Baseline Sensitivity of California Isolates of White Rot to Fungicides

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CGORAB MEETING

Overview

*INTRODUCTION TO WHITE ROT

*FIELD EXPERIMENTS

*PHYTOTOXICITY ISSUES ASSOCIATED WITH FUNGICIDES

*IMPORTANCE OF ESTABLISHING A BASELINE SENSITIVITY

*RESULTS OF EXPERIMENT

*DISCUSSION OF RESULTS

Importance of White Rot of Onion and Garlic

- Caused by the soil fungal pathogen *Sclerotium cepivorum*, which spreads and overwinters as sclerotia



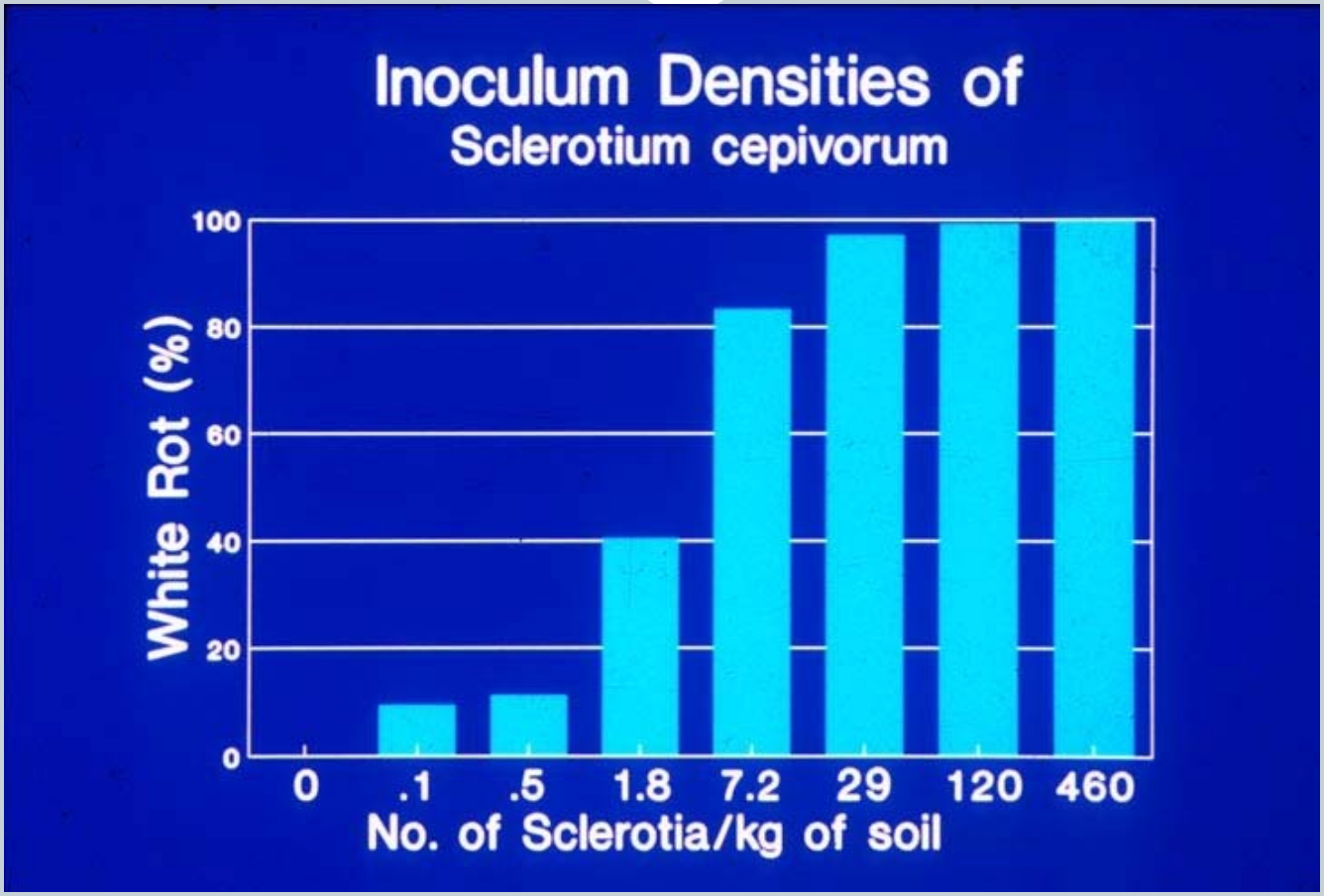
- White rot is a monocyclic disease. Disease symptoms are often not present until just a few weeks before harvest, sometimes forcing growers to abandon fields.

- White rot is the typically the limiting factor to production when it is present, and can cause devastating losses, anywhere from 50-100% total loss.

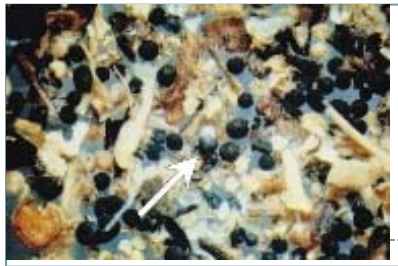
What makes white rot so devastating?

- Sclerotia can remain viable for over 30 years in the soil, even in the absence of hosts.
- Sclerotia are small enough that they can easily be moved any time dirt, or propagative materials (especially garlic cloves) are transported.
- A very small number of sclerotia can cause significant disease.

Effect of Inoculum Density on white rot incidence



1980. Crowe, F.J. et al. Density of *Sclerotium cepivorum* and the incidence of white rot of onion and garlic. *Phytopathology*, 70:64-69.



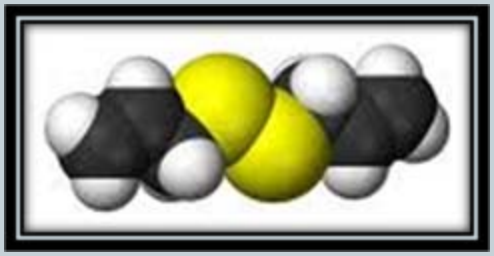
Sclerotium cepivorum

- Plants in the *Allium* family are the only hosts, and onions and garlic are especially susceptible.

- Sclerotia germinate in response to chemicals exuded by *Allium* roots, especially Allicin and other diallyl sulfur compounds.

Sclerotia Germination Stimulants

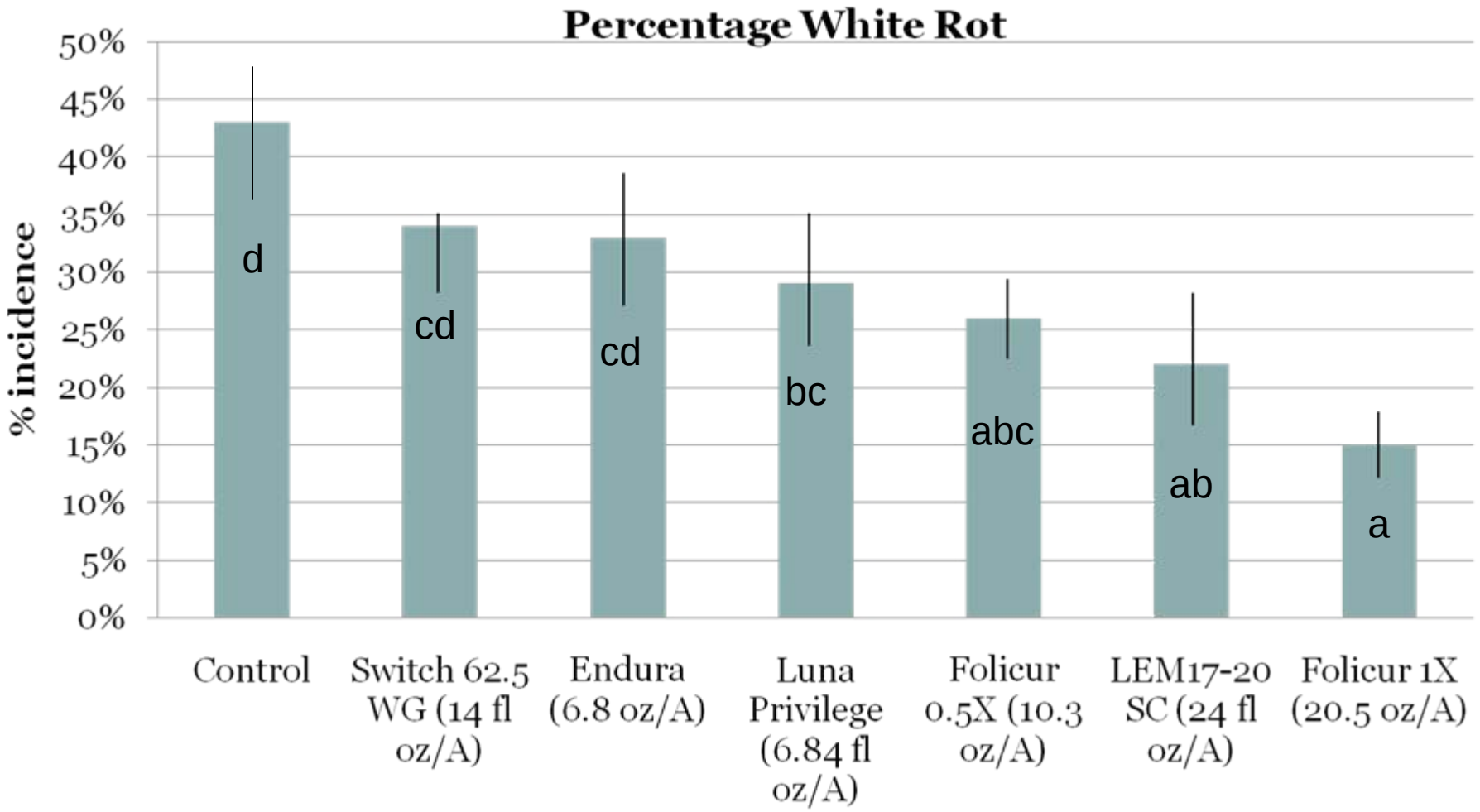
- Diallyl disulfide (DADS) (which mimics natural garlic and onion sulfur compounds) or garlic or onion extracts are sprayed on fallow fields and incorporated.
- Sclerotia germinate, expecting host presence, and lacking a carbohydrate source, mycelium dies.
- DADS, and other similar compounds can easily reduce sclerotia levels in the soil by 90-98%.



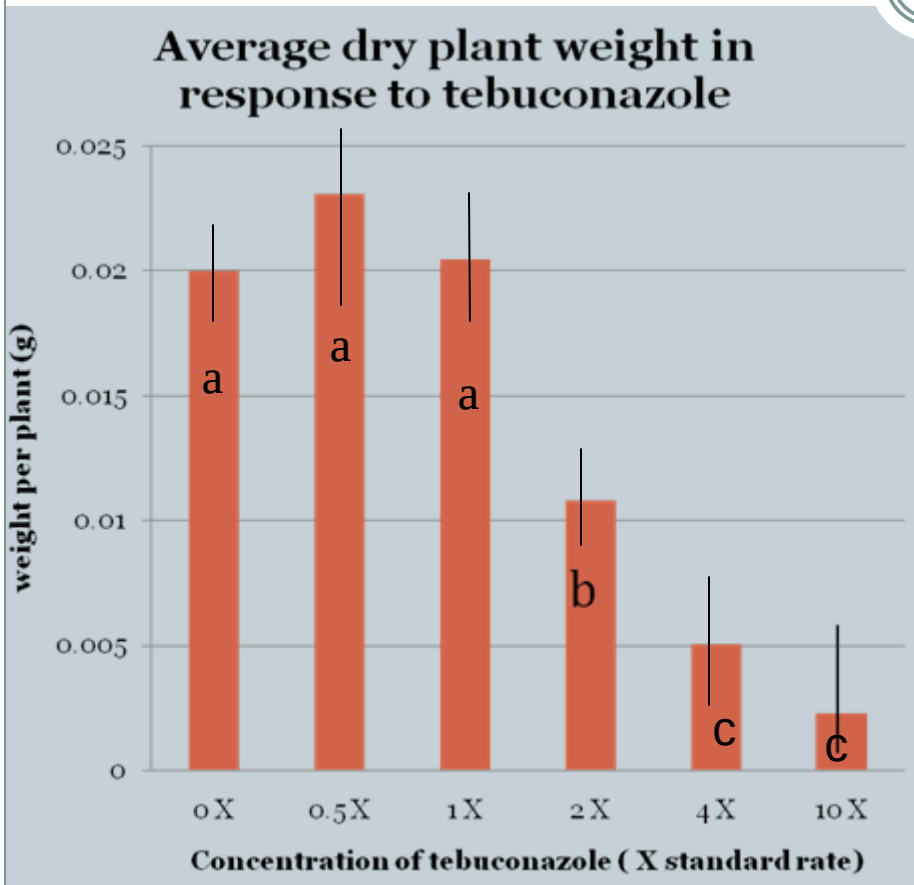
Chemical Control/Plant Protection

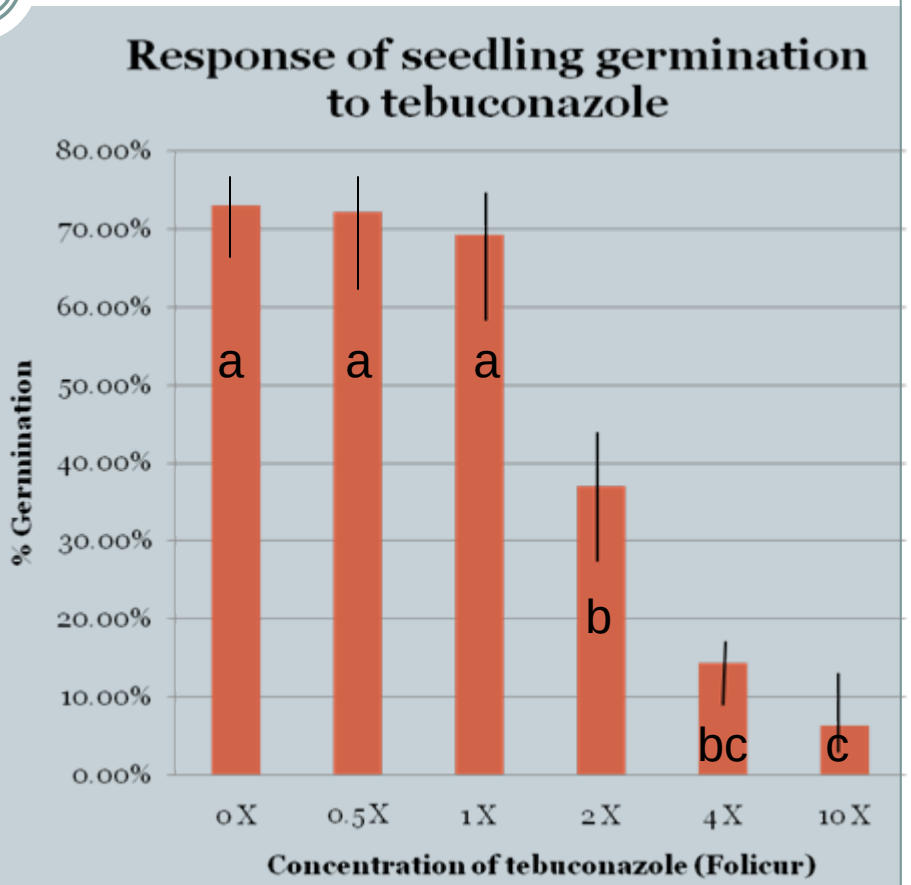
- DADS (or other sclerotia stimulants) must be combined with fungicides for adequate disease control
- Currently registered:
  - **Folicur (tebuconazole)**
  - **Maxim, Cannonball, and Switch (fludioxonil)**
  - **Endura (boscalid)**
- New Fungicide Chemistries
  - **Luna Privilege (fluopyram)**
  - **LEM17-20 (penthiopyrad)**

Field Study, Tulelake CA Disease Percentages



Phytotoxicity of tebuconazole

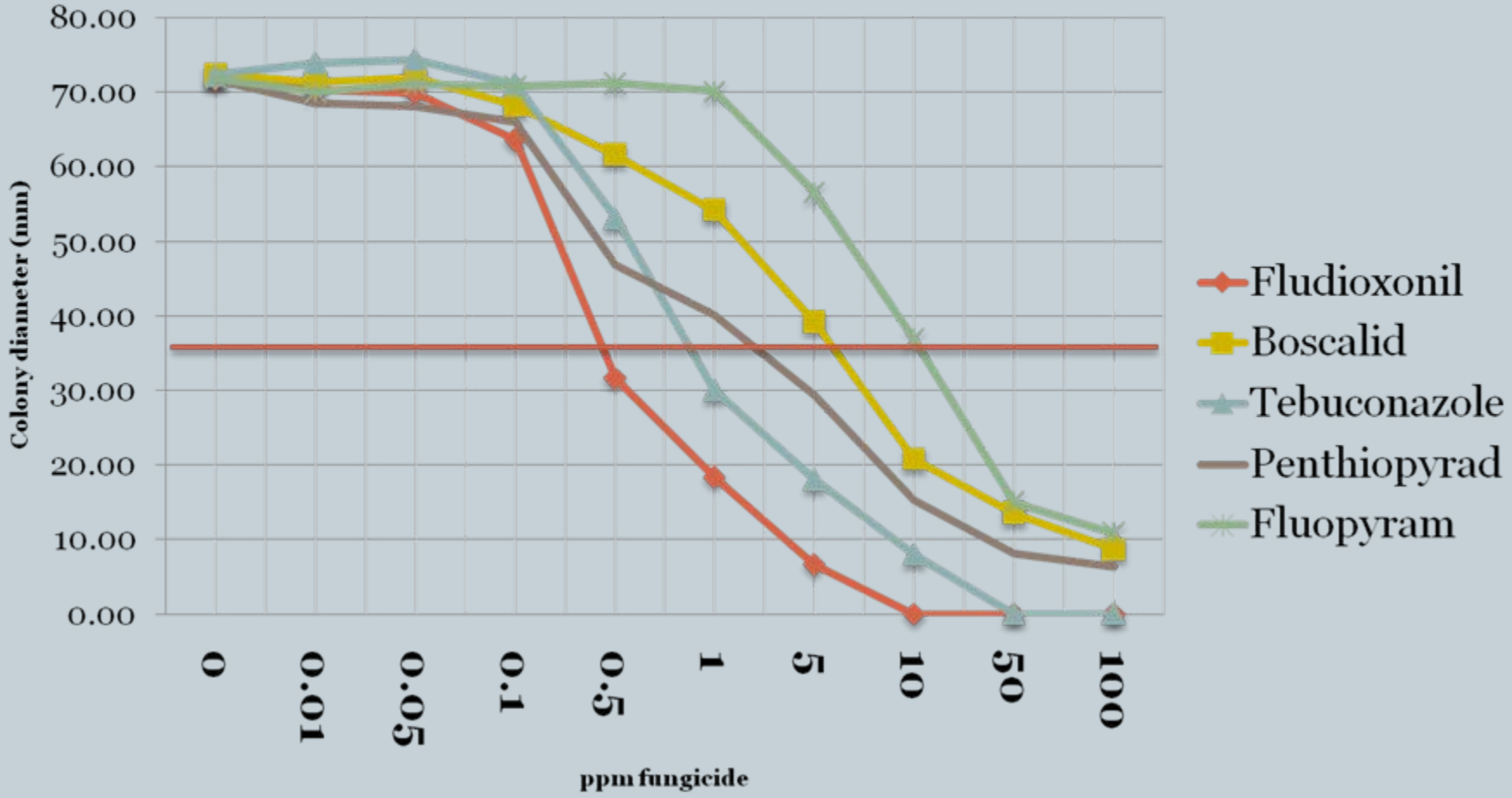




Baseline Sensitivity

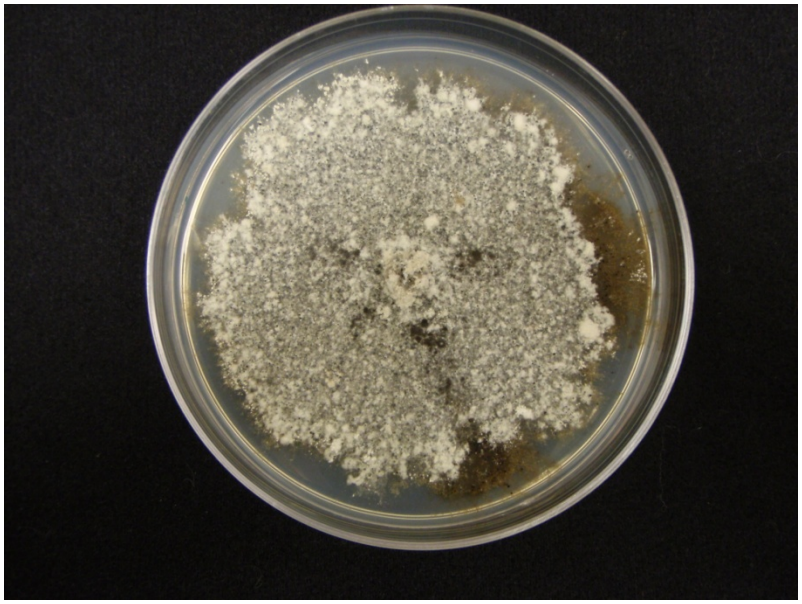
- Reliance on fungicides for the control of disease increases the chance of the development of resistance.
- Baseline sensitivities provide a standard for monitoring for resistance
- $EC_{50 \text{ and } 80-}$ the fungicide concentration required to reduce mycelial growth by 50 and 80%.
- $LD_{50 \text{ and } 80-}$ the fungicide concentration required to prevent spore germination by 50 and 80%

Effective concentration to reduce mycelial growth

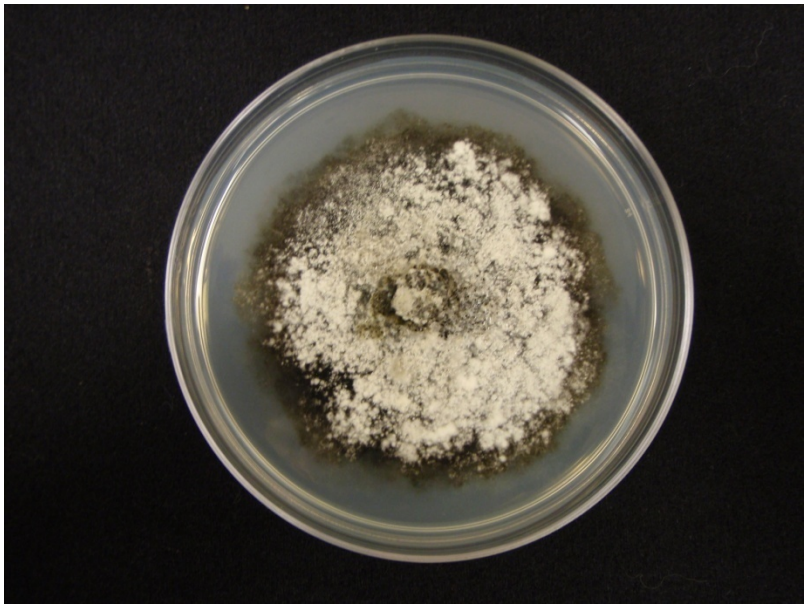


Effect of tebuconazole on sclerotia formation

0.01 ppm tebuconazole

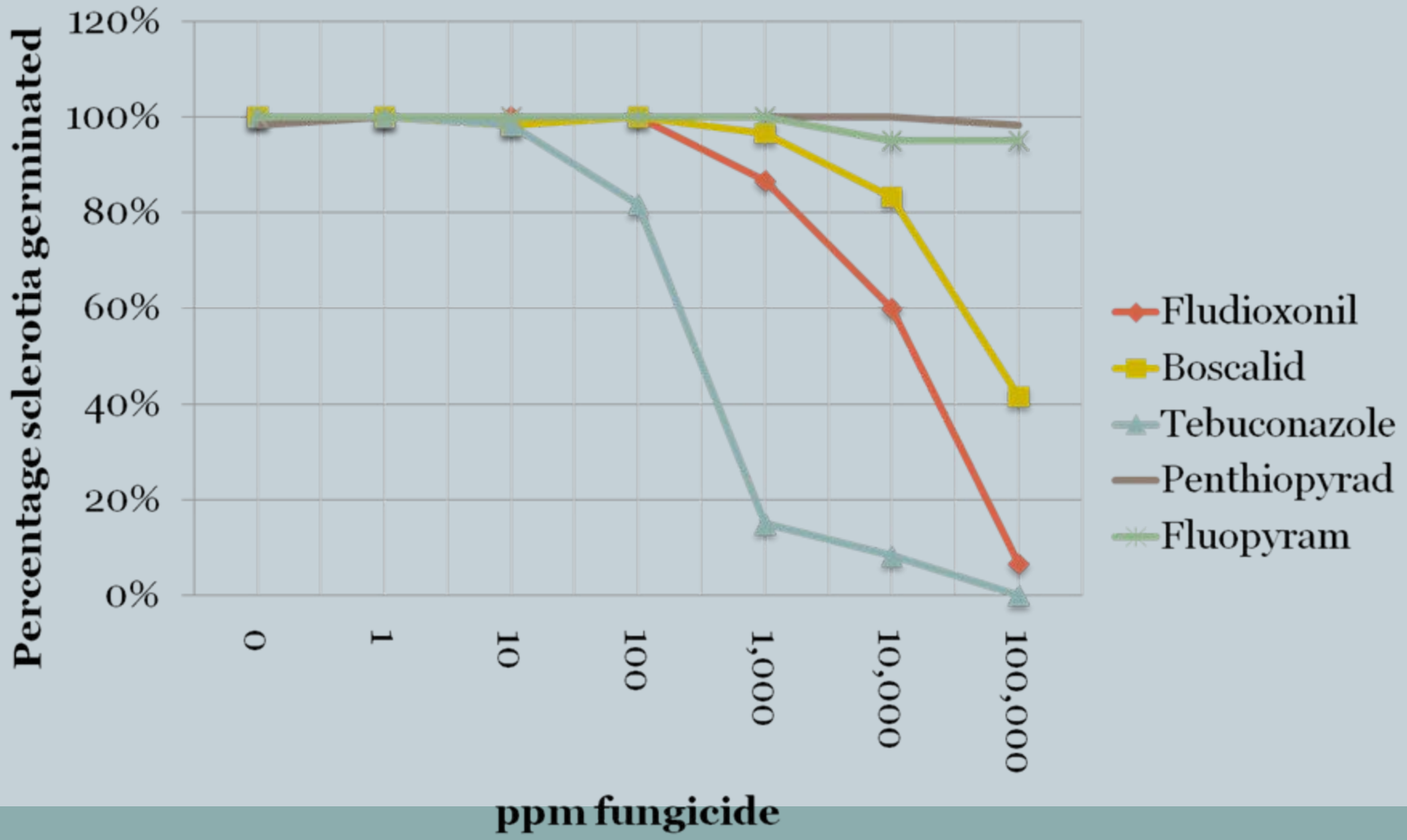


0.1 ppm tebuconazole



1 ppm tebuconazole

Lethal Dose to Prevent Germination of Sclerotia



Phytotoxicity of fungicides

- Phytotoxicity of all other fungicides was tested in greenhouse studies.
- Fungicide application method sequence and soil type did not have a significant effect on the phytotoxicity of tebuconazole.
- None of the fungicides (other than tebuconazole) showed significant phytotoxicity at concentrations up to 10X normal concentration.

- No phytotoxicity was observed either in the field plots at Tulelake, or in greenhouse studies when applied at the recommended rate.

Future Research

- Determine how long tebuconazole remains active in soil
- Determine whether tebuconazole slows mycelial growth at plant roots or in the soil before mycelia reaches plant roots.
- Determine the best recommended practices for combining DADS and fungicides in fields with varying numbers of sclerotia.

Questions

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