

Plant Disease



- Douglas County
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OSU Extension Agent

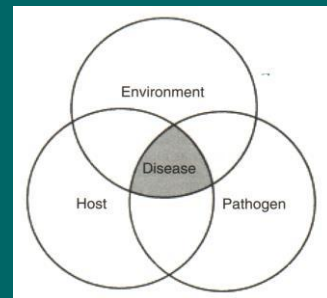
Objectives

- Principles of plant disease
- Types of disease
- Usual suspects
- Diagnostic process
- Control strategies

Disease - defined

- abnormal and harmful physiological condition brought about by:
- biotic pathogens- living agents
- abiotic pathogens- nonliving factors

Disease triangle



Disease Triangle

Disease results when:

- host plant is...
- environment...
- pathogen is...
- ...susceptible
- ...favors pathogen
- ...present/living/active

Abiotic factors

Which can cause disease?

- environmental
- chemical
- mechanical

Grape Freeze Damage



Grape

2,4-D injury



Mechanical abrasion: what cause?



Biotic pathogens

- fungi
- bacteria
- viruses
- nematodes
- parasitic plants

Apple scab-fungi

Are spread by:

Wind
Water
Seed
Insects

Can infect on
their own



Armillaria root rot



Bacterial Canker Cherry

Bacteria require
natural openings
to infect



Fireblight - apple



Leafroll virus - grape

Can't spread
on their own

- Insects
- Grafting
- Nematodes
- Infected-
plants

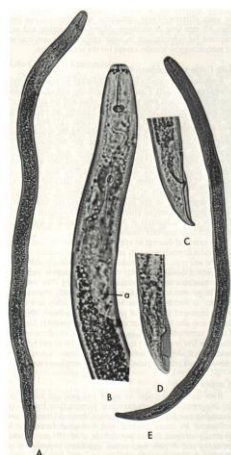


Ringspot virus- Impatiens



Plant parasitic nematodes

- microscopic
- stylet to pierce plant tissue
- endo- or ectoparasitic
- sedentary or migratory



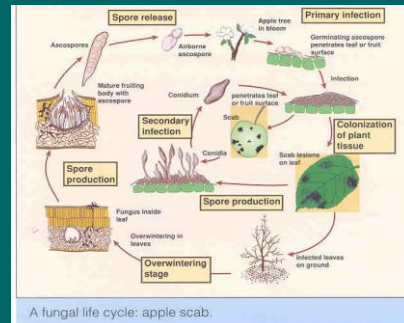
Parasitic Plants



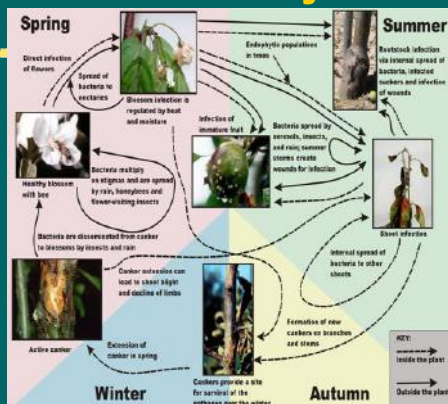
Biotic disease cycles

- Understand & target weak links for control
 - # cycles per year
 - cankers--single cycle
 - scabs, mildews--multiple cycles
 - Complex cycles involving alternate hosts
 - Over wintering

The disease cycle



The disease cycle



Pests (factors in disease). Why do we target pests?

- insects
- mites
- mollusks
- mammals
- birds
- weeds

Pests as factors in disease

- vectors
- mechanical injury
- contribute to environmental problems, e.g., light and moisture competition

The “Usual Suspects”

- 75% due to environment (abiotic), e.g...
 - too wet or too dry
 - soil compaction
 - freezing
 - chemicals (pesticides & nutrition)
- 25% biotic, most due to fungi, e.g...
 - root diseases, leaf spots, mildews

Environmental vs. Living

- Environmental conditions predispose plants to living pathogens e.g...
 - Freezing- Pseudomonas
 - Too wet- roots, Pythium or Armillaria
 - Too wet- leaves, Anthracnose



Disease Diagnosis

Disease Diagnosis

Things aren't always as they first appear!

Police begin a campaign to run down jaywalkers

Panda mating fails; Veterinarian takes over

Teacher strikes idle kids

Double-Takes

Miners refuse to work after death

Juvenile court to try shooting defendant

Red tape holds up new bridges

Chef throws his heart into helping feed needy

Local high school dropouts cut in half

Hospitals are sued by 7 foot doctors



Disease diagnosis

1. Define the problem
2. Look for patterns (assess symptom dist.)
3. Identify time develop. of damage pattern
4. Determine causes of the plant damage

1. Define the problem

- ID the host plant and characteristics of the problem
- Step back: examine the entire plant and surrounding community
- Know what the healthy plant looks like

Know what the healthy plant looks like



What is wrong with my ...?



What is wrong with my ...?



What is wrong with my ...?



What is wrong with my ...?



What is wrong with my ...?



2. Look for patterns

- Nonuniform patterns of damage indicate **"living factors"**
 - Damage mostly on one species or only part of a plant
- Uniform patterns of damage indicate **"Nonliving factors"**
 - Damage will appear on all leaves of a certain age or exposure

Nonuniform pattern



Uniform pattern



Uniform pattern (close up)



Uniform or non uniform?



3. Identify time dev. of the damage pattern

- Living factors multiply, progress with time, **gradual**
- Nonliving factors do not spread with time, **sudden**

Time development, gradual or sudden?



Gradual or sudden?



Gradual or sudden?



Gradual or sudden?



4. Determine the cause of plant damage

- Living factors:
 - Symptoms and signs of disease:
 - Fungal pathogens often round spots, mycelium
 - Bacterial pathogens angular spots, gummosis
 - Symptoms and signs of insects:
 - Leaf edge notched, weevil
 - Leaf eaten in to the mid-rib, caterpillar
 - Insects or frass on the plant

Living or nonliving?



Living or nonliving?



Living or nonliving?



Living or nonliving?



4. Determine the cause of plant damage

- Nonliving factors:
 - Mechanical
 - Breakage: construction, lawn mower, moving
 - Physical
 - Environmental: temperature, light, moisture
 - Chemical
 - Pesticides, pollutants, nutritional

Living or nonliving?



Living or nonliving?



Living or nonliving?



Galls on plants caused by:

- Insects
- Mites
- Bacteria
- Fungi
- Nematodes
- Herbicide injury
- Wound response of plants
- All of the above.



Symptoms or Signs

- **Symptom:** a change in a plant's growth or appearance in response to living or nonliving damaging factors
- **Sign:** direct physical evidence of a damaging factor (pest or pathogen)

Common Symptoms:

- Abscission, Blight
- Blotch, Canker
- Chlorosis, Defoliation
- Desiccation, Dieback
- Dwarfing, Enation
- Epinasty, Etiolation
- Fasciation, Flagging
- Gall, Mosaic
- Mottle, Necrosis
- Rot, Rugose
- Russet, Scab
- Stippling
- Water-soaked
- Wilt
- Witches' broom

Common Signs:

- Pest itself
- Bacterial slime or gumosis
- Conk, Cyst
- Frass, Fruiting body
- Girdling, Honeydew
- Mole mounds, Mycelia
- Weather records, Webbing

Common names for plant problems

- Simple and descriptive
- Leaf spot, cherry
- Scab, apple
- Shot hole, apricot
- Powdery mildew, grape

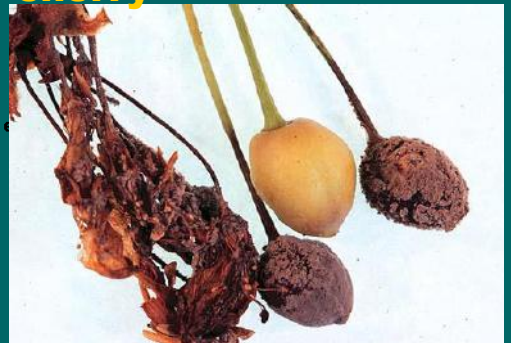
Leaf spot - cherry



Apple Scab



Brown rot blight cherry



Root-knot nematode



Shothole - apricot



Powdery Mildew-grapes



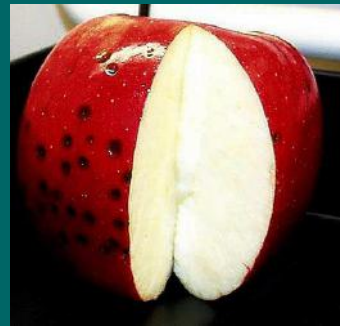
Potato Scab



Symptom or sign?



Symptom or sign?



Symptom or sign?



Symptom or sign?



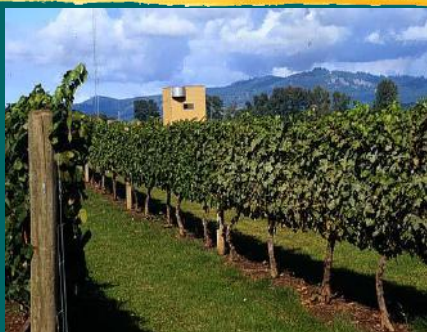
Symptom or sign?



Symptom or sign?



Symptom or sign?



Symptom or sign?



Symptom or sign?



Symptom or Sign?



Symptom or sign?



Symptom or Sign?



Symptoms are clues not answers

- Completely different factors may cause similar symptoms on the same plant
- The probability of making a correct diagnosis based on one or two clues or symptoms is low

Knowing the primary diseases of your plants:

- Allows you to plan a control program
- Helps you monitor plant health
- Helps you focus on what part of the plant is most susceptible, e.g... roots, tubers, stems, leaves, flowers, fruit

Using diagnostic keys

- Chapter 16 pages 350-386, Sustainable Gardening
- These keys help you move methodically through the process
- The keys give you the most likely problems with specific crops

Control Strategies

- Exclusion
- Avoidance
- Eradication
- Protection
- Resistance
- What is your tolerance for plant disease?

Control 1. Exclusion

National or state

- Quarantines
- Inspections
- Certification



local

- Barriers
- Trap crops
- Baits
- Repellents

Exclusion



Control 2. Avoidance

- If the disease is in the area...
 - Healthy planting material
 - Right plant, right place
 - Site preparation
 - Prevent plant injury
 - Horticultural practices to promote health
 - Plant diversity

Control 3. Eradication

- Elimination or reduction of pathogen
 - rotation with non hosts - nematodes, fungi
 - heat treatment - soil, plant material
 - eliminate alternate hosts - rusts
 - sanitation to prevent over wintering
 - Chemical applications

Soil solar fumigation



Control 4. Protection

- biological or chemical treatment of a plant **before** it becomes diseased
- e.g., lime sulfur, benomyl fungicides, applied @ prepink, pink & petal fall in apples/pears -- to protect against scab and mildew on spring growth

Protection



Homeowner sprayers



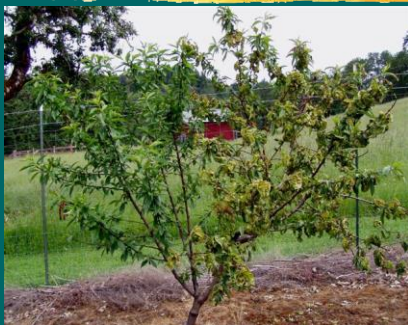
Cultural Strategies to Prevent Disease

- Row orientation
- Site selection
- Timing irrigation
- Sanitation
- Pruning
- Crop rotation

Control 5. Resistance

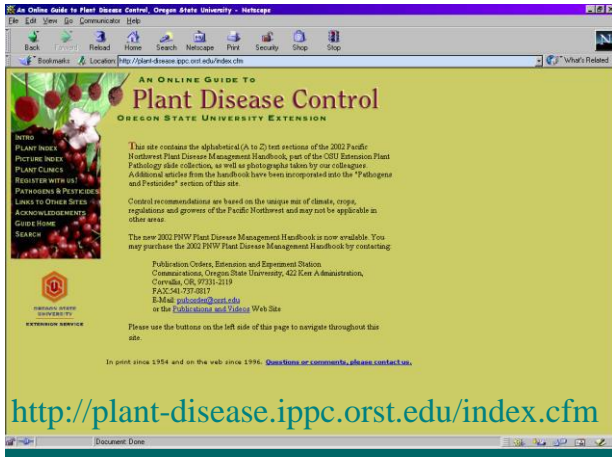
- The plant's genetic response to a pathogen:
 - Susceptible
 - Resistant
 - Tolerant
 - Immune
- Reference seed, nursery catalogs

Plant resistance (leaf curl) Frost Mary Jane



PNW Plant disease management handbook

- Host-disease descriptions, also...
 - Root rots
 - Armillaria
 - Phytophthora
 - Viruses & virus certification
 - Pseudomonas syringae
 - Mosses on roofs
- Testing services
- Pesticides
- Winter injury
- Tree decline
- Damping off



Sherlock Holmes & The Diagnostic Process

- Sherlock Holmes and Dr. Watson went on a camping trip. After a good meal and a bottle of wine they lay down for the night, and went to sleep.
- Some hours later, Holmes awoke and nudged his faithful friend.

Sherlock Holmes & The Diagnostic Process

- "Watson, look up at the sky and tell me what you see."
- Watson replied, "I see millions and millions of stars."
- Holmes asked, "What does that tell you?"

Sherlock Holmes & The Diagnostic Process

- Watson ponders and replies:
 1. Astronomically, it tells me that there are millions of galaxies and potentially billions of planets.
 2. Astrologically, I observe that Saturn is in Leo.
 3. Horologically, I deduce that the time is approximately a quarter past three.
 4. Theologically, I can see that God is all powerful and that we are small and insignificant.
 5. Meteorologically, I suspect that we will have a beautiful day tomorrow...Whew! Watson is proud!

Diagnostics: Putting Things Into Perspective

- Watson concludes: "So, Holmes, what does it tell you?"
- Holmes thought a minute, then spoke: "Watson you idiot! Someone has stolen our tent!"