

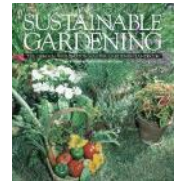


Plant Diseases & Disease Diagnosis in Home Gardens

Cynthia Ocamb, PhD
Extension Plant Pathologist
Oregon State University, Department of Botany and Plant Pathology

Responsible for plant disease problems of vegetables and field crops in Oregon

- basic concepts are covered in the Sustainable Gardening manual
- images of diseased plants are posted on the PNW Plant Disease Management Handbook web site



<https://pnwhandbooks.org/plantdisease>



Goals for today's class:

- (1) Recognize and name disease symptoms
- (2) Where to get information on plant diseases
- (3) Develop an awareness of commonality of diseases

- Images of diseased plants used today are mainly from Ocamb's home gardens



Photos by C. M. Ocamb

Disease — Injurious change from normal biological function resulting from continual irritation by a causal factor.

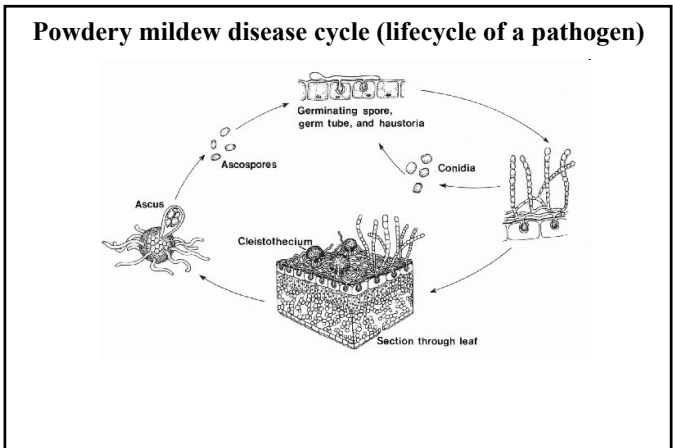
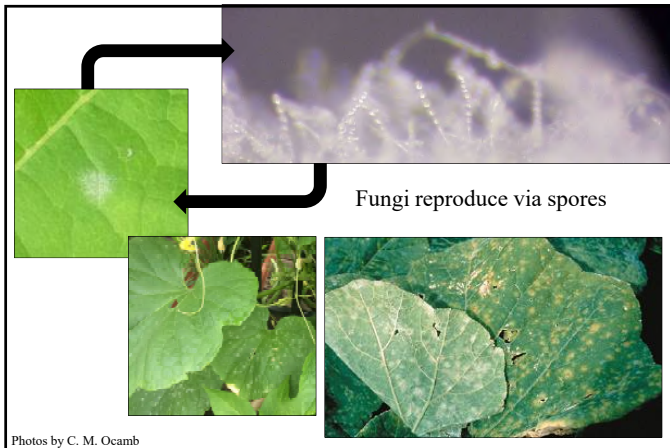
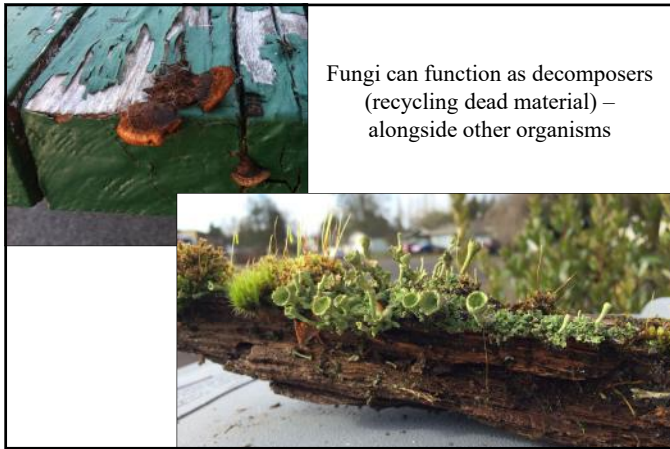
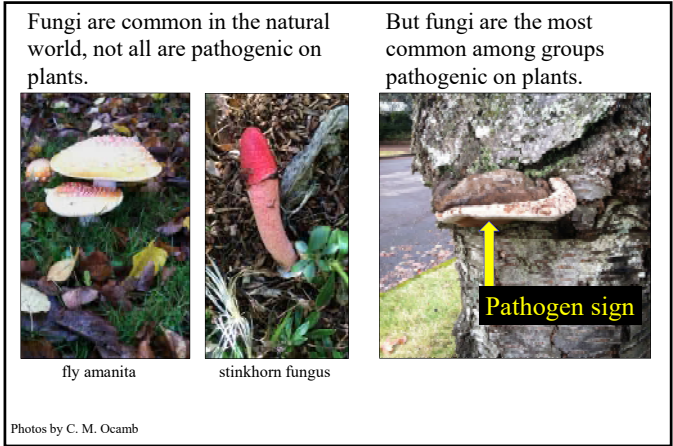
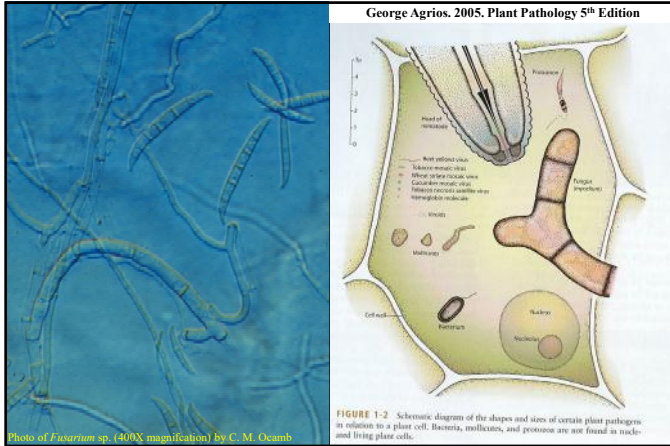
Disease —The sum of the deviations of the vital functions beyond the latitude of health (PNW Disease Management Handbook, 2020).

Disease — Any malfunctioning of host cells and tissues that results from continuous irritation by a pathogenic agent or environmental factor and leads to the development of symptoms (G. Agrios, Plant Pathology 5th Edition, 2005).

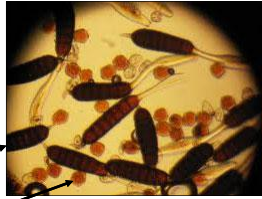
Disease — A condition of the living animal or plant body or one of its parts that impairs normal functioning and is typically manifested by distinguishing signs and symptoms: SICKNESS, MALADY (Merriam-Webster Dictionary, 2020).

Biotic agents of plant diseases (plant pathogenic organisms)

- **Fungi** – branching hyphae & spores *Powdery mildews*
- **Oomycetes** – water molds *Late blight of tomato*
- **Bacteria** – water-loving microbes *Bacterial canker of peach*
- **Nematodes** – microscopic *Root-knot nematode*
- **Viruses** – nucleic acids with protein coat *Mosaics*
- **Viroids** – ribonucleic acids *Hop stunt viroid*
- **Parasitic plants** – plants lacking chlorophyll and/or roots *Mistletoe*



Some fungi, such as rust of rose (*Phragmidium* sp.), produce multiple spore types



Teliospore
overwintering stage

Uredospore (produced throughout growing season)

Rose – Rust (*Phragmidium* sp.)



Telia in February



Uredia in May

What is a symptom of rust on rose? Signs?

Photos by C. M. Ocamb

Environment strongly modulates plant disease

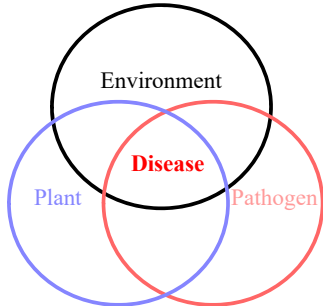


Photo by C. M. Ocamb

Oomycetes (also known as water molds) do best under wet conditions

Photo by C. M. Ocamb

Abiotic agents of plant diseases

- temperature (cold injury)
- sunlight (sunburn)
- wind (desiccation)
- soil pH
- chemicals (herbicide residues, etc.)

Biotic agent (infectious)

vs.

Abiotic (noninfectious) cause of disease

- *Some abiotic factors cause specific symptoms but many 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



Golden Euonymus



Burning bush (winged Euonymus)

Photos by C. M. Ocamb

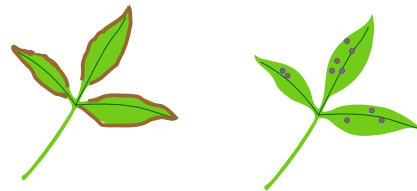
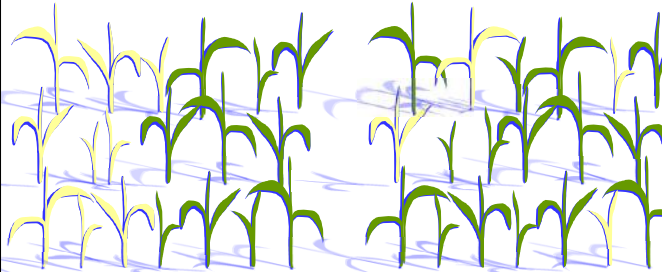


Is growth normal ?

Patterns?

- Abiotic disease
– Uniform distribution

- Biotic disease
– Random distribution



Affected plant patterns

Abiotic problem:

- more uniform distribution
- >1 plant species affected

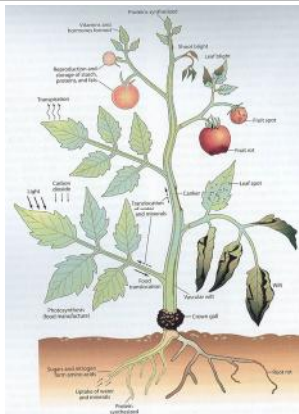
Biotic disease problem:

- generally a single host species affected
- less uniform distribution

Is growth normal ?
Patterns ?



Part of plant affected?
Symptoms?



From
Plant Pathology – G. Agrios

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 ?

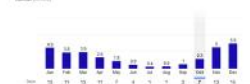
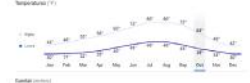
Synthesis of information → diagnosis

Disease Management

There are some things that you cannot do much about:

- cool, wet springs or cool summers
- highly susceptible plants
peach variety 'Red Haven'
- perennial plants growing outside of their natural range
blood oranges in home gardens

Avg. temp and rainfall in Douglas County



Storm of 1996 caused death and destruction in Douglas County



2 inches of rain fell on Nov. 18
4.35 inches of rain fell on Nov. 19

Image by News-Review (https://www.artoday.com/news/local/douglas_county/storm-of-1996-caused-death-and-destruction-in-douglas-county/article_00c7aac2-298d-5275-812e-30a301a1a10.html)

Disease Management

There are practices that you can do and should do to avoid plant disease problems

❖ *cultural controls !!*

Examples of cultural controls for disease management

- site selection *sunny, well-draining site ideal for vegetable gardens*
- time of planting *damping-off promoted by cold, wet soils*
- plant resistant cultivars *'Frost' peach is highly resistant to leaf curl*
- quality seeds/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*
- remove diseased plants *rake up scabby leaves/fruit in fall, pull off blighted leaves*
- etc.



Photos by C. M. Ocamb

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 → eggplant → potato*
vs tomato → lettuce → bean
eliminate alternate host - *Cedar apple rust*
- **protection** chemical (fungicides) or biological control

Resources for making a diagnosis

- PNW Plant Disease Management Handbook
<https://pnwhandbooks.org/plantdisease>
- other Extension publications (factsheets, etc.)
- APS compendia, other books
- Additional on-line resources (public [.edu] & private)
- OSU Master Gardener veterans & Extension staff
- **Accurate diagnosis is important!**
may need a plant diagnostic clinic
– submit good samples for diagnosis
<https://pnwhandbooks.org/plantdisease/diagnosis-testing/testing-services>



- 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 Diagnostic Clinics

**to provide an answer to problem
and prevention or management options.**

Break time



Photo by C. M. Ocamb



Photo by C. M. Ocamb

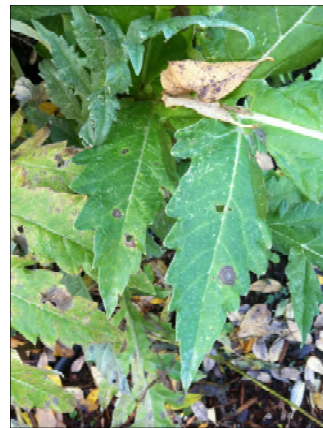


Photo by C. M. Ocamb



Photo by C. M. Ocamb

Pepper – Bacterial leaf spot (*Xanthomonas vesicatoria*)



Photo by C. M. Ocamb

Celery – Septoria leaf spot (*Septoria apiicola*)



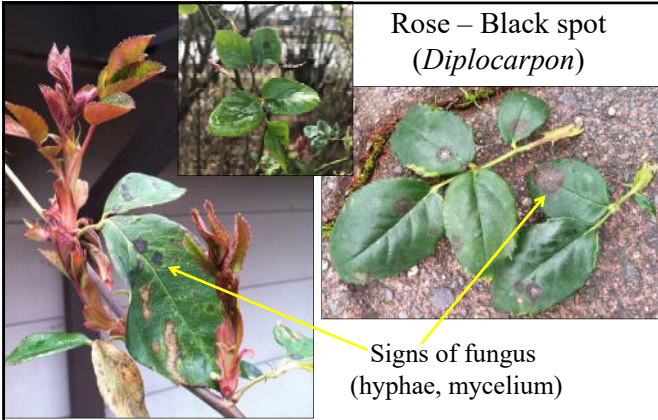
Photo by C. M. Ocamb

Celery – Septoria leaf spot (*Septoria apiicola*)



Photos by C. M. Ocamb

Rose – Black spot (*Diplocarpon*)



Signs of fungus
(hyphae, mycelium)

Photos by C. M. Ocamb

Rose – Botrytis blight



Rose – Botrytis blight



Tomato – Late blight (*Phytophthora infestans*)



Photo by C. M. Ocamb

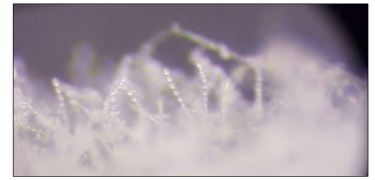
Fluffy sporulation on underside of leaf lesions



Photo by C. M. Ocamb

Powdery mildews

- highly host specific



Photos by C. M. Ocamb

Bean – Powdery mildew (*Erysiphe polygoni*)



Photo by C. M. Ocamb



Photos by C. M. Ocamb

Swiss chard - Powdery mildew (*Erysiphe betae*)



Photo by C. M. Ocamb

Rhododendron – Powdery mildew (*Erysiphe azalea*)



Photo by Jay W. Pscheidt

Rhododendron – Powdery mildew (*Erysiphe azalea*)



Rhododendron – Powdery mildew (*Erysiphe azalea*)

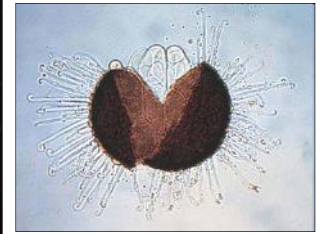
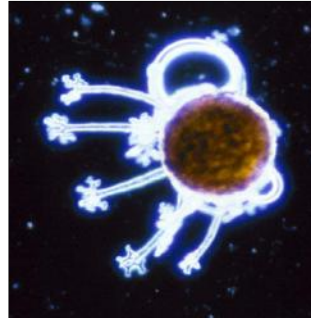


Photo by Jay W. Pecheid

Tomato – Powdery mildew (*Oidium neolycopersici*)



Leveillula taurica presents as a whitish powdery growth on the leaf's lower side, sporulates sparsely. *Oidium neolycopersici* produces profuse white powdery growth on the upper leaf surface, stems, and petioles, and sometimes on the underside of leaves.

Photos by C. M. Ocamb

Onion – Downy mildew (*Peronospora destructor*)

Downy mildews

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



Photo by C. M. Ocamb

Cucumber – Downy mildew (*Pseudoperonospora cubensis*)



Photos by C. M. Ocamb



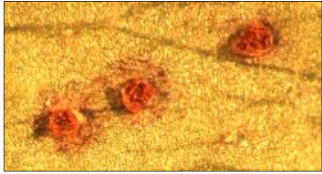
Cucumber – Downy mildew (*Pseudoperonospora cubensis*)



Photos by C. M. Ocamb

Rusts

- host specific
- complex life cycles
- promoted by rainy weather
- spores produced in pustules








Photos by C. M. Ocamb

Quince – Rust (*Gymnosporangium* spp.)

Alternate hosts produce telia (junipers/cedars)

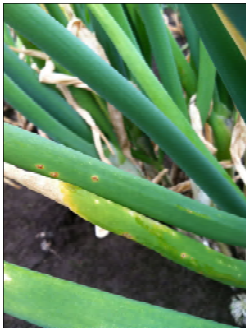

Aecia in May

Photos by C. M. Ocamb

Photo by OSU Extension Plant Pathology Slide Set



Onion – Rust (*Puccinia allii*)

Uredospores produced throughout growing season
Teliospore may be produced on onion (overwintering stage)
Optimal conditions for infection are ~59°F with 100% relative humidity for ≥ 4 hr

Photos by C. M. Ocamb

Smuts/Galls

Agrios '05






Photo by C. M. Ocamb


Peach – Leaf curl (*Taphrina*)

Copyright Oregon State University Extension Plant Pathology Image Collection

Photo by Ed Hoffman

Rose – Crown gall (*Agrobacterium*)



Cankers
Lesions on stems or branches

Peach – Bacterial canker (*Pseudomonas syringae*)



gummosis

Cankers, gum exudation, and dieback are the prominent symptoms of bacterial canker; bud kill and leaf spots also occur.

Photos by C. M. Ocamb

Bacterial canker (*Pseudomonas syringae*) affects almond, apricots, cherry, peaches, plums and prunes. Cankers can girdle branches or the main stem. It can kill >90% of the buds on an affected tree.



Photos by C. M. Ocamb

Madrone – Phytophthora Canker



Photo by Ralph S. Byther

Broccoli -- Black leg (*Phoma lingam*)



Photos by C. M. Ocamb

Black leg leaf spots can appear on any unprotected leaf



Photos by C. M. Ocamb

Rosemary – Botrytis stem canker (blight)



Photos by C. M. Ocamb

Honeysuckle – Botrytis bud blight



Photos by C. M. Ocamb

Fruit & Bulb Rots



Feijoa (pineapple guava) with fruit rot

Photo by C. M. Ocamb

Fruit rot (*Botrytis*)

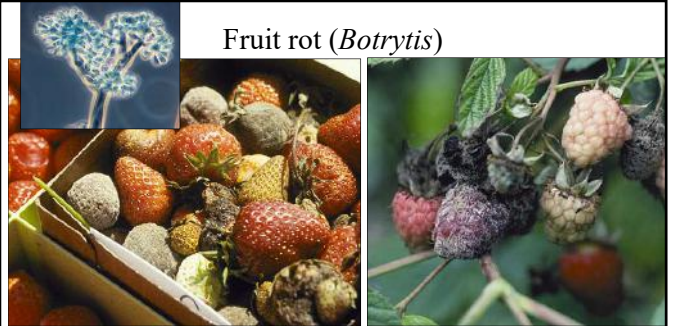


Photo by Jay W. Pscheidt

Photo by Ralph S. Byther

Cucurbit – Fruit rot (*Fusarium*)

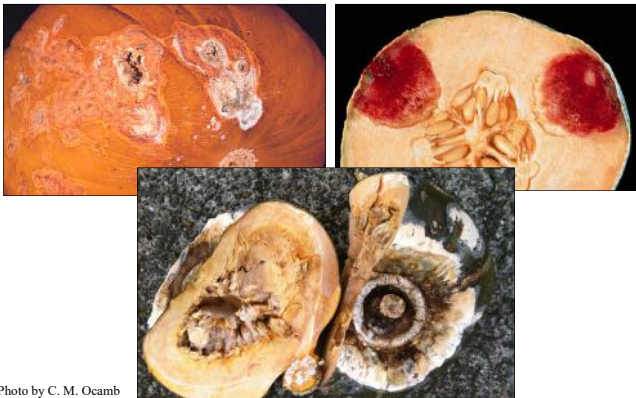


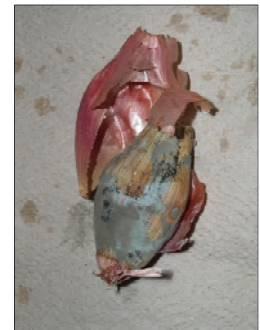
Photo by C. M. Ocamb

Onion – Neck Rot (*Botrytis* sp.)



Photos by C. M. Ocamb

Shallot – Blue Mold (*Penicillium* spp.)



- 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 emerges 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* →)



Photo by C. M. Ocamb

Red beet – Damping-off (*Rhizoctonia, Pythium, Fusarium*)



Photo by C. M. Ocamb

Pumpkin – Damping-off



Photo by C. M. Ocamb

Squash – Root rot (*Fusarium*)

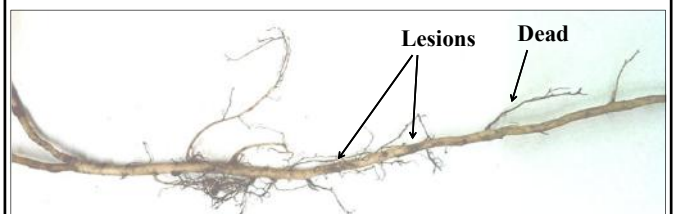


Photo by C. M. Ocamb

Port-Orford Cedar -- Phytophthora root rot
15 April 2010



Photo by C. M. Ocamb



Photo by Jay W. Pscheidt

April 2010



April 2012



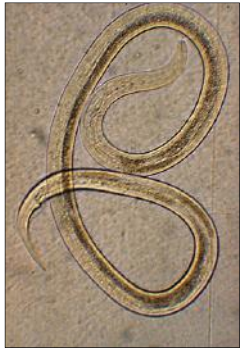
Jan 2016



Photos by C. M. Ocamb

Nov 2012

Nematode problems



Root-knot nematode (*Meloidogyne*)



Cucurbit



Bean



Vascular Wilts



Basil – Fusarium wilt



Photo by C. M. Ocamb

Rose – Verticillium wilt



Maple – Verticillium wilt



Photo by Rich Regan



Plants with wilts show vascular browning

Viral diseases

injury symptoms due to some herbicides can resemble viral infection

Squash – Squash leaf curl



2,4-D damage



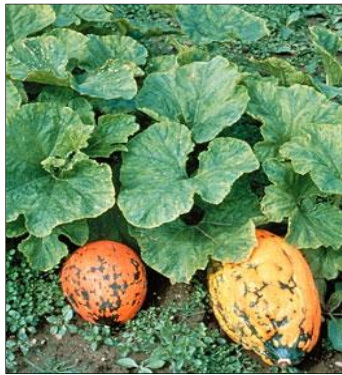
Viruses can stunt plants and cause leaf deformities



Cucumber mosaic virus



Watermelon mosaic virus



Parasitic Plants

Plants that parasitize host plants for food and/or water

Oak – Mistletoe



Photos by C. M. Ocamb

Abiotic Diseases

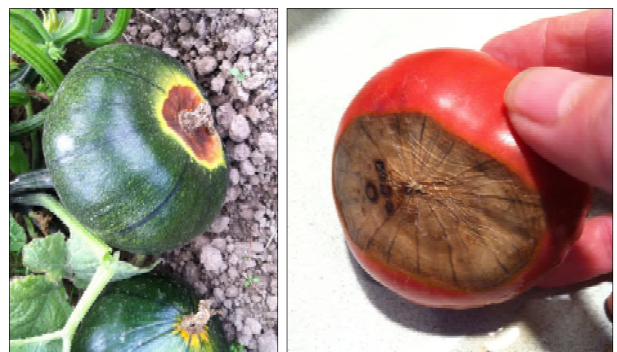
Rhododendron – Lime-induced chlorosis



High alkalinity of soils can make iron or manganese unavailable to plants, causing leaf chlorosis

Photos by C. M. Ocamb

Blossom-end Rot – Calcium deficiency



Photos by C. M. Ocamb

Blossom-end Rot can lead to secondary pathogens



Photo by C. M. Ocamb

Growth cracks (fruit “growing too fast”)



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.

Sunburn – excessive sunlight



Photos by C. M. Ocamb

Rhododendron – Sunscald (desiccation injury)



Copyright 2006 Melodie Putnam, Oregon State University

Sunburn



Photo by C. M. Ocamb

Sour cherry – Sunscald



Photos by C. M. Ocamb

Rose – Heat Injury



Salt injury appears similar to heat injury, salts exuded with guttation droplets

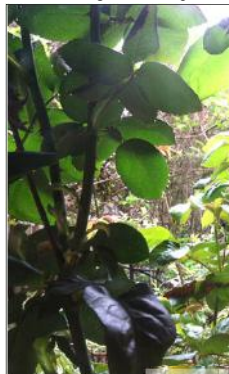


Photo by C. M. Ocamb

Cold injury – Low temperature for prolonged periods



Photos by C. M. Ocamb

Cold injury is often not noticed until springtime



Photos by C. M. Ocamb

Cold injury can lead to secondary pathogen problems



Pruning out cold injury can help survival of herbaceous plants



Photos by C. M. Ocamb



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

Evaluation of C. M. Ocamb's presentation on Plant Pathology for Douglas County Master Gardener Program 2023

https://oregonstate.qualtrics.com/jfe/form/SV_bvaAJ901D9FTOr
or
<https://beav.es/TVu>

