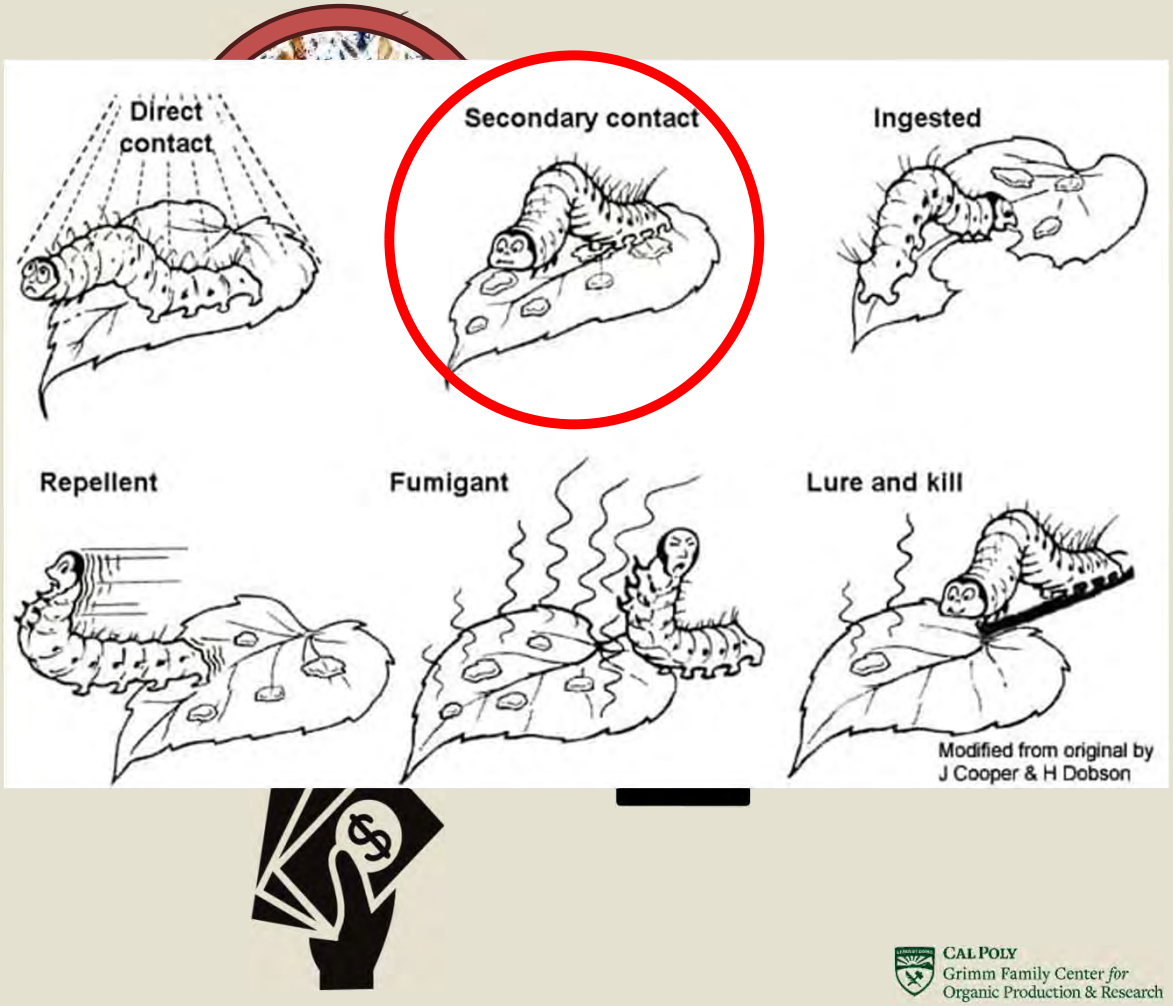
Insecticide Performance Characteristics

- Broad Spectrum
- **Fast and Low Dose**
- Delivery pathway
- Residual
- Cost



Insecticide Performance Characteristics

- Broad Spectrum
- Fast and Low Dose
- **Secondary Contact**
- Residual
- Cost

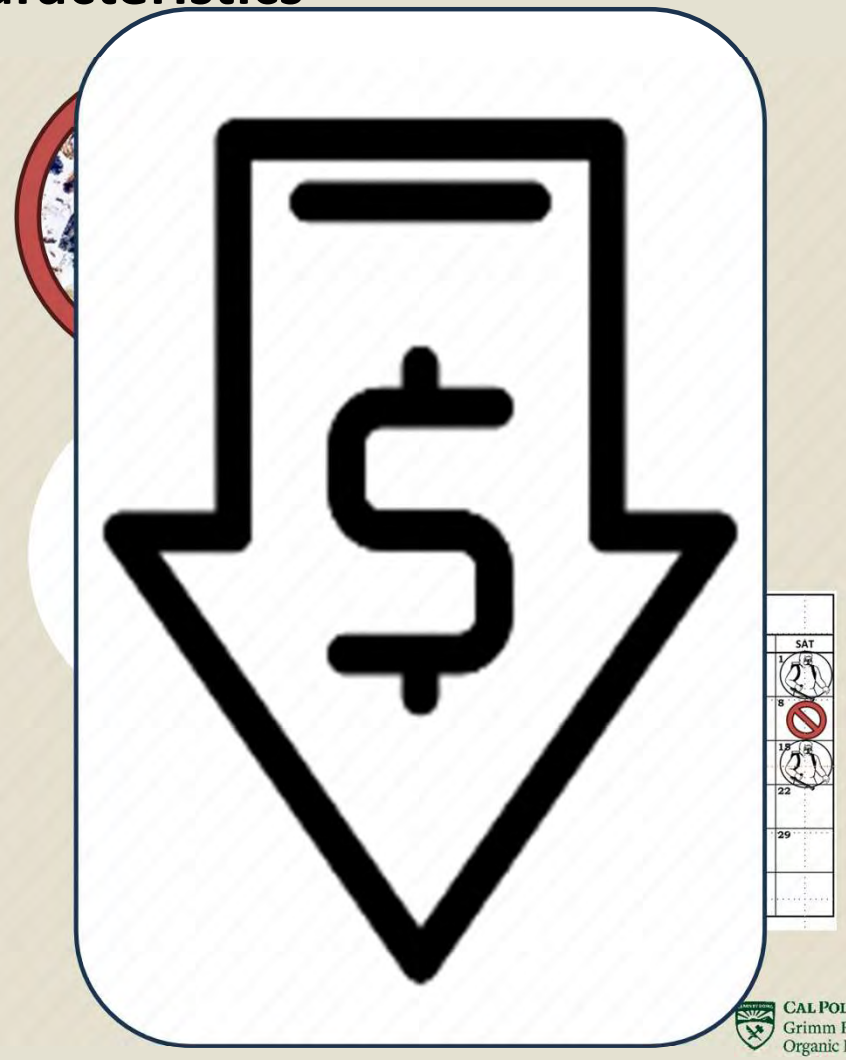


Insecticide Performance Characteristics

- Broad Spectrum
- Fast and Low Dose
- Secondary Contact
- **2+ Weeks**
- Cost

Insecticide Performance Characteristics

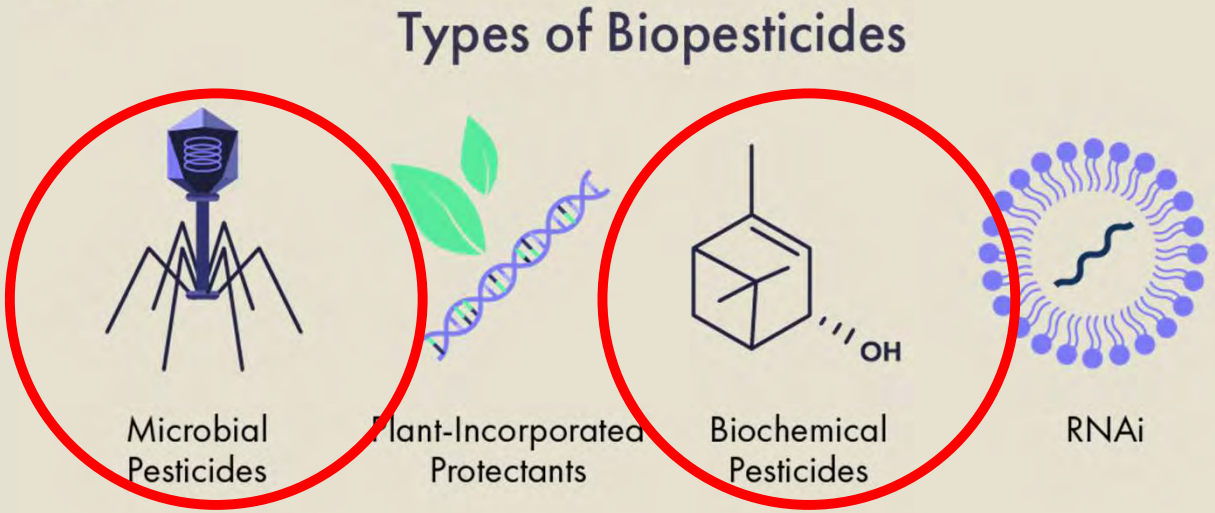
- Broad Spectrum
- Fast and Low Dose
- Secondary Contact
- 2+ Weeks
- **Inexpensive**



Bioinsecticide (and reduced risk) Performance Characteristics

Categories of Bioinsecticides and Biostimulants

- Microbial (living)
  - Bacteria, Fungi, Nematodes, Viruses
- Biochemical
  - Plant extracts, Metabolites, Pheromones, Diatoms, Elements

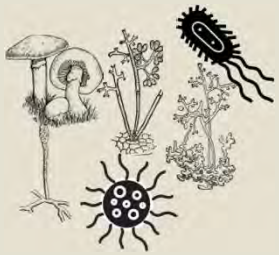


Performance Characteristics of Bioinsecticides

	Fungal	Nema-todes	Pyreth-rum	Spin-osyns	BTs	Neem	Hort. Oils	Ess. Oils
	?	?	✔	✔	✘	✘	✘	?
	✘	✘	✔	✔	✘	✘	✘	✔
	✔	✔	✔	✔	✘	✔	✘	?
	✘	✔	✘	✘	✘	✘	✘	✘
	✘	✘	✘	✘	✔	✘	✔	✘

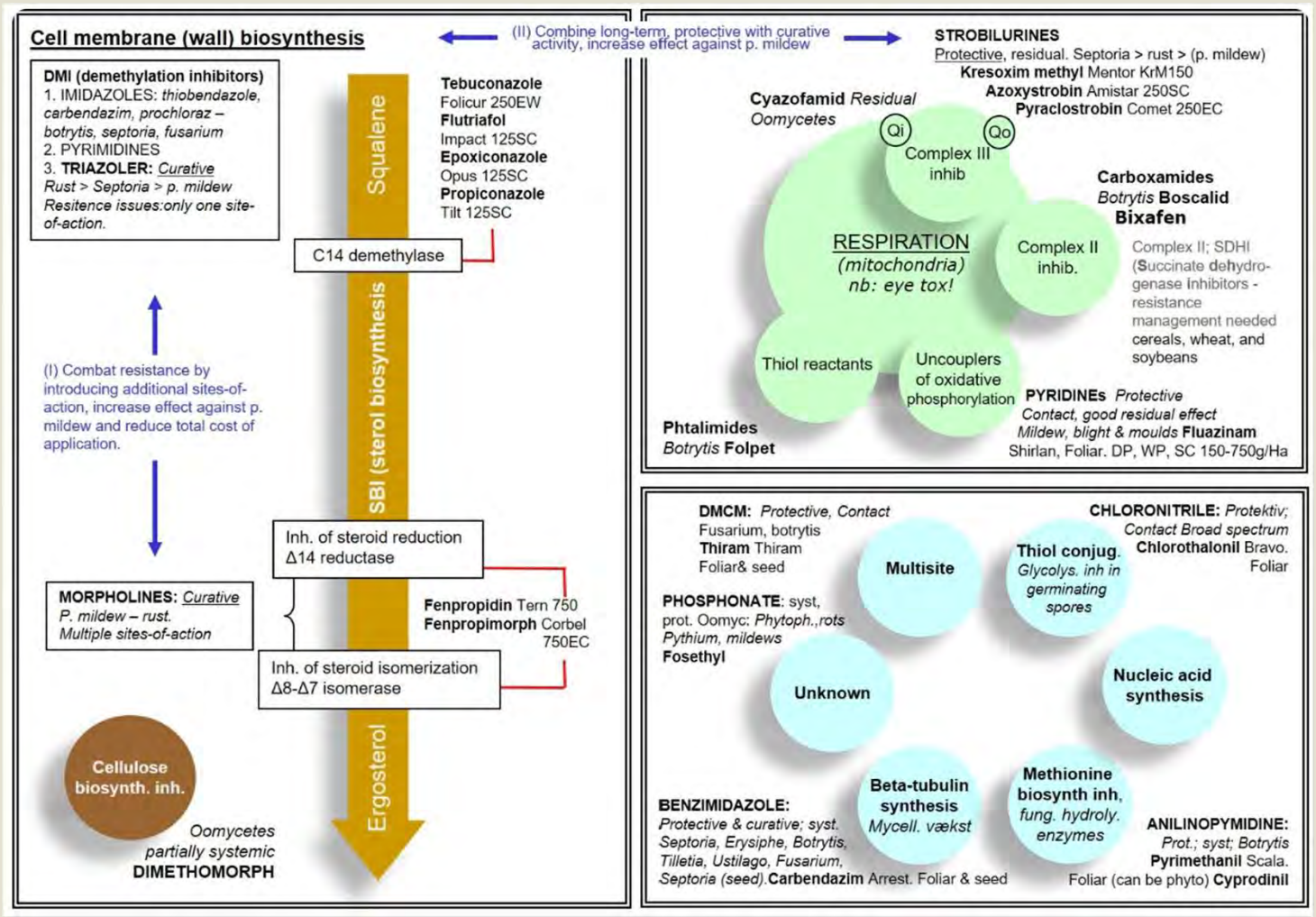
Fungicide Performance Characteristics

- Spectrum of activity
- Protectant or Curative
- Residual
- Cost



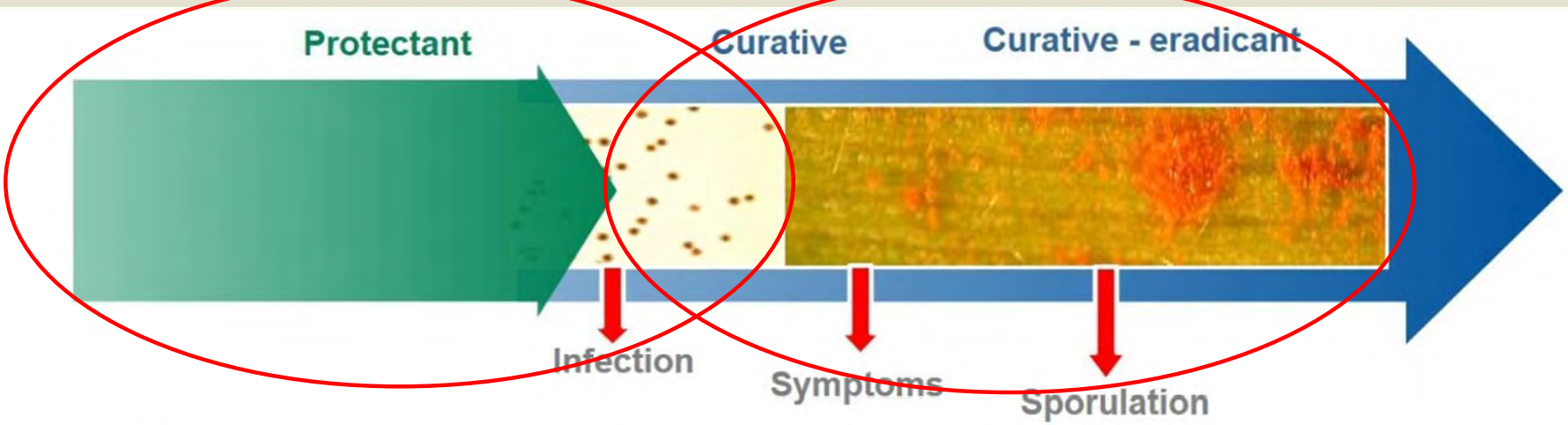
Synthetic Fungicide Mechanisms of Action

- Cell wall inhibitors
- Respiration inhibitors
- Multisite



[Dr. Harry Teicher (13) Fungicide Mode-of-Action: The LabCoat Guide to Pesticides & BioPesticides | LinkedIn]

Fungicide Performance Characteristics

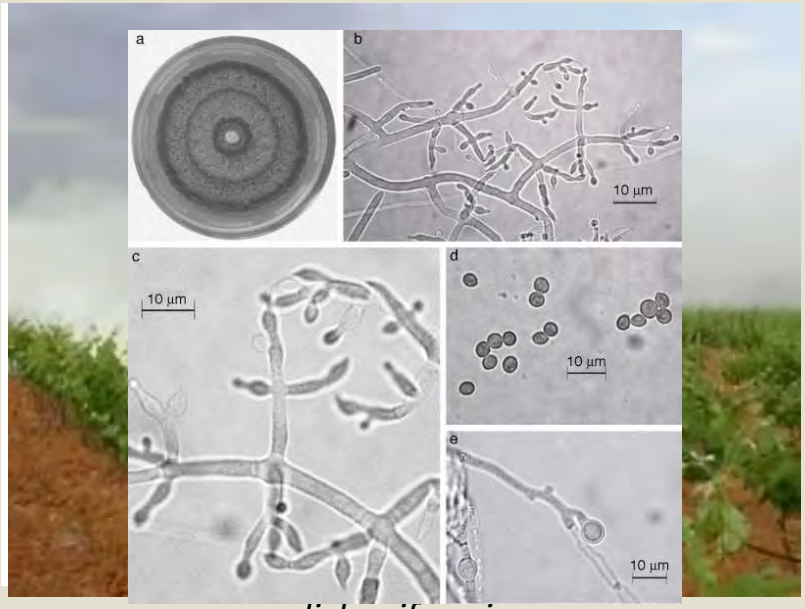


Contact Fungicides	Penetrant/ Locally Systemic Fungicides	Systemic Fungicides
Preventative function	Preventative function	(Preventative) and curative
Multi-site	Single-site	Single-site biotic inhibitors
Less resistance	Greater resistance chance	Greater resistance chance
Higher doses	Lower doses	Lower doses
More applications	Moderate applications	Few applications
Low residual	Low to medium residual	Medium to high residual

[Dr. Harry Teicher (13) Fungicide Mode-of-Action: The LabCoat Guide to Pesticides & BioPesticides | LinkedIn]

Biofungicide Mechanisms of Action

- **Antibiosis** - microbial metabolites such as antibiotics or fungitoxins which inhibit spore germination or pathogen growth
- **Plant defense induction** - the induction by biofungicides of localized or systemic defense mechanisms within the host plant
- **Exclusion** - competition and displacement of pathogenic fungi from the rhizosphere or on the leaf surface by microbial biofungicides
- **Mycoparasitism** - parasitization of pathogenic fungi by microbial biofungicides
- **Biostimulation** - stimulation of plant growth and resilience



licheniformis
Sulfur, Copper, Potassium Bicarbonate, Some Botanicals

[Dr. Harry Tiecher (13) BioPesticide Mode-of-Action: The LabCoat Guide to Pesticides & BioPesticides | LinkedIn]

Performance Characteristics of Biofungicides

	Bacillus	Tricho-derma	GKW/ Harpin	Sulfur/ Copper	Neem	Hort. Oils	Ess. Oils
	?	✗	✓	✓	?	✓	?
	✗	✗	✗	?	✗	✗	✗
	✗	?	✓	✗	✗	✗	✗
	✗	✗	✗	✓	✗	✓	✗

So many different types of Applications – Which is right for you?

Low Volume Drone Applications

BioStimulant Soybean Simulated Vigor Video - [redacted]

These plants received their final watering the day before treatment (9/27) and then were left with no water for the duration of the video at a daytime temp of 72F.

The video was taken 10/2/23-10/7/23

Small Plot Trials are a good way to get an idea of how a product will work under certain conditions

Microbial Crop Health Consortium – Start in the Greenhouse and Follow into the Field

ter *for*
& Research

Split Block Design Fertigation

Factors that will Affect the Efficacy of Biological Pesticides – Be Mindful of the 4R's and their Overall Importance - " An Ounce of Prevention is Worth a Pound of Cure." B. Franklin

- **Right Timing – What time of day and stage of Crop?**
- **Right Source – Which Biological will you choose, mix and match or single application?**
- **Right Rate – Top of label rate or somewhere in between?**
- **Right Placement – Foliar, Drip, Shank, Greenhouse….**

[redacted] Thyme Oil is less volatile & more stable at high temperatures

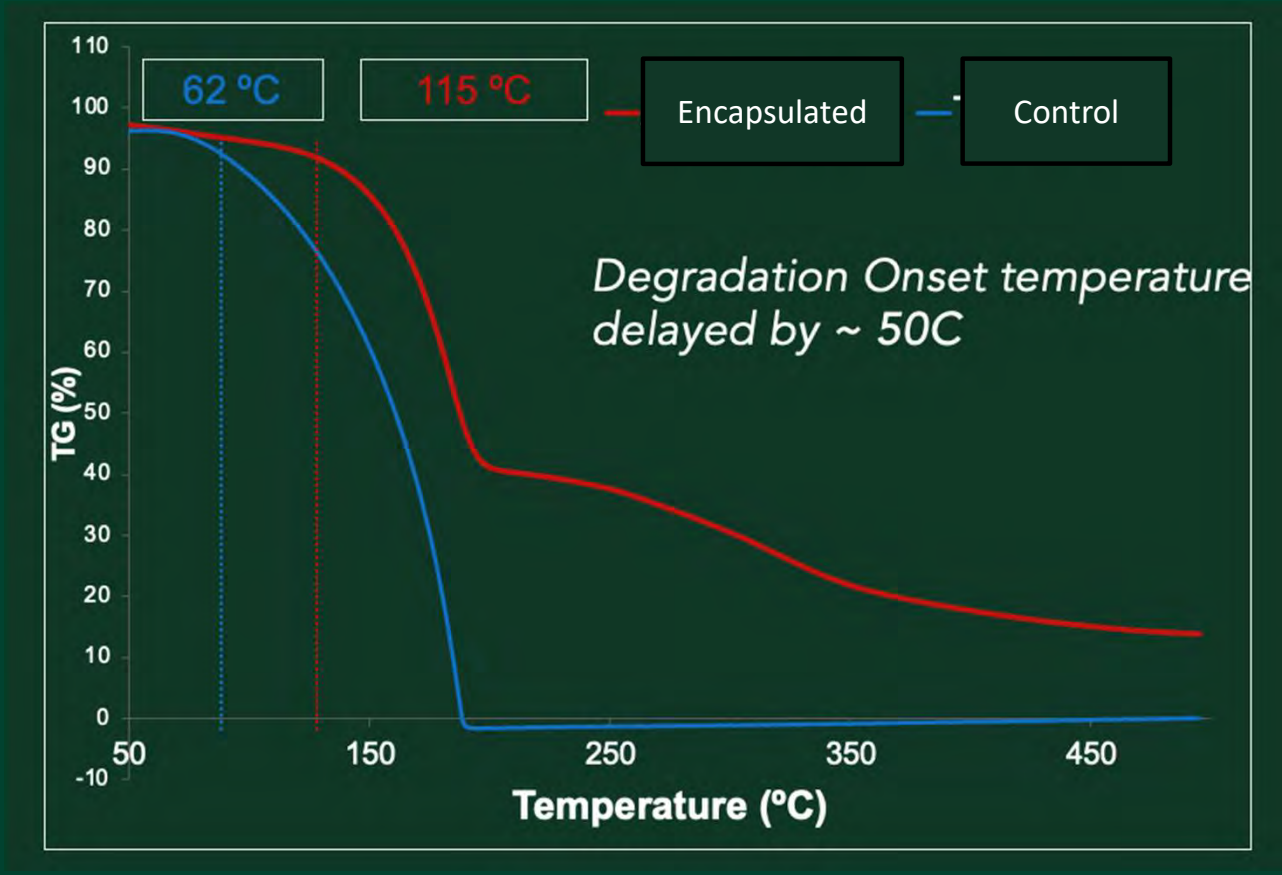
enables low use rate & extended field life for Thyme

Summary

AC[redacted]: AgriCell encapsulated Thyme Oil (Red)

[redacted]: Unencapsulated Thyme Oil

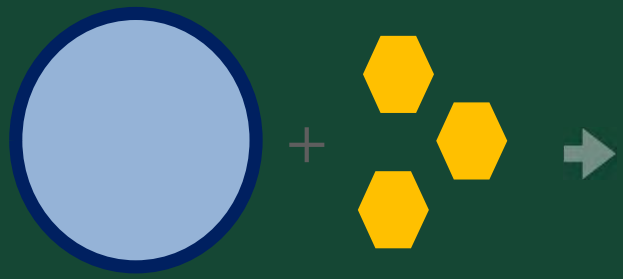
AgriCell encapsulation enhances thermal stability



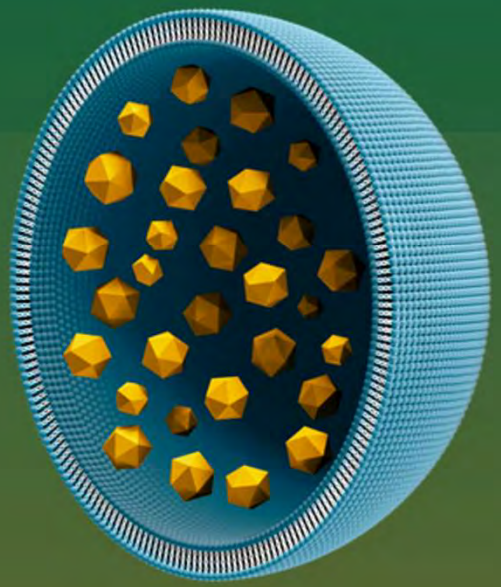
ENCAPSULATED SMALL MOLECULES

- The AgriCell is a cost-effective, sustainable formulation component that promotes environmental stability and controlled release.
- Foundation of Biorational Product Portfolio.
- Plant extracts/oils, pheromones, etc.

- Completely Biodegradable
- Enhanced Residual efficacy
- Enhanced environmental stability
- Oils can be dried into powder form – Versatile Formulation



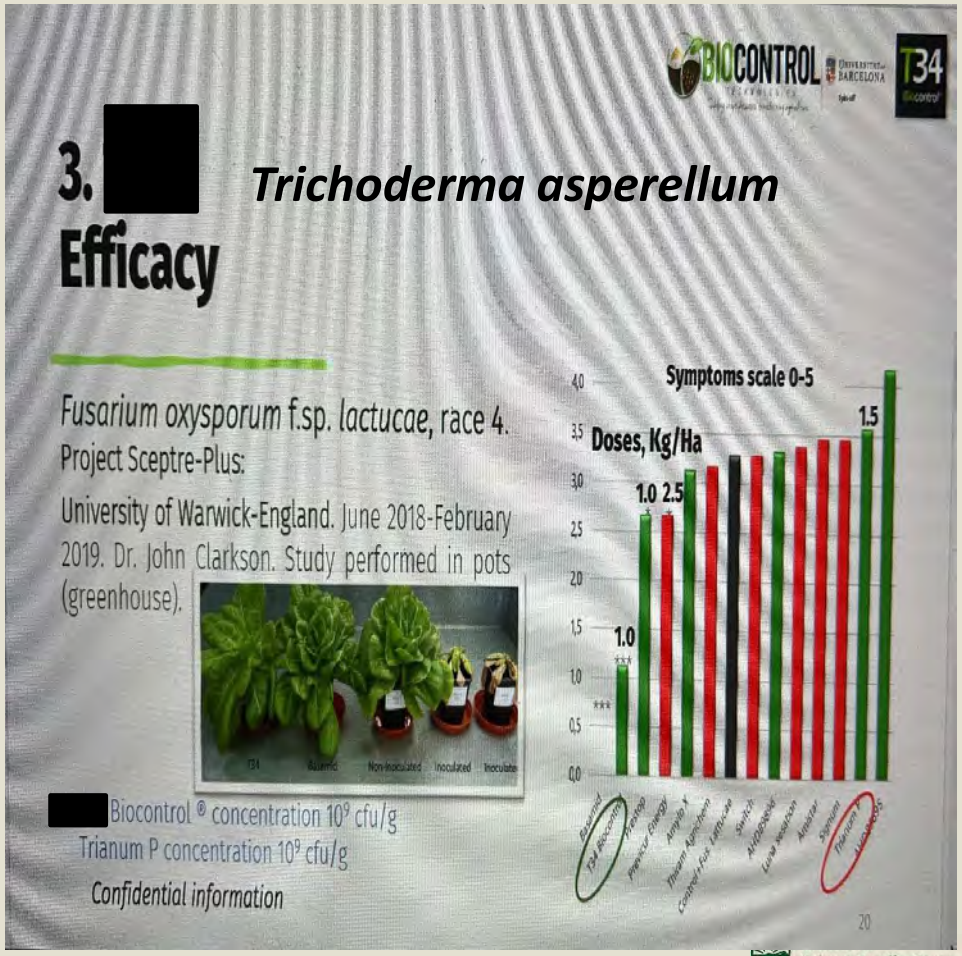
AgriCells are loaded with various active ingredients



Loaded AgriCells are formulated for field application

Coverage is very important with Biological product applications and supportive data demonstrates that nonionic organo silicone spreaders are an adjuvant that should be added to most foliar applications for optimum coverage. Do not underestimate the benefits of a good adjuvant, but also know what type of adjuvant for the recommended treatment and the right rate for optimum coverage without it rolling off the leaf.

New Insecticides and Fungicides coming to the Market in 2025



Product Description

Harpin αß, the 2nd generation of the Harpin protein present in [redacted] is a **biochemical plant health promoter** produced by many pathogenic bacteria that **signals plants' growth & pathogen response pathways** that results in **improved overall yield** of certain crops.

- **Signal word**: Caution
- **REI:** 4 hours.
- **PHI:** 0 days
- **Rain fast:** 30 minutes
- **PPE:** Coveralls, waterproof gloves, shoes and socks
- **Active Ingredient:** 1- Harpin αβ Protein
- **Resistance management Use:**
  - Use a nonionic surfactant
  - Tank mix compatible with foliar nutrients and most pesticides.

Not NOP compliant

[redacted]

[redacted]

A Biochemical Pesticide that:

- Suppresses Nematode Egg Production
- Enhances Crop Growth, Quality and Yield
- Increases Plant Stamina and Vigor

Wettable Dry Granule

ACTIVE INGREDIENT:	
Harpinαß Protein:	1.0%
OTHER INGREDIENTS:	99.0%
Total:	100.0%

EPA Reg. No. 71771-3 EPA Est. No. 88746-GA-1

KEEP OUT OF REACH OF CHILDREN

CAUTION - PRECAUCIÓN

See additional precautionary statements elsewhere on this label.

Si usted no entiende la etiqueta, busque a alguien para que se la explique a usted en detalle. (If you do not understand the label, find someone to explain it to you in detail.)

Read the entire label before using this product. Read WARRANTY AND DISCLAIMER before buying or using. If terms are not acceptable, return at once unopened.

PRECAUTIONARY STATEMENTS

HAZARDS TO HUMANS AND DOMESTIC ANIMALS

CAUTION

Harmful if inhaled. Avoid breathing dust or spray mist. Remove and wash contaminated clothing before reuse.

FIRST AID

If Inhaled:	• Move person to fresh air. • If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth- to-mouth if possible. • Call a poison control center or doctor for further treatment advice.

HOT LINE NUMBER

Have the product container or label with you when calling a poison control center or doctor, or going for treatment.

For emergency medical treatment information, call the National Pesticide Information Center at 1-800-858-7378, 6:30 AM to 4:30 PM Pacific Time, seven days a week. During other times, call the poison control center at 1-800-222-1222.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Applicators and other handlers must wear:

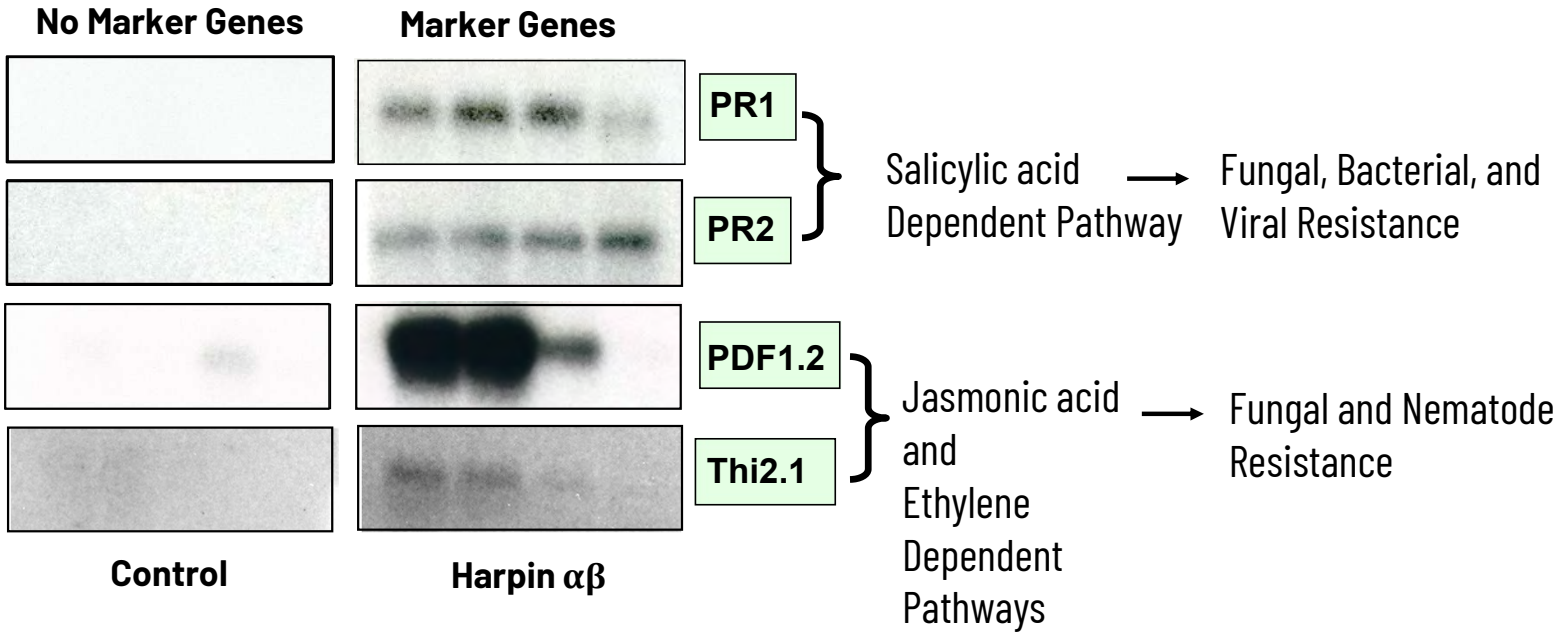
- Long-sleeved shirt and long pants.
- Shoes and socks.

Follow the manufacturer's instructions for cleaning / maintaining PPE. If no such instructions exist for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

Net Weight: 8 oz.

How Does [redacted] Work?

Genetic Evidence that Harpin αβ Activates the Salicylic Acid, Jasmonic Acid and Ethylene Defense Pathways



- Weed Management – Organic Chemical Thinner and Weeder
  New Technologies like Verdant and Carbon Robotics, Steam

Other Factors to Consider when Deciding to Use a Biological Pesticide and getting the most out of its Performance

- Know what Crop and Pest issues prior to planting to have a Plan. Prevention is your best Plan.
- Type of Pest that may affect your crop – Insect (aphid, leps, leafhoppers…), Mites, Fungus, Bacteria, Virus, Weeds
- Population of that Pest and their Thresholds – what damage is acceptable?
- Irrigation Quality, Quantity and Type – What is the best method of application? With irrigation water, foliar applications, drone,
- Soil Health Status – O.M Content, CEC, Structure – The healthier the soil, the healthier and more resilient the crop. Best prevention, but not the cure.
- Temperature and Wind Considerations
- Crop - Annual, Semi Permanent, Permanent – Always best to keep the first generation of the season as low as possible reducing compounding generational population explosions.
- Depending on type of crop, timing and method of planting - When is the best time to apply (Prime the Plant for optimum growth)

Thank You!

Questions?