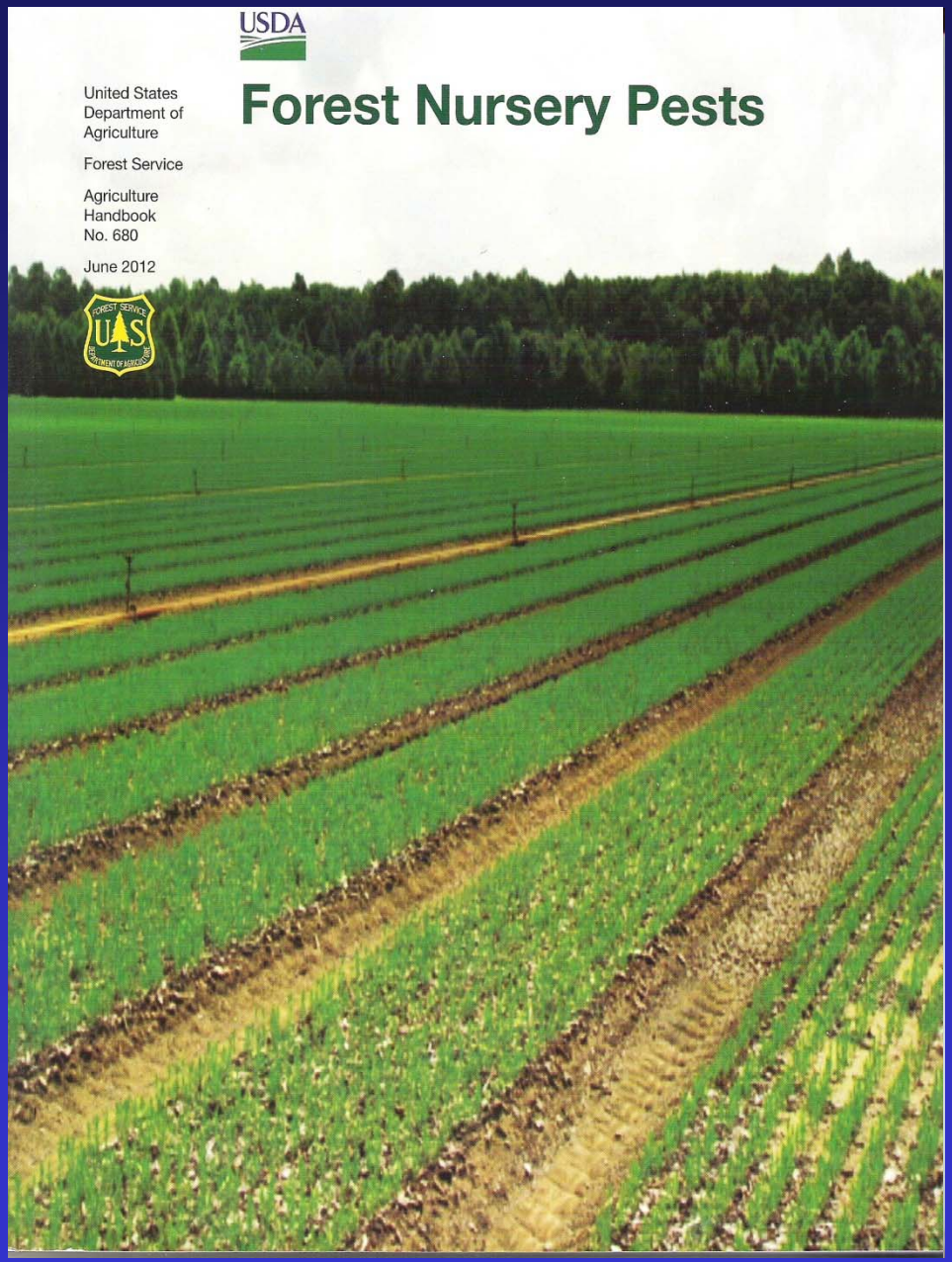


Reference

Forest Nursery Pests

USDA Forest Service
Ag Handbook 680

Celebrating 40 Years 1972 - 2012 of Increasing Nursery Production

Plant Pathology

- Pathogen:
  - Obligate parasite:
  - Facultative parasite:
- Parasite:
- Saprophyte:
- Symbiosis:

DISEASE = IMPARED PHYSIOLOGY

- **Signs and Symptoms of Disease**
  - **Signs**
  - **Symptoms**

Symptoms of Disease

– Necrosis

– Decay

– Cankers

– Leaf spots

- Wilts

- Blights

- Hypertrophy

- Atrophy

- Physiology

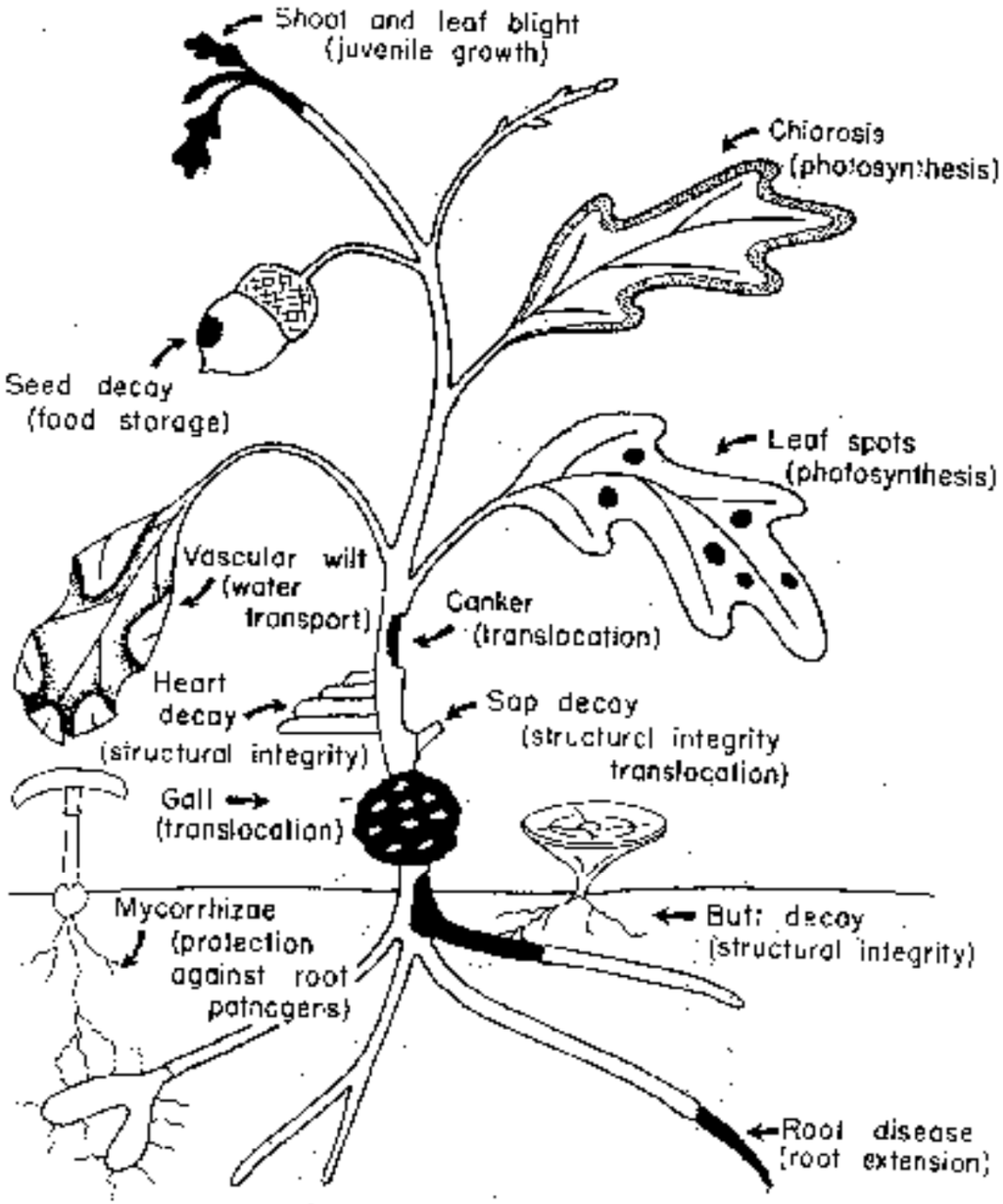


FIGURE 2.3 Schematic representation of the effects of diseases on tree health, showing the vital functions of a tree and their impairment by various types of pathogenic influences.

Principals of Disease Prevention

- Exclusion distribution
- Eradication survival
- Protection barrier
- Resistance compatibility

Agents of Plant Disease in Forest Tree Nurseries

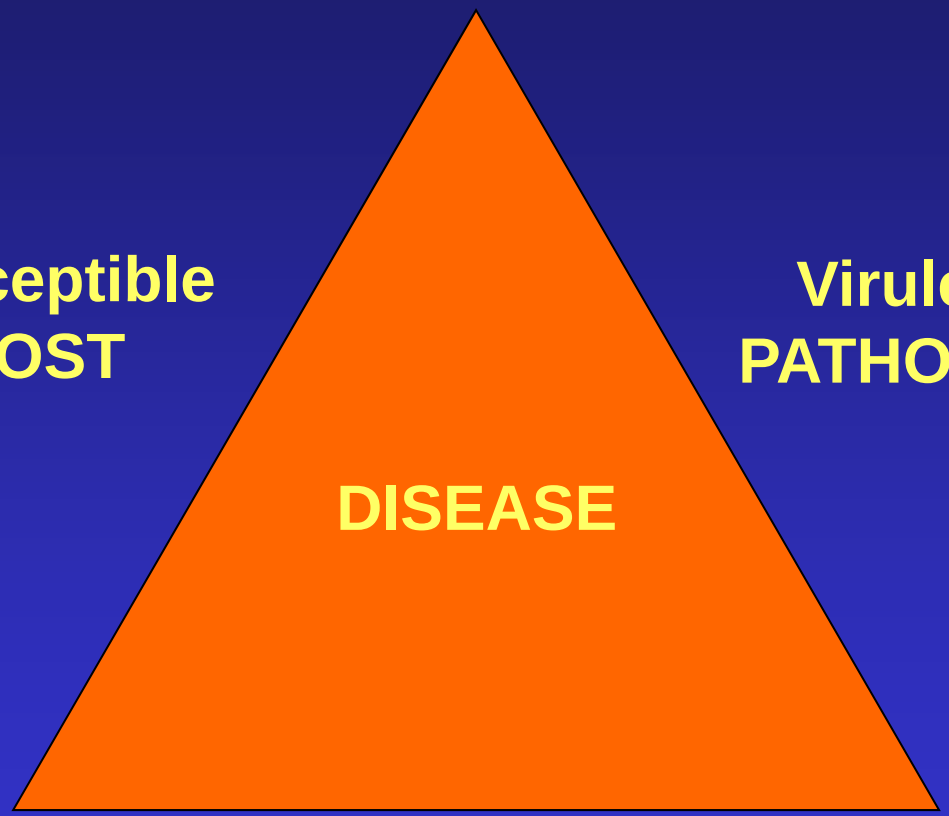
- Fungi are Number 1
- Nematodes; once major now minor. In the future without MBr? They predispose seedlings to fungi.
- Bacteria are minor in nurseries.
- Viruses are even less. More so in seed propagated plants.

Fungi

- Eukaroytic organisms
- Non-chlorophyll
- Vegetative growth is through mycelium
  Singular = mycelia
- Single thread = Hypha

  plural = Hyphae
- Propagate via spores

THE DISEASE TRIANGLE



THE DISEASE TRIANGLE

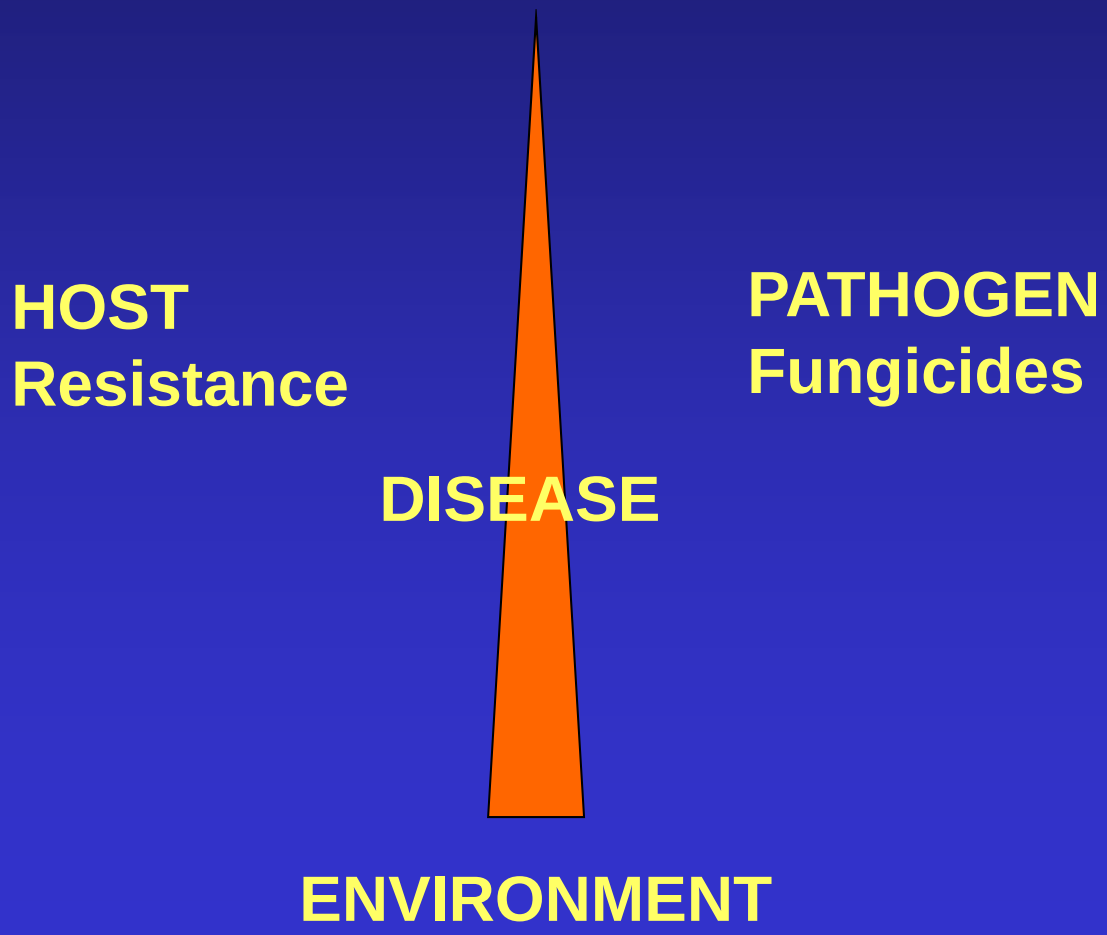
HOST
(Immune)

Virulent
PATHOGEN

DISEASE

Favorable
ENVIRONMENT

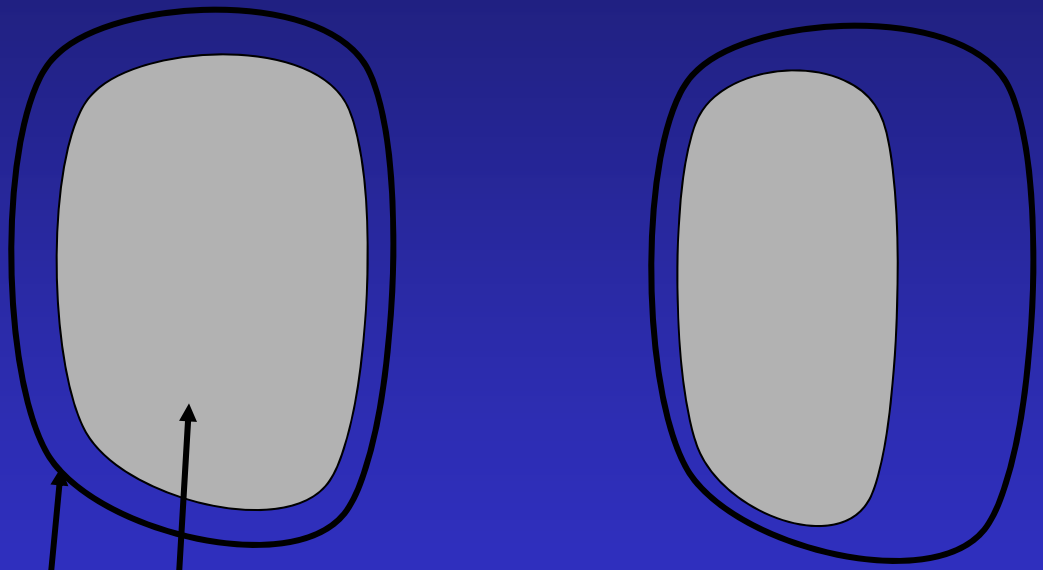
THE DISEASE TRIANGLE
FOR A PATHOGEN LIKE FUSIFORM RUST



Water Relations & Disease: Walking a fine line

Healthy / full turgor

Plasmalized

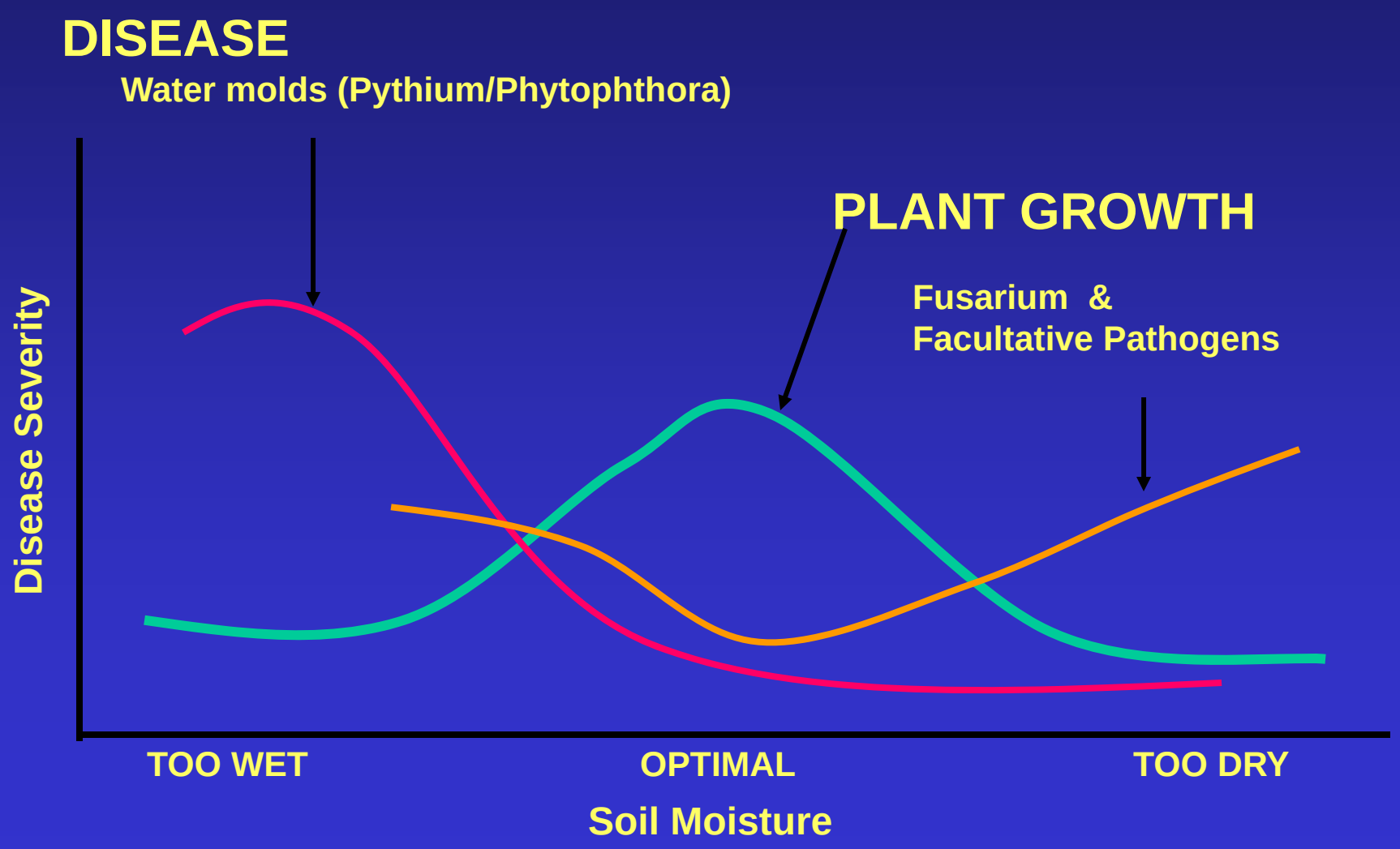


The plasmalized cell is predisposed to penetration by fungi

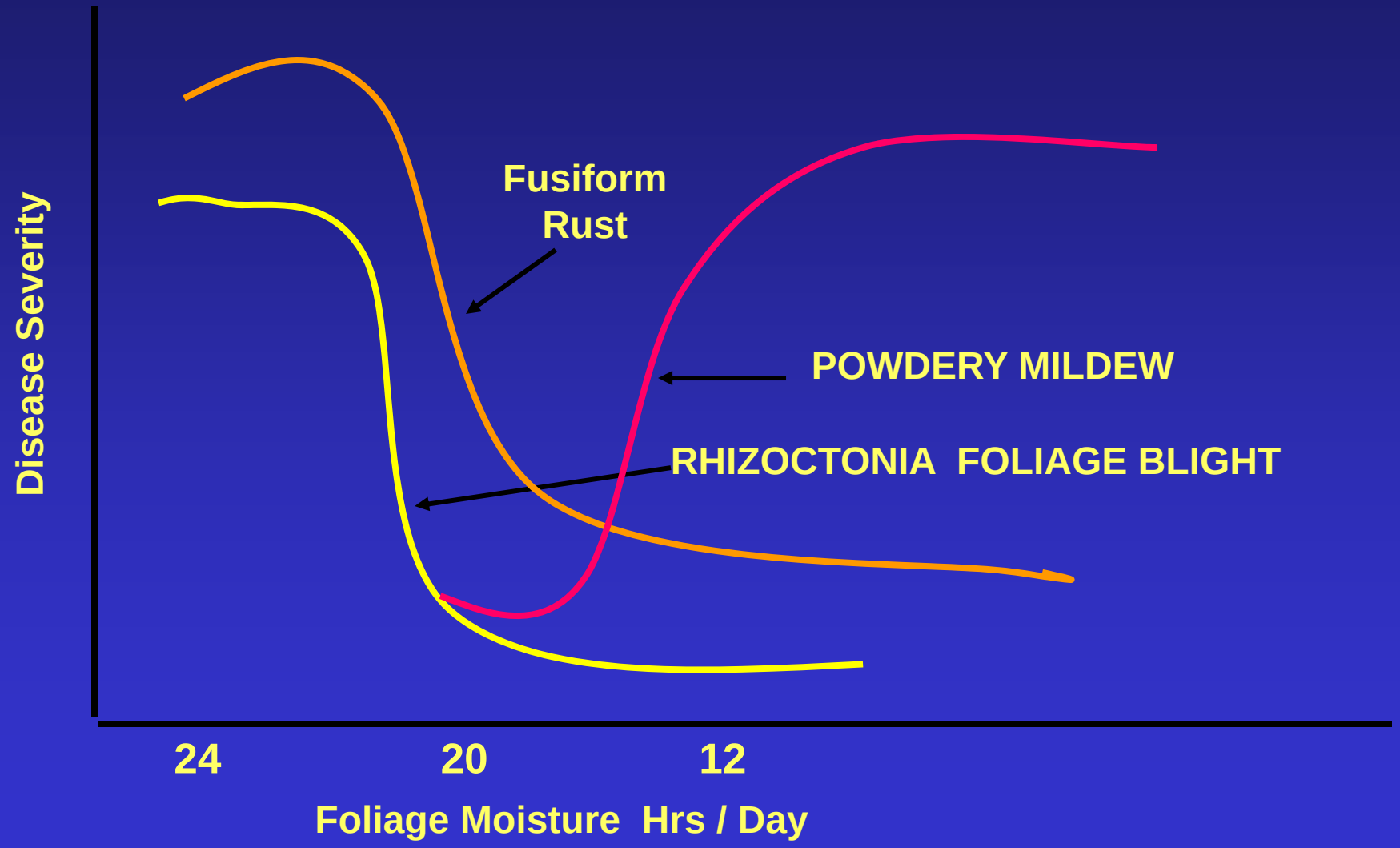
Plasma membrane with cytoplasm inside

Primary cell wall

EFFECTS OF SOIL MOISTURE ON DISEASE POTENTIAL and PLANT GROWTH

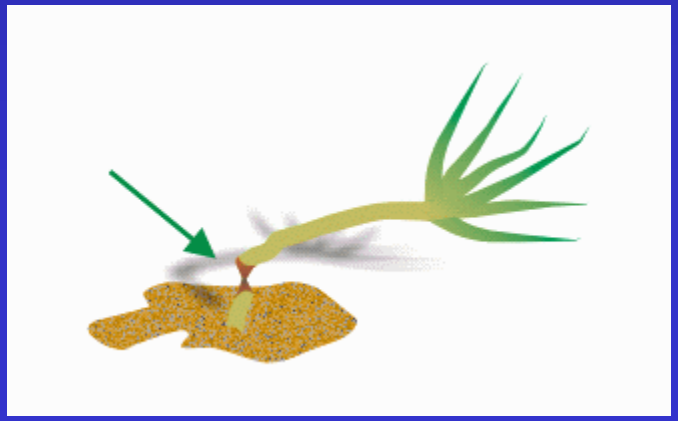


EFFECTS OF FOLIAGE MOISTURE ON DISEASE POTENTIAL OF THREE PATHOGENS



Damping Off

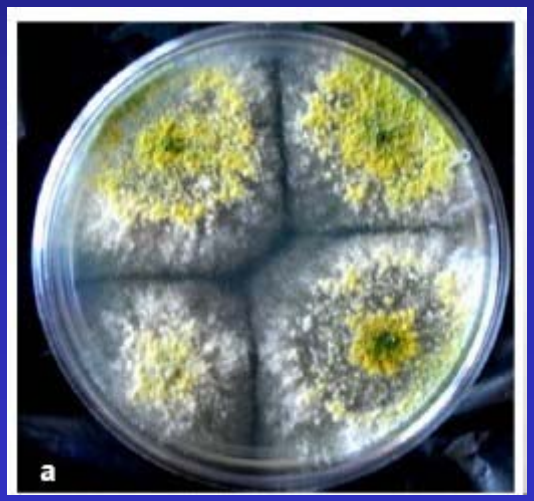
- Early season problem
- Associated with too much water
- Causal agents – Pythium & Phytophthora and Fusarium
- Pre-emergent
- Post-emergent
- Late season Blight

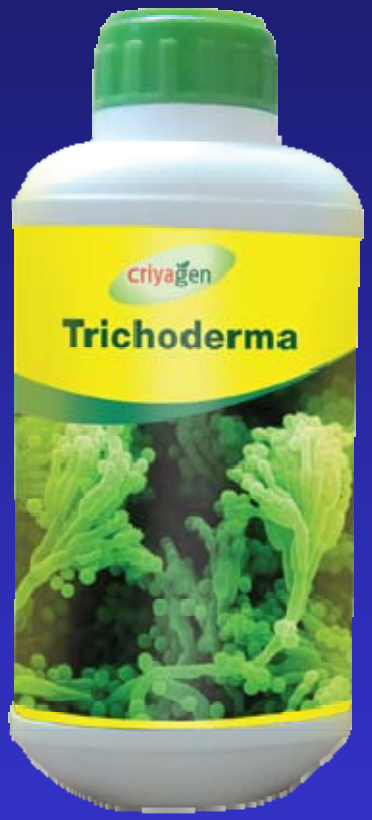


The role of soil fumigation to control damping-off

The role of soil fumigation to control damping-off

The role of soil fumigation and presence of Trichoderma spp in the soil

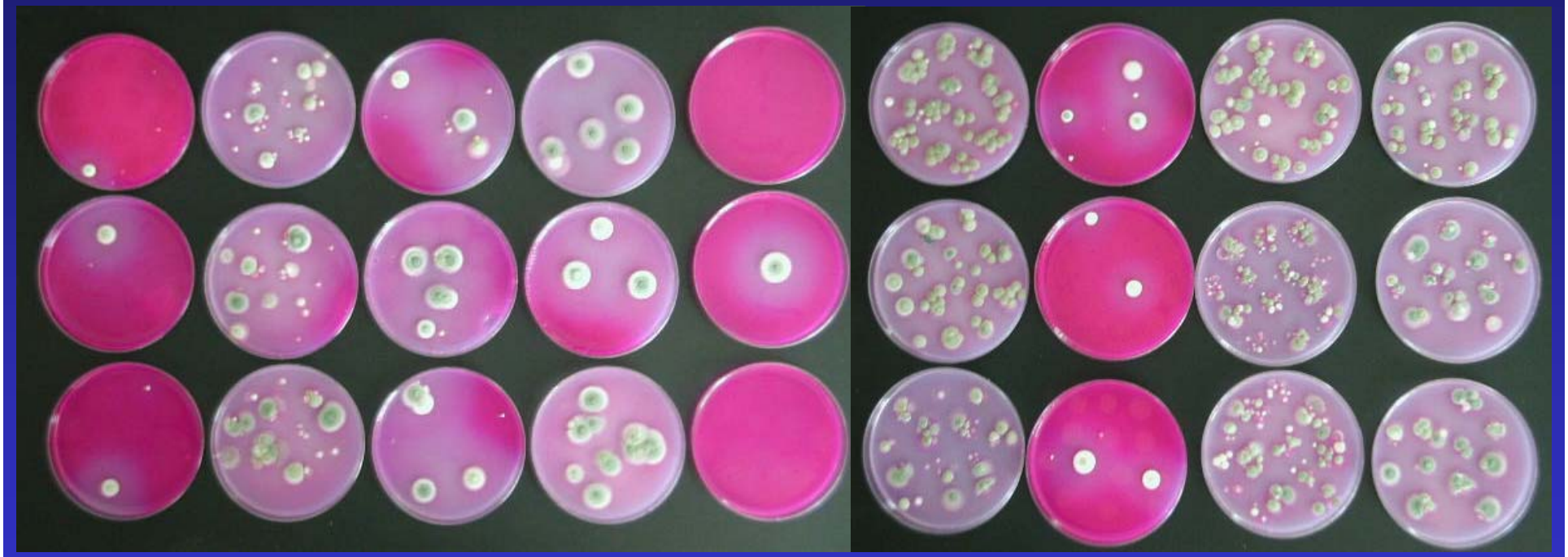




Trichoderma after fumigation with MBr and other fumigants

Trichoderma dilution plates 1 seedling crop &
9 months after fumigation, Glennville GA 2005

BAS MI MI MI BAS MBr BAS MBr MBr



Block 1 **Block 9**

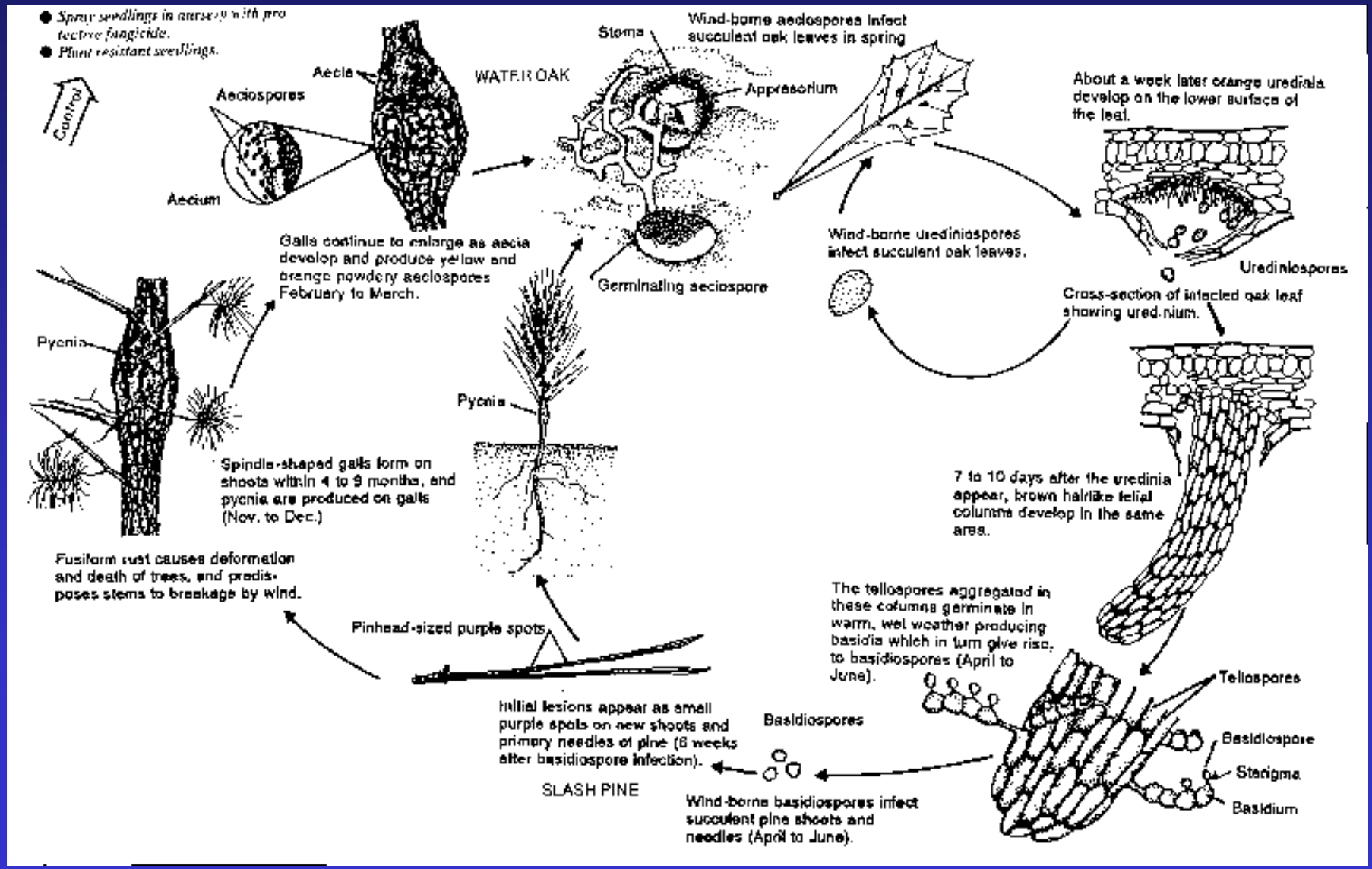
Rhizoctonia without and with Trichoderma

Rhizoctonia

Rhizoctonia under Trichoderma

Fusiform rust

Cronartium quercuum f.sp. *fusiforme*



Healthy

Fusiform Rust

Fusiform rust

Seed treatment:
Bayleton at time of sowing, 10 oz / 50 lbs seed.
Gives 21 days of rust control.

Foliar sprays: Bayleton 4-16 oz/acre or Proline 5 oz/acre at 14-21days post sowing, every 14-21 days until mid to late June.

Mid June is when the presence of basidospores released from the oak leaves is over.

Current Proline label implications for nurseries

- We are comfortable with current label rate of (**5 fl oz/a**) for foliar applications on southern pines.
- The label seed treatment rate of 10 fl oz per 50 lbs of seed is probably higher than it needs to be.
- For that reason we recommend using Bayleton for rust control as a seed treatment, then switch to Proline for foliar treatment.
- Compared to other crops the seed-treatment rate is 66X more than needed.


Rhizoctonia solani
1. Rhizoctonia needle blight
06/07/2005
2. Rhizoctonia crown rot

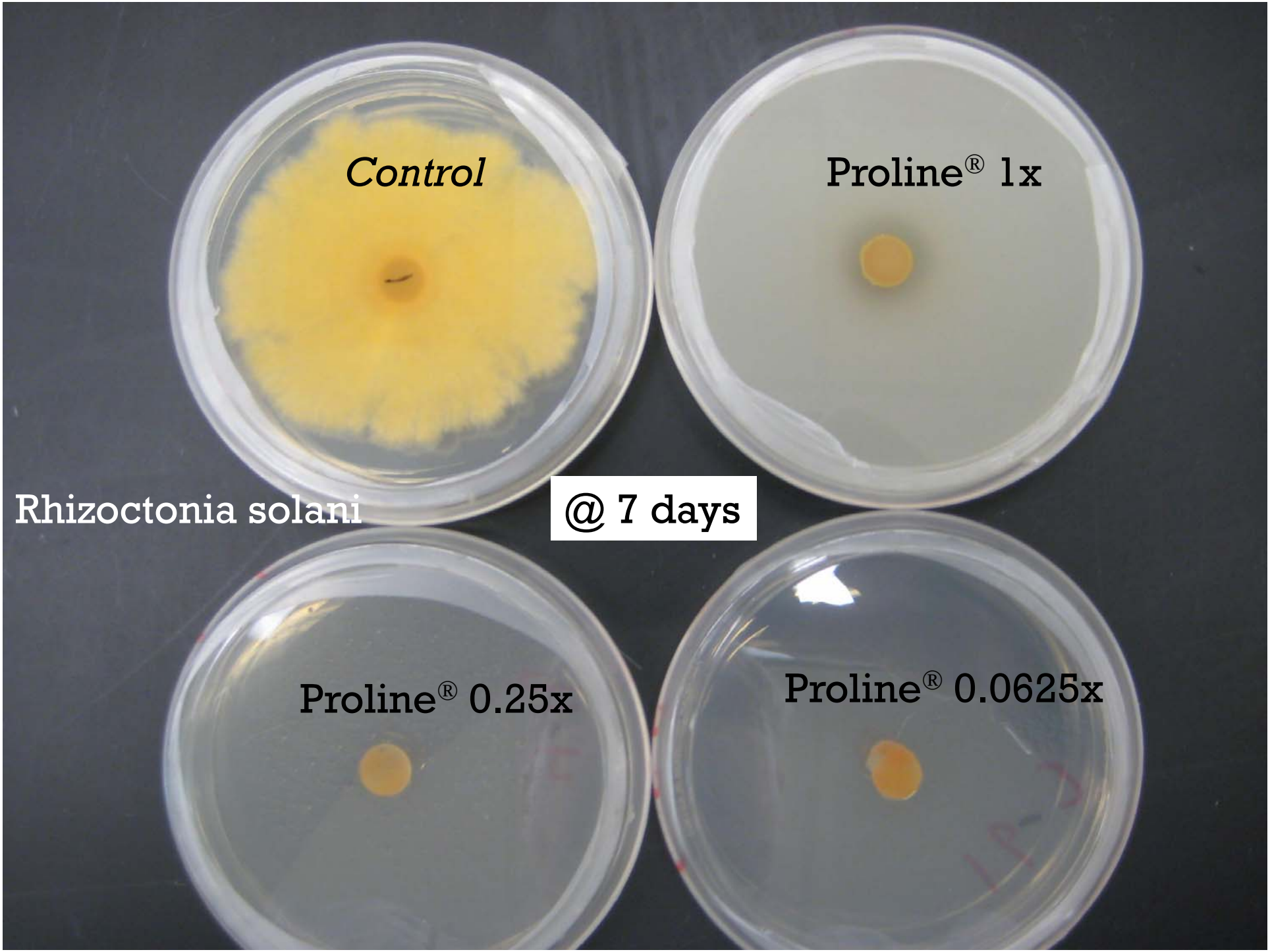
“Disease-Free” Nursery Beds

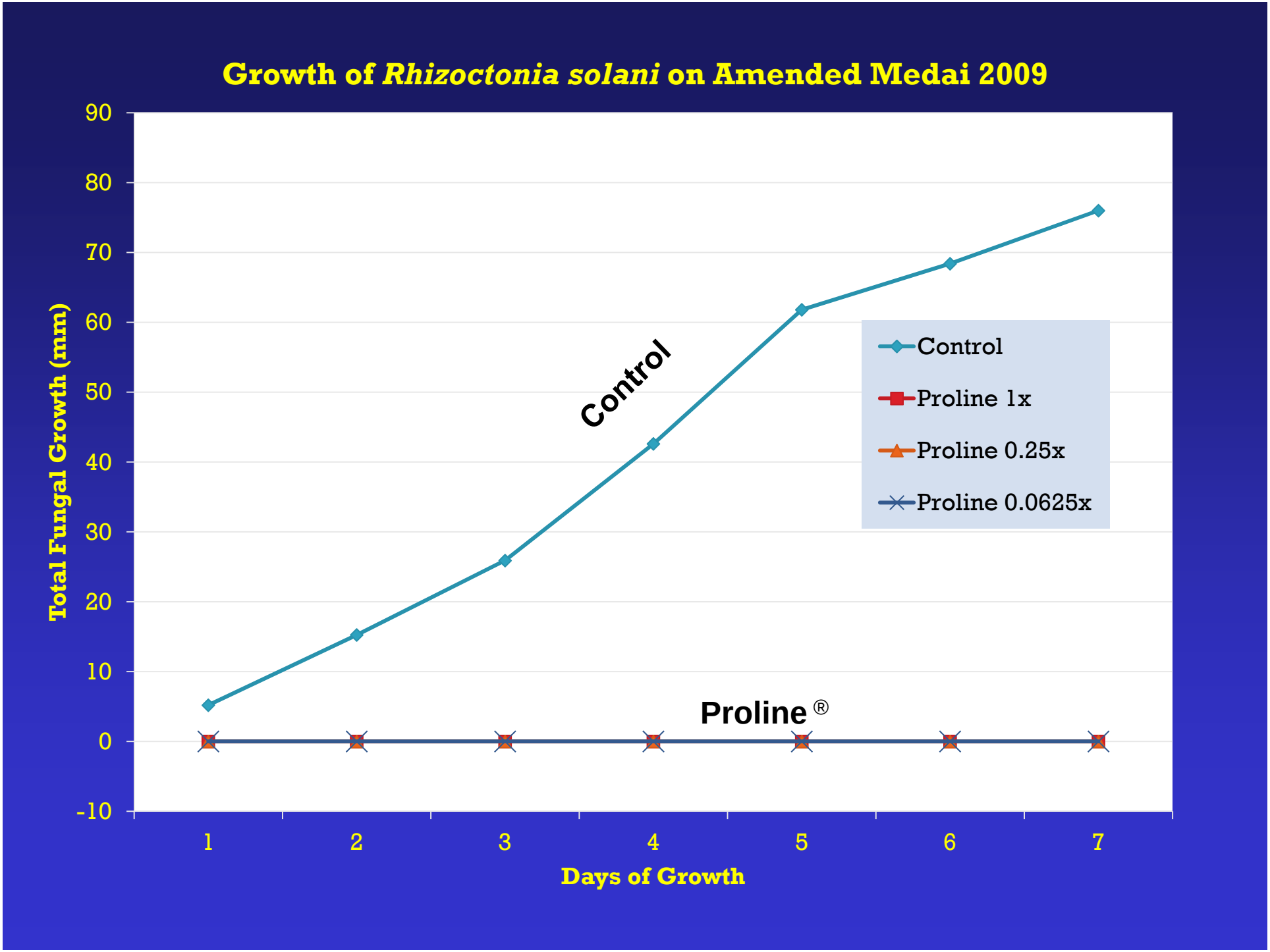
Rhizoctonia within Seedling Rows

Rhizoctonia “appearing” after top clipping

Rhizoctonia Foliar Blight

Hyphae – fungal threads of Rhizoctonia


Control
Proline® 1x
Rhizoctonia solani
@ 7 days
Proline® 0.25x
Proline® 0.0625x


Growth of Rhizoctonia solani on Amended Medai 2009
Total Fungal Growth (mm)
90
80
70
60
50
40
30
20
10
0
-10
1
2
3
4
5
6
7
Days of Growth
Control
Proline ®
Control
Proline 1x
Proline 0.25x
Proline 0.0625x

Rhizoctonia Blight: Management

- ✓ Fumigation appears to affect incidence and severity.
- ✓ Time since fumigation increases disease.
- ✓ Moisture and stand density affect disease.
- ✓ Fungicides can be used to control pathogen.
  - ✓ prothioconizole (Proline)
  - ✓ Iprodinone (Chipco)
  - ✓ fludioxonil
  - ✓ Azoxystrobin (Heritage)

Potential label applications for nurseries

- Other diseases listed on label (for other species) but not tested by SFNMC – *Cylindrocladium*, Powdery Mildew, *Septoria, Blotch, leaf spots, leaf blights, mold, and rusts.*
- Proline® is an extremely efficacious fungicide.
- For other non-conifer species – test for phytotoxicity
- Use label rate (5.0 fl oz/a) or lower.

A few closing comments….

- Don’t stop using Bayleton
  - Nurseries need as many fungicides as possible
  - Bayleton has proven to be effective for 30+ yrs
- Proline and Bayleton are in the same fungicide resistance class (3)
  - Growing season application alternates – Proline and Cleary’s 3336

Other Diseases:

Brown spot needle blight: Longleaf

Brown Spot Needle Blight: Management

Chlorothalonial – Bravo, Bravo Weather-Stick

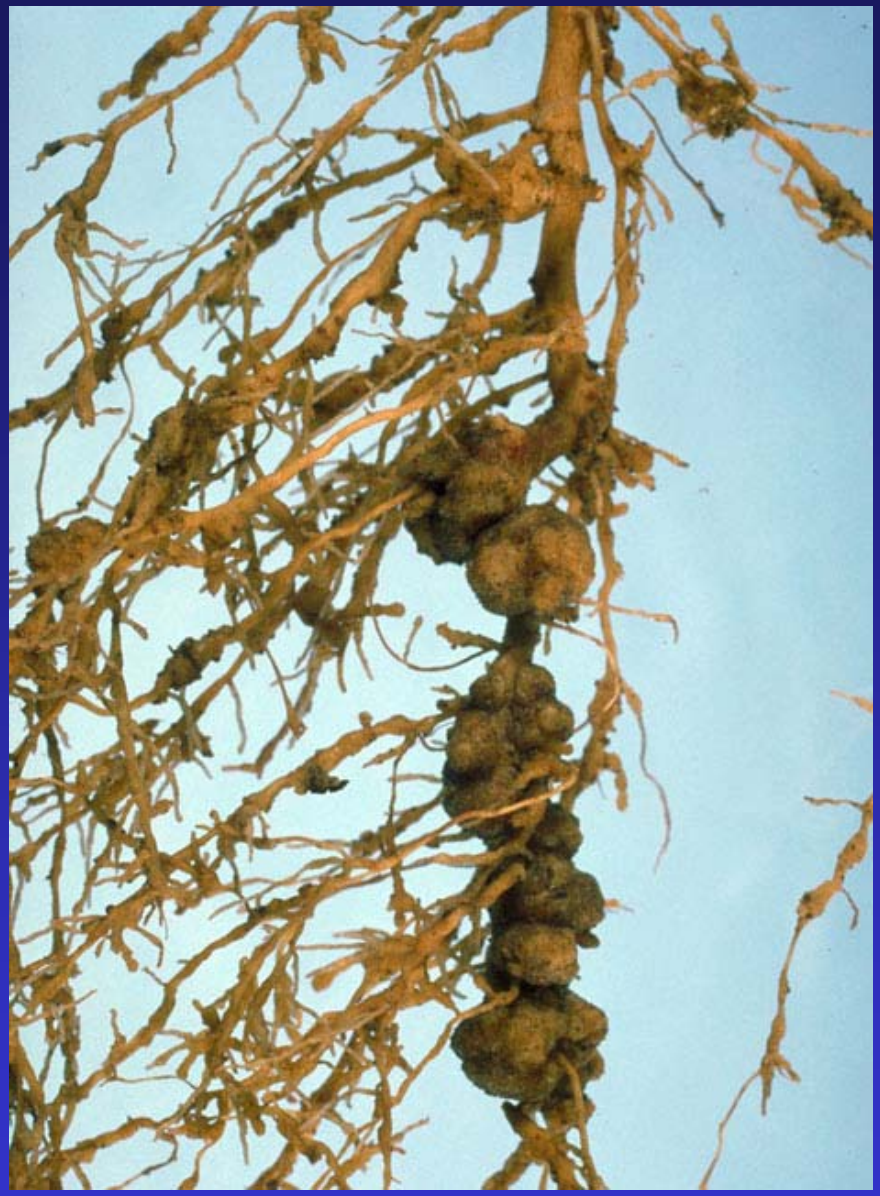
Pitch canker: Seed borne

Resin-soaked seedling stems

Resin-soaked seedling stems

Pitch Canker: Management

- Reduce incidence by controlling insects.
- Use seed from uninfected seed orchard as the fungus is moved from infected trees, to infected cones to seed, eventually to seedlings. RR 11-04.
- Clean seed externally using hydrogen peroxide, or bleach prior to sowing.
- Especially on longleaf seed that you believe may be infested.
- Proline at 5 oz / acre foliar application if disease appears during the growing season.



Nematodes: Root Knot, Stunt, Lesion

Nematodes

Nematodes: Management

- ✓ There are no registered nematicides to control nematodes during the growing season.
- ✓ Fumigate with Telone (1, 3, Dichloropropene) prior to sowing in between fumigation.
- ✓ Push seedlings with additional liquid fertilizer.
- ✓ Type of cover crop will influence nematodes
  - •Fallow is better than cover crop
  - •Sorghum is better than corn

Excessive moisture coupled with hurricane force winds. Abiotic disorder that mimics foliar pathogen.

Powdery Mildews: Management

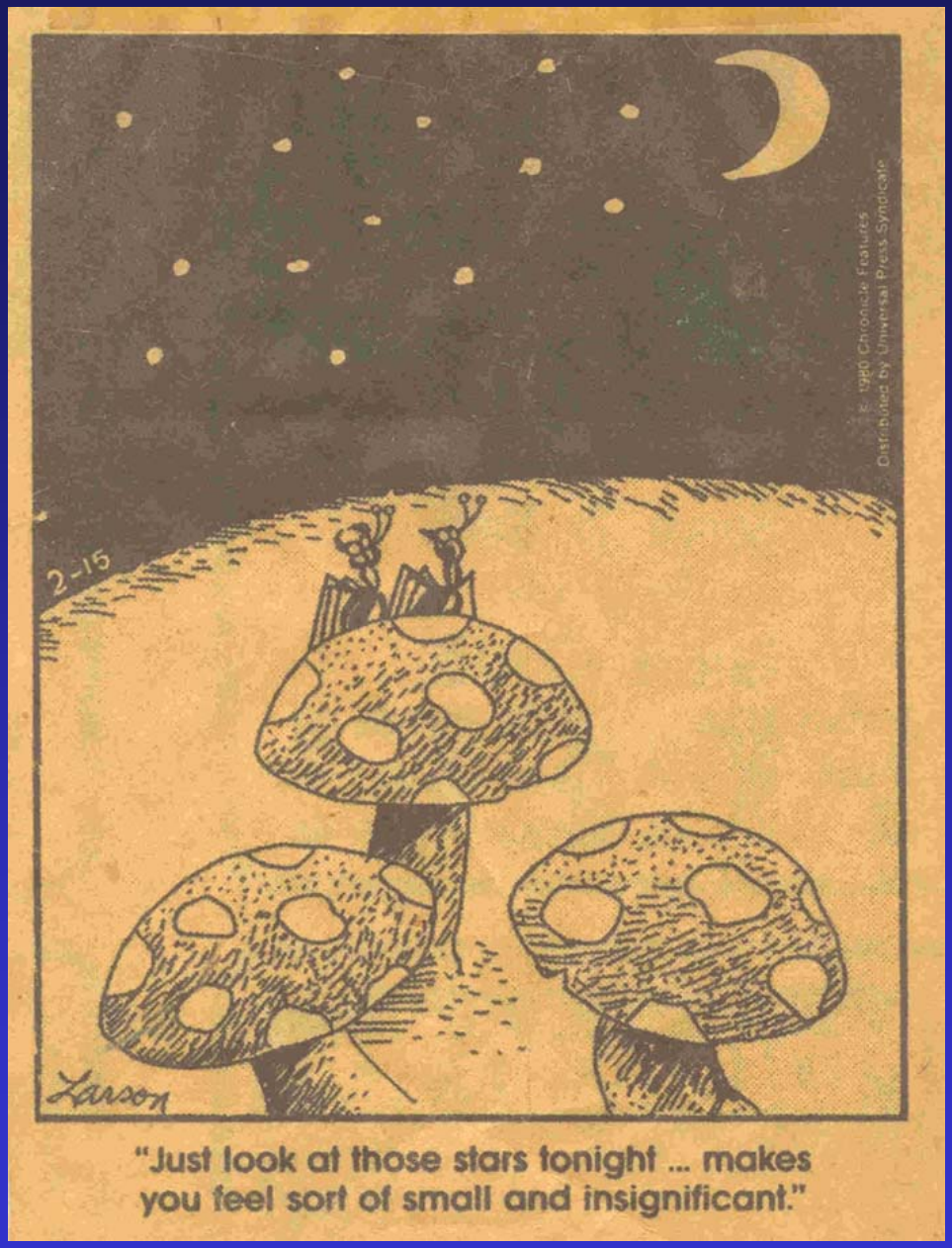
- Purely cosmetic, but annoys nursery personnel.
- Rarely kills/affects infected trees.
- Fungicides available, but leaves will fall off prior to lifting.
- Is the cost (fungicides) worth the benefit (feeling better)?

Tip Blight of Southern Pines

Tip Blight of Southern Pines

Tip Blight of Southern Pines

- **Appears in August – September**
- **Associated with hot temperatures late in the growing season.**
- **Usually when you might observe wilting of new terminal growth.**
- **Terminal inch or two of seedling is killed, stem turns purple**
- **Random, scattered within the beds, “shotgun” blast.**
- **No evidence of spread or circles like damping–off or *Rhizoctonia* foliage blight.**
- **Syndrome of several fungi associated with the dieback; *Fusarium, Diplodia, Phompsis*.**
- **Rarely kills/affects infected trees.**
- **Top clipping “removes” the disease.**
- **The disease is purely cosmetic, but annoys nursery personnel.**
- **Fungicides have not shown to be effective.**
- **Is the cost (fungicides) worth the benefit (feeling better)?**



"Just look at those stars tonight ... makes you feel sort of small and insignificant."