Fungi in Cold Storage and Survivability of Pine Seedlings

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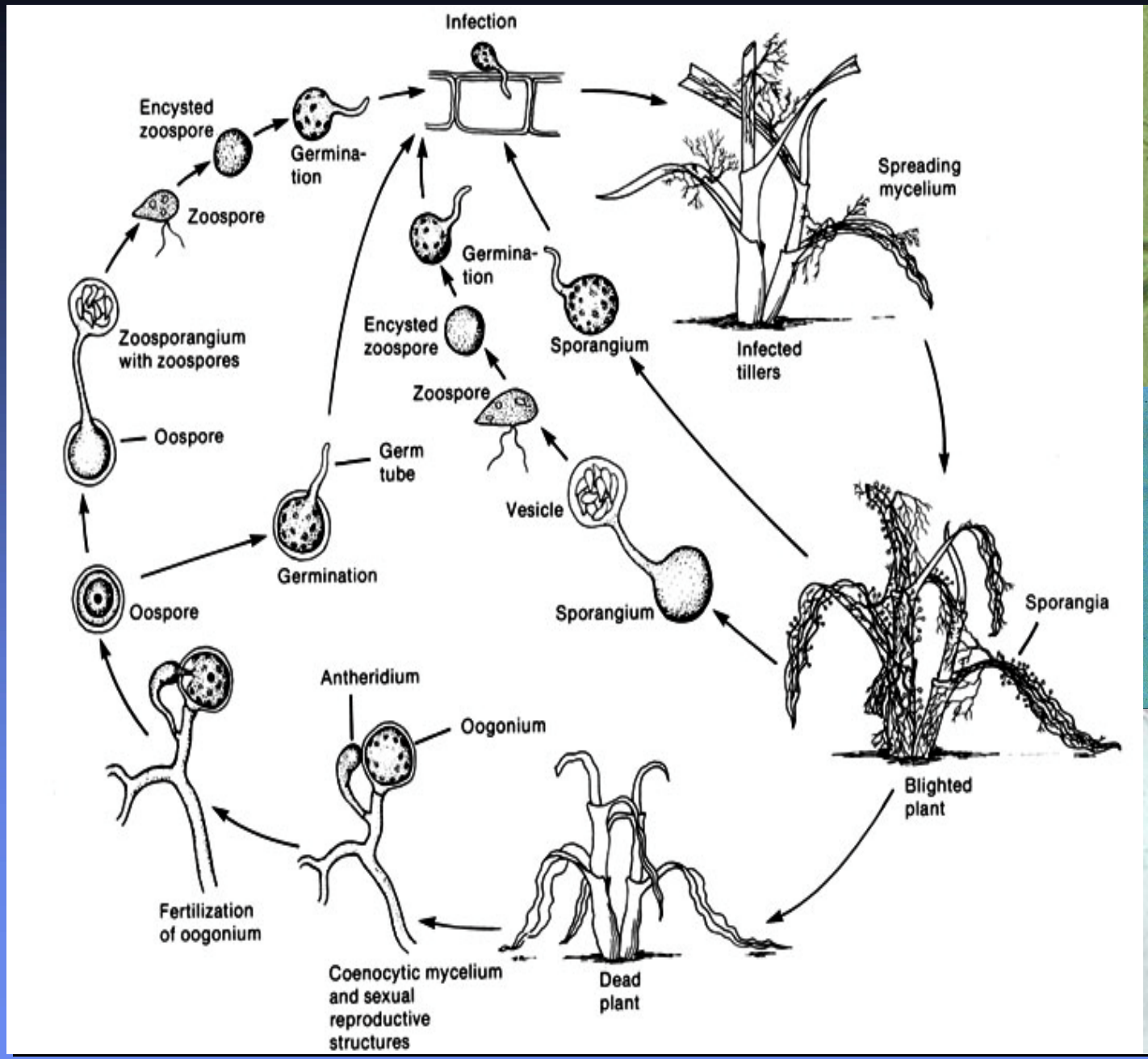
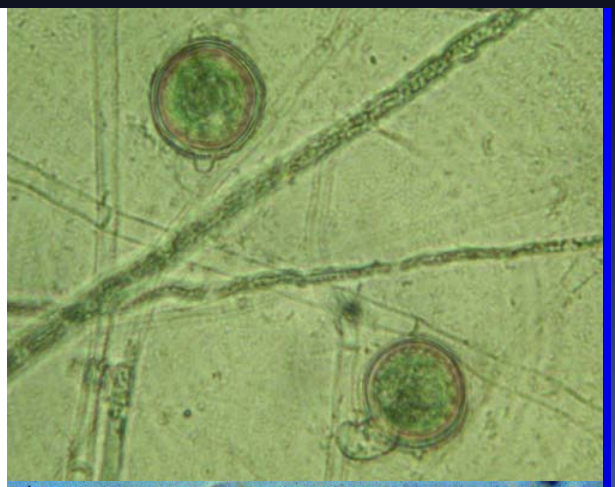
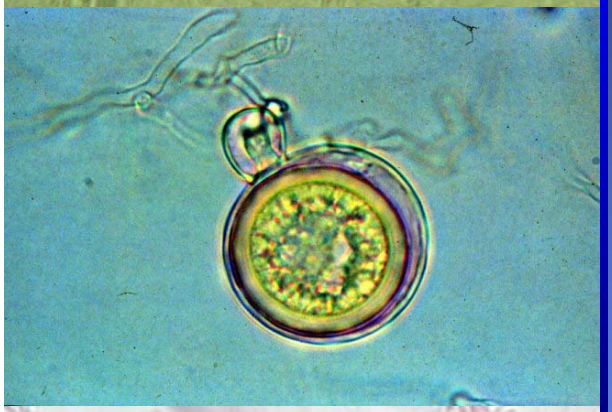
Fungal Pathogen Associated with Damping-off Disease of Pine Seedlings in Cold Storage

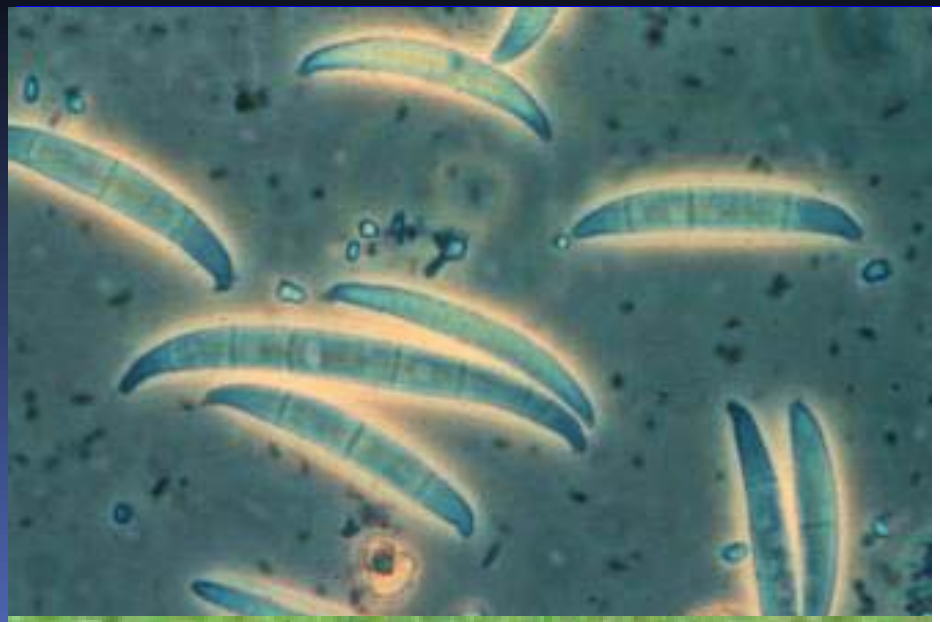
- *Pythium, Fusarium, Rhizoctonia, Sclerotium*
- Characteristics of soilborne fungi:
  - Mycelial (filamentous) in form, most of the biomass is microscopic in size.
  - Cell walls contain chitin and glucans.
  - Organism is heterotrophic, absorptive, eucaryotic,
  - Organism reproduces by spores, spread actively or passively
  - Have high water requirement due to thin cell wall.
  - Survive well in soil, saprophytically or in dormancy.
  - Falcutative parasites.


Infection
Encysted zoospore
Germina-tion
Zoospore
Zoosporangium with zoospores
Oospore
Germ tube
Germination
Oospore
Antheridium
Oogonium
Fertilization of oogonium
Coenocytic mycelium and sexual reproductive structures
Dead plant
Blighted plant
Sporangia
Sporangium
Vesicle
Zoospore
Encysted zoospore
Germina-tion
Sporangium
Infected tillers
Spreading mycelium

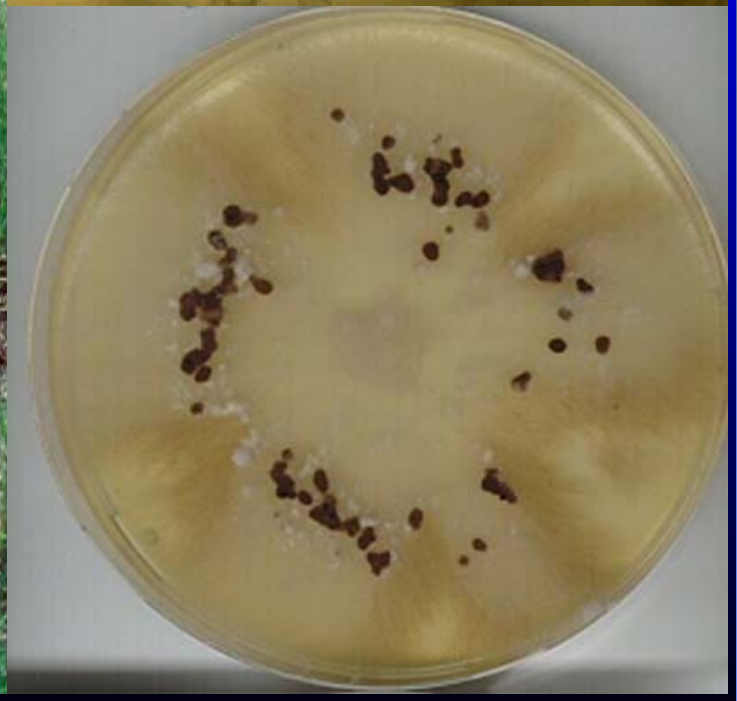


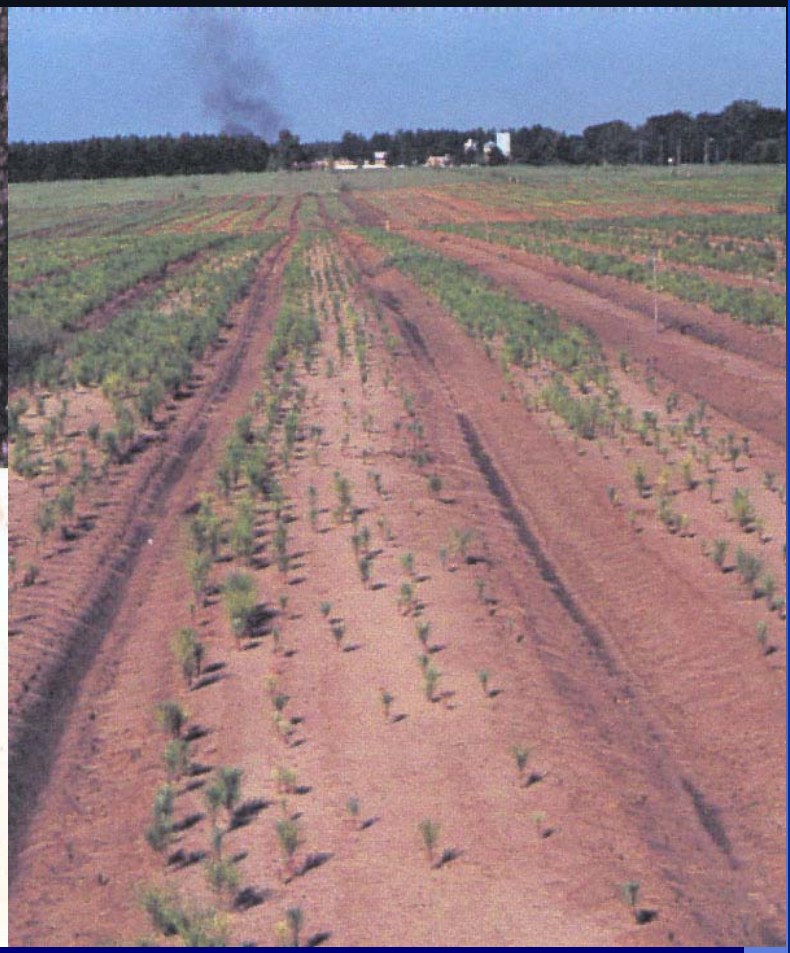


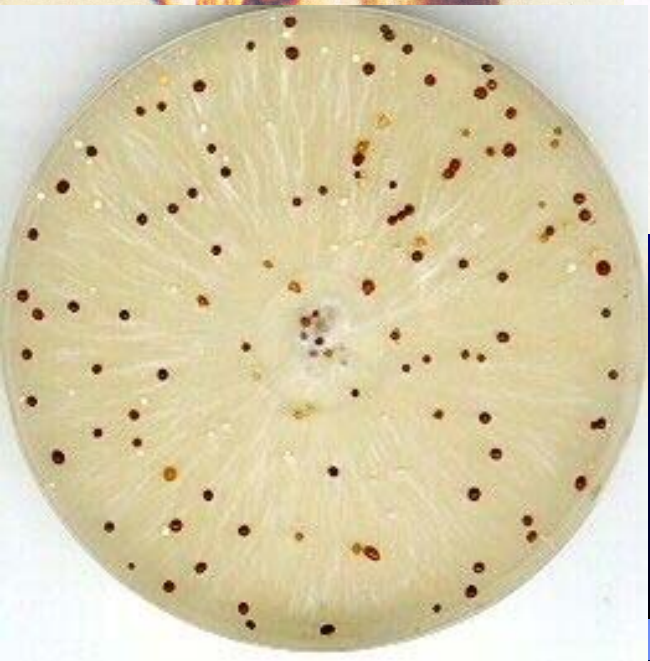
Black Root Rot caused by *M. phaseolina* + *F. oxysporum*



Damping of longleaf pine seedlings, 9% mortality in nursery, up to 19% in the field trial







Macrophomina phaseolina
(syn. *Sclerotium bataticola*)
Charcoal root rot

Disease Table

Biotic Disease

1. Virulent pathogen
2. Susceptible host
3. Conducive environment
4. Sufficient time

Storage of Pine Seedlings

- Dormant seedlings can be stored up to 12 weeks in cold storage (35 to 38 F) at a humidity above 80 percent
- If cold storage is not available, seedlings can be stored up to 4 weeks in a cool (38 to 50 F) shaded warehouse. Raised corky cell mass;
- Slurry-type root dips or weekly watering of the root systems may extend warehouse storage up to 8 weeks if the seedlings remain dormant.

Longleaf Pine for Southern Forest?

- Relatively disease and insect resistant,
- Cold tolerant,
- Fire resistant,
- Generally superior tree.

- Difficult to regenerate
- Cold storage of seedlings needed for outplanting in a large scale.
- Grass period

Cold Storage, an Environment Favorable for Pythium

- Nursery grown seedlings are injured to some degree while being lifted, which makes an easy avenue for pathogens to penetrate roots.
- Stored in the cold in bales or kraft paper bags in bundles, easy for fungi to spread.
- Seedlings are dipped in clay slurry, enough moisture for fungi to grow and reproduce.
- Seedlings are stored at a low temperature (4 C), favorable to Pythium.

Summery of 1992-1995 Research Objectives

- Identification of *Pythium* spp and *Trichoderma* spp. isolated from pine roots.
- Aassessment of pathogenicity of selected *Pythium* isolates
- Development and evaluation of *in vitro* screening system for potential biocontrol candidates among the *Trichoderma* isolates.
- Determination of biocontrol mechanisms of *Trichoderma* and *Gliocladium.*
- Development and assessment of a feasible field system for testing and applicating of *Trichoderma* as a biocontrol agent.

Summery of 1992-1995 Research Results

- Forty of the 75 *Pythium* isolates were pathogenic to newly-germinated slash pine seedlings *in vitro.* Seven out of 14 selected *Pythium* isolates were *P. dimorphum.*
- Some *Trichoderma* totally killed *Pythium* isolates tested *in vitro*.
- Medium pH, metabolite of *Trichoderma*, and/or competition might have involved in inhibiting *Pythium* growth in vitro.
- Some *Trichoderma* species suppressed *Pythium* population in cold storage to some degree.
- *Trichoderma* may have suppressed Pythium population through competition for the niche.
- Application of cultured *Trichoderma* species in wheat bran in clay slurry may achieve biological control.

Summery of 1992-1995 Research Closing Remarks

- Biological agents used for control of soilborne fungi in longleaf pine cold storage were not as effective as any current commercial fungicide.
- Management of irrigation, fertilization and application of fungicide in nursery is critical in mitigating any potential fungal infections in cold storage.
- To reduce fungal inoculum level in nursery, early detection and application of fungicide are essential. Send samples to professionals for identification if seedlings start showing symptoms.
- Adding fungicide in clay slurry is a good practice to eliminate any possible problems caused by fungal infection.
- Pay attention to some parasitic nematodes harmful to pine seedlings.