UC IPM Urban & Community Webinar Series

Plant Diseases and Abiotic Disorders

Presented by Belinda Messenger-Sikes, UC Statewide IPM Program

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Four Things You Need To Know About Plant Diseases

1. The difference between a sign and a symptom
2. Major plant pathogens: fungi, bacteria, viruses, and nematodes
3. Disease requires susceptible host, pathogen, and favorable environment
4. The disease cycle = interaction of pathogen and host

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1 What is Plant Disease?

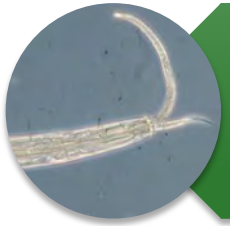
- A plant disease is any abnormal condition that alters the appearance or function of a plant.
- Biotic (infectious) diseases and abiotic diseases (disorders) occur.
- Visible effects of disease on plants are called symptoms.
- Physical evidence of the pathogen is a sign of a biotic plant disease.

2 What Causes Plant Diseases?

Fungi/Oomycetes: #1 cause of plant diseases

Bacteria: enter through wounds or openings in plants

Viruses/viroids: genetic material + protein coat



Nematodes: tiny soil-dwelling worms

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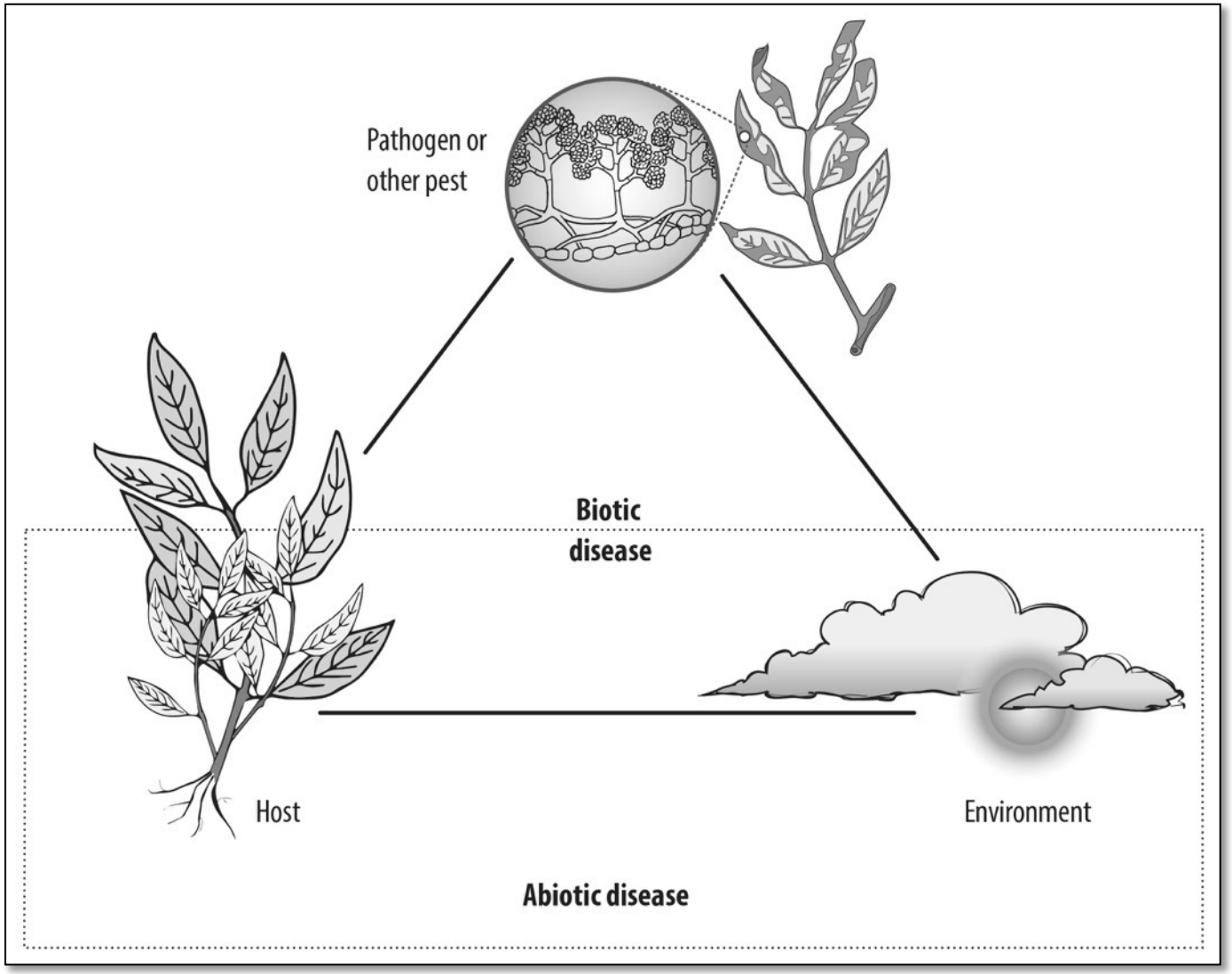

The Disease Triangle

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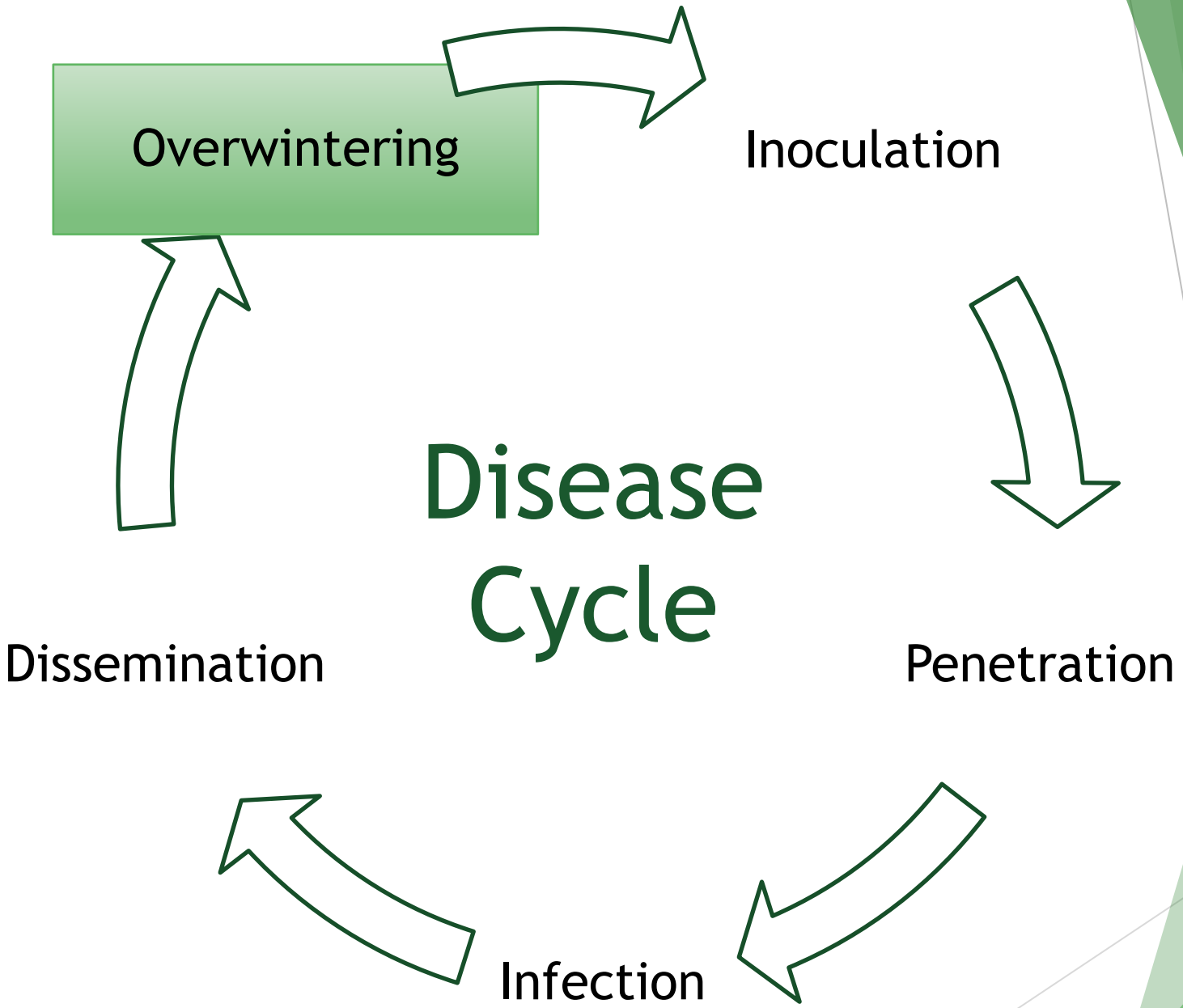
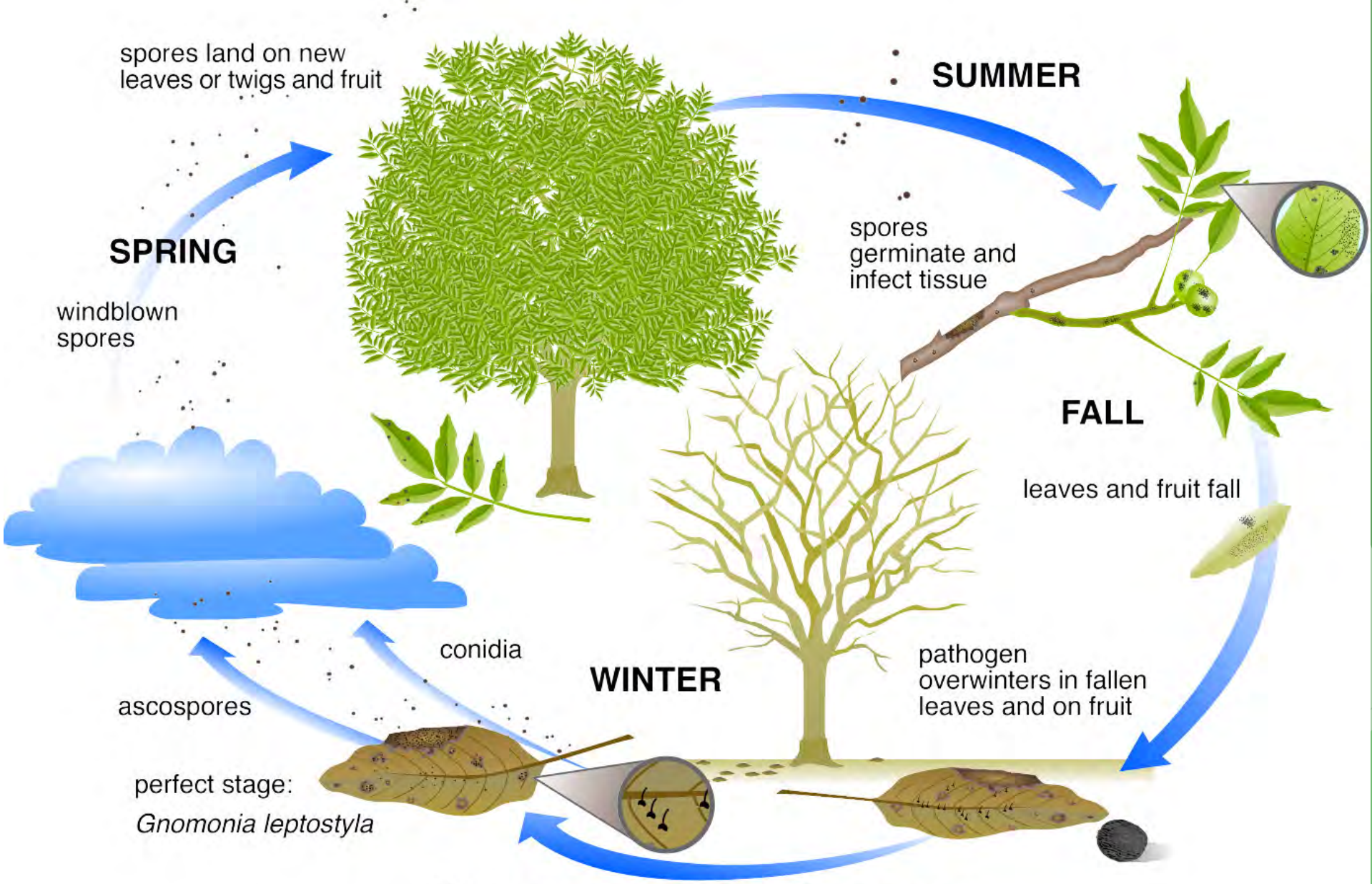


Disease Cycle



Disease cycle of anthracnose

Marssonina juglandis

Credit: Gwen Conville

How Plant Pathogens Spread: Inoculum

Inoculum: part of pathogen that can infect host plant, such as spores

May be produced on residues left in the garden	In the soil
	In weeds or other plants in the area
	In or on the seed
	In soil sticking to equipment or tools
Carried by	Wind or water
	Insect vectors
	Animals, birds, and people

Managing Plant Diseases

- Prevention
- Diagnosis and Monitoring
- Cultural Practices
- Mechanical Practices
- Chemical Control

Prevention: Resistant Varieties

- Prevent plant diseases: choose resistant plant varieties
  - Some plants naturally tolerant or resistant to diseases
  - Some varieties bred for resistance
  - Root Knot Nematode-resistant or tolerant vegetable varieties
  - VFNT-resistant tomatoes: *Verticillium*, *Fusarium*, nematode, tobacco mosaic virus
  - Rose hybrids resistant to rust, powdery mildew, and blackspot
  - Apple varieties resistant to apple scab, powdery mildew, and fire blight

Diagnosis and Monitoring

- Know the plant host and the possible diseases
- Symptoms vary by plant, environment, and pathogen
- Look for patterns and signs of a pathogen
- Check plants regularly for symptoms and signs
  - **Don’t forget to check the roots!**
- Respond quickly; diseases can spread fast

Diagnosis and Monitoring

- Downy mildew on cucumber

- Angular leaf spot on cucumber

Cultural Practices: Sanitation

- Reduce inoculum and prevent spread
- Work in uninfested areas first
- Clean shoes and tools
- Disinfect pruning tools
- Dispose of diseased plant parts

Cultural Practices: Irrigation Management

- Provide appropriate water based on plant species, soil conditions, and local environment
- Well-drained soil: oxygen and water for roots
- Pathogenic fungi and bacteria need moisture
- Avoid overhead watering except early A.M.
- Water drip line, not near trunk

For more information about pruning, see ipm.ucanr.edu/homegarden/pruning/

Mechanical Practices: Pruning

- Stop or slow the spread of a pathogen
- Cut healthy tissue below infection
- Dispose of infected material
- Excessive or unnecessary pruning can lead to more disease
- Proper timing to avoid disease
  - Pruning induces succulent new growth, possible powdery mildew infection

Chemical Control

- Not generally useful in garden or landscape situations
- Negative impact on natural enemies
- Accurate identification and correct timing crucial
- Protective, not curative (except powdery mildew)
- Foliage-infecting fungi can be controlled

Common Plant Diseases in the Home Garden

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Fire Blight

- *Erwinia amylovora*, a bacterium
- Hosts: pome trees like pear, apple, and quince, and related trees like toyon, hawthorn, mountain ash, and firethorns (*Pyracantha*)
- Symptoms: sudden wilting, shriveling and blackening of shoots, blossoms, and fruit, bacterial ooze
- Spread by water splashing, rain, and pollinators

See *Pest Notes: Fire Blight* for more details

Peach Leaf Curl

- Caused by *Taphrina deformans*, a fungus
- Host: peach and nectarine
- Damage: leaf curl, reddish blistering, defoliation, fruit drop
- Spread: water splash, rain

See *Pest Notes: Peach Leaf Curl* for more details

Anthracnose

- Caused by various fungi
- Hosts: both deciduous and evergreen trees and shrubs including sycamore, oak, ash, Chinese elm. Fruits, vegetables, turfgrass in some regions.
- Damage: Leaf spot/blotches, blights, cankers, and twig dieback
- Spread: wind-blown or rain splash

See *Pest Notes: Anthracnose* for more details

Powdery Mildew

- Caused by various fungi
- Hosts: apple, rose, crape myrtle, sycamore, stone fruit, grapes, cucurbits
- Damage: white patches on leaves and shoots, sometimes on fruit
- Spread: wind, doesn't need free water
- Example: Powdery Mildew on grapes, caused by *Uncinula necator*

See *Pest Notes: Powdery Mildew on Fruits and Berries* for more details

Powdery Mildews

Powdery mildew on pea, caused by *Erysiphe pisi*

Powdery mildew on tomato, caused by *Erysiphe lycopersici*

Downy Mildews

- Caused by oomycetes
- Hosts: many vegetables
- Signs and symptoms: patches of spores on the underside of leaves that start white and turn brown, purple, or black, yellow blotches on top that turn brown
- Spread: wind
- Conducive environment: cool and wet

Downy mildew on collard leaf, caused by *Hyaloperonospora brassicae* (=*Peronospora parasitica*)

Downy Mildews

Downy mildew on cucurbits, caused by *Pseudoperonospora cubensis*

Downy mildew on pea, caused by *Peronospora viciae (=pisi)*

Powdery Mildew or Downy Mildew?

- Collect information
  - Cool, wet or warm, dry weather?
  - Symptoms mostly underside of leaves or both?

Photo by Scot Nelson, Flickr via CC BY-SA

Rusts

- Caused by various fungi
- Hosts: roses, rhododendron, stone fruit, caneberries, incense cedar, pine, grasses
- Damage: pustules on leaves, leaf drop, stunts shoot growth, lesions on fruit, galls on shoots
- Spread: wind, water splash
- Example: Rust on roses, caused by *Phragmidium mucronatum*

See *Pests of Landscape Trees and Shrubs* for more detail.

Damping Off

- Caused most often by *Pythium*, an oomycete
- Hosts: all plants at the seedling stage
- Damage: rapid decline and death due to root decay
- Spread: in cold, wet soil or infested organic matter in soil
- Example: Bean damping off

See *Pest Notes: Damping-off Diseases in the Garden* for more details

Crown and Root Rots

- Caused by *Phytophthora*, an oomycete
- Hosts: avocado, rhododendron, almost all fruit and nut trees, vegetables, and many others
- Damage: wilt, discolored leaves, darkened bark around crown, brownish roots, stunted growth, cankers
- Plants decline; speed depends on age of plant and part of plant infected
- Spread: water movement in soil and water splashing aboveground
- Example: Avocado root rot, caused by *Phytophthora cinnamomi*

See *Pest Notes: Phytophthora Root and Crown Rot in the Garden* for more details

See *Pest Notes: Armillaria Root Rot* for more details

Armillaria root rot

- Caused by *Armillaria mellea*
- Hosts: many trees and woody plants including alder, elm, eucalyptus, oaks, pines, poplar
- Damage: Some plants decline and die quickly, shoot dieback, sparse canopy
- Spread: soilborne from nearby infected plants
- Example: Armillaria “honey” mushrooms growing at the base of a tree.

Lawn Diseases

- Usually fungal diseases
- Symptoms: grass discolors (yellow, reddish-brown or black) and eventually dies
- What type of grass (host)
  - Poorly growing grass more susceptible
- Conducive environment:
  - Time of year (temperature)
  - Waterlogged soils

Fusarium blight in annual bluegrass

See *Pest Notes: Lawn Diseases: Prevention and Management* and the UC Guide to Healthy Lawns for more details.

Bacterial Blast, Blight, and Canker

- Caused by *Pseudomonas syringae*, a bacterium
- Many hosts including lilacs, oleander, fruit and nut trees
- Symptoms: limb dieback with rough, irregular, water-soaked cankers, gumming. Blossoms brown and shriveled, depressed black spots
- Spread: water splash, wounds
- Example: Bacterial canker of almond

Viruses

- Viruses don’t reproduce without a host, submicroscopic particles
- Symptoms: mosaic pattern on leaves, vein clearing, ringspots, necrosis, stunting. Sometimes NO symptoms.
- Spread: insect, grafting, propagation, soil-borne fungi
- Example: Cucumber mosaic disease (aphid vector)

See *Pests of Garden and Small Farm* for more details

Nematodes

- Nematodes are tiny, almost microscopic roundworms
  - Sometimes plant parasitic and attack roots
  - Some attack pest insects or plant parasitic nematodes
- Hosts: many ornamentals, fruit and nut trees, and vegetables
- Damage: slows plant growth, reduces yield, wilting, premature leaf drop, galls (swellings) on roots
- Spread: in infested soil, need moisture
- Example: Root Knot Nematode (*Meloidogyne incognita*) on tomato

See *Pest Notes: Nematodes* for more details

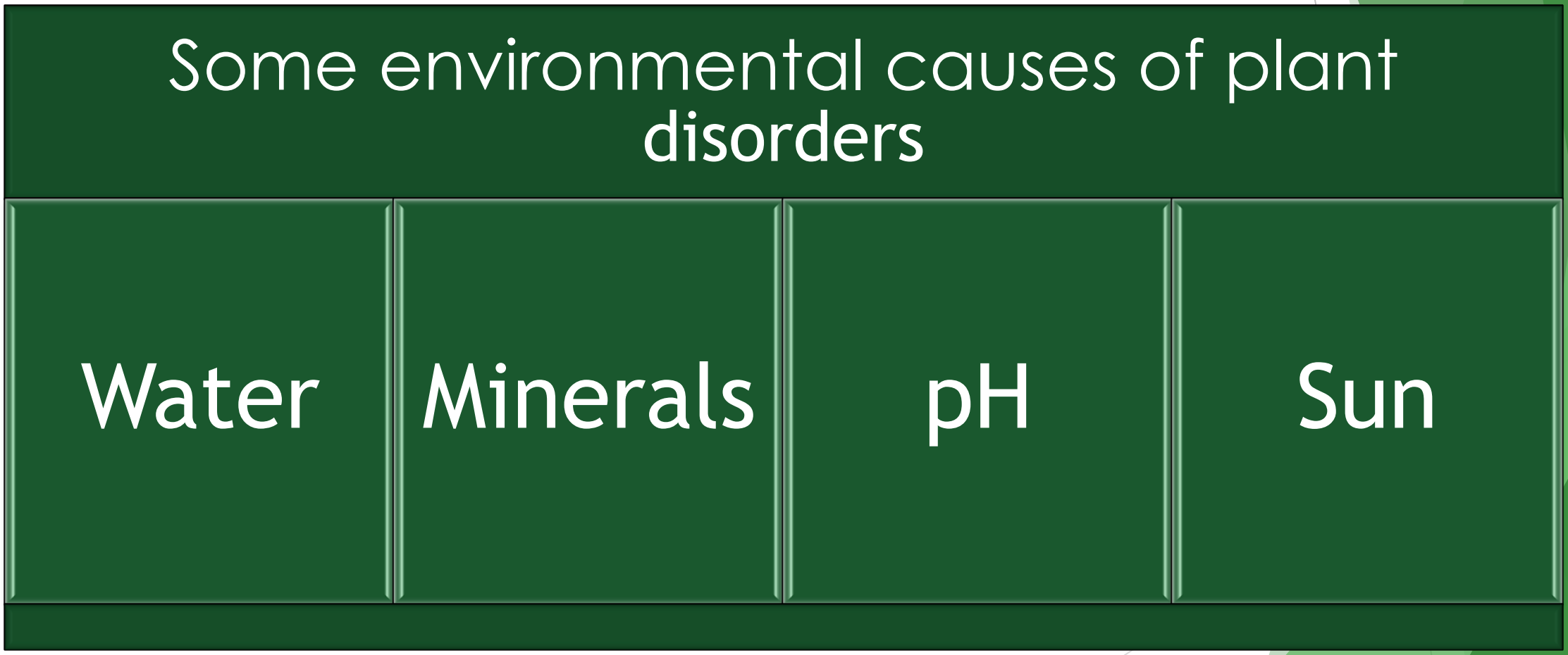
Preventing and Managing Plant Diseases

- Prevention
  - Resistant varieties
  - Sanitation
- Management
  - Pruning
  - Water management
  - Pesticides for foliar diseases

Abiotic Disorders (Noninfectious diseases)

See *Pests of Landscape Trees and Shrubs* for more detail.

What are Abiotic Disorders?



Irrigation: Too Much and Too Little

- Moisture imbalance most important abiotic disorder
- Both can cause crown dieback of trees
- Deficit: wilt, fade, tip dieback, premature leaf drop
- Excess: not enough oxygen for roots

Blossom End Rot

- Hot, dry weather
- Tomatoes, peppers, squash
- Water + calcium deficiency
- Sunken, leathery lesions on blossom end

Aeration Deficit

- Air movement through soil vital for plant health
- Soil bluish grey or black, smell of rotten eggs, waterlogged
- Short-term effects: wilting, premature leaf drop
- Chronic effects: kills roots, stunts growth, dieback, cankers

Nutrient Problems

- Macronutrients (Nitrogen, Phosphorus, Potassium)
  - N: plants grown in containers or sandy soil, esp. fruit and nut trees, palms. Check plant roots and soil conditions.
- Micronutrients (Boron, Calcium, Copper, Iron, Manganese, Magnesium, Sulfur, Zinc)
  - Most garden soil has adequate levels of micronutrients
  - Adverse soil conditions inhibit nutrient uptake

Problems with pH

- High soil pH can cause nutrient deficiency symptoms
- Soil pH affects nutrient availability in soil
  - Inhibits nutrient uptake by plants

Sunburn/scald

- Exposure to excess solar radiation
- Injury most severe on south and west sides of plant
- Bark discolored, cracks, cankers
- Foliage glazed, silvery, reddish-brown

Is it a Disease or a Disorder?

Symptoms: Distorted, curled, swollen, or galled leaves

Some possible causes:

- Insect damage
- Herbicide toxicity
- Nutrient deficiencies
- *Taphrina* species fungi

How to Distinguish Plant Diseases from Abiotic Disorders

- Host plant, including cultivar
- Environmental conditions
- Other nearby plants affected
- Symptoms over time

Tips for Distinguishing Diseases and Disorders

Pest Notes about plant diseases:

ipm.ucanr.edu/PMG/PESTNOTES/index.html#DISEASE

UC Guide for Healthy Lawns

ipm.ucanr.edu/TOOLS/TURF/

Pruning trees and shrubs

ipm.ucanr.edu/homegarden/pruning/

Questions?

Thank You

- Future Webinars - Third Thursdays @ 1:00pm PST
  - August 19: Weed Identification
  - September 16: Identifying Insect Pests in the Home and Garden
- Other topics: pesticide safety, vegetable pests, rose diseases, and more!
- New Webinar Time Starts October 21 @12:00pm PST
- Visit https://ucanr.edu/sites/ucipm-community-webinars/ to register for future webinars



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