



WILBUR-ELLIS®

# Bio Controls and Organic Products for Nursery Production

Joel Fields, Wilbur-Ellis Company




**WILBUR-ELLIS®**

**Buying All Organic Commodities**

LICENSED & BONDED • PROMPT PAYMENT • ON-FARM PICK-UP  
306-934-8244 • WILBUR-ELLISFEED.COM



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# USA WEST

March 7-9, 2018 • Sheraton Carlsbad Resort &

## Thanks for Attending our 2017 Biocontrols<sup>SM</sup> USA West Conference & Expo in Reno, NV

During the first week of March, attendees representing 200+ companies

# Agenda

- Living Bio Control Agents
  - Bugs in a jug, biopesticides, nematodes
- Non Living Bio Controls
  - Botanicals, oils, plant extracts.....
- Organic and natural fertilizers

## What is Biological Control?

Biological control involves the release or application of natural enemies including parasitoids (parasitic wasps), predators and pathogens (entomopathogenic fungi and nematodes) to regulate an existing pest population.

– Dr. Raymond A. Cloyd



Minute Pirate Bug *Orius insidiosus*

# Biological Controls Introduced!

## TREK NET



By Gavin Thomson and Dave Gomersall



# Bio Controls: Predators, Parasites, Microbials, and Botanicals

- Predatory insects/mites

Lacewings, minute pirate bug/Orius, persimilis

- Parasites – live and feed in/or on host

Ex) Wasps and flies; HI's wiliwili tree

- Entomopathogenic nematodes – vectors of pathogenic bacteria

# Bio Controls: Predators, Parasites, Microbials, and Botanicals

- Micro organisms- fungi, virus, protozoa

*Bacillus thuringiensis* (Bt) – fungus gnats, caterpillars

*Beauveria Bassiana* – fungus controlling aphids, whitefly

*Spinosyns*

- Botanicals – plant extracts

Pyrethrins, nicotine, aza-diractins

Captiva – Bio Insecticide & Repellant



- Living Bio Control Agents

- ▣ Bugs in a jug, biopesticides,  
nematodes



## Wilbur-Ellis has hired a biological control specialist!!!!!!!!!!!!!!

- Moriah LaChapell  
Biological Control Agents
- [mlachapellschalock@wilburellis.com](mailto:mlachapellschalock@wilburellis.com)



# Designing a Pest Management System with Bioline™ Beneficial Insects & Conventional Tools



## Beneficial Insects for HRM and Broad Mites

Beneficial Insect	Target Pest
<i>Amblyseius cucumeris</i> (“cucs”)	Type II Selective Predator
<i>Galendromus occidentalis</i> (“occi’s”)	Type II Selective Predator
<i>Amblyseius fallacis</i> (fallacis)	Type II Selective Predator
<i>Amblyseius andersoni</i> (andersoni)	Type III Generalist Predator
<i>Neoseiulus californicus</i> (californicus)	Type II Selective Predator (shares Type III traits)



*Galendromus occidentalis*



*Amblyseius cucumeris*



*Amblyseius andersoni*

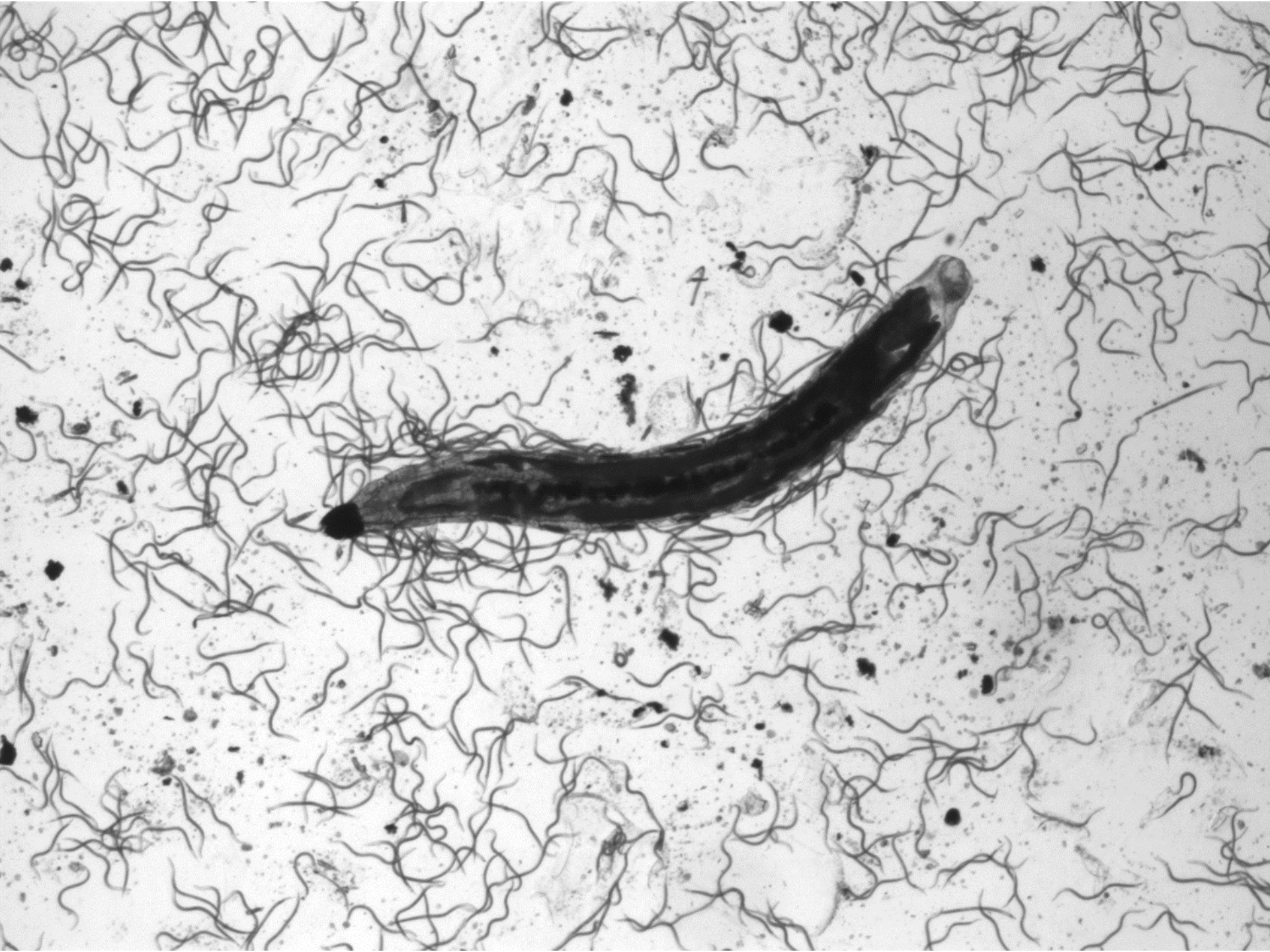


*Neoseiulus californicus*

# NemaShield™

- Contains *Steinernema feltiae*
  - 100 Million, 500 Million, or 2 Billion units
- 100 million to 1100 to 3400 sq ft
- Effective on fungus gnat larvae, WFT pupae
- Completely safe to humans
- EPA exempt from registration, no REI
- Compatible with many pesticides

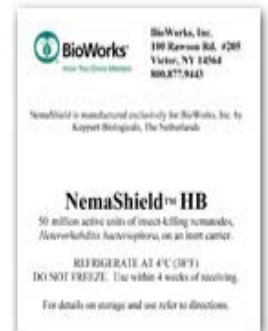




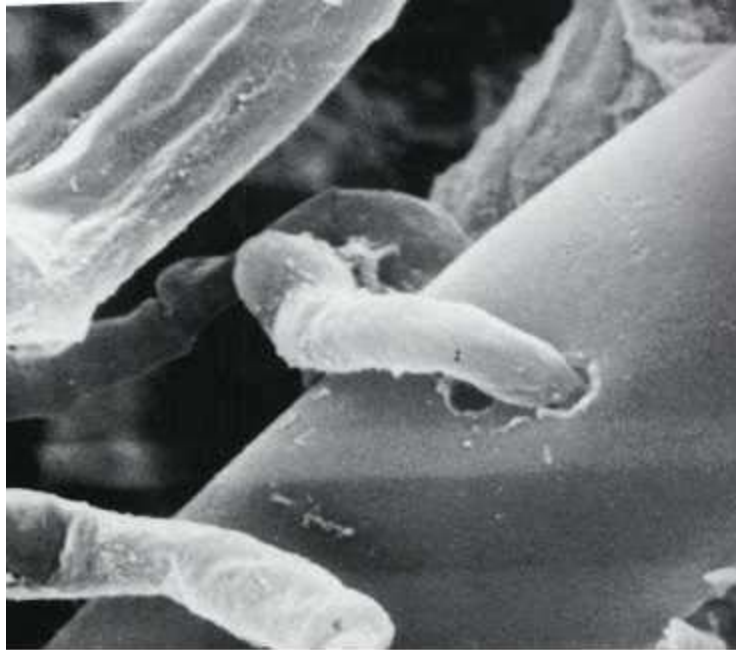
# NemaShield HB

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- Contains *Heterorhabditis bacteriophora*
  - 50 Million and 500 Million units
- 50 million per 2,000 sq ft; 1 billion to an acre
- Controls black vine weevil, soil dwelling and boring larvae (caterpillars), beetles, flies
- Soil temperature must be 50-85 degrees F
- EPA exempt from registration, no REI



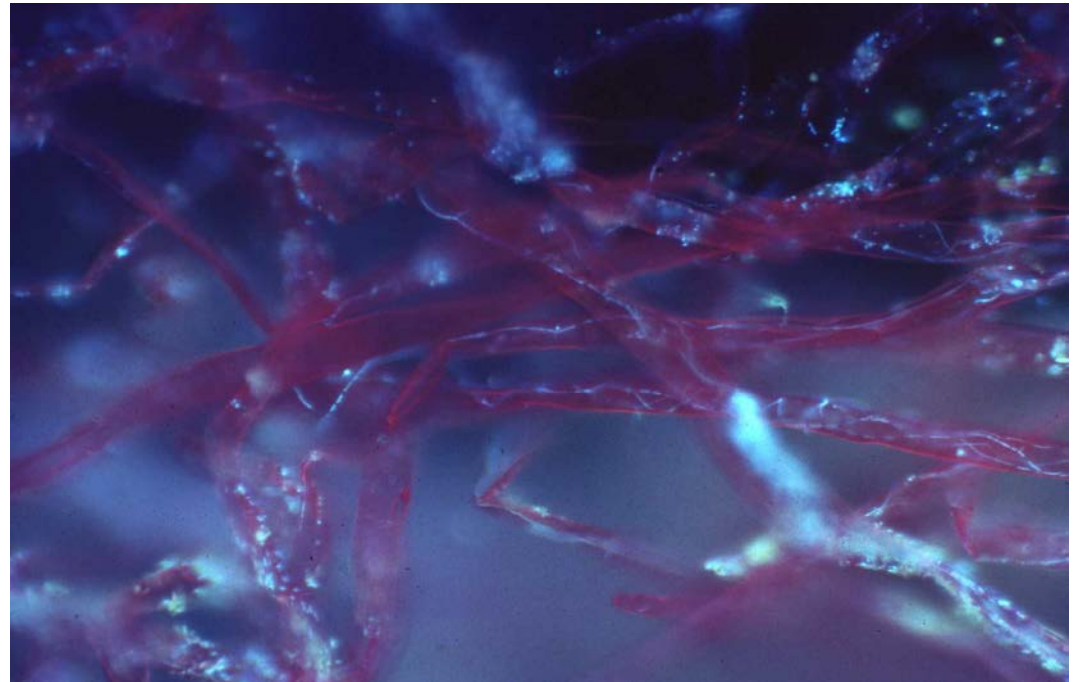
# Biological Pesticides



# HOW DO THEY WORK? (1)

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

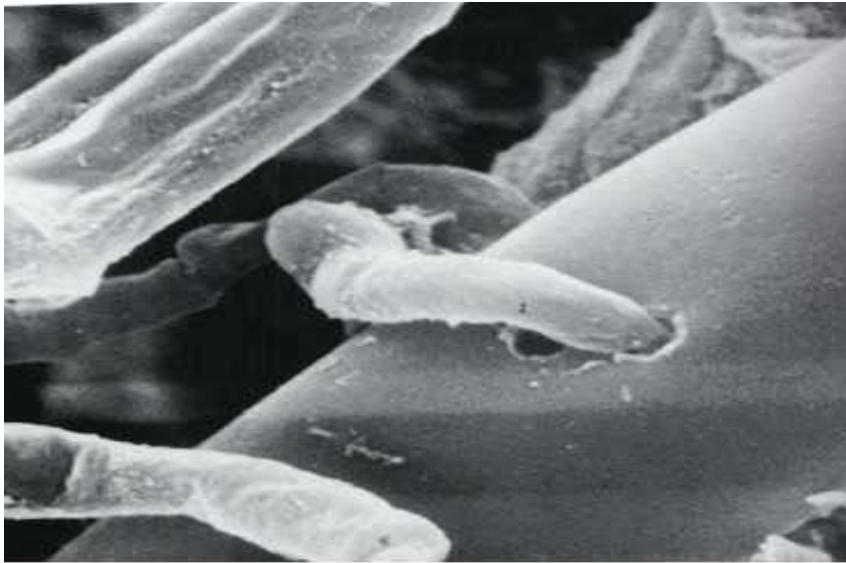
Competitive  
exclusion  
(competition for  
nutrients and  
space)



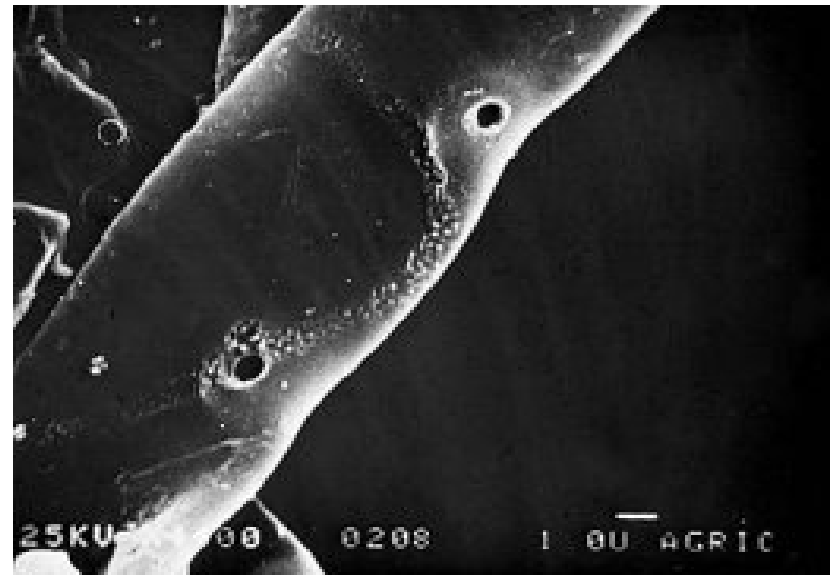


# HOW DO THEY WORK? (2)

## Mycoparasitism



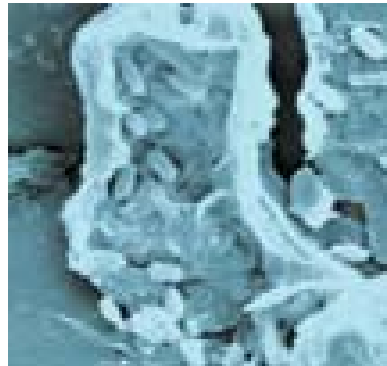
RootShield attacking a hyphal strand of *Rhizoctonia* using enzymes to degrade the cell wall of the pathogen.



Cavities left in the pathogen after attack by RootShield.

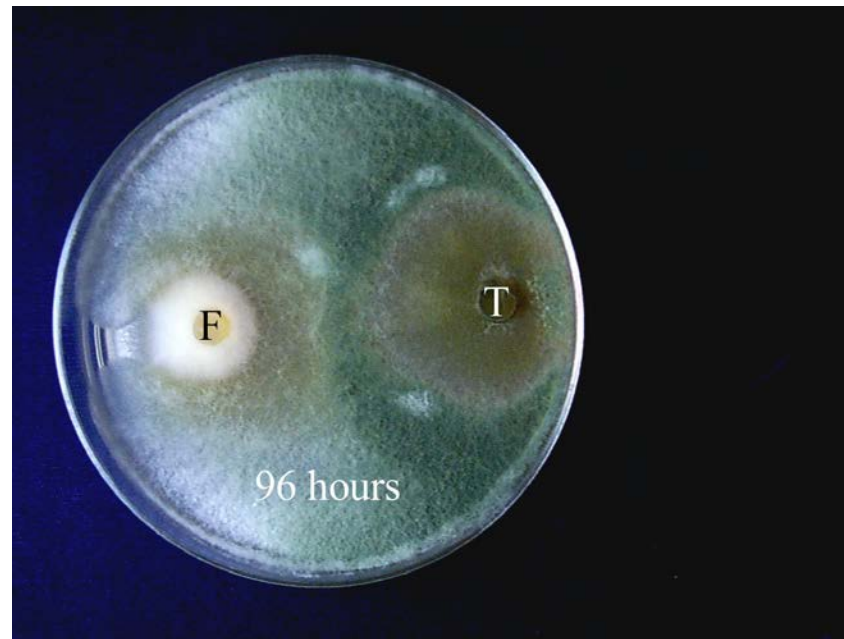
# HOW DO THEY WORK? (3)

Disruption of pathogen cell membranes with metabolites, including lipopeptides



# HOW DO THEY WORK? (4)

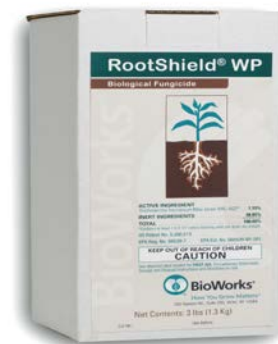
Production of antibiotic agents, anti-fungal enzymes



# RootShield Granules®

## RootShield WP/PlantShield HC®

- *Trichoderma harzianum*, T22
- EPA-Registered biofungicide
- Controls Pythium, Rhizoctonia, Fusarium, Thielaviopsis and Cylindrocladium
- Zero Hour REI
- OMRI listed and VeriFlora certified
- No phytotoxicity



# What does RootShield Biological Fungicide Do?

- RootShield protects roots from diseases caused by *Pythium*, *Rhizoctonia*, *Fusarium*, *Thielaviopsis*, and *Cylindrocladium*
- RootShield permits stronger, healthier root systems
- RootShield allows greater soil exploration by roots and enhanced nutrient uptake
- Increased stress tolerance due to better root systems
- Solubilization of phosphate and trace elements (Cu, Fe, Mn, Zn)

- RootShield WP & RootShield® Granules



### RootShield WP

*3-5 oz per 100 gal*

### RootShield Granules

*1-1.5 lbs per cubic yd  
of soil mix*



# CEASE™



- **Based on a naturally occurring patented strain of *Bacillus Subtilis* (strain QST 713)**
- **Contains naturally occurring antifungal and antibacterial lipopeptide compounds**
  - ***multiple modes of action***
  - ***resistance management tool***
  - ***valuable addition to any disease control program***
- **4 Hour REI, 0 day PHI**
- **OMRI Listed**

# CEASE™



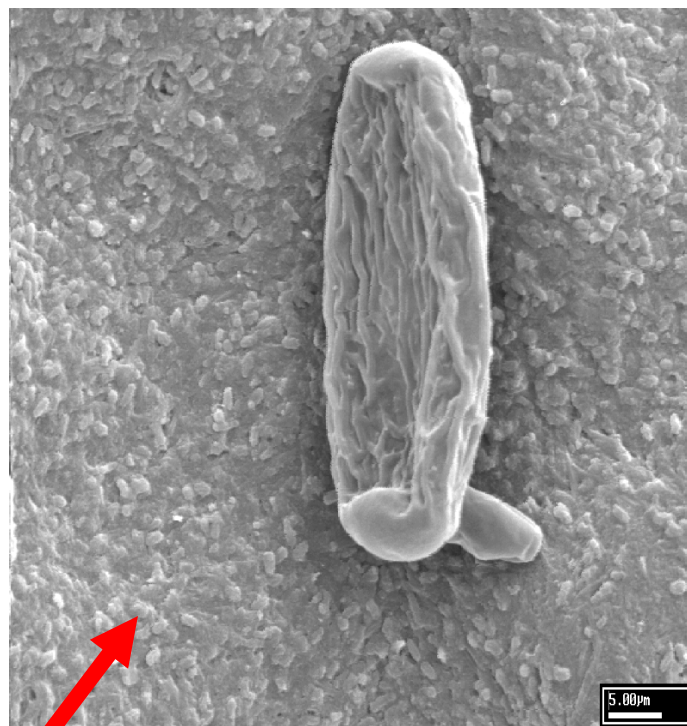
- **Foliar Disease** - *Botrytis, Powdery Mildew, Anthracnose* and several leaf spot diseases such as *Alternaria* and *Entomosporium*
- **Bacterial Diseases** – *Erwinia, Pseudomonas* and *Xanthomonas*
  - *Rotate with coppers or use as preventative stand alone*
  - *2-8 qts / 100 gallons, Re-apply weekly*
- **Soil Diseases** - *Rhizoctonia, Pythium, Fusarium* and *Phytophthora*,  
*4-8 qts / 100 gallons, Re-apply 21-28 days*



# CEASE

## Mode of Action

Presence of *B. subtilis* spores create a physical **barrier** blocking pathogen access to plant surface



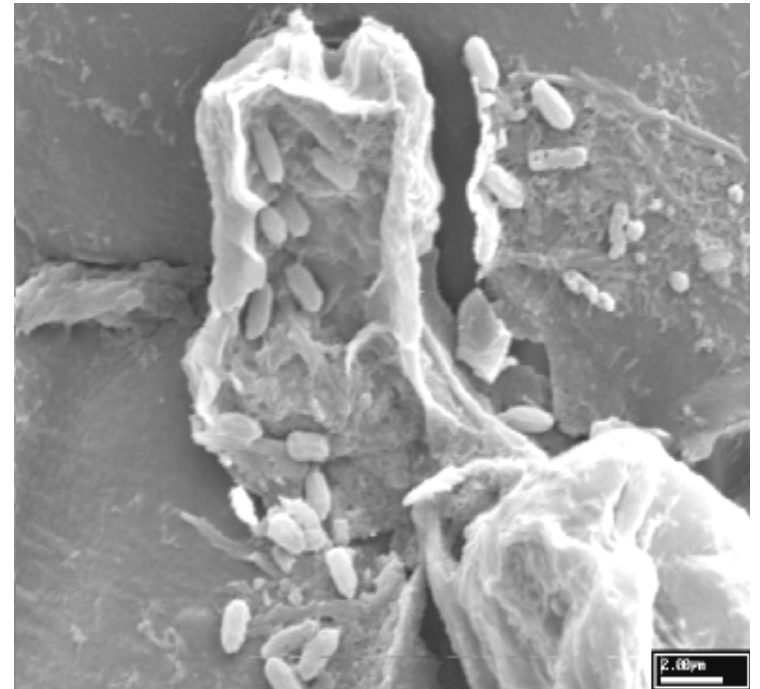
CEASE covers the surface of the leaf

# CEASE

## Mode of Action

### Antifungal lipopeptides

- destroy cell wall integrity
- prevent spore germination
- pathogen cell death

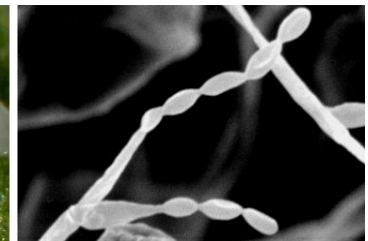


# Ancora/Preferal Microbial Insecticide

- ▶ Naturally-occurring fungus that infects many arthropod hosts:
  - Whiteflies, thrips, psyllids, leafminers, spider mites, weevils, scale, mealybugs, other pests
  - Infects all life stages (esp. immobile ones)
- ▶ Contains Blastospores (like primed seed) for faster germination and infection
- ▶ Little or no impact on beneficial insects:
  - Bees, ladybeetles, parasitic wasps, **predatory mites**, other insect predators (e.g. *Orius*)



Whitefly killed by Preferal



Spores of *I. fumosorosea*

\* Formerly known as *Paecilomyces fumosorosea*

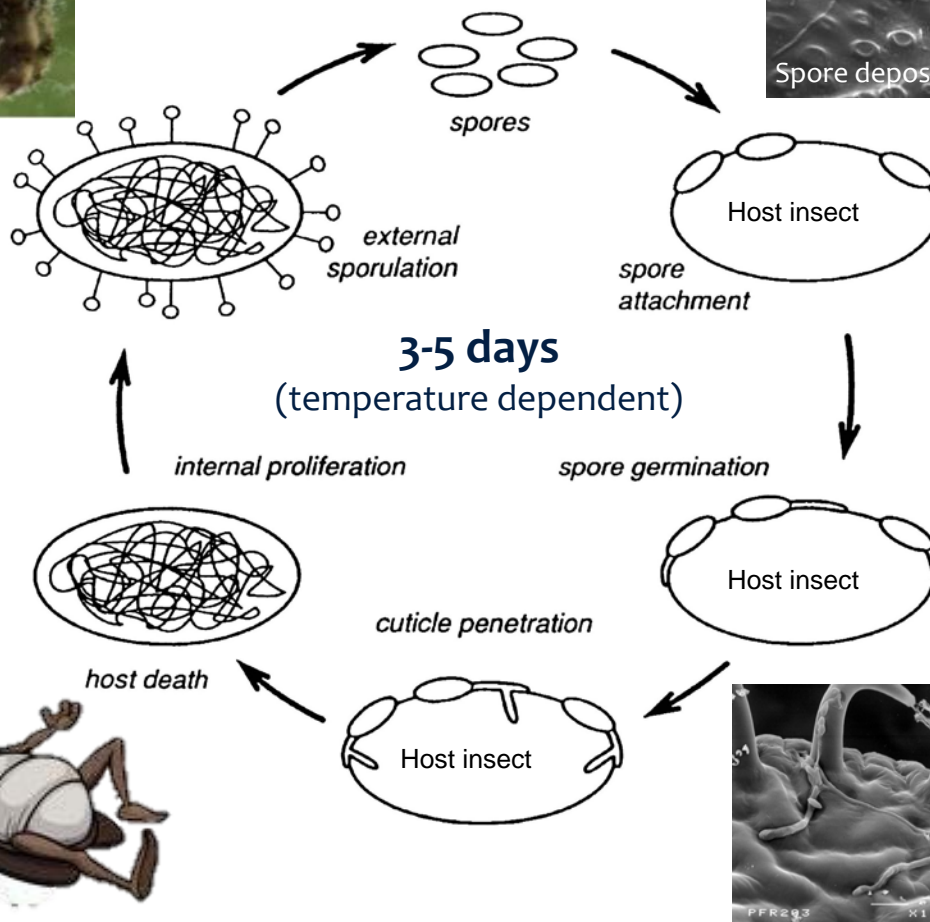
# Infection Cycle of *Isaria fumosorosea*



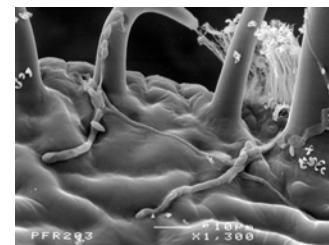
Asian citrus  
psyllid killed  
by Ancora



SEM photos:  
Z. Landa, Univ.  
of South  
Bohemia,  
Czech Rep.



Spider mite eggs  
killed by Ancora





Dead Whitefly infected by Preferal



Whitefly eggs infected by *Preferal*



Madeira Mealy bug killed Preferal



Scale infected and killed by Preferal





Thrips infected and killed by Preferal



Caterpillar infected and killed by Preferal



# Ancora Labeling: Target Pests

# ANCORA™

MICROBIAL INSECTICIDE

SPECIMEN LABEL

FOR ORGANIC PRODUCTION

FOR CONTROL OF INSECT AND MITE PESTS ON VEGETABLES, FRUITS, ORNAMENTAL PLANTS GROWN IN GREENHOUSES OR OTHER COVER, OR IN NURSERIES.

**ACTIVE INGREDIENT:**

*Isaria fumosorosea* Apopka Strain 97 (ATCC 20874) ..... 20%

(formerly *Besicomyces fumosoroseus*)

**OTHER INGREDIENTS:** ..... 80%

**TOTAL:** ..... 100%

\*Contains 1 x 10<sup>9</sup> CFU/g (equivalent to 1.4% technical grade active ingredient)

EPA Reg. No. 70051-19-59807

EPA Est. No. 70051-CA-001

KEEP OUT OF REACH OF CHILDREN  
**CAUTION**

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

FIRST AID	
<b>IF ON SKIN OR CLOTHING:</b>	<ul style="list-style-type: none"> <li>Take off contaminated clothing.</li> <li>Rinse skin immediately with plenty of water for 15-20 minutes.</li> <li>Call a poison control center or doctor for treatment advice.</li> <li>If product, diluted in accordance with the directions for use, gets on skin, medical attention is not required.</li> </ul>
Have the product container or label with you when calling a poison control center or doctor, or going for treatment. Hot Line Number: 1-800-368-6847.	

USER SAFETY RECOMMENDATIONS
<p>User should:</p> <ul style="list-style-type: none"> <li>Wash hands before eating, drinking, chewing gum, using tobacco, or using the toilet.</li> <li>Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing.</li> <li>Remove PPE immediately after handling this product. As soon as possible, wash thoroughly and change into clean clothing.</li> </ul>

PRECAUTIONARY STATEMENTS  
HAZARDS TO HUMANS AND DOMESTIC ANIMALS  
**CAUTION**

Harmful if swallowed, inhaled or absorbed through the skin. Avoid breathing spray mist. Causes moderate eye irritation. Avoid contact with skin, eyes or clothing. Wash thoroughly with soap and water after handling and before eating, drinking, chewing gum, or using tobacco. Remove and wash contaminated clothing before reuse.

**PERSONAL PROTECTIVE EQUIPMENT (PPE)**

Applicators and other handlers must wear:

- Long-sleeved shirt and long pants.
- Shoes plus socks.
- Mixers, loaders, applicators and other handlers must wear a dust/mist filtering respirator (MSHA/NIOSH approval number prefix TC-21C), or a NIOSH approved respirator with prefix N-95, R-95, or P-95.

Net Contents: 1 pound (454 grams)

**ENVIRONMENTAL HAZARDS**

For outdoor, non-greenhouse use. Do not apply when bees are actively foraging. Do not apply directly to water, or to areas where surface water is present, or to intertidal areas below the mean high water mark. Do not contaminate water when disposing of equipment washwaters or rinsate. Do not allow contamination of or discharge into lakes, streams, ponds, or public waterways. Drift and runoff may be hazardous to aquatic organisms in water adjacent to treated areas. Apply this product only as specified in the label.



## Foliar application

- Whiteflies
- Spider mites
- Mealybugs
- Aphids
- *Liriomyza* leafminers
- Psyllids
- Thrips
- Citrus leafminers
- *Lygus* bugs

## Soil application

- Black vine weevil
- Thrips pupae
- Other crown/root weevils
- Symphylans
- Coleoptera larvae (grubs, rootworms, wireworms)
- Lepidoptera larvae (caterpillars, cutworms)

# Ancora vs. Soil Grubs in Potted Fir

## METHODS

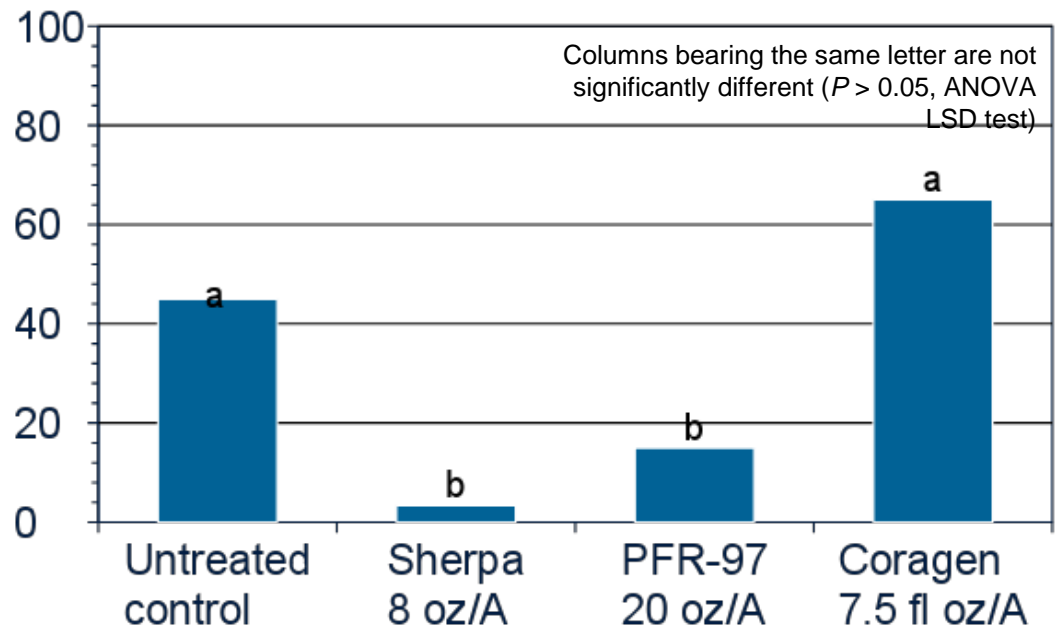
- Randomized complete block with 4 reps (potted fir seedling)
- Each pot infested with 15 grubs.
- Ancora applied 3X at weekly interval. Chemical insecticides applied once.
- Soil drench in 5 – 8 fl oz water per pot, plus Freeway NIS (0.1% v:v).
- Survival assessed by destructive sampling of pots 36 days after treatment.



*Serica* sp.  
(Coleoptera: Scarabeidae)

## RESULTS:

- Ancora reduced larval survival by >60%.
- Not as effective as imidacloprid standard, but much better than rynaxypyr.





**Non Living Bio Controls**  
**Botanicals, oils, plant**  
**extracts, organics**

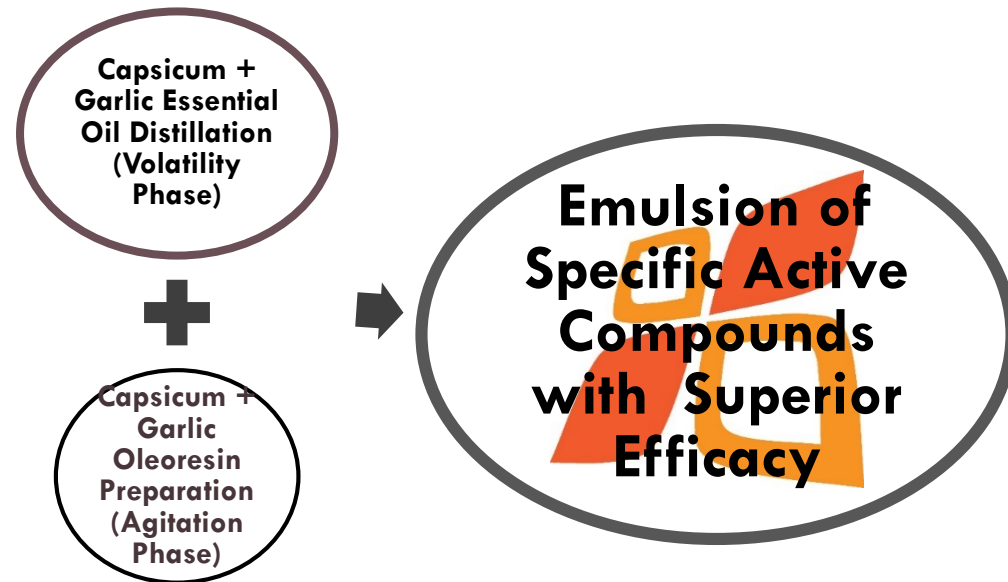


**Captiva™**

INSECT REPELLENT / INSECTICIDE

## Plant Extracts through Essential Oils and Oleo-resins

- Captiva is made from garlic and capsicum varieties chosen for their specific and unique pest defense properties.
- The patented dual extraction method of manufacturing harvests the active properties of each component.



7.6% Capsicum oleoresin extract  
23.4% Garlic oil  
59.3% Soybean oil

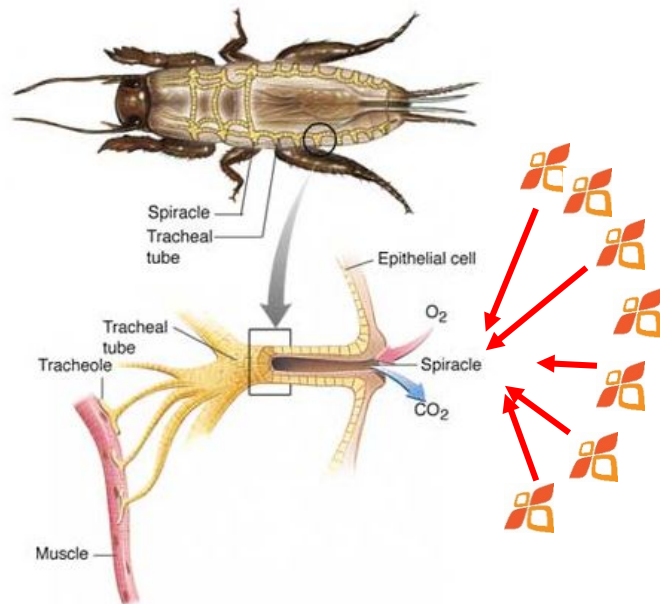
# Dual Extraction Yields Multiple Modes of Action



**Captiva™**  
INSECT REPELLENT / INSECTICIDE

## □ VAPOR PHASE

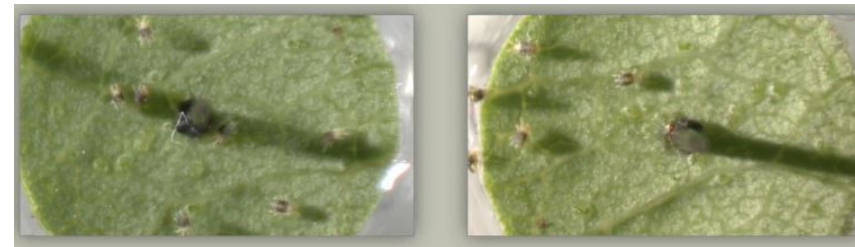
- REPELLANCY LASTING 1-3 DAYS



Inhalation of the aromatic essential oils drives the pest out of hiding in search of shelter.

## □ AGITATION PHASE

- RESIDUAL CONTACT AGITATION LASTING 1-7 DAYS



Untreated surface, mites all over

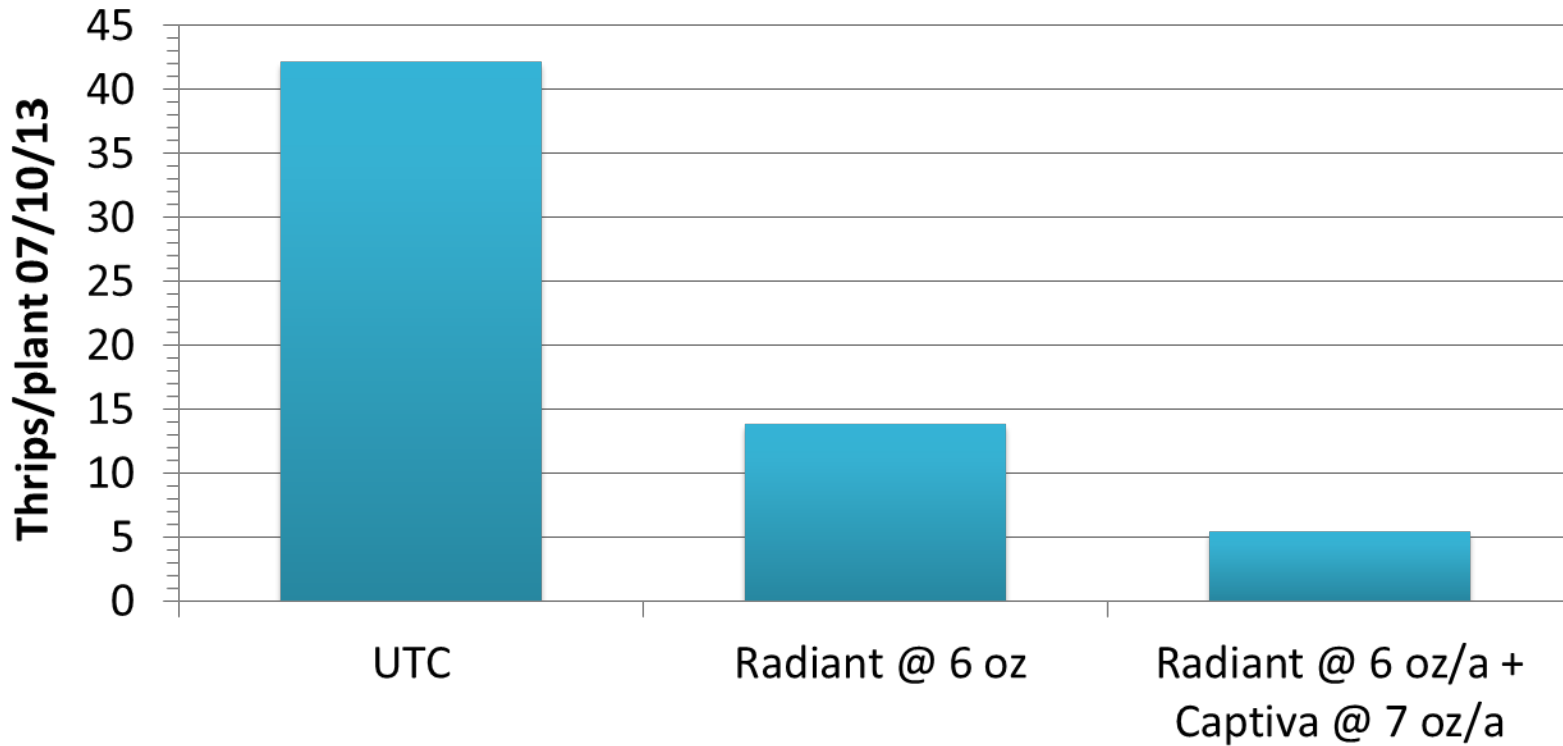
Treated surface, mites driven to margins

Contact with the oleoresin causes constant irritation, increasing mobility, preventing feeding and depleting energy reserves.



**Captiva**<sup>™</sup>  
INSECT REPELLENT / INSECTICIDE

# Onion Thrips – Onions TANK MIX APPLICATION Idaho 2013



**Control at peak thrips  
population 7-20-13**

Radiant = spinetoram





**Captiva™**  
INSECT REPELLENT / INSECTICIDE

## Safety

- ✓ Non-toxic to honey bees and other beneficial insects  
Recommend release 2-3 days after Captiva spray
- ✓ Plant Safety – no phyto
- ✓ 4-hour REI
- ✓ For food crops: 0-day PHI, exempt from residue tolerances
- ✓ No documented resistance  
Reduces resistance risk for tank mix partners

OMRI Certification status



## Active Ingredients:

Rosemary Oil 10%

Peppermint Oil 2%

## Inerts:

Wintergreen Oil

Butyl Lactate

Vanillin

Lecithin

## Insecticide/Miticide

# Ecotec®

## Product Characteristics / Benefits:

- *Fast-acting contact insecticide/miticide*
- *Broad spectrum control:* including mites, aphids, whiteflies, thrips, leafhoppers, plant bugs, pear psyllid, Small Larva of cutworms, armyworms, loopers,
- *Can be applied throughout growing season* including bloom
- *Effective against all stages of development of most insects/mites species* (eggs to adults)
- *Cost effective* versus most commonly used conventional products
- *Ideal rotational or tank mix partner* with many pest control products
- *Ideal for use in pest resistance programs*

## Additional Product Information:

- ***Easy to mix / apply*** - disperses evenly in spray solution
- ***Broad compatibility*** with pesticides, nutrients and adjuvants
- ***Labeled for use*** on vegetables, row crops, nuts, pomes, stones, citrus, soft fruits/berries, grapes, herbs & spices
- ***Supplemental label for use*** on indoor/outdoor plants, trees and in greenhouses/nurseries



WILBUR-ELLIS®

PROFESSIONAL MARKETS

# Azadirachata indica: The Neem Tree

## Source for the Limonoid - Azadirachtin\*



- Known over 2000 years in India
- Researched since 1961
- Crude Uses since 1961
- Inconsistency on efficacy
- Azadirachtin identification-1970
- Technology development - 1980

# The Neem Fruit



WILBUR-ELLIS®  
PROFESSIONAL MARKETS



# Azadirachtin has been shown to be effective on over 200 species of insects and mites<sup>1</sup>

- *ACARINA* such as red spider mites
- *COLEOPTERA* such as beetles, grubs, and weevils
- *DIPTERA* such as flies, fungus gnats, and leafminers
- *HEMIPTERA & HOMOPTERA* such as white flies and aphids
- *LEPIDOPTERA* such as leafrollers, cutworms, loopers, and armyworms
- *ORTHOPTERA* such as grasshoppers
- *SEPHONOPTERA* such as fleas and lice
- *THYSANOPTERA* such as thrips

# AzaGuard® Botanical Insecticide/Nematicide



WILBUR-ELLIS®

PROFESSIONAL MARKETS

- AzaGuard is a 3% Azadirachtin formulated Insect Growth Regulator (IGR) that offers broad spectrum insecticidal control on over 300 insect species. AzaGuard prevents molting between larval, pupal and nymphal stages and also repels insects in treated areas, reducing insect infestations on turf grasses.

AzaGuard's natural botanical formula meets all of the requirements of the National Organic Program (NOP).







# Pyganic 5.0 EC

- About 200 years ago people in central Asia discovered that dried, crushed flowers of certain chrysanthemums were toxic to insects. During the Napoleonic Wars (1804-1815) this "insect powder" was used to control flea and body lice infestations by French soldiers.
- **Fast** – PyGanic delivers quick knockdown and control of crop-damaging insects.
- **Flexible** – No pre-harvest interval
- **Organically compliant** – PyGanic is OMRI® listed and meets the USDA's NOP requirements for an input.
- **Broad spectrum** – May be used on over 200 growing crops to control a broad spectrum of insects



# PyGanic®

PyGanic® Formulation		Most commonly used rate	Rates for treating high populations of adult and/or hard to kill insects		
 <b>PyGanic 1.4<sub>II</sub></b> <b>Rate per acre</b>	<b>1 Pint</b> 16 fl. Oz.	<b>2 Pints</b> 32 fl. Oz.	<b>3 Pints</b> 48 fl. Oz.	<b>4 Pints</b> 64 fl. Oz.	
	Acres per Quart	2	1	.67	.5
	Acres per gallon	8	4	2.7	2
	Rate for Hand Sprayers	1 – 2 Fluid Ounces of PyGanic 1.4 <sub>II</sub> per gallon of water			

 <b>PyGanic 5.0<sub>II</sub></b> <b>Rate per acre</b>	<b>4.5 fl. Oz.</b>	<b>9 fl. Oz.</b>	<b>13.5 fl. Oz.</b>	<b>18 fl. Oz.</b>	
	Acres per Quart	7	3.5	2.4	1.8
	Acres per Gallon	28.4	14.2	9.5	7.1
	Rate for Hand Sprayers	1.5 - 3 teaspoons of PyGanic 5.0 <sub>II</sub> per gallon of water			

POTASSIUM SILICATE

AgSil  
SilMatrix

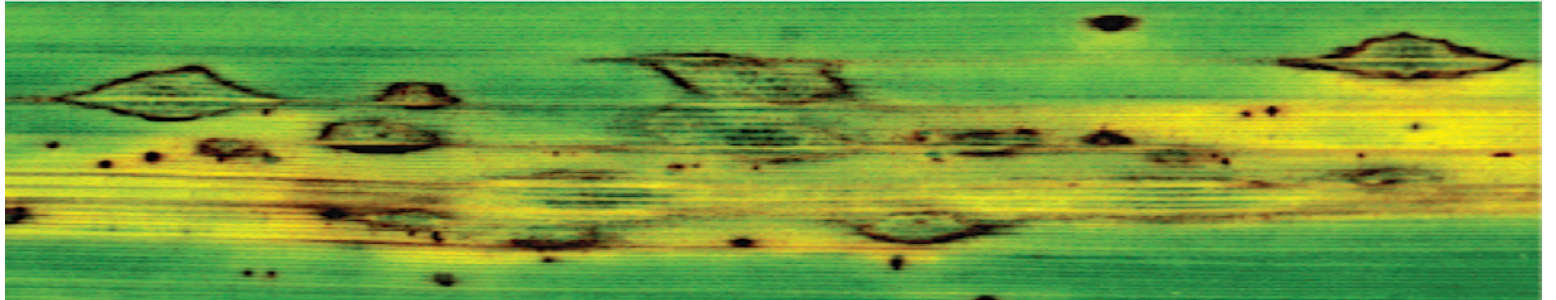
# SILICON

- 2<sup>ND</sup> MOST ABUNDANT ELEMENT IN THE EARTH'S CRUST  
2 FORMS – CRYSTAL & AMORPHOUS

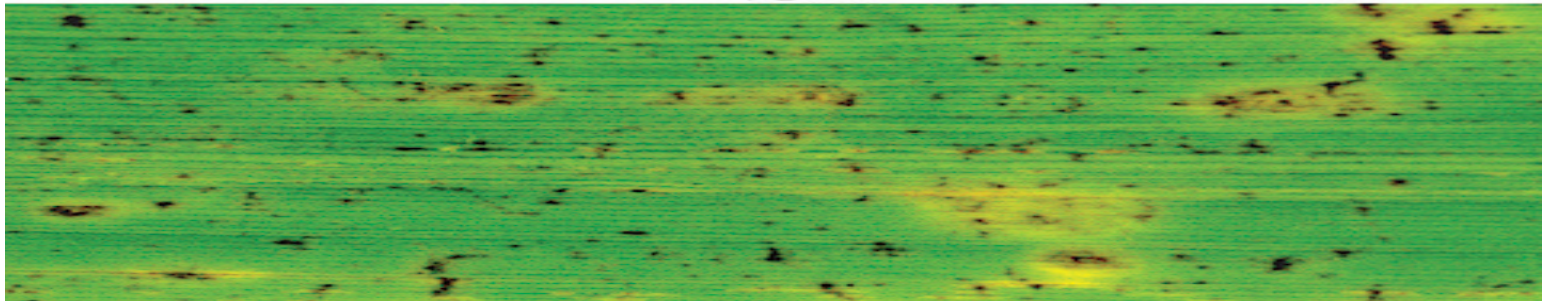
# IMPORTANCE OF SILICON

- ENHANCE PHYSICAL STRENGTH – MAKES THE TISSUE TOUGHER – REINFORCES CELL WALLS
  - STRUCTURAL STRENGTH
  - TISSUE MORE RESISTANT TO INSECTS / DISEASE
- PHYSIOLOGICAL EFFECTS
  - REDUCES ENVIRONMENTAL STRESS – HEAT / DROUGHT
- Biotic
  - Fungal, Bacterial and Viral
- Abiotic
  - Temperature, Drought, Salinity, Nutrient Imbalances
  -

**- Si**



**+ Si**



# HOW TO USE AgSil

- TAKEN UP BY ROOTS IN THE FORM OF SILIC ACID
  - MOVES WITH THE WATER WITHIN THE PLANT & DEPOSITED IN THE TISSUE
  - DOES NOT MOVE WITHIN THE PLANT
  - NEEDS TO BE REAPPLIED AS THE PLANT DEVELOPS

# AgSil APPLICATIONS

FOLIAR SPRAY

LOCALLY SYSTEMIC

COVERAGE VERY IMPORTANT!!!

FOLIAR TISSUE RESISTS FUNGAL / INSECT / MITE

PRESSURE

CHEWING MOUTHPARTS DAMAGED

FEEDING DIFFICULT FOR PIERCING / SUCKING

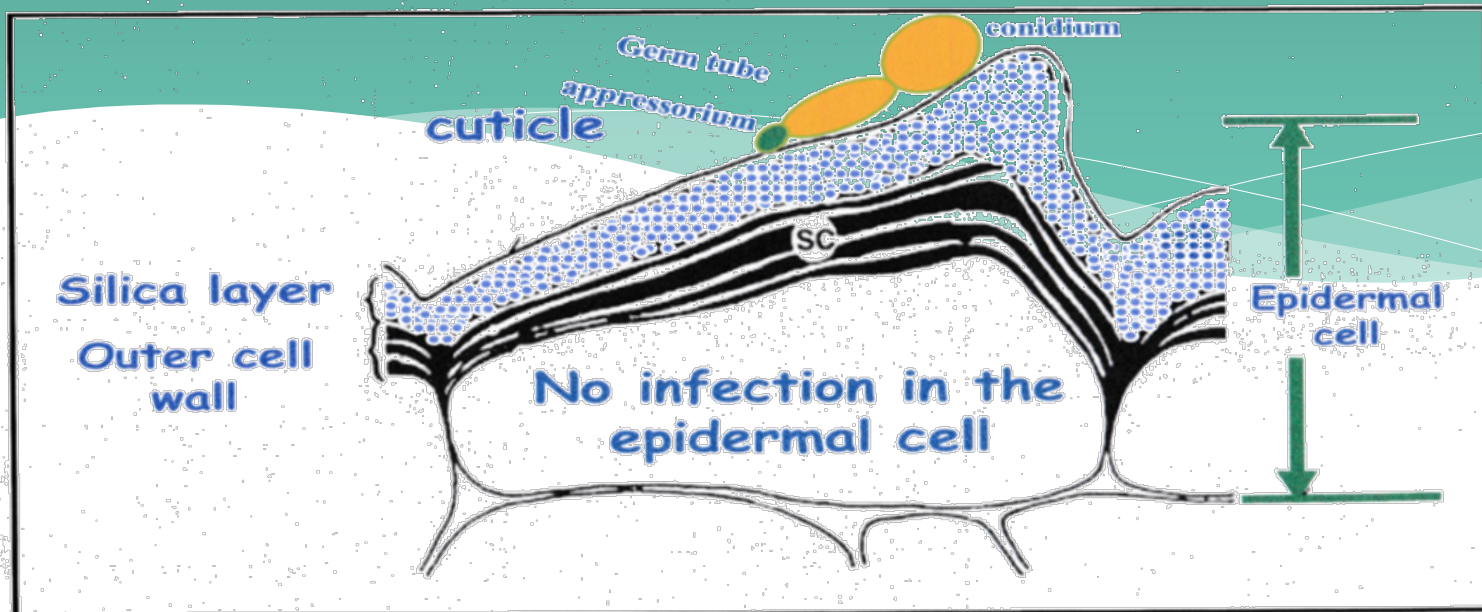
INSECTS



# SilMatrix

## The mechanical barrier hypothesis

Cuticle-silica double layer (Yoshida et al., 1962)





**AXXE**

Broad Spectrum Herbicide

**BioSafe Systems**<sub>L.L.C.</sub>  
The BioSecurity Company

New *Organic* Herbicide  
from BiosafeSystems



- **Non –selective herbicide** for Ag., commercial and residential use
- **Soap product- A.I. Ammonium Nonanoate- 40.0% (35% Pelargonic Acid)**
- **Scythe has 58% by wt of Pelargonic Acid.**
- **Mode of Action:** Disrupts plant tissue through cell wall penetration, resulting in cease of plant growth and brown necrosis.
- **A Contact spray control or burn down** of annual and perennial weeds and Grasses, moss and liver worts.
- Non-volatile and water soluble



- **Application Rates-** 3.0%-15.0% v/v
- **6.0%-10.0% v/v commonly used**
- **Spray Volume-** 30-125 Gallons per Acre
- 45-75 GPA commonly used
- Rate and spray volume depend on weed species, height, leaf shape and weed density.
- **Use method-** Vegetative burn down, directed and shielded spray, pre- emergence spray and dormant/post-harvest sprays.
- Broad number of crop and non-crop groups.
- **No aquatic applications**

Before AXXE



After AXXE



Before AXXE



After AXXE



# Organic fertilizers

## Nitrogen

- Feather
- Blood
- Fish Meal
- Bat Guano
- Corn Gluten Meal
- Soybean Meal
- Cottonseed Meal

## Phosphorus

- Fishbone
- Bone Meal
- Crab Meal
- Shrimp Meal
- Rock Phosphate
- Bat Guano

## Potassium

- Potassium Sulfate
- K-Mag
- Greensand

General: Alfalfa Meal, Kelp, Humate, Worm Castings

# Pacific Natural ® Fresh Fish Fertilizer

**N-P-K Rating:** 2-3-0

•2% total Nitrogen (N), 3% available Phosphoric acid (P205),  
0% soluble potash (K20)

**Process:** Fresh fish offal processed with organic non-GMO enzyme and low temperature hydrolysis, twice-filtered (80-mesh), stabilized with phosphoric acid to target pH 3.5 - 3.8.

**Available in 5 gallon bucket**

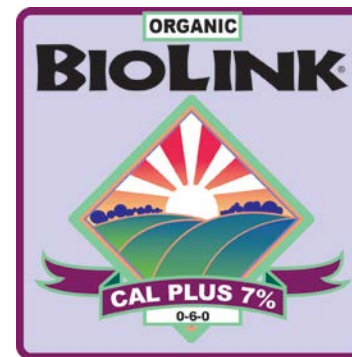
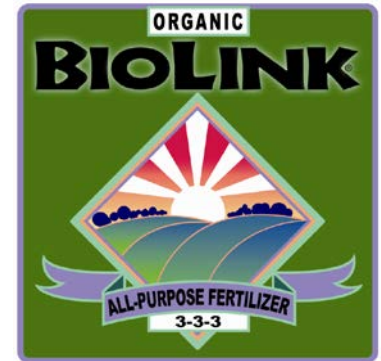
<http://www.greatpacificbioproducts.com>



# Organic TRIGGRR® & Organic BioLink® Nutritional Program

## The Products:

- Organic TRIGGRR®
- Organic BioLink® All-Purpose Fertilizer 3-3-3
- Organic BioLink® Cal Plus 7%
- Organic BioLink® Micronutrient Fertilizer





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PROFESSIONAL MARKETS

THANK YOU

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