

2015 Peninsula Master Gardener Training Schedule

Plant Pathology Agenda

- **Tools for plant disease diagnosis and management** (9:00-9:50 AM)
- **Must-know emerging diseases** (10:15-11:15 AM)
 - Sudden oak death
 - Impatiens downy mildew
 - Boxwood blight
 - Rose rosette disease
- **Questions and hands-on experience** (11:15-noon)

Survey Questions

- How many participants are new to the MG program?
- How many people have taken at least one plant pathology or disease diagnosis class?
- How many people have answered phone calls from home owners regarding plant diseases or related issues?

Tools for plant disease diagnosis and management

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Outline

- How important is plant disease and diagnosis?
- What does the history tell us?
- What is our goal of disease diagnosis?
- What diagnostic tools may we use?
- How to use these tools ...
 - New and reemerging diseases

**How important is
plant disease and diagnosis?**



Stand of young, pole-sized chestnut trees devastated by *Cryphonectria parasitica* in West Virginia during the chestnut blight epidemic of 1904-1944

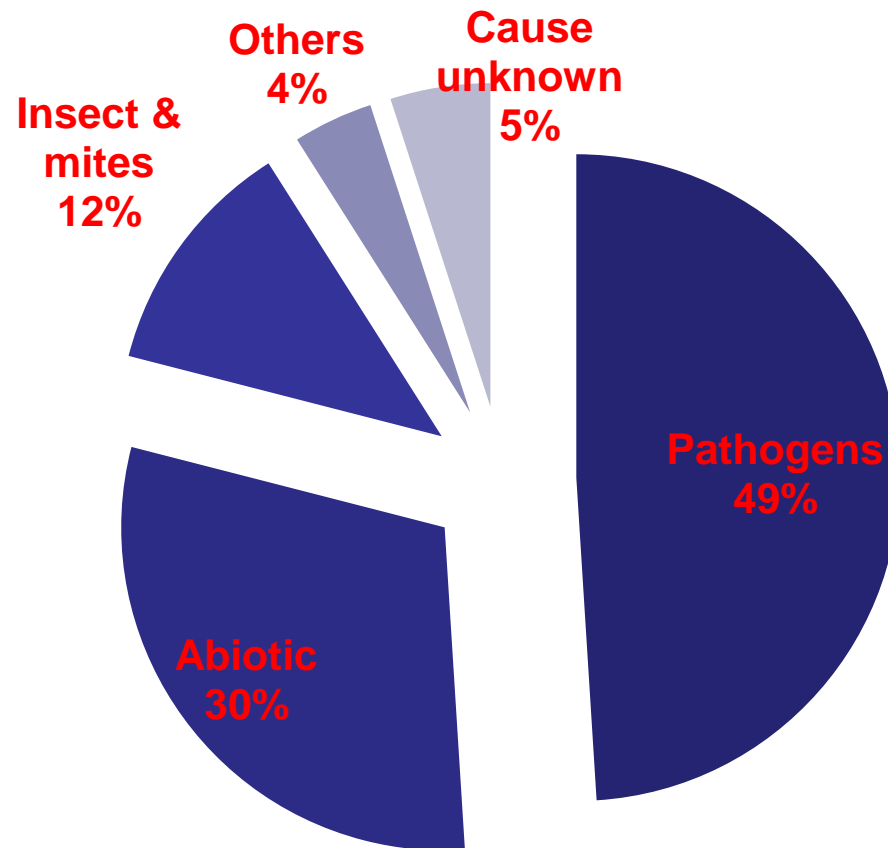


Starving Irish people
emigrating to N.
America following
potato famine
caused by
Phytophthora
infestans in 1840s



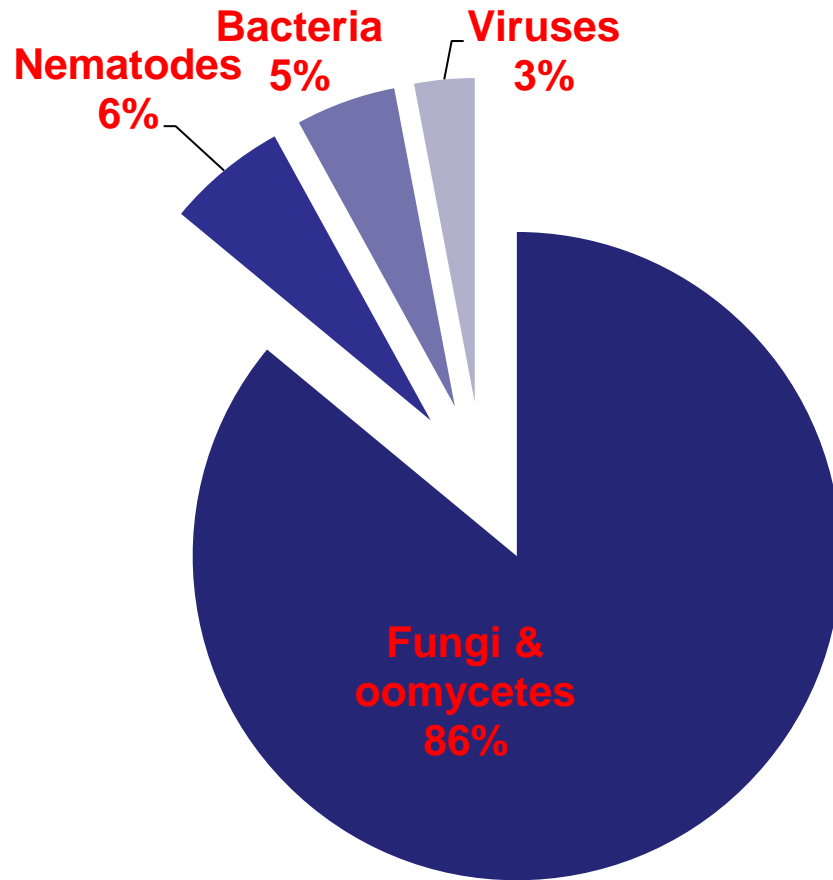
What does the history tell us?

Statistics of Recent Disease Samples



Sources: Disease Clinics in Blacksburg and HRAREC

Statistics (cont'd)



**What is our goal
of disease diagnosis?**

Goal

- Plant protection
 - Early detection
 - Preventing spread of diseases
 - Prescribe the right 'drug' for the 'bug'
 - Recommend a long-term solution(s)

Treating the 'Bug' with the Right 'Drug'

Problem Nature

- Infectious diseases
 - Fungal
 - Bacterial
 - Oomycete
 - Nematode
 - Viral
- Noninfectious or abiotic disorders

Chemical Option

- ← Biocides
 - ← Fungicides
 - ← Bactericides
 - ← Oomycetocides
 - ← Nematicides
 - ← Viricide? (not yet)
- ← Fertilizers/plant growth regulators

**What diagnostic tools
may we use?**

Diagnostic Tools

'Software'

- Plant disease patterns in the fields
- Patterns on individual plants
- Disease symptoms
- Disease signs

Hardware

- A hand lens
- A scissor and beaker
- Plastic bags and rubber bands
- A dissecting microscope
- Reference books

Diagnostic tips– Patterns

- Most useful in separating **infectious** from noninfectious diseases
 - Spatial
 - **Sporadic, not uniform, ...**
 - Temporal
 - **Gradually, ...**
 - Diversity
 - **Single or a few species or varieties affected,...**



Diagnostic tips– Patterns

- Useful in determining where or which part of a plant to examine
 - Whole plant affected –
stem base or roots
 - Isolated areas of the foliage – symptomatic spots



Disease Symptom: Plant Appearance

Leaf spot



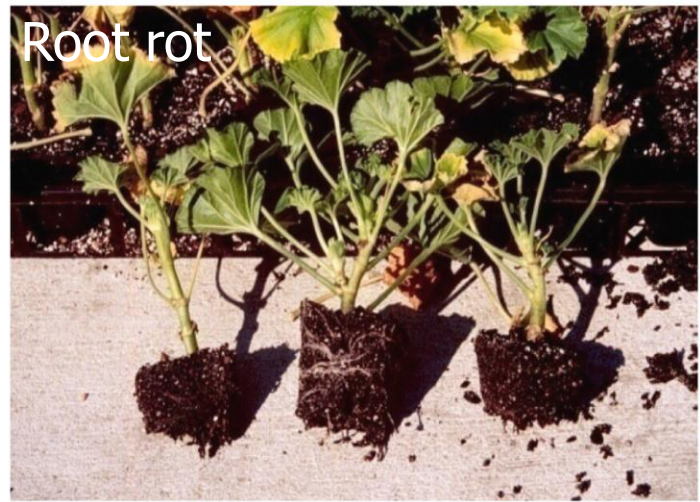
Sneaky virus



Soft rot



Root rot



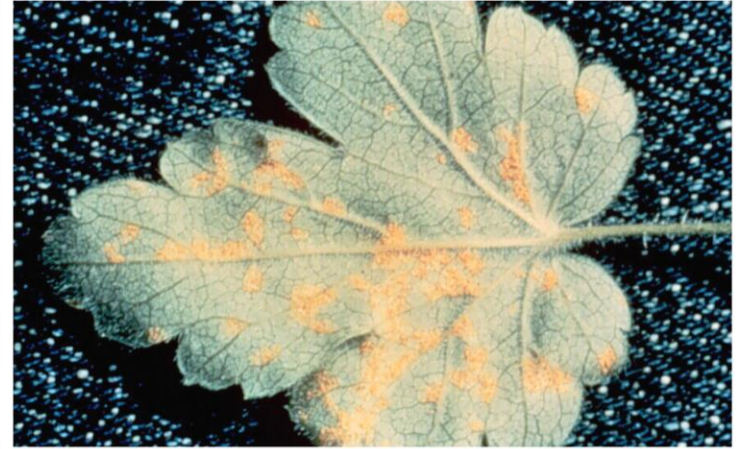
Disease Sign: Pathogen Mass

(Powdery mildews)

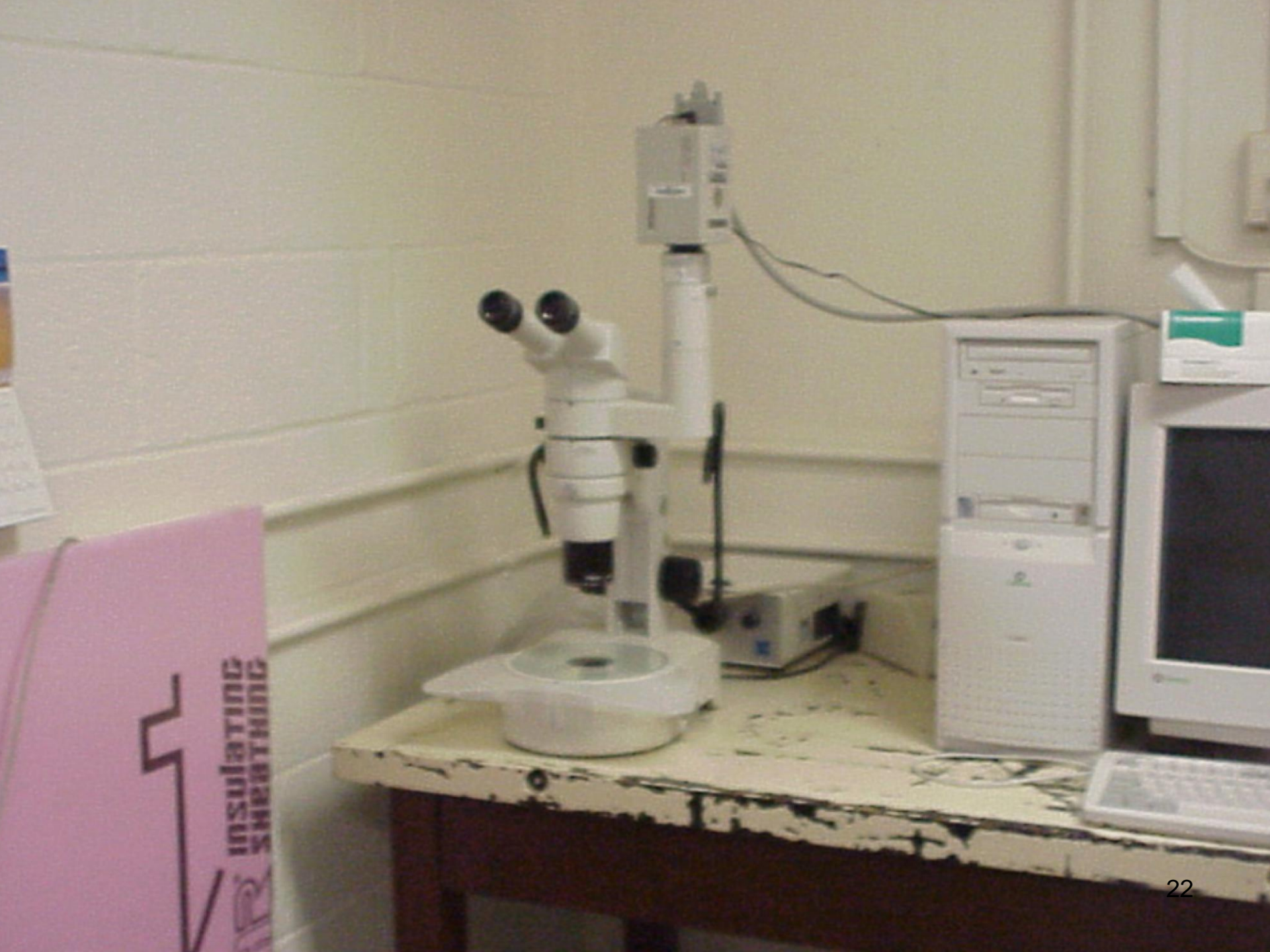


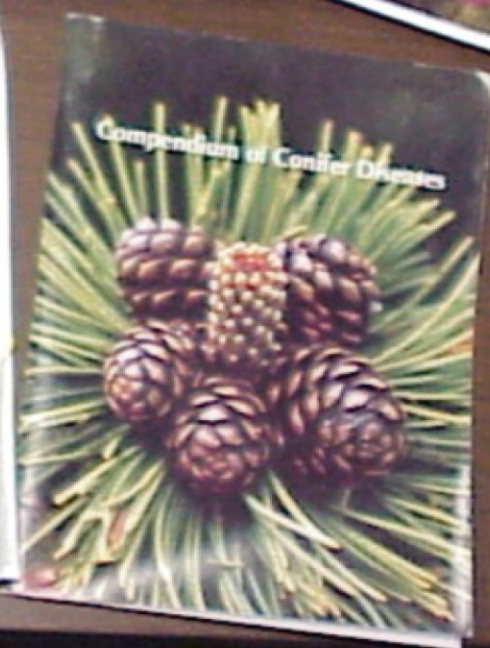
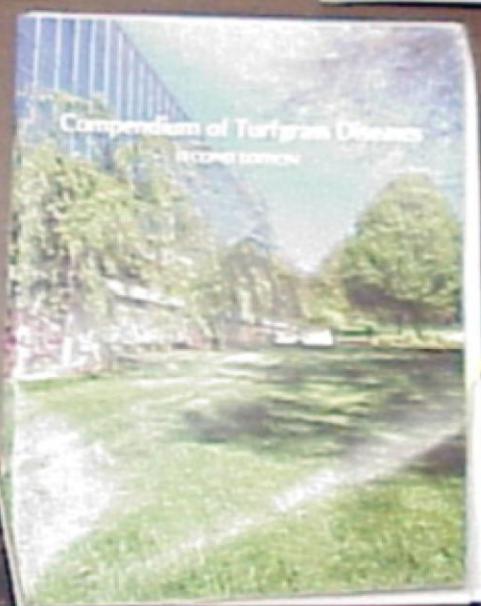
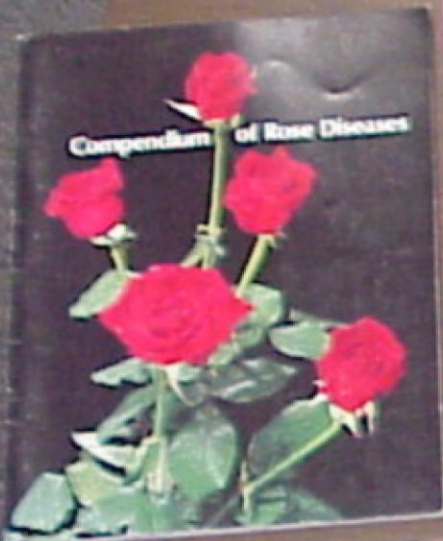
Disease Sign (cont'd)

(Rust)











How to use these tips/tools to figure out what causes a disease problem?

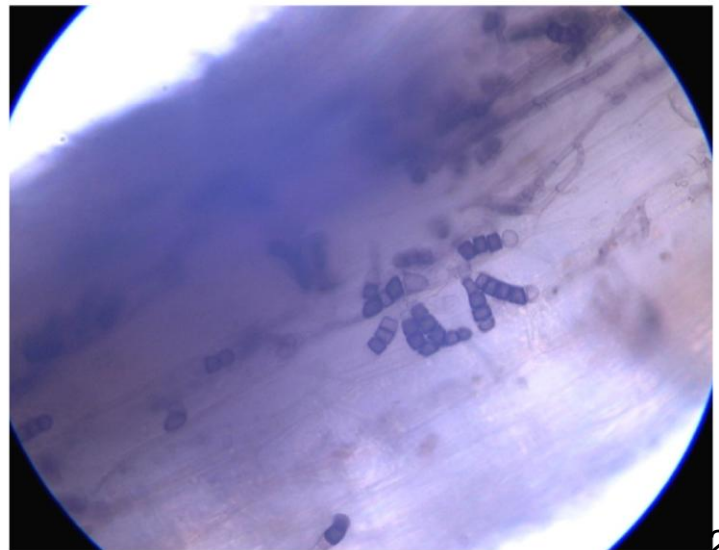
- New and reemerging diseases
 - Fungal
 - Bacterial
 - Viral
 - Oomycete
 - Abiotic or physiological disorder

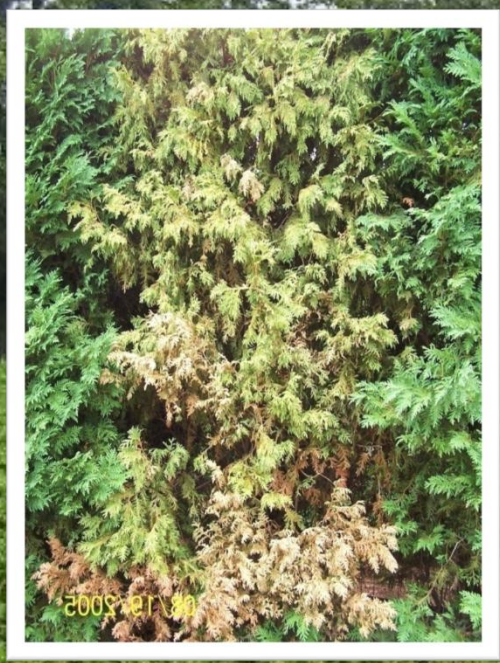
Gray mold or Botrytis blight





Black root rot (*Thielaviopsis basicola*)











Armillaria root and crown rot



Armillaria root
and crown rot

Mushrooms
develop under
wet conditions

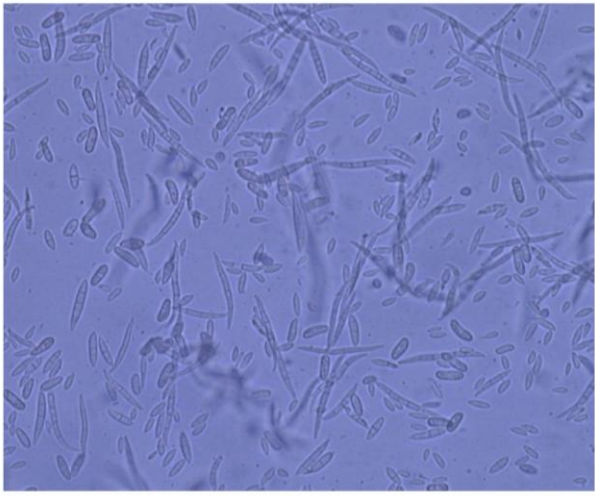




Weeping willow



Armillaria root and crown rot



Fusarium canker and leaf spot



Entomosporium leaf spot 38

Powdery mildew



Fungal Diseases

- Disease signs
 - Mycelium mats, gray mold, whitish “powder”, rust,...
- Disease symptoms
 - Black spot (Rose), Entomosporium leaf spot (Photinia), leaf spot (Rudbeckia),...
- Chemical control
 - True fungicides only



Black leg⁴¹

Fire Blight



Fire blight (*Erwinia amylovora*)




Bacterial ooze close-up





Bacterial wilt on Geranium

A close-up photograph of several plant stems against a light-colored background. The stems are primarily green, but several sections are severely damaged by soft rot. These damaged areas are dark brown to black, shriveled, and have a rough, irregular texture. The rot appears to be progressing along the length of the stems. One stem on the left shows a long, dark, and heavily decayed section. Another stem in the center-right has a similar dark, shriveled area. A third stem on the far right is mostly green but has a small, dark, damaged tip. The overall appearance is one of significant plant tissue decay.

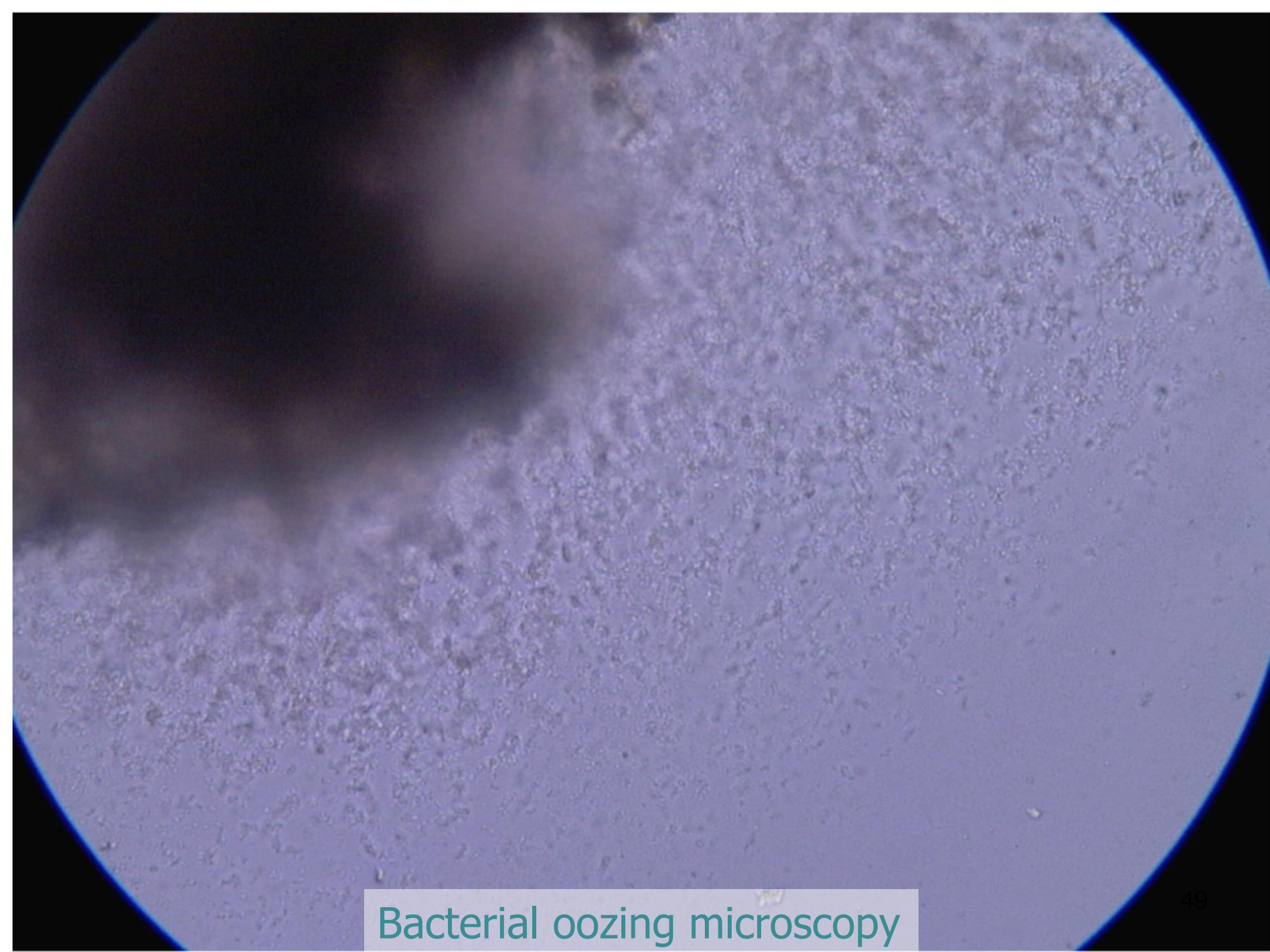
Soft rot

Bacterial oozes



Bacterial streaming





Bacterial oozing microscopy

Soft rot



The 'Extra' from Soft Rot



It smells bad too!



Bacterial Diseases

- Disease signs
 - Bacterial ooze, streaming
- Disease symptoms
 - Cabbage black leg ('V' shape), mountain laurel shot hole, soft rot, ...
- Chemical control
 - Bactericides only



Sneaky virus syndrome

Rose mosaic virus


Virus Diseases

- Disease symptoms
 - Specific patterns
- Disease control
 - Use of virus-free planting materials
 - Vector (insect) control
 - Improve plant vigor or remove severely diseased plants

Oomycete Diseases

- Downy mildews
 - Leaf spot (water soaked)
 - Stem canker
- Phytophthora
 - Foliage blight
 - Root/crown rot
- Pythium
 - Root rot

Downy mildew

A close-up photograph of green plant leaves showing signs of downy mildew. The leaves are covered with a white, powdery substance, particularly on the undersides and along the veins. Some leaves also show brown, necrotic spots and areas of discoloration. The lighting is bright, highlighting the texture of the mildew and the damage to the foliage.

Downy mildew

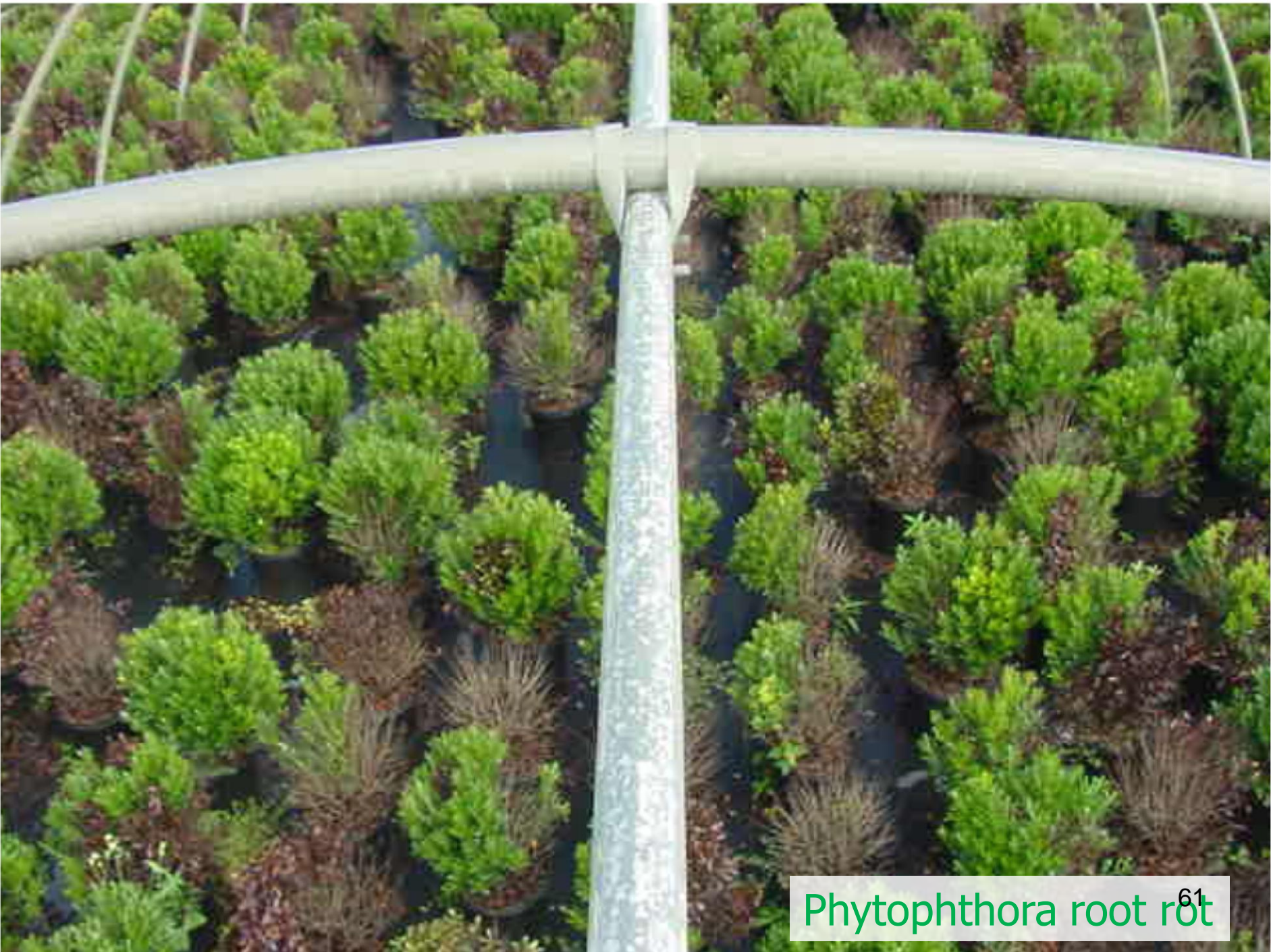
Phytophthora root rot





Phytophthora root rot






Phytophthora root rot



Phytophthora root/crown rot⁶²

Oomycete Diseases

- Disease signs
 - Mycelium and sporangia (limited to downy mildews)
- Disease symptoms
 - Water soaked spots (downy mildews)
 - Foliage blight (Phytophthora)
 - Root/crown rot (Phytophthora/Pythium)
- Chemical control
 - Oomycetocides only



**Damage caused by
salt applied to
roadways to melt
snow and ice**



**Improper
application of
fertilizer to turfgrass**



**Phytotoxicity
from ethazole
fungicide
spilled around
catch bucket
when sprayer
screen was
being cleaned.**

Summary

- Disease diagnosis
 - Distribution patterns, impact patterns, disease symptoms and signs
 - Hardware and web resources helpful
- Disease control
 - Best strategy is **prevention** (for **ALL** diseases)
 - 'Good' sanitation practices are key to control of root/soilborne diseases.
 - **Biocides** work better for **foliage** than root **diseases**.