

Feeling a Bit Grey and Fuzzy??

Dr. Mary Hausbeck

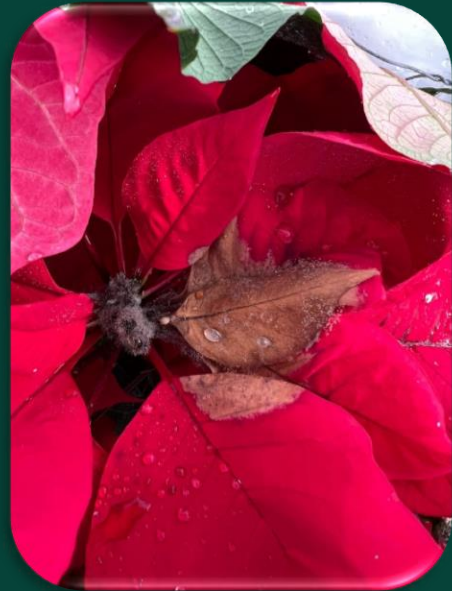
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Botrytis cinerea

Some plants are a magnet for this pathogen



Geranium



Poinsettia



Botrytis Blight



Begonia

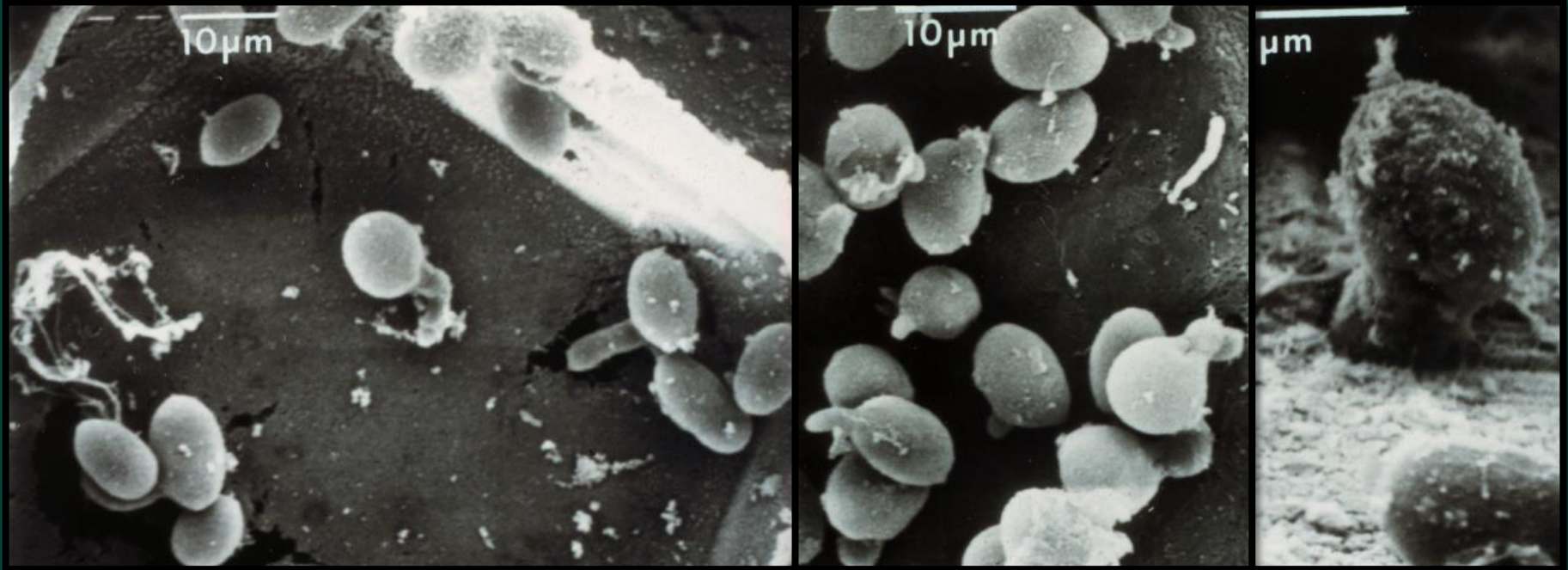


Petunia

So Many Spores . . .

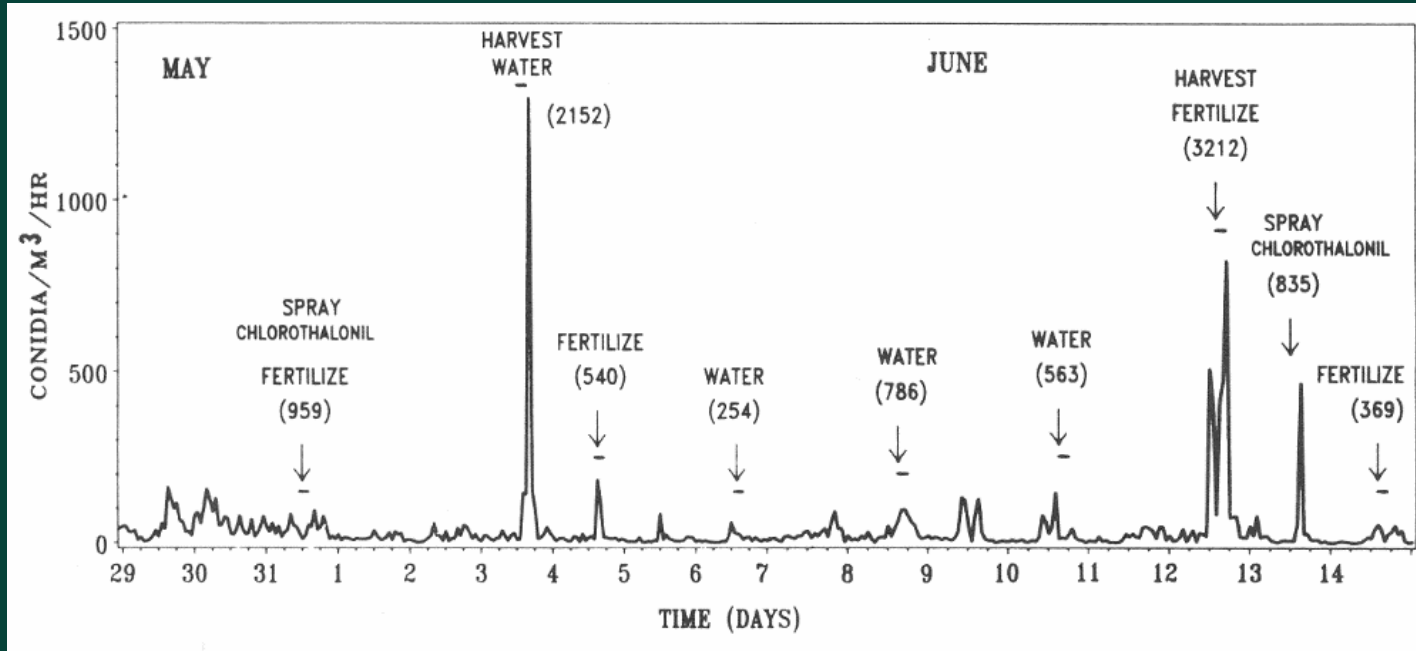


Germinating Spores



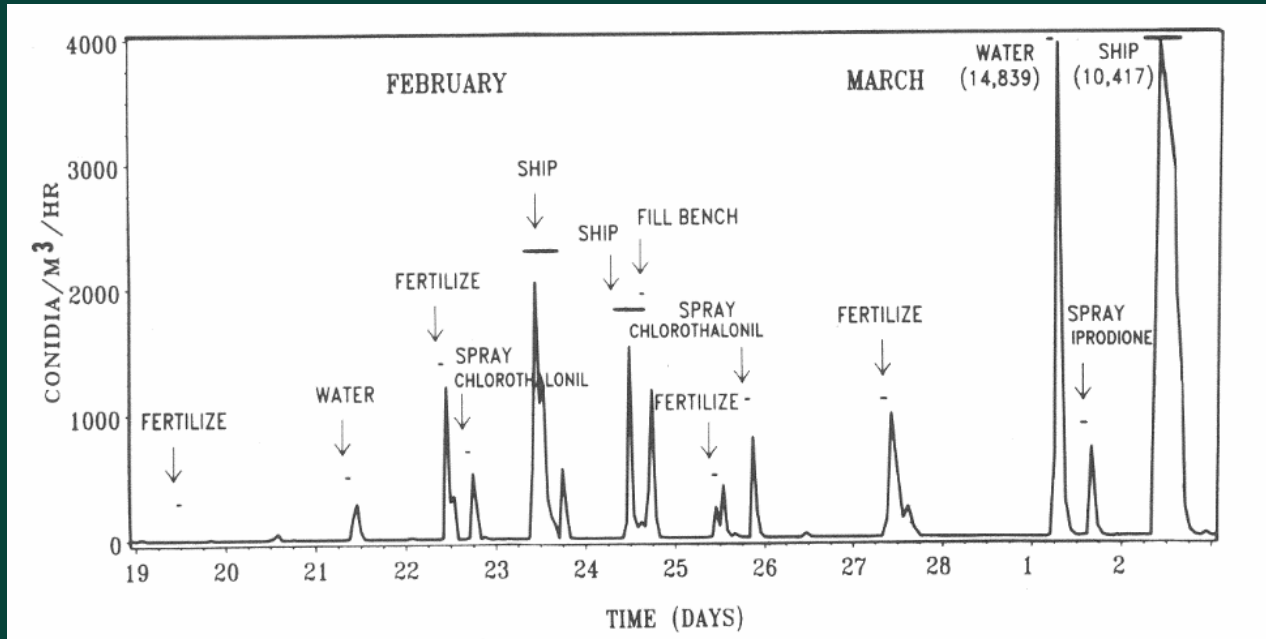
Greenhouse Spore Showers

Stock Plants



Greenhouse Spore Showers

Shipping



Keep Leaves and the Environment Dry!

- ▶ Space plants to avoid a dense canopy
- ▶ Move the air to prevent pockets of high RH (less than 85%)
- ▶ Prevent standing water
- ▶ Vent or heat to remove moist air
- ▶ Water in the morning
- ▶ More than 6 hours of wetness allows a Botrytis spore to germinate in 3 hours and infect in 6-9 hours



Clean Up Those Spores!

- ▶ *Botrytis* infects and produces spores on plants that are dead or alive
- ▶ Remove diseased plants, fallen petals, flowers and leaves
- ▶ Cover trash containers and keep them out of production areas



Maximize Botrytis Protection

- ▶ Use products proven to be effective
- ▶ Days between sprays should be shortened if weather is favorable for Botrytis or disease has gotten a head start
- ▶ Alternate effective fungicides based on FRAC codes
- ▶ Susceptible crops should be protected before disease develops especially prior to bloom



Broadform[™]

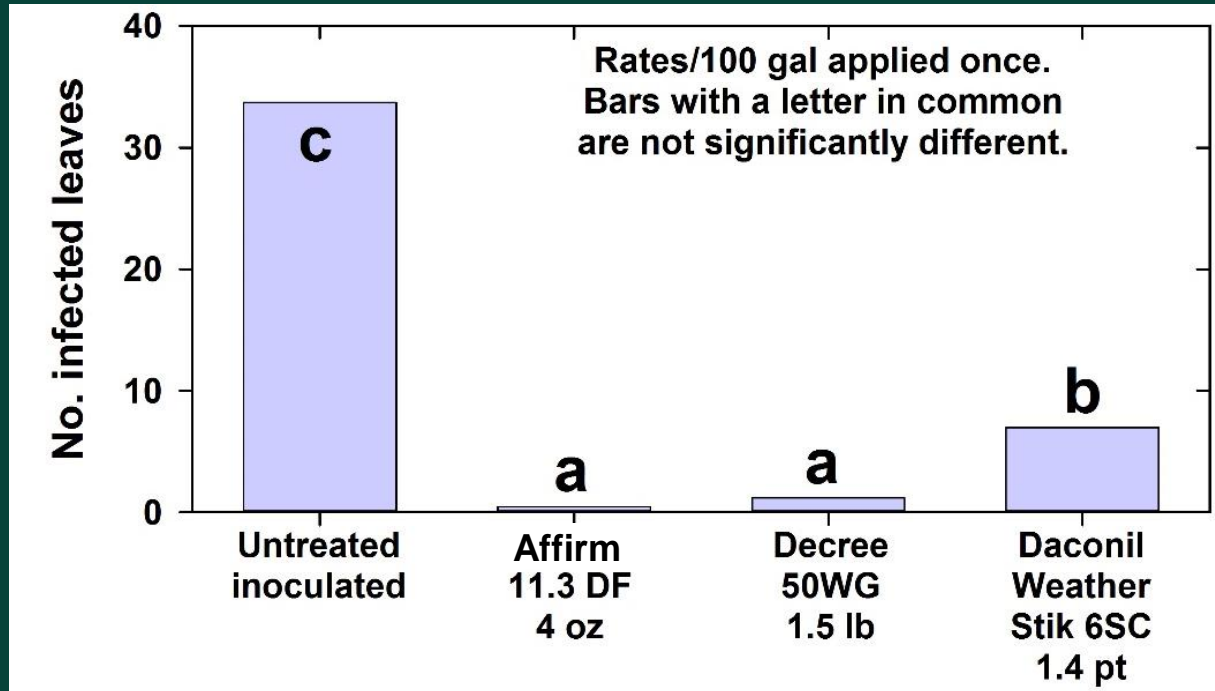
GROUP 7 | 11 FUNGICIDE

Botrytis Blight Fungicides

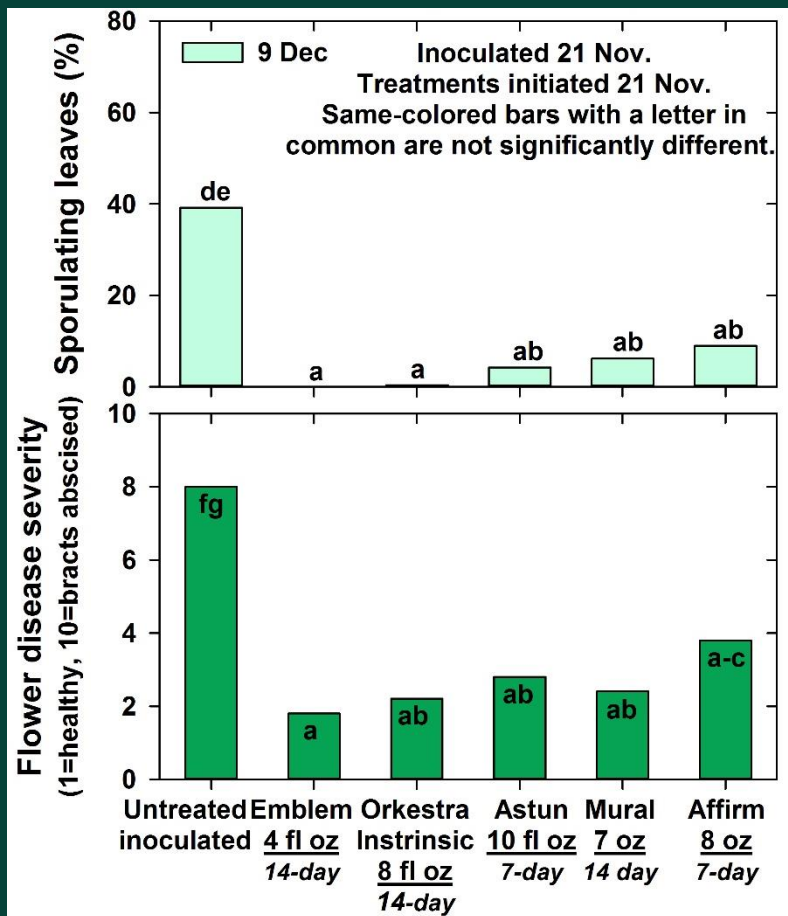
- ▶ Broadform SC (fluopyram/trifloxystrobin) [FRAC=7/11]
- ▶ Affirm WG (polyoxin D zinc salt) [FRAC=19]
- ▶ Astun SC (isofetamid) [FRAC=7]
- ▶ Daconil (chlorothalonil) [FRAC=M05]
- ▶ Decree (fenhexamid) [FRAC=17]
- ▶ Emblem/Medallion/Spirato (fludioxonil) [FRAC=12]
- ▶ Mural (azoxystrobin/benzovindiflupyr) [FRAC=11/7]
- ▶ Orkestra (fluxapyroxad/pyraclostrobin) [FRAC=7/11]
- ▶ Palladium (cyprodinil/fludioxonil) [FRAC=9/12]
- ▶ Medallion/Spirato GHN (fludioxonil) [12] – do not apply to geraniums

Botrytis on New Guinea Impatiens

Comparing well-known fungicides







Newer Fungicides

Poinsettia 'Early Prestige Red'

Emblem

(fludioxonil) [FRAC=12]

Orkestra

(fluxapyroxad/pyraclostrobin) [FRAC=7/11]

Astun

(isofetamid) [FRAC=7]

Mural

(azoxystrobin/benzovindiflupyr) [FRAC=11/7]

Affirm

(polyoxin D zinc salt) [FRAC=19]

No fungicide



Emblem 4 fl oz
14-day



Orkestra Intrinsic 8 fl oz
14-day



Astun 10 fl oz
7-day



Mural 7 oz
14-day

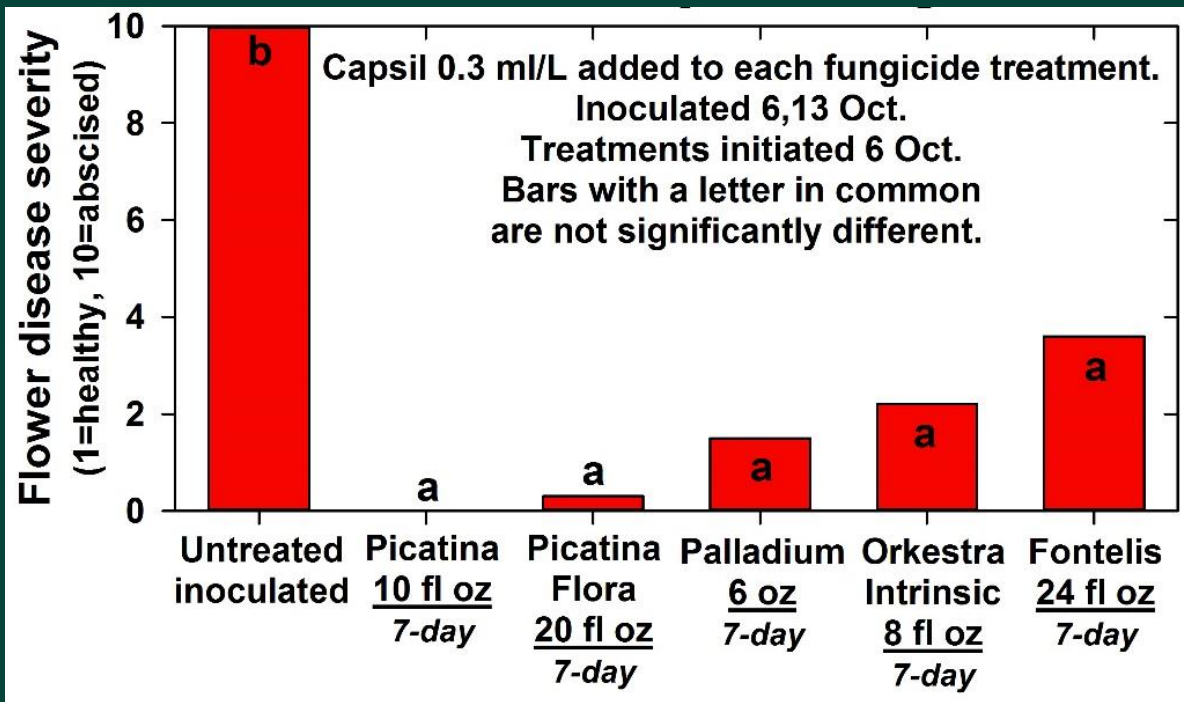


Affirm 8 oz
7-day



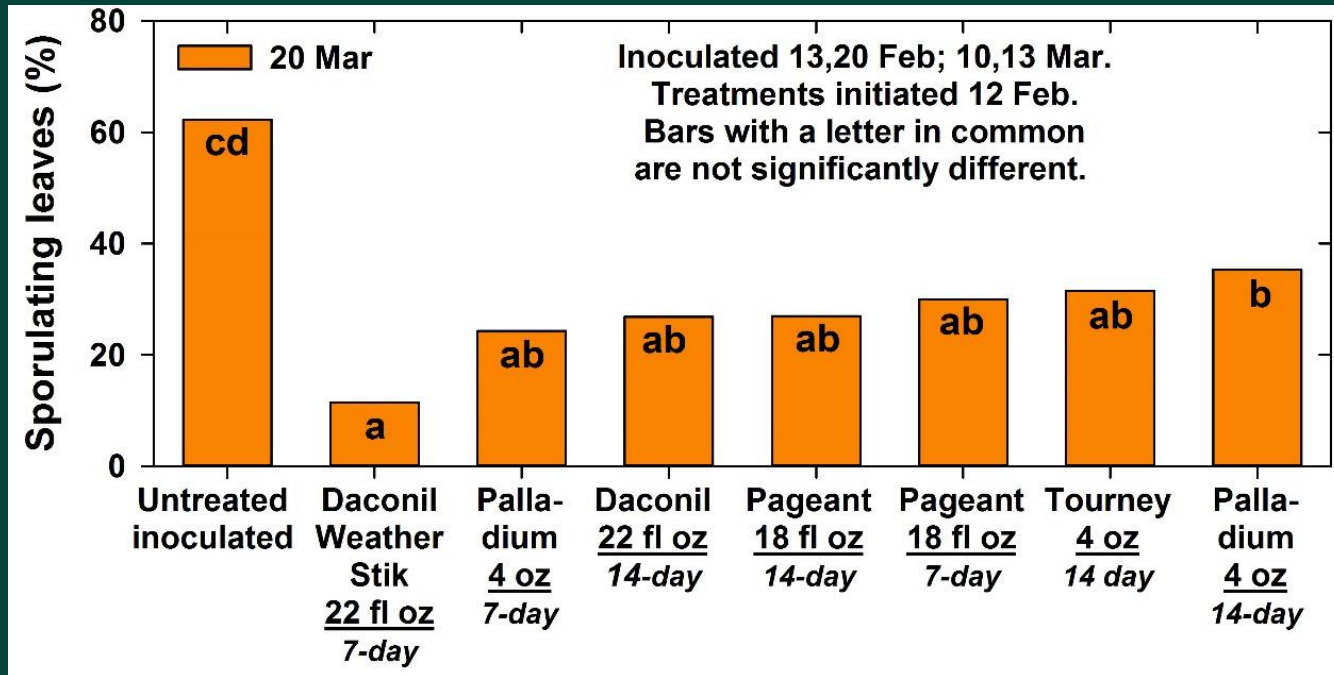
Botrytis on Poinsettia 'Early Prestige Red'

Similar FRAC codes and new products



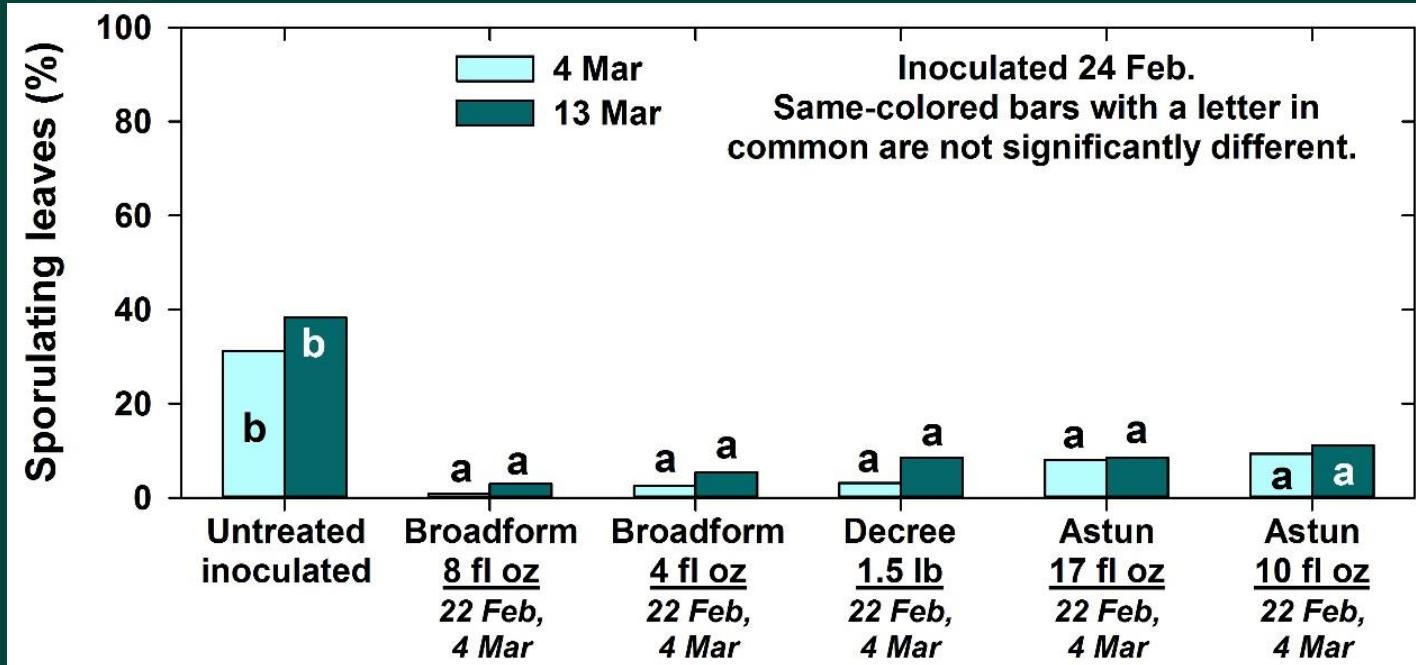
Botrytis on Geranium 'Pinto Premium White'

Comparing 7-day to 14-day



Botrytis on Geranium 'Pinto Premium White'

More is not always better



Untreated



Broadform 8 fl oz



Decree 1.5 lb



Astun 17 fl oz



Why is Botrytis a Top Disease Problem?

Many plants are susceptible

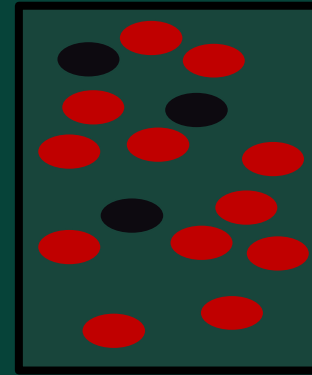
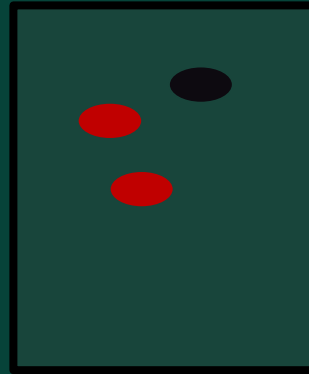
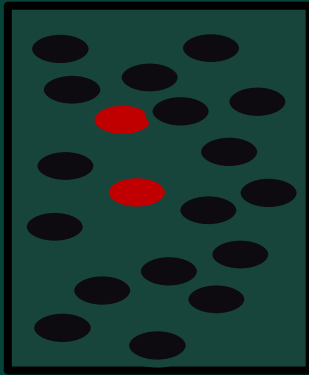
Reproduces rapidly
under wet, humid
conditions

Botrytis is 'everywhere' in the
environment
It's a ubiquitous pathogen

Has Botrytis adapted to some fungicides, so they aren't
limiting disease?

How Resistance Becomes Widespread

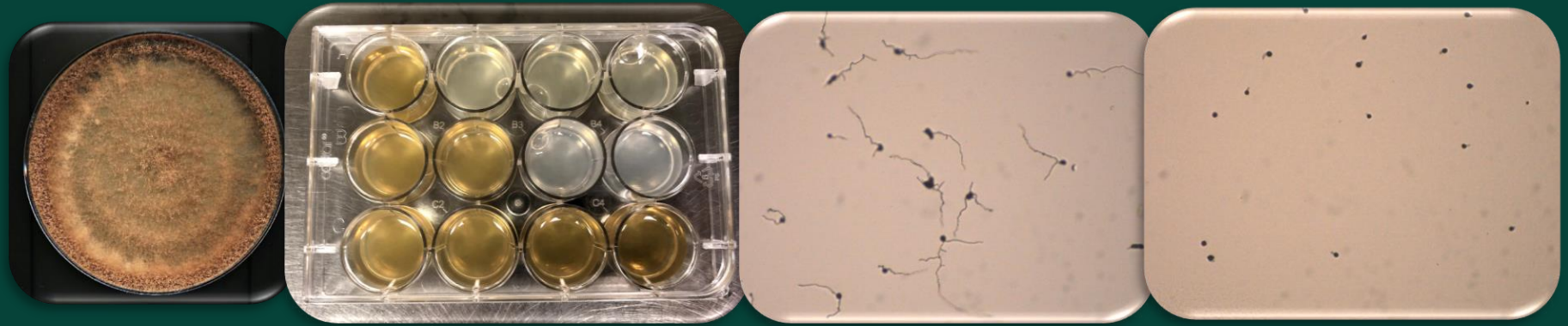
● = Sensitive ● = Resistant



Fungicide
Application

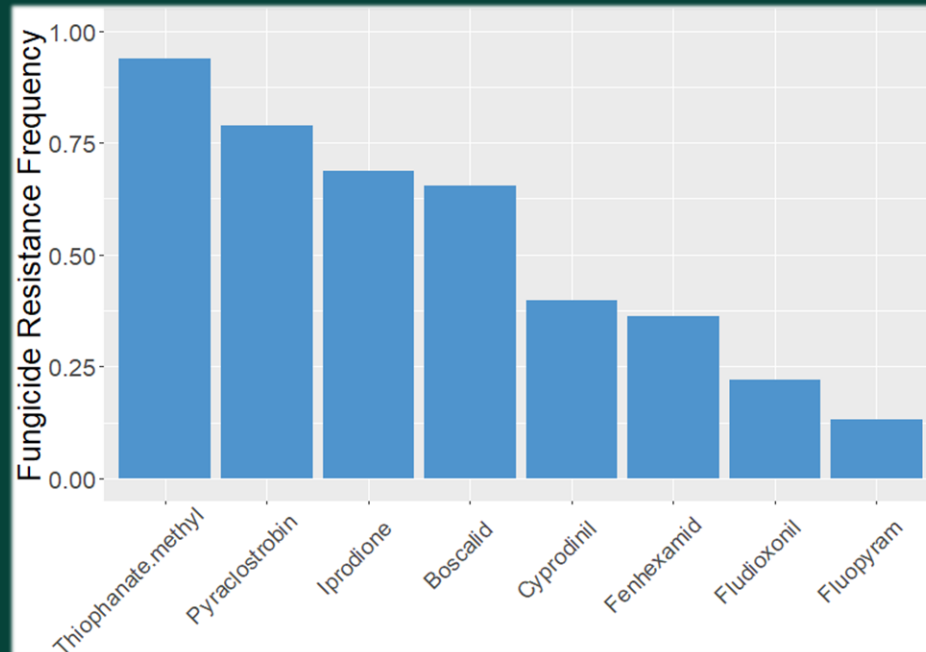
Reproduction

Monitoring Fungicide Resistance Frequencies in *Botrytis*



Collected ~400 isolates of *Botrytis cinerea* from ornamental greenhouses and screened them using germination assays for resistance to common fungicides

High Fungicide Resistance Frequencies in *Botrytis*



Stop the MUTANTS!

Limit exposure of Botrytis spores to fungicides by intervening early



Scout susceptible plants to look for early infections and take action

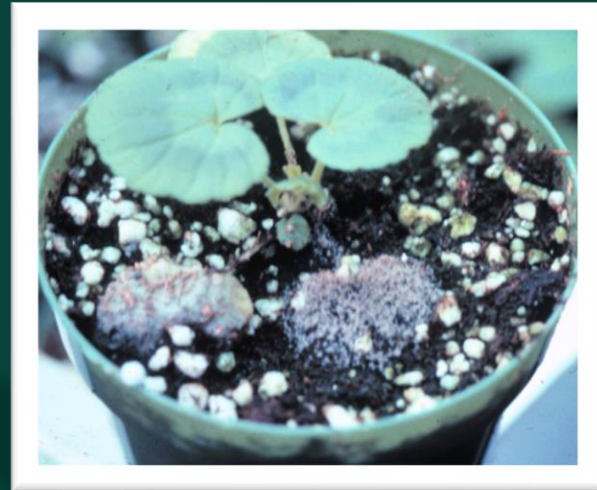


Be on the offense prior to bloom
Heat and vent + fungicide sprays

Scout and be Warned of Potential Epidemics

Flowers, dead or damaged leaves are good places to look

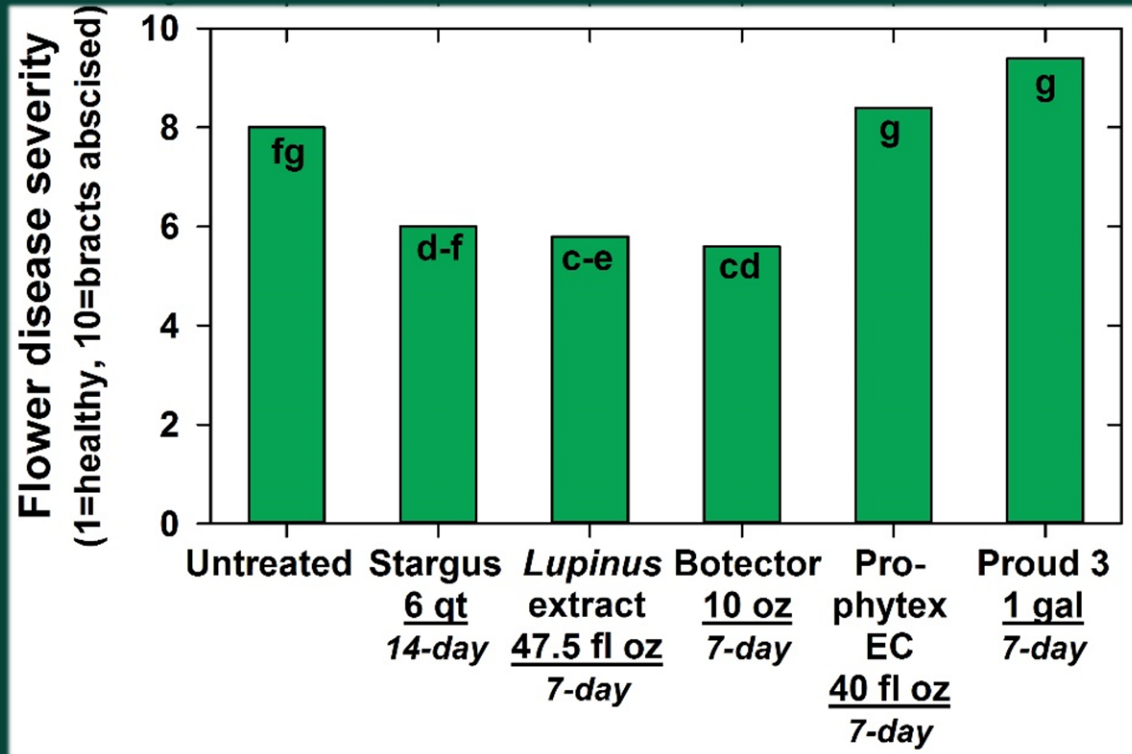
Pay attention to the weather forecast



Biopesticides for Botrytis Blight

Product	Active ingredient	FRAC	Labeled
Affirm WDG	polyoxin D zinc salt	19	yes
Botector WG	Aureobasium pullulans	NC	yes
EcoSwing F	Swinglea glutinosa	NC	yes
Howler WP	Pseudomonas chlororaphis	NC	yes
Lupinus	Lupinus	NC	no
Prophytex EC/WP, Serenade WP	Bacillus subtilis	44	no
Proud 3	thyme oil	NC	yes
Regalia CG	Reynoutria sachilinensis	P05	yes
Stargus SC	Bacillus amyloliquefaciens	44	yes
Ulocladium oudemansii	Ulocladium oudemansii	NC	no

Poinsettia 'Early Prestige Red'



Lupinus extract 47.5 fl oz
7-day



Stargus 6 qt
14-day



Botector 10 oz
7-day



Prophytex WP 20 oz
7-day



Prophytex EC 40 fl oz
7-day



Proud 3 1 gal
7-day



Testing Calcium for *Botrytis* Control

- ▶ Calcium chloride dihydrate (325 ppm) applied to bracts 2 times weekly and then inoculated with *Botrytis* and incubated under high RH
- ▶ Ca was applied alone or mixed with fungicides 24 hours prior to inoculation with *Botrytis* and incubation under high RH

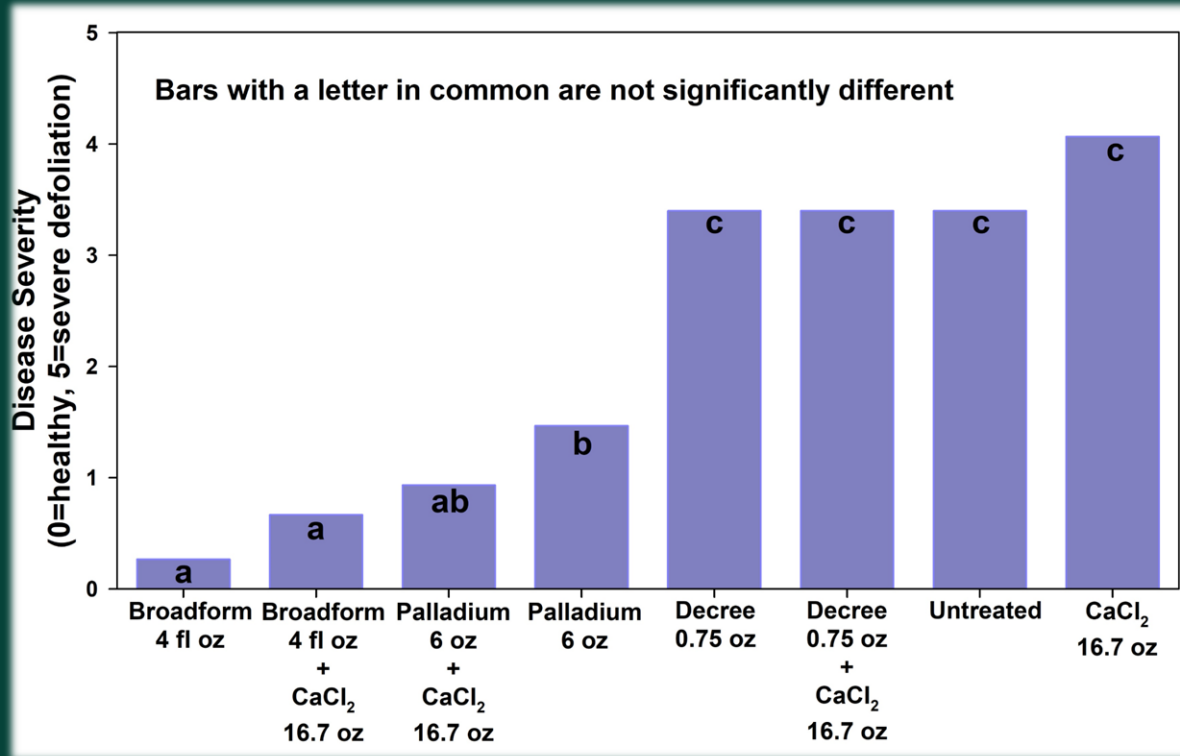


The Role of Calcium in Plants

With high levels of fungicide resistance, how else can Botrytis be managed?

- ▶ **Calcium helps maintain structure between plant cells. Deficiencies may result in weak or senescent plant tissue which is susceptible to Botrytis**
- ▶ **Greenhouses may have high relative humidity and extended days of overcast weather (ideal for Botrytis) and can slow calcium translocation**

Calcium With and Without Fungicides



Calcium vs. Broadform *Botrytis* Treatments



Untreated

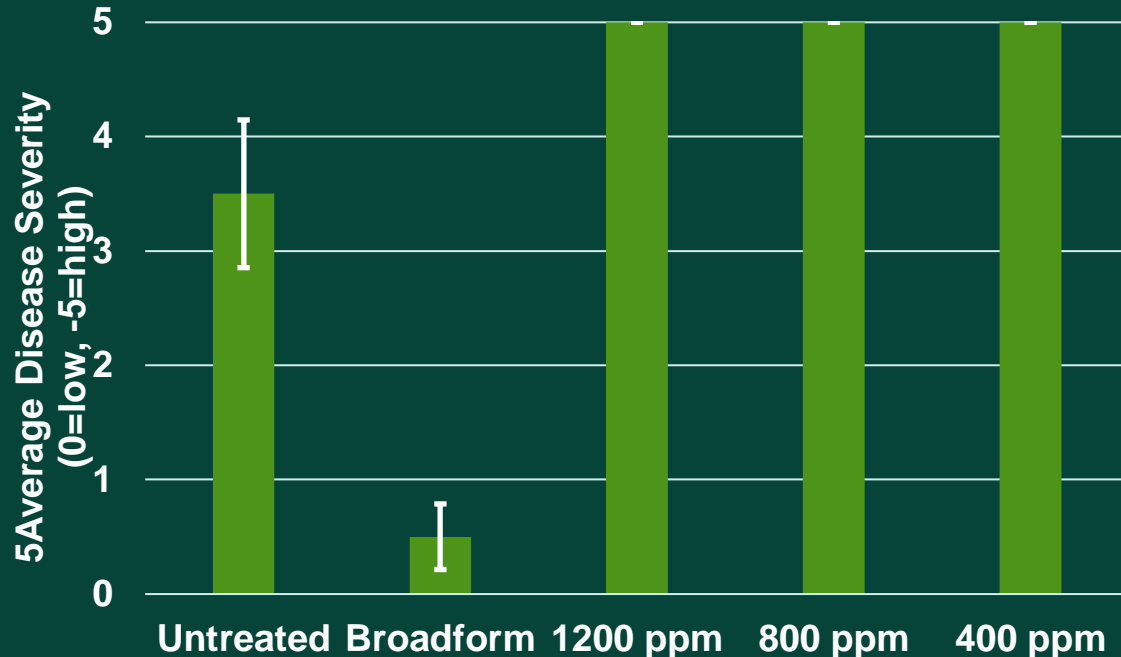


Calcium



Broadform

Can Higher Rates of Calcium Provide *Botrytis* Control?



Can Higher Rates of Calcium Provide *Botrytis* Control?



400 ppm



800 ppm



1200 ppm

Please Consider This

- ▶ Botrytis is limited by a dry and clean greenhouse
- ▶ Botrytis is becoming resistant to important fungicides and could be resulting in control problems
- ▶ Use fungicides proactively, alternating among FRAC codes to prevent fungicide resistance
- ▶ Foliar applications of calcium chloride do not directly prevent Botrytis blight on poinsettia

Combining Approaches

- ▶ Environmental control = dry
- ▶ Reduce spore load = clean up
- ▶ Avoid resistant Botrytis = alternate among FRAC codes
- ▶ Timing is everything = scout
- ▶ Biocontrols with measurable activity + conventional fungicides



This research was funded by:

- ▶ Western Michigan Greenhouse Association
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- ▶ USDA IR-4 Project





Thank you

Questions?