Cytospora Canker New Biopesticides

Marion Murray

Cytospora Species

Over 500 different species of Cytospora infect more than 60 trees and shrubs

- aspen, cottonwood, willow, hybrid poplars
- green ash
- Siberian elm
- alder

<u>spruce</u>:

Leucostoma/Cytospora kunzei

<u>stone and pome fruits</u>:

L. cincta

L. persoonii



Cytospora on Spruce

Starts at lowest branches

Needles: purplish to brown to loss



Cytospora on Peach

Fall/early winter temperature extremes

- Nov 25, 2010
- Dec 6, 2011
- Jan 1 – 7, 2013
- Dec 5 – 13, 2013
- Nov 16, 2014
- Dec 27, 2015

Sprinkler irrigation

Tree stress/replant conditions

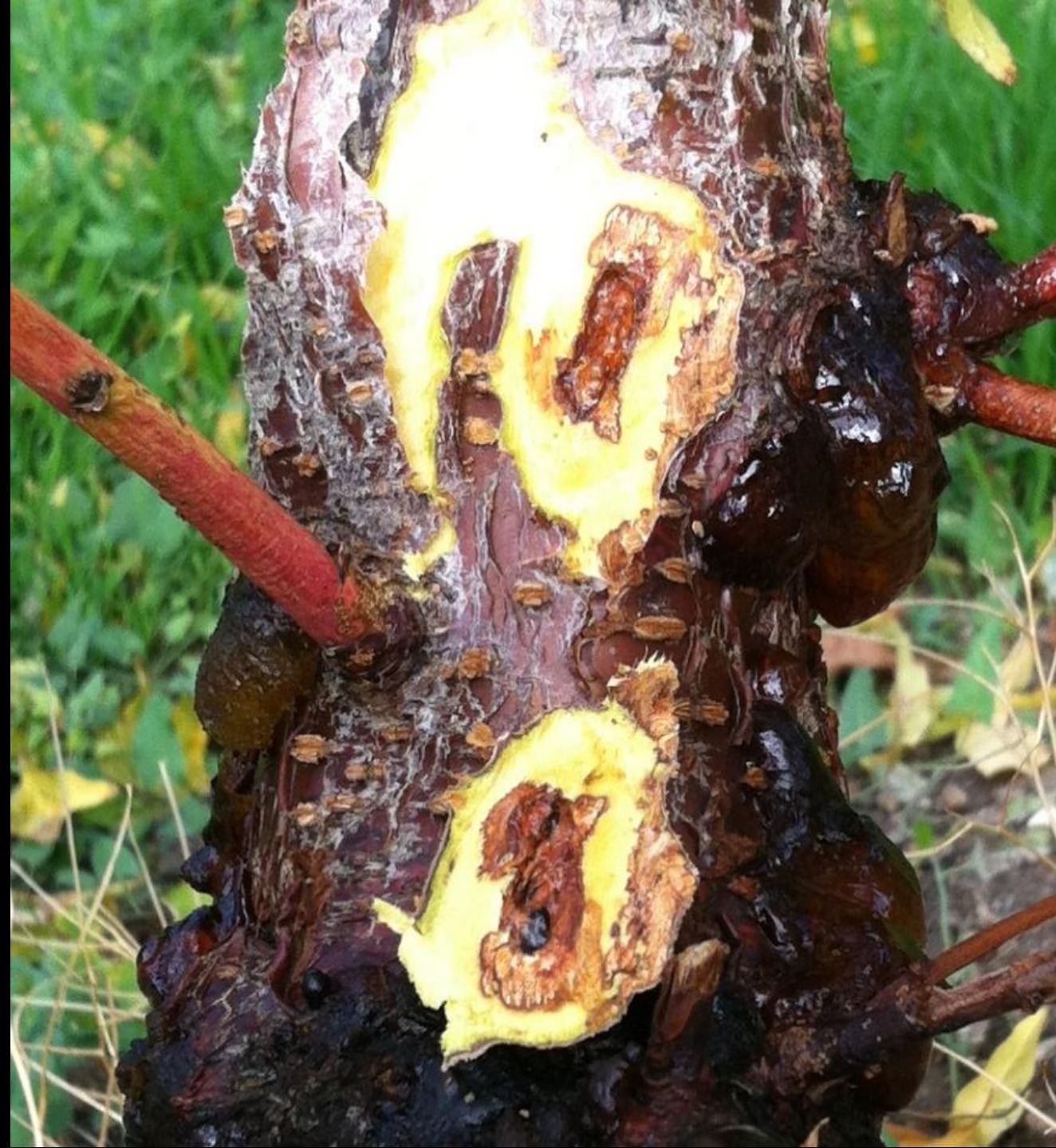
“Gummosis”

environmental stress

- over-bearing
- severe summer pruning
- excessive irrigation
- planting too deep
- wound

borers







Cytospora Management

Good pruning practices

- Remove all dead or diseased branches and limbs as they appear

Maintain tree health with optimal watering and fertilization

Fungicides?



Pruning Best Mgmt Practices

Prune young trees carefully to avoid weak, narrow-angled crotches

Prune infected peach trees as close to bloom as possible

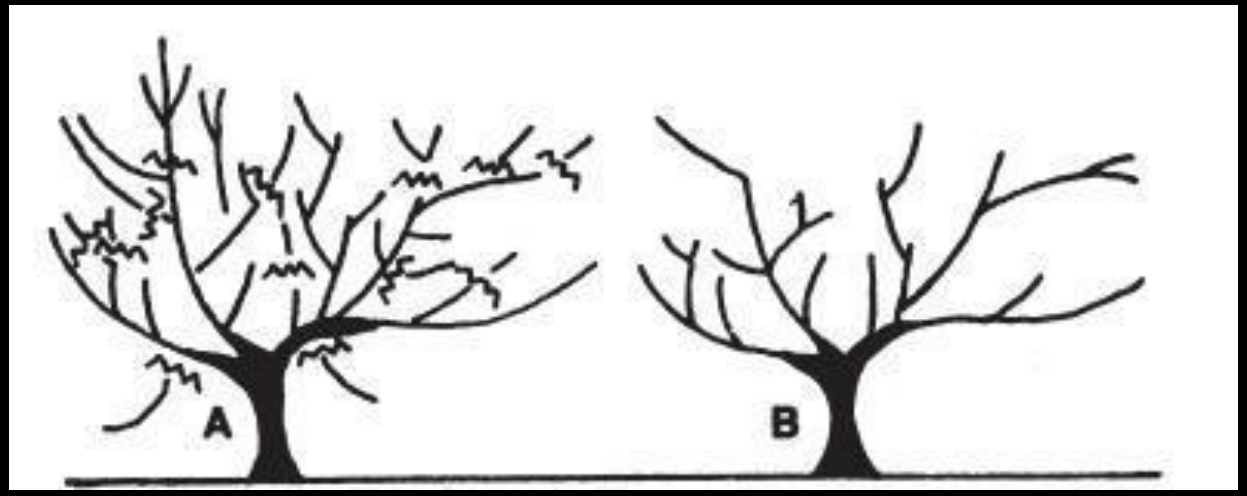
Do not prune in wet weather

Make clean cuts

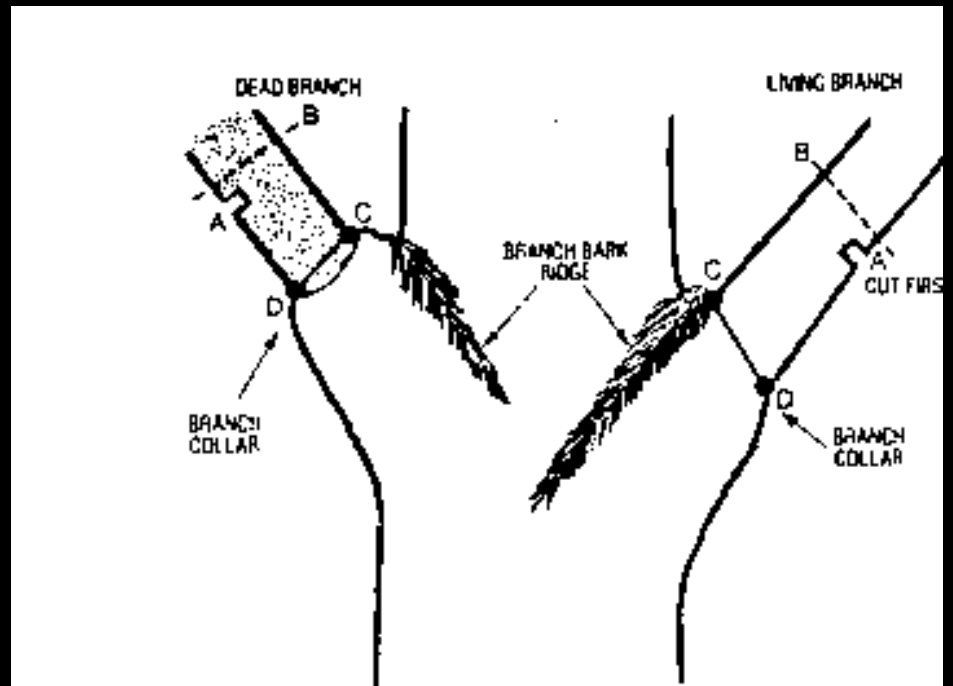
Remove diseased limbs

Disinfect between cuts

50%






DEAD BRANCH
B
A
C
D
BRANCH COLLAR
BRANCH BARK RIDGE
LIVING BRANCH
B
C
A'
CUT FIRS
D
BRANCH COLLAR

Preventive: Maintain Tree Health

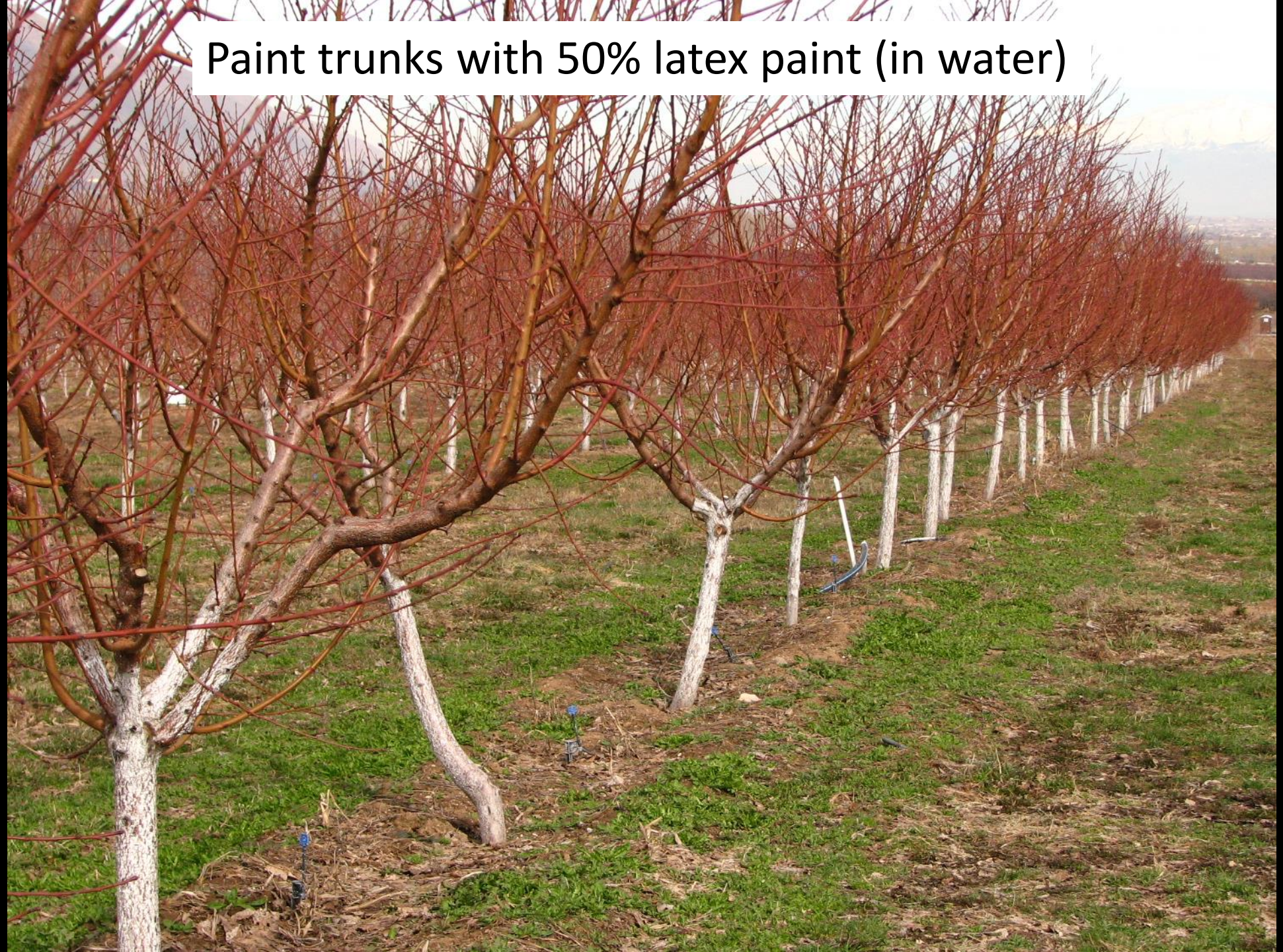
Proper fertilization and irrigation

- check micronutrients (iron, zinc, manganese)

Avoid establishing new orchards in poor soils

Remove weak trees

Paint trunks with 50% latex paint (in water)



Fungicide Treatments?

Apply fungicide right after general pruning: Pristine, captan, chlorothalonil

Apply fungicide to cytospora pruning cuts and cankers: Inspire, Rovral, Topsin

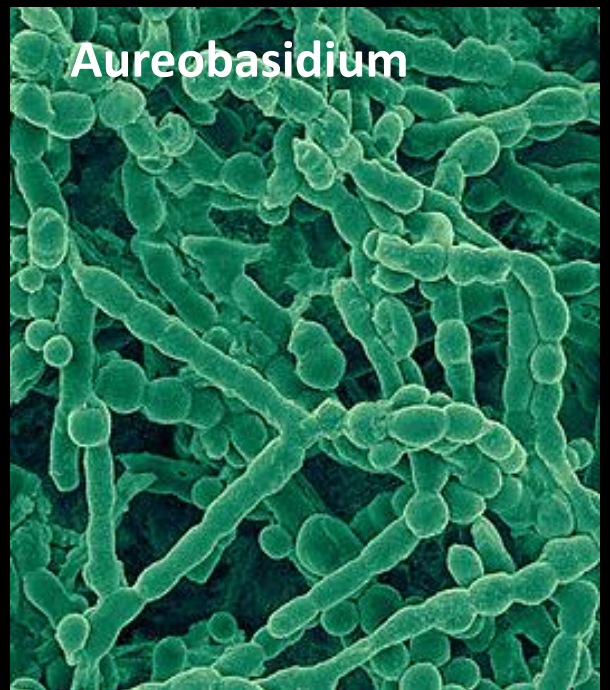
- Add Pentabark enhanced chemical penetration
- Remove gumming before application

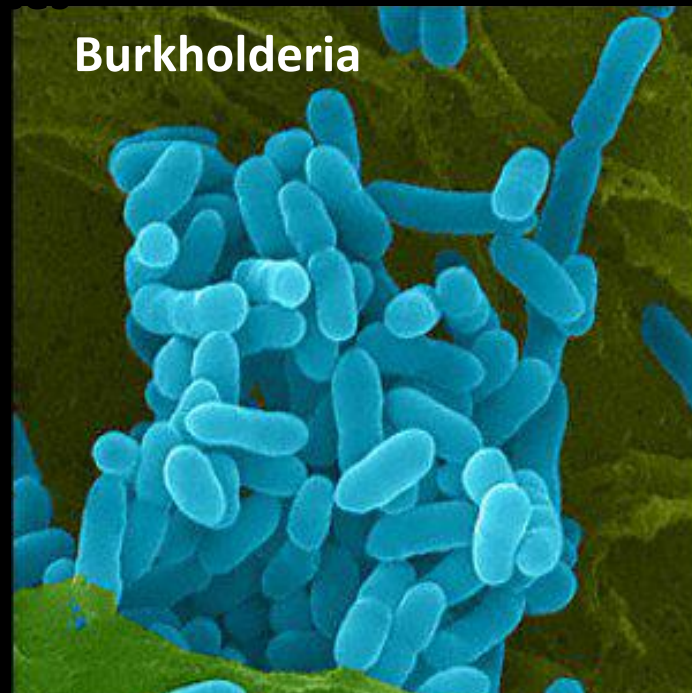
Updates in Biopesticides

Microbial pesticides (formed from bacterium, fungus, virus or protozoan)

Biochemical pesticides (naturally occurring substances, such as plant extracts, fatty acids or pheromones)

Plant-Incorporated-Protectants (genetically modified plants)





Bacillus species

Found in many conditions: salt water, soil, hot springs

Have capacity to produce a dormancy stage (spores) that withstands high temperatures, unfavorable pH, lack of nutrients or water

Easy to store

Diverse modes of action

- stomach poison
- antagonist or competitor to inhibit growth of pathogens
- induces systemic resistance

Grandevo

Fermentation solids of *Chromobacterium subtsugae*

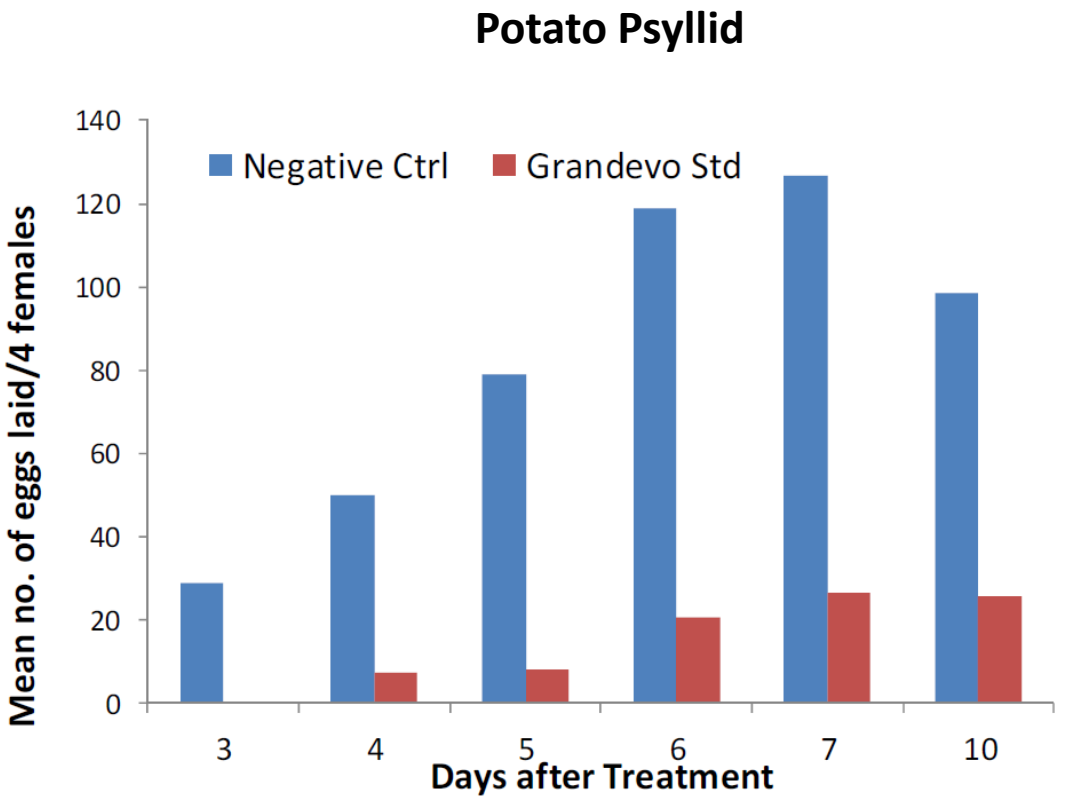
ag crops and ornamental plants

Stomach poison and repellent for caterpillars, coleopteran, aphids, whiteflies and plant-sucking mites

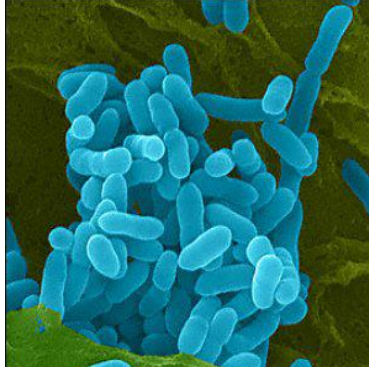
Apply at egg hatch

Good efficacy for:

- stink bug
- turf grubs
- potato psyllid
- spider mites



Venerate XC



Killed cells and fermentation solids of a new species of *Burkholderia: B.* sp. strain A396

- fruit and vegetable crops

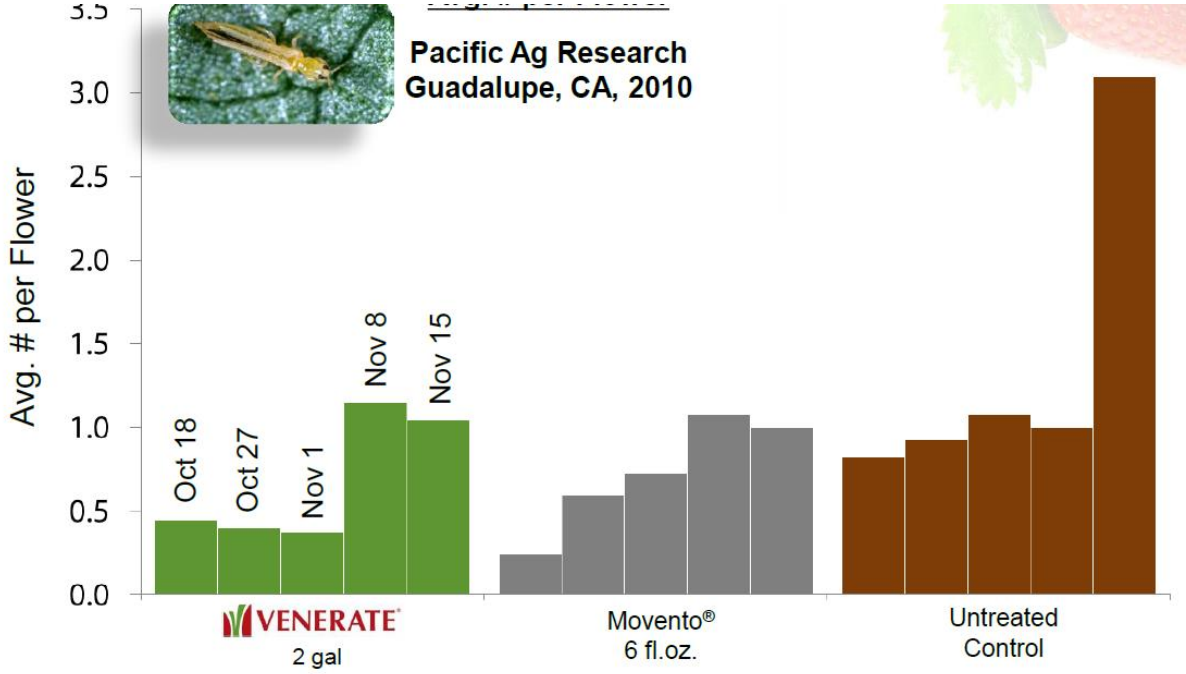
Degrades exoskeleton and prevents molting via contact and/or ingestion

- caterpillars, beetles, aphids, white flies, spider mites

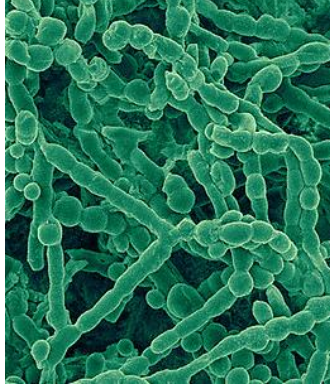
Good efficacy for:

- Asian citrus psyllid
- whitefly

Western Flower Thrips, 2 Treatments



Blossom Protect

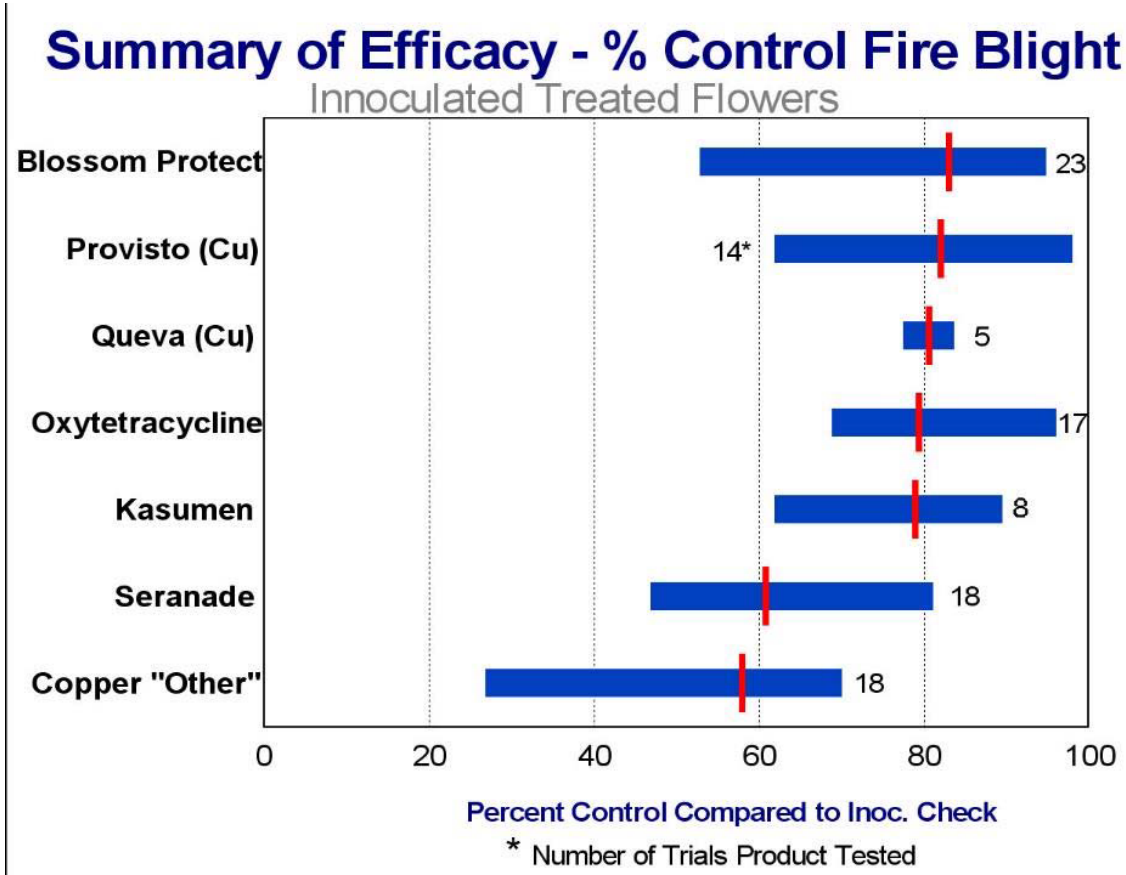


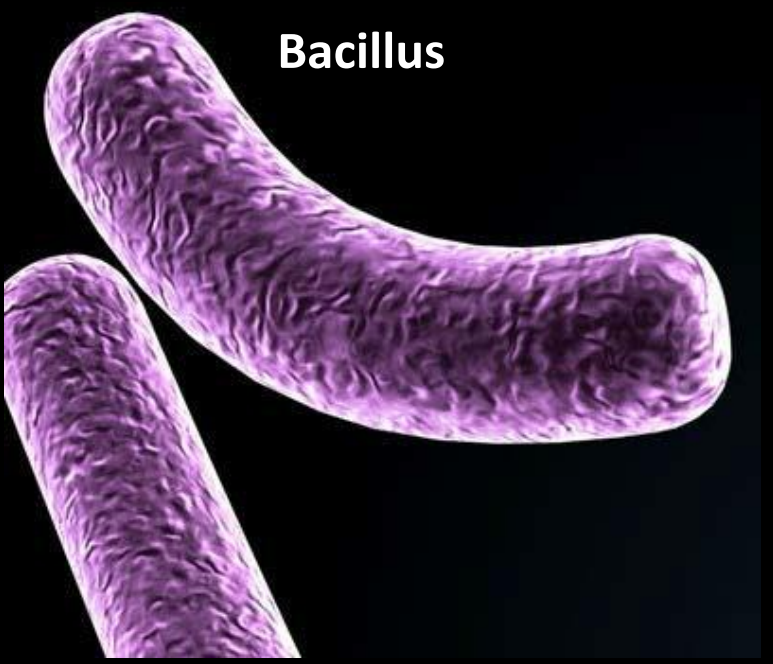
Live formulation of *Aureobasidium pullulans*

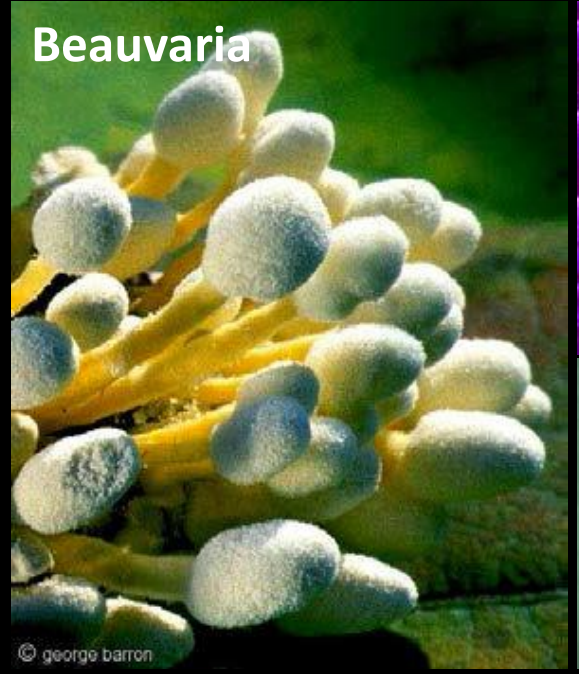
Fire blight: applied up to 4 times per season at 10%, 40%, 70% and 90% open blossoms

Colonizes flower and prevents colonization of *Erwinia* bacteria

Best efficacy of all fire blight biopesticides

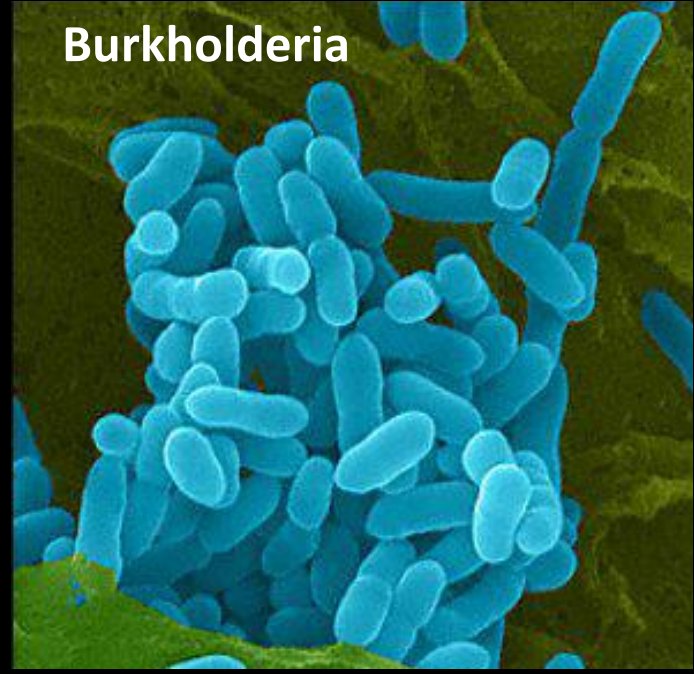


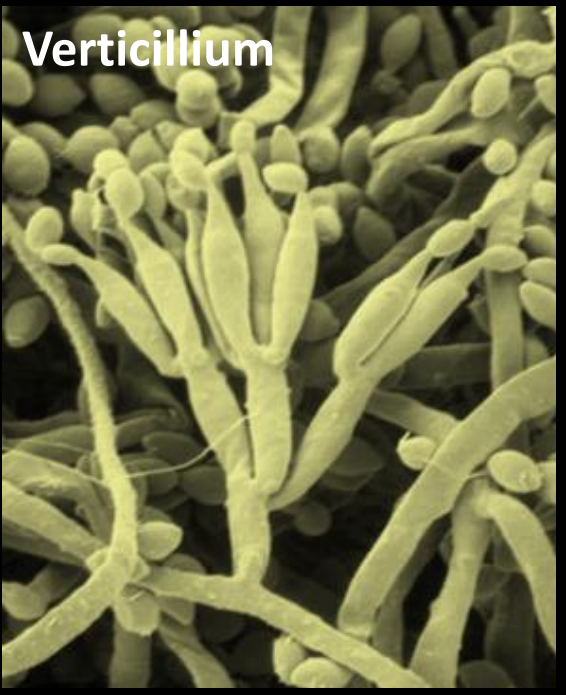

Bacillus

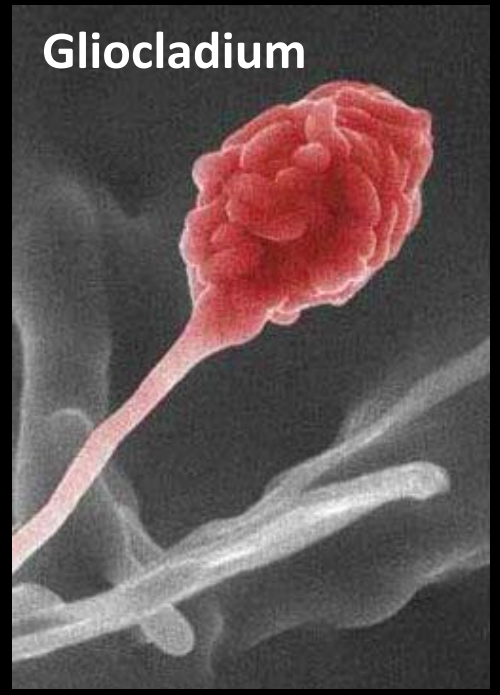

Beauvaria
© george barron

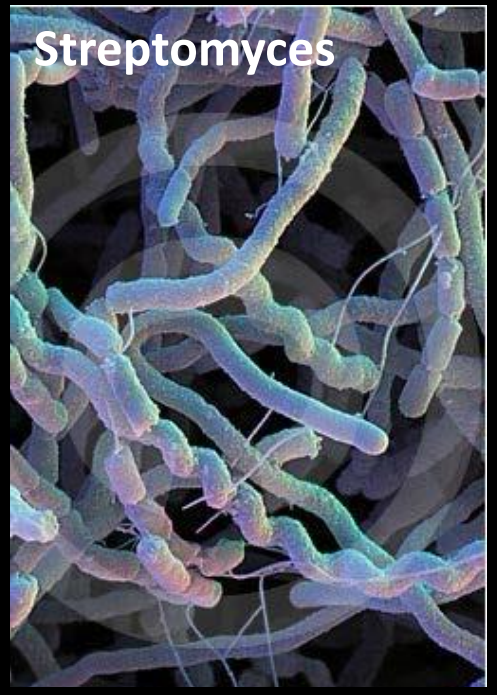

Chromobacterium

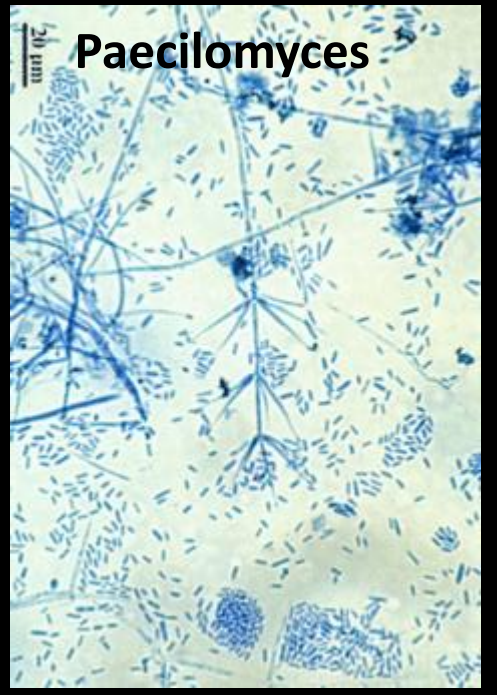

Metarhizium


Burkholderia


Verticillium


Gliocladium


Streptomyces


Paecilomyces


Trichoderma
5 µm

Biofungicides

Biochemicals

- Affirm (polyoxin D)
- Alexin (fruit & vegetable extract)
- CG100 (Caprylic acid)
- Citrex (Citrus extraction)
- Copper based products
- Endorse (polyoxin D)
- K-Phite (Phophorus acid salts)
- Kleengrow (Didecyl dimethyl ammonium chloride)
- Milstop (potassium bicarbonate)
- Omega GroPlus (Fish oil)
- Phosphorous acid/phosphorus acid generators
- Proud 3 (thyme oil)
- Regalia (Extract of *Reynoutria sachalinensis*)
- Triact (Neem Oil Extract)
- TriCon (Sodium tetraborohydrate decahydrate)

Microbials

- Actinovate Soluble (Streptomyces lydicus WYEC 108)
- Bloomtime (Pantoea agglomerans strain E325)
- BMJ (Bacillus mycoidesisolate J)
- Cease (Bacillus subtilis strain QST 713)
- Companion (Bacillus subtillis GB03)
- EcoGuard (Bacillus licheniformis SB3086 + Indole-3- butyric Acid)
- PreStop (Gliocladium catenulatum Strain J1446)
- Remedier (Trichoderma asperellum + Trichoderma gamsii)
- RootShield Plus (Trichoderma harzianum T-22 + Trichoderma virens G-41)
- Taegro (Bacillus subtilis var amyloliquefaciens strain FZB24)

Bioinsecticides

Biochemicals

- Agra-50 (propylene glycol alginate)
- Aza-Direct (azadirachtin)
- AzaGuard(azadirachtin)
- AzatinXL (azadirachtin)
- BugOil (mineral oil)
- Hexacide (rosemary oil)
- M-Pede (insecticidal soap)
- MilStop (potassium bicarbonate)
- NeemazalF (azadirachtin)
- Neemix (azadirachtin)
- Ornazin3% (azadirachtin)
- Proud 3 (thyme oil)
- Saf-T-Oil (Horticultural Oil)
- Safer Soap (Potassium Salts of Fatty Acids)
- Sucrocide (Sucrose octanoateester)
- SuffoilX (Petroleum Oil)
- Surround WP (Kaolin Clay)
- Triact (Neem Oil Extract)
- TriCon (Sodium tetraborahydrate

Microbials

- BotaniGard (Beauveria bassiana)
- GrandEvo (Chromobacterium subtsugae NRRL B-30655)
- Met52 (Metarhizium anisopliae strain F52)
- Natural Solutions (Verticillium lecanii)
- NoFly (Paecilomyces fumosoroseous strain FE 9901)
- Preferal (Isaria fumosoroseus)
- TickExEC (Metarhizium anisophliae)
- Venerate (Burkholderia sp. strain A396)

Bacillus thuringiensis insecticides

B.t. kurstaki (Lepidoptera) – Bonide Thuricide, Monterey, Dipel, Javelin

foliage feeding caterpillars

B.t. aizawai (Lepidoptera) – Agree, XenTari

cabbage caterpillars

B.t. israelensis (Diptera) – Gnatrol, Summit

mosquitoes and flies

Bacillus fungicides

B. amyloliquefaciens: Double Nickel 55

brown rot, bacterial diseases, powdery mildew

B. pumilis: Sonata

powdery mildew

B. subtilis: Serenade (home and commercial formulations), Cease, Rhapsody

powdery mildew, anthracnose, Phytophthora, bacterial diseases