Goals for today's class:

(1) Recognize and name disease symptoms
(2) Where to get disease information
- today's information is in the Sustainable Gardening manual
- images of diseased plants mainly from the PNW disease handbook web site

Disease
Injurious change from normal biological function resulting from continual irritation by a causal factor
Plant Pathogenic Organisms

- **Fungi** -- branching hyphae & spores  *many diseases*
- **Oomycetes** -- water molds  *Late blight, downy mildews*
- **Bacteria** -- water-loving microbes  *Fire blight of pear*
- **Nematodes** -- microscopic worms  *mostly affect roots*
- **Viruses** -- nucleic acids with protein coat  *mosaics*
- **Viroids** -- ribonucleic acids  *Hop stunt viroid*
- **Phytoplasmas** -- wall-less microbes  *Aster Yellows*
- **Parasitic plants** – plants lacking chlorophyll and/or roots  *mistletoes*

Photos by C. M. Ocamb
Photos by C. M. Ocamb

Rose – Rust (Phragmidium sp)

Teliospores

Uredospores (repeating spore stage - produced throughout growing season)

Photos by C. M. Ocamb

Rose – Rust (Phragmidium sp.)

Telia in February

Uredia in May
Abiotic factors

- temperature
- wind
- light
- soil pH
- chemicals (herbicides, etc.)

Pathogen (infectious) vs. Abiotic (noninfectious) cause of disease

- Some abiotic factors cause specific symptoms but most abiotic diseases result in nonspecific symptoms.
- Diagnosis is difficult without historical knowledge of environment or weather, cultural practices, etc.

Steps in making a diagnosis

Is growth normal?

What is normal growth?

Compare problem plant to normal plant
Both plant images are of “normal” plants.

Photos by C. M. Ocamb

Is growth normal?

Patterns?

• Abiotic disease
  – Uniform distribution

• Biotic disease
  – Random distribution
Affected plant patterns

Abiotic problem:
• more uniform distribution
• >1 plant species affected

Biotic disease problem:
• generally a single host species affected
• less uniform distribution

Is growth normal?
Patterns?
Part of plant affected?
Symptoms?
Is growth normal?  
Patterns?  
Parts of plant affected, symptoms?

Development of damage over time?

Is growth normal?  (know normal growth)  
Are patterns apparent?  (plant, garden or field)  
Parts of plants affected?  (look at entire plant)  
Symptoms or signs?  (progression over time)

Ask questions!!
- Cultural practices?  
- When symptoms developed, extent?
- Representative samples?

Synthesis of information ➔ diagnosis

Disease Management
- things that you cannot do much about
  - extra cool, wet springs or cool summers
  - highly susceptible plants
    - peach variety ‘Red Haven’
      in the Willamette Valley
  - perennial plants growing outside of their natural range
    - Prickly pear cacti or lemons in western Oregon
    - Swamp cypress on the east side of the Cascades

2011
Disease Management

• things that you can do & should do to avoid problems

  cultural controls !!

Examples of cultural controls

• site selection  sunny, well-draining site ideal for vegetable gardens
• time of planting dampering-off promoted by cold, wet soils
• plant resistant cultivars ‘Frost’ peach
• quality seeds and transplants  don’t sow garlic, potato from grocery
• plant spacing provide room for sufficient light and air movement
• fertility & water overwatering or too much N can lead to disease
  overhead irrigation enhances disease – drip
• remove diseased plant parts rake up scabby leaves/fruit in fall
  pull off tomato leaves with late blight
• etc.

Control of Infectious Plant Diseases

• exclusion
• avoidance
• resistance
• eradication
• protection
Control of Infectious Plant Diseases

- exclusion – Gov. quarantines, inspections, certification
- avoidance – planting locale/time, plant in warm soils, pathogen-free transplants and seeds
- resistance – genetic, plant resistant varieties
- eradication – sanitation, remove infected plant material, crop rotation, tomato > lettuce > bean, eliminate alternate host, Cedar apple rust, use pasteurized planting medium for “starts”
- protection – chemical (fungicides) or biological

Resources

- PNW Plant Disease Management Handbook https://pnwhandbooks.org/plantdisease
- Factsheets, extension publications, etc.
- APS compendia, other books
- Additional on-line resources (public [.edu] & private)
- OSU extension staff
- Accurate diagnosis is important! may need plant disease clinic – submit good samples for diagnosis

Is growth normal (know normal growth)
Are patterns apparent? (plant, garden or field)
Parts of plants affected? (look at entire plant)
Symptoms or signs? (progression over time)

Ask questions!!
Use all information resources
Publications (paper and electronic)
Land Grant University systems (OSU, WSU, etc.)
County Extension staff
Plant Clinics
to provide an answer to problem and prevention or management options.
Pepper – Bacterial leaf spot (*Xanthomonas vesicatoria*)

Water-soak appearance initially
Prunus laurocerasus -- Leaf spots and shothole

- *Pseudomonas syringae* pv. *syringae*
- *Cercospora* sp.
- *Blumeriella* sp.
- *Wilsonomyces carpophilum*
- copper spray injury
- boron toxicity

All can cause leaf spotting & shothole

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Crucifers – White Leaf Spot (*Mycosphaerella capsellae*)

Water-soak appearance later

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Bok choi – White leaf spot (*Mycosphaerella capsellae*)

Black leg (*Leptosphaeria* spp.)

Light leaf spot (*Pyrenopeziza brassicae*)

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Leptosphaeria leaf spot (Black leg)

Light leaf spot

Leptosphaeria leaf spot (Black leg)

Stem lesion due to light leaf spot compared to black leg

Black leg (Leptosphaeria spp.)
• Plant only seed that has been certified to be free of black leg by official testing and has been treated with an approved fungicide or hot water (15 to 25 min at 122°F).

Crucifer seed stock intended for planting in Oregon must be accompanied by an official test stating that the untreated seed is free from black leg.

Homeowner seed packets, 0.5 oz size or smaller, are no longer exempt from black leg seed testing requirements.

**ALL seed must be certified as black leg free to be sold/planted in Oregon**
Rose - Botrytis blight

Copyright Oregon State University Extension Plant Pathology Image Collection

Rhododendron -- Botrytis shoot blight

Photo by Jay W. Pscheidt

Copyright Oregon State University Extension Plant Pathology Image Collection
Tomato - Late blight (*Phytophthora infestans*)

Fluffy sporulation on underside of leaf lesions

Powdery mildews
- highly host specific
Tomato -- Powdery mildew

Photos by C. M. Ocamb

Onion -- Downy mildew (*Peronospora destructor*)

Downy mildews
- highly host specific
- promoted by wet conditions or high relative humidity

Photos by C. M. Ocamb

Cucumber -- Downy mildew (*Pseudoperonospora cubensis*)

Photos by C. M. Ocamb
Cucumber – Downy mildew (*Pseudoperonospora cubensis*).

- Spores
- Photos by C. M. Ocamb

Rusts
- Obligate parasites
- Host specific
- Complex life cycles
- Promoted by rainy weather
- Spores produced in pustules

Quince – Rust (*Gymnosporangium* spp).
- Aecia in May
- Alternate hosts produce telia (junipers/cedars)
- Photos by C. M. Ocamb
Healthy plants can tolerate considerable amounts of galling without serious damage.

Similar-looking insect gall

Copyright Oregon State University Extension Plant Pathology Image Collection
Rose – Crown gall (*Agrobacterium*)

Apple – Perennial canker (*Cryptosporiopsis*)

Cankers: lesions on herbaceous or woody stem tissues

Peach – Bacterial canker (*Pseudomonas syringe*)

Photo by C. M. Ocamb
Fruit & Bulb Rots

Photo by Jay W. Pscheidt

Peach – Brown rot (*Monilinia*)

Photo by Jay W. Pscheidt
Fruit rot (*Botrytis*), Photo by Jay W. Pscheidt

Cucurbit – Fruit rot (*Fusarium*), Photo by C. M. Ocamb

Pepper – White mold (*Sclerotinia*), Photos by C. M. Ocamb
• Seed Rots & Damping-off
• Root Rots

Fusarium, Rhizoctonia, Pythium, etc. incite diseases
No plant emergence
-- seed rot or pre-emergence damping-off
Post-emergence damping-off
-- seedling emergences then falls over
Root rot – decay of roots, at any time
usually present at low levels on healthy plants

Cabbage– Damping-off (decay at base of stems*)
Port-Orford Cedar -- Phytophthora root rot
15 April 2010

Photo by C. M. Ocamb

Photo by Jay W. Pscheidt

April 2010 April 2012 Jan 2016

Photos by C. M. Ocamb

Sunchoke – Southern blight (Sclerotium rolfsii)

Photos by C. M. Ocamb
Phlox – Stem nematode (*Ditylenchus*)

Photo by Meldsie Putnam

Clubroot (*Plasmodiophora brassicae*) – affects crucifers

Photo by C. M. Ocamb

Vascular Wilts
Basil – Fusarium wilt
Cut stems show vascular browning

Viral diseases
Injury symptoms due to some herbicides can resemble viral infection

Parasitic Plants
Abiotic Diseases

Blossom-end Rot -- Calcium deficiency
Blossom-end Rot -- Calcium deficiency

Photos by C. M. Ocamb

Sunburn—Injury to aboveground plant parts (leaves, bark, flowers, and fruit) caused by excessive exposure to solar radiation. Associated with high temperatures but not necessarily lack of soil moisture.

Sunscald—Plant tissues are injured when freezing temperatures precede or follow daytime warming by the sun. Can also be considered winter injury or called southwest injury.

Photos by C. M. Ocamb
Rhododendron -- Sunscald or desiccation injury

Sunburn

Is growth normal (*know normal growth*)
Patterns (*plant level, field level, landscape*)
Part of plant affected (*look at entire plant*)
Symptom description (*progression*)

Ask questions!!
Use all information resources available