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*Rockbridge Extension Master Gardeners*

# Plant Problem Solving

Extension Master Gardeners Bedford

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This module was developed by Phyllis Turner, PhD,
Extension Master Gardener
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# Welcome to Plant Problem Solving

In this module you will learn to identify common plant diseases including typical signs and symptoms.  You will learn causation and management for typical plant diseases.

- Read Chapters 4, 5, and 6, in your Master Gardener Handbook before viewing these slides.
- Browse the Suggested Readings at the end of these slides.  They contain online sources that will be helpful for your learning.
- The Test Your Knowledge section is for fun and review

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# What I Will Learn in This Module (Objectives)

- The type of organism that is responsible for the vast majority of plant diseases
- Definition and description of biotic and abiotic causes of plant diseases
- Conditions necessary for disease
- Symptoms and Signs of fungal and bacterial plant diseases
- What I Will Become Familiar With:
- Descriptions of various infectious organisms
- Symptoms, signs, and syndromes of diseases
- Process of disease development
- Methods of disease control

# What I Will do in the Lab

- Identify organisms responsible for plant diseases
- Identify biotic and abiotic causes of plant diseases
- Describe symptoms and signs of a variety of diseases
- Apply the 'process of disease development' to the more common plant diseases seen in our area
- Describe methods of disease control (IPM and PMG)

# PLANT DISEASES



Mosaic virus on soybean
Photo credit




Plum Pox Virus Photo credit



Red stripe on rice
Photo credit



Crown gall on rose. Photo credit



Cercospora leaf spot on hydrangea. Photo credit

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# What is a plant disease?

"Any disturbance that prevents the normal development of a plant and reduces its economic or aesthetic value"

(Source:  The Virginia Master Gardener Handbook)

Every plant has disease problems of one sort or another. Most plants are able to tolerate them.



Bacterial leaf streak of corn Photo credit



Blackberry orange rust. Photo credit

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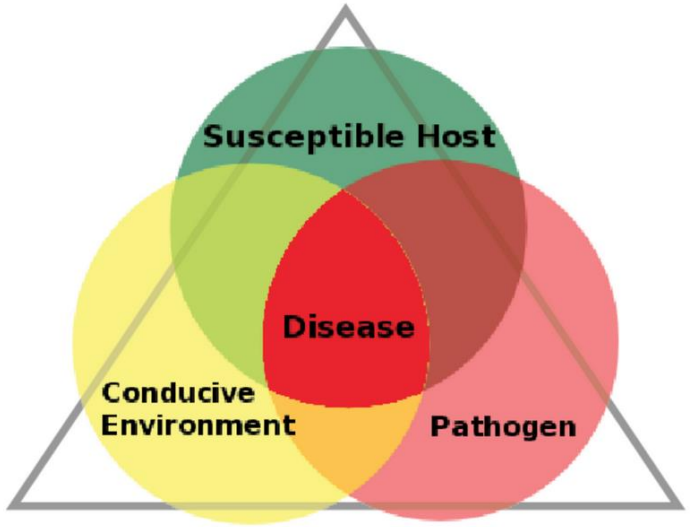
# The Disease Triangle




The Disease Triangle Photo credit

Disease represents interaction between three factors: a susceptible host (the plant), a pathogen (disease causing organism) and a favorable environment.

Disease control is modifying part of this triangle.

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Video: IPM Practices and the Disease Triangle

Recommendation: Review the entire slide deck prior to viewing this video

# Causes of Plant Diseases

Factors causing plant damage can be grouped into two major categories:

Abiotic factors (non-living cause)

Biotic Factors (caused by living organism; pathogens or pests)

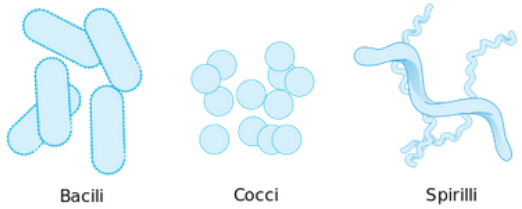
# Biotic Causes of Plant Problems

Pathogens

- Fungi
- Bacteria
- Viruses
- Nematodes
- Phytoplasmas



Fungi (Anthracnose)
Photo Credit: Umass.edu




Bacteria Photo credit



Grapevine virus: Photo credit

Insects, mammals and birds may spread disease



Insect feeding: Photo credit



Photo credit



Photo credit



Nematode: Photo credit

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# Biotic

- Characterized by a random pattern
- Damage is progressive over time
- Damage initially limited to only one part of the plant



Random pattern on leaf – plant disease

Photo credit



Random pattern on entire plant – plant disease

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# Biotic: Fungi

- Largest pathogen group
- Reproduce via spores
- Fungal Structures (most distinguishing clue for fungi)

| | |
|---|---|
| Spores | Fruiting Bodies |
| Rust Spores | Sooty Mold |

Common symptoms associated with fungi include: Leaf spots and blights; fruit, stem, root, wood and seedling rots; cankers, vascular wilts; galls; mildew diseases; rust diseases. Leaf spots are generally round with zones of different color (bulls eye) and distinct margins. Differentiating between bacterial and fungal pathogens is not always easy.



Black spot: Photo credit



Rust Fungus: Photo credit

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# Biotic: Bacteria

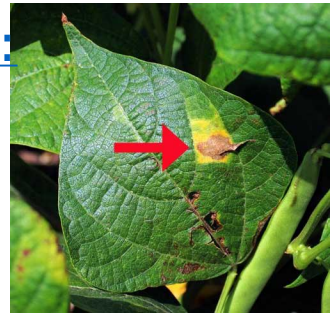
Citrus canker on fruit: Photo credit. Osu.edu



**Signs**

Bacterial ooze, Water-soaked lesions, Bacterial streaming in water from a cut stem

Bacterial leaf spot: Photo credit



**Symptoms**

Leaf spot with yellow halo, Fruit spot, Canker, Crown gall, Shepherd's crook stem ends on woody plants

Bacteria reproduce by cell division, and generally speaking, cannot invade healthy plant tissue; they need a wound or an area of dead or dying tissue to start an infection.

Bacterial leaf spots are often angular because they are initially limited by the leaf veins. Color is usually uniform. Tissue may first appear oily or water soaked, then translucent and papery as it becomes dry.

Plant bacterial diseases can be controlled with the same kinds of antibiotics that are used to control animal diseases, such as streptomycin. However, we are generally reluctant to use these on a large scale and control is usually based on avoidance or removal of sources of inoculum.

# Biotic: Viruses

- Symptoms are categorized as:
  - Lack of chlorophyll formation (mottled green and yellow mosaic or ringed foliage) Veins appear transparent.
  - Stunting or growth inhibition secondary to reduced chlorophyll
  - Distortion of leaves and flowers (Witches' brooms or rosettes)
  - Necrotic areas or lesions
- Viruses disrupt cell division and are disseminated by mites, insects, fungus, nematodes, abrasions, grafting, and other propagation techniques
- Use resistant varieties where possible
- Control weeds, insects, and nematodes, which may transmit disease






Tomato spotted wilt virus. Photo credit. Cornell.edu

# Biotic: Nematodes
## What are they and what do they do?

- Microscopic parasitic worms
- Stem nematodes cause shortening of internodes.
- Root nematodes damage the root system which shows up as wilting and stunting.
- Foliar nematodes cause angular leaf spots.

Nematodes



Gardenia root system showing galling and discolored roots associated with Southern root-knot nematode. Photo credit

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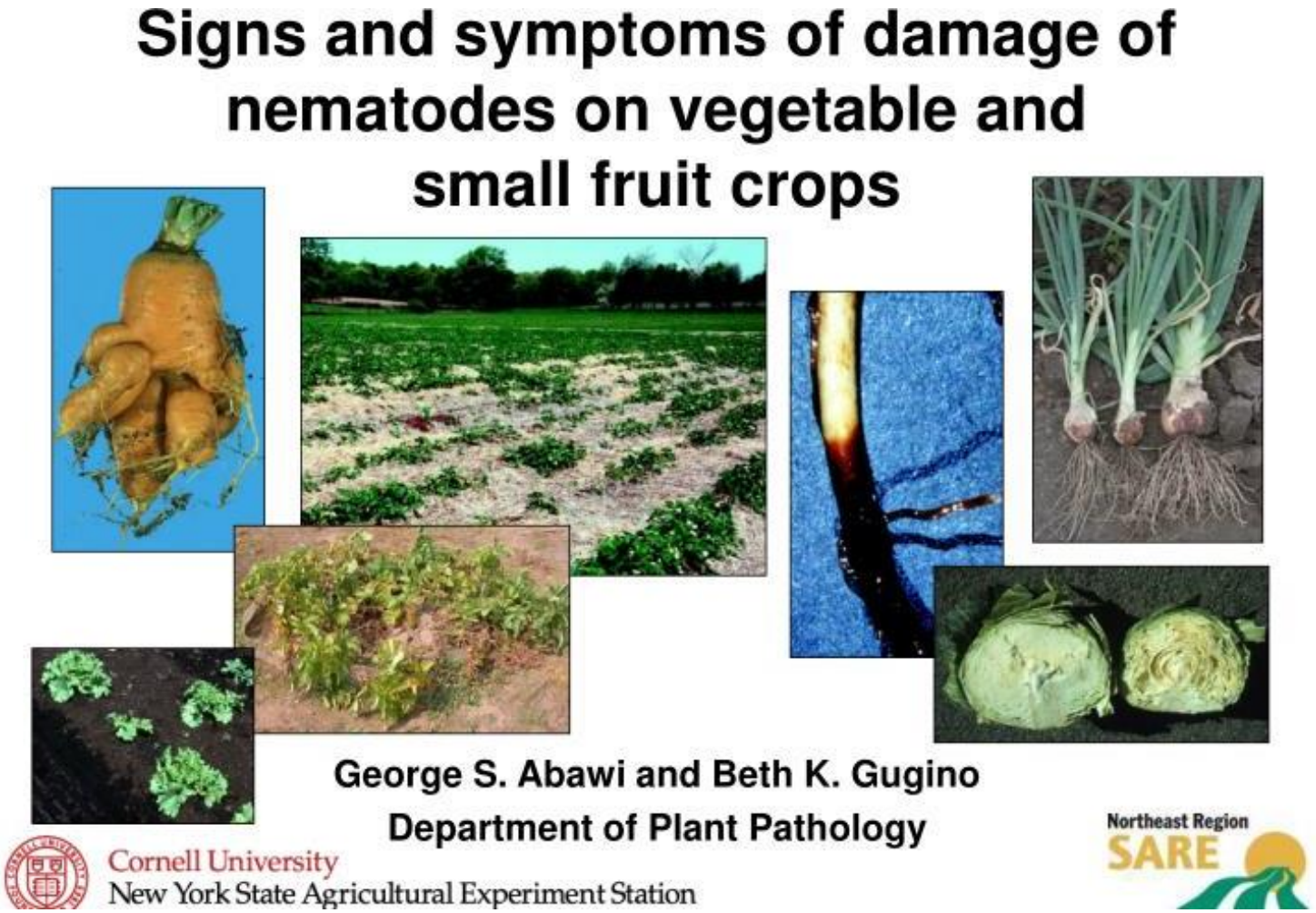
# Nematodes Symptoms

- Poor yields, unthrifty appearance, and increased mortality
- Plants may be stunted, yellow, and have galls or swellings on roots
- Roots may be stunted, bushy, and discolored
- Plants may suddenly wilt in dry weather




[Nematode damage]

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# Nematodes: Treatment

- Move garden to a different area
- Treat soil with approved chemical controls
- Crop rotation with certain plants may be effective

# Biotic: Phytoplasmas

- Phloem-limited bacterial parasites that cause damaging diseases to plants
- Transmitted by sap-sucking insects (e.g. leafhoppers)
- Symptoms: witches' broom (clustering of branches) of developing tissue; phylody (abnormal development of floral parts into leafy structures); virescence (green coloration of non-green flower parts; bolting (growth of elongated stalks); formation of bunchy fibrous secondary roots; reddening of leaves and stems; generalized yellowing and decline



Phyllody induced by phytoplasma infection on a coneflower. Photo credit: Wikipedia.org

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Phytoplasmas: bacteria that manipulate plants and insects

# Abiotic Causes of Plant Problems

Abiotic factors (non-living cause)

- Mechanical (abrasions)
- Physical / environmental (temperature, light, moisture, oxygen, lightning)
- Chemical (pesticides, nutritional disorders)

Examples of abiotic diseases include nutritional deficiencies, soil compaction, salt injury, ice, and sun scorch

# Abiotic: Non living

- Characterized by uniform and repeated damage
- Look for nonliving factors
- Sudden onset of symptoms
- Mechanical:  broken bruised plant parts



Scars on tree trunk from use of a weed whip. Photo credit. Missouribotanicalgarden.org

Mechanical Damage

# Abiotic: Non living

- Physical /Environmental: weather extremes, light extremes, oxygen and moisture extremes

- Chemical: look for drift or runoff of chemicals; damage diminishes uniformly from one side to another; irregular pattern

Red oak species damaged by microburst. Photo credit mgnv.org





Frost damage: photo credit




Herbicide damage: photo credit

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# Steps to Plant Diagnosis: 1. Identify the Plant

What is normal? Compare the diseased plant with a healthy 'normal' plant. Are these plants normal?



Chameleon plant (*Houttuynia cordata*) is normally this variegated color. Photo credit



Unripe female cones of oriental arborvitae. Photo credit: ncsu.edu

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Photo credit

Genetic disorder.
Growing points with variegated leaves can sometimes arise spontaneously from some species such as this *Origanum*. Genetic variants such as this are sometimes confused with plants with virus disease or nutrient deficiency symptoms. *Photo*: S. A. Tjosvold.

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# 2. Describe the Signs and Symptoms

Signs = actual pathogen, parts or by-products seen
Symptoms = plant reaction or alterations of appearance due to disease

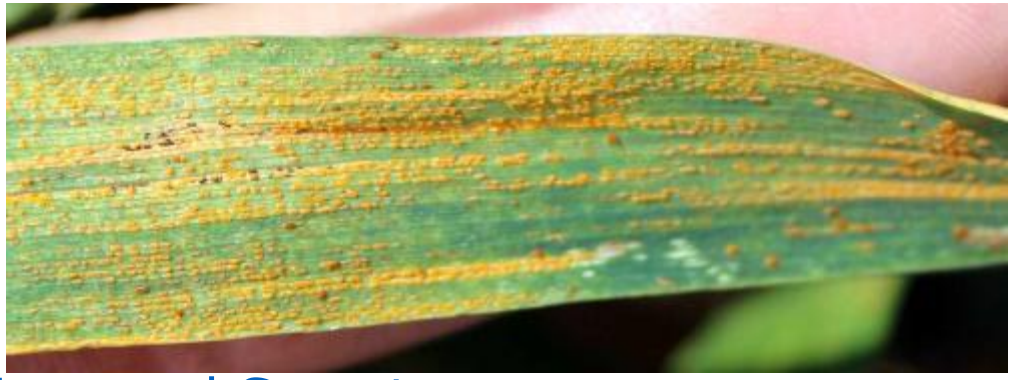
Symptoms of **Fungal** disease

- Birds-eye spot (anthracnose)
- Damping off of seedlings (Phytophthora)
- Leaf spot (Septoria brown spot)
- Chlorosis (yellowing of leaves)

Signs of **Fungal** disease

- Leaf rust
- Stem rust
- Sclerotinia (white mold)
- Powdery mildew

Note: These are examples, not an exhaustive list



Signs and Symptoms. Photo credit: msu.edu

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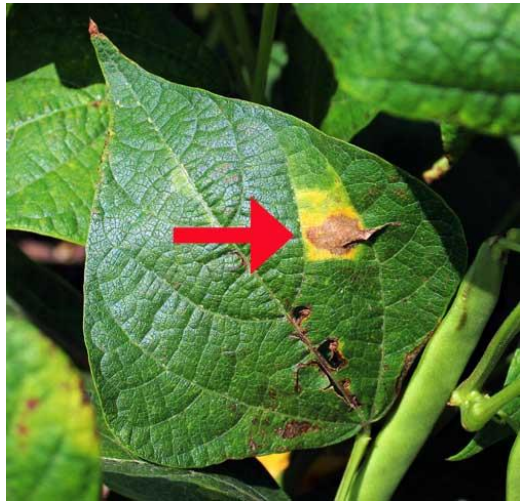
# 2. Describe Signs and Symptoms…con't

Symptoms of **Bacterial** disease

- Leaf spot with yellow halo
- Fruit spot
- Canker
- Crown gall
- Shepherd's crook stem ends

These are examples, not an exhaustive list



Kidney bean leaf with brown leaf spot with yellow halo (bacterial leaf spot symptom)

Signs of **Bacterial** disease

(difficult to observe)

- Bacterial ooze
- Water-soaked lesions
- Bacterial streaming in water from cut stem

Photo credit: msu.edu

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# 2. Describe Signs and Symptoms…con't

Symptoms of **Viral** disease

- Mosaic leaf pattern
- Crinkled leaves
- Yellowed leaves
- Plant stunting

Signs of **Viral** disease

- None. The viruses can't be seen

These are examples, not an exhaustive list

Tobacco mosaic virus on tomato plant. Photo credit



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# 3. Look for Patterns

- On a particular plant part?; Over the entire plant?; Affecting more than one plant?
- Is this a random or non-random pattern?



Newly planted Korean fir tree; heat stress. Photo credit: iastate.edu

# Rule of Thumb for Patterns
## Random vs. Non-Random

Random pattern caused by a pathogen (living organism) **biotic cause**
Examples: Bacteria, viruses, fungi, nematodes



Downy mildew: a fungal disease. Photo credit

Non-random pattern caused by (non-living) **abiotic factor**: mechanical, environmental, chemical; soil properties

Examples: iron chlorosis; excessive irrigation; sun burn; herbicide damage, winter damage, salt damage, girdling roots, planting depth



Abiotic diseases Heat & drought symptoms on a hosta. Photo credit: iastate.edu

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# 4. Define Time Development of Problem

- Gradual onset/spread of symptoms usually indicates… biotic (living organism) cause
- Sudden onset of symptoms usually indicates an abiotic (non-living) cause

# 5. Determine Possible Causes

Distinguish between abiotic and biotic factors:

- Look for signs of pathogen (living organism; for example, fungi)
- Use pattern and time development as clues

# 6. After Assembling Clues, Use References

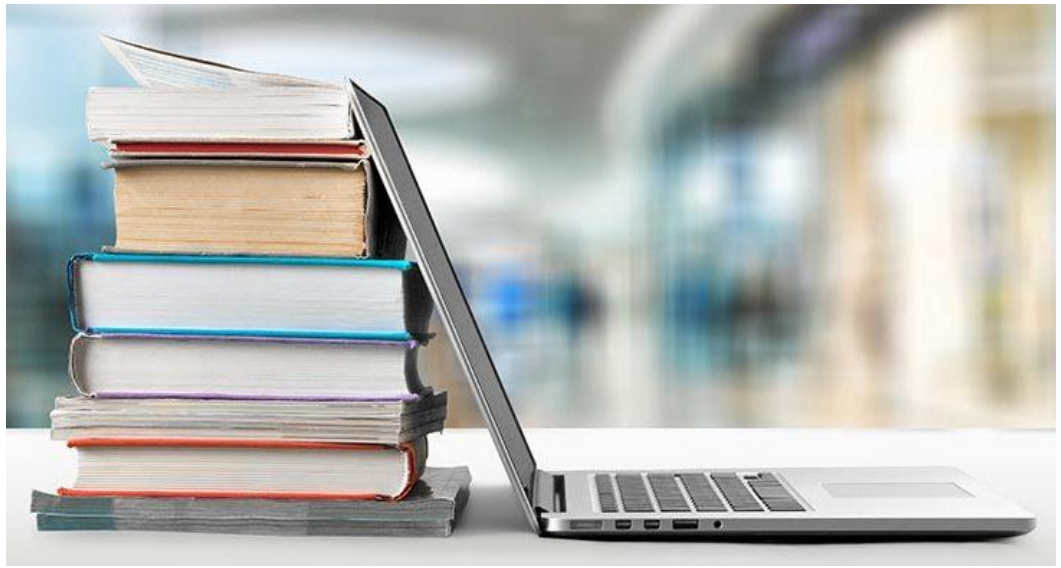

Photo credit

Photo credit




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# Methods for Controlling Disease
## Use of an Integrated Approach (IPM)

- In an IPM program there are non-chemical and chemical control methods available.
- Non-chemical control methods should be used first, if available and feasible.
- The techniques or tactics you choose will depend on the target pest and the kind and amount of control needed.
- IPM promotes the use of four basic pest control methods…..
  - Cultural
  - Mechanical
  - Biological
  - Chemical (Pest Management Guide; PMG): You can find a copy of the PMG on www.ramga.org in the same section as the modules. It is updated each year and can also be found at www.ext.vt.edu (type 'PMG' in the search box)

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An introduction to integrated pest management
Video: IPM Tactics in the Home Garden

# Cultural Management of Plant Diseases

- Avoid pathogens
- Buy seed from a reputable source
- Inspect plants prior to purchase for above and below ground pathogens/diseases
- Inspect plants for insect pests
- Control alternate hosts
- Use non-contaminated water

A Healthy plant is less susceptible to disease

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[Cultural Practices for Managing plant diseases]

# Cultural Management of Plant Diseases…con’t

Avoid environmental conditions conducive for plant diseases by:

- Ensuring moderate soil moisture
- Reducing humidity
- Providing balanced nutrition for the plants
- Preventing water/heat stress
- Being aware of activities surrounding your plants

# Cultural Management of Plant Diseases…con't

- Sanitation
- Disinfect tools
- Adequately clean pots and benches
- Decontaminate recycled water
- Remove diseased plants promptly
- Remove senescent plant parts promptly
- Crop rotation
- Manage fertilization and soil pH
- Plant at proper depth

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# Mechanical Management of Plant Disease

- Hand pick insects when they are first identified
- Exclusion devices: row covers, nets, paper collars
- Traps and attractants (sticky barriers)
- Diatomaceous earth
- Insecticidal Soaps
- Water pressure spray
- Insect vacuums

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[Mechanical Pest Controls]

# Biological Management of Plant Diseases

- Apply organisms that inhibit, eat, or parasitize plant pathogens
- Stimulate naturally occurring beneficial organisms by soil amendments, water management
- Keep the host and pathogen away from each other
  - Keep equipment clean
- Biological pesticides

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[Biological Control Strategies]

# Chemical Management of Plant Diseases

- Protectant fungicides/bactericides
- Systemic fungicides/bactericides
- Use registered/labeled materials only
- Use products safely
- Get training

Photo credit



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# Some Specific Diseases

- Powdery Mildew
- Sooty Mold
- Black Spot
- Boxwood Decline
- Early Blight
- Rhizoctonia Blight
- Fireblight
- Slime Mold
- Seiridium Canker
- Blossom End Rot
- Septoria Leaf Spot
- Phytophthora Root Rot
- Viruses
- Environmental Factors

# Powdery Mildew




Photo credit

Fungal Group

- Infects almost all ornamental plants
- Superficial white or gray powdery growth on leaves, stems, flowers, or fruit
- Young foliage and shoots particularly susceptible
- Produces airborne spores and infect plants when temperatures are moderate
- Does not require water on the plant surface in order to germinate and infect; however, some are favored by high humidity
- Usually not a fatal disease
- May hasten plant defoliation and fall dormancy

# Powdery Mildew Cultural Control

- Purchase only disease-free plants
- All dead wood should be removed and destroyed
- Rake up and destroy all dead leaves
- Maintain plants in a high vigor
- Plant in well-prepared and well-drained soil where the plants will obtain all-day sun
- Space plants for good air circulation
- DO NOT plant highly susceptible plants--such as phlox, rose, and zinnia--in damp, shady locations
- Do not handle or work among the plants when the foliage is wet
- Avoid overhead watering and sprinkling the foliage, especially in late afternoon or evening

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# Powdery Mildew Chemical Control

- Spray programs must begin as soon as mildews are detected
- Spray on a regular schedule
- Use a good spreader-sticker with the fungicides (dish detergent)
- Be sure and cover both surfaces of all leaves with the spray

See PMG for Specific Recommendations

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# Sooty Mold



Photo credit:

Fungal Group

- Gray-black, velvety coating may develop on the leaves or needles, fruits, and branches of plants
- Will not kill plants; usually a cosmetic or aesthetic problem
- Respiration can be reduced through the physical closure of stomates by the molds‘ vegetative growth
- If plant vigor has been reduced, the plant may also be predisposed to further injury by other insects, diseases or environmental stresses
- Sucking insects (aphids, scales, mealybugs, psyllids) are the primary cause of sooty mold growth: Produce honeydew (fecal matter). Excreted honeydew falls on anything underneath the infested area of the plant. The sooty mold fungi grow on this excretion
- Plants may be infected if a tree above them drops honeydew onto them

# Sooty Mold Control

- Control sooty molds by controlling the honeydew producing insect.  Identify the insect involved.
- A strong spray of water can be used to dislodge the mold growth from many plants
- Adding a mild soap or detergent solution (at one teaspoon per gallon) will aid in cleaning them
- Disclaimer: Use caution, since some plants may be damaged by soaps. You should test for damage if you are not sure
- Prepare your wash suspension, spray a small area of the plant, then wait a week or so to see if any damage will appear

See PMG for specific recommendations

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# Black Spot



Photo credit

Fungus

- Most common cause of defoliation of landscape roses in Virginia
- Small, round spots; 1/16“ to 1/2" in diameter, on upper sides of leaves; leaf tissue adjacent to the spot turns yellow
- Whole leaves eventually turn yellow and fall prematurely
- Can be distinguished from other leaf spot diseases of rose by the generally fringed margins and the darker and consistently black color of the leaf spots
- Fungus survives in infected canes and fallen leaves

# Black Spot…con't

- Spores are spread by splashing water; infection takes place only when water remains on the leaves for seven or more hours
- Fungus tolerates a wide range of temperatures
- A preventative program for black spot should begin in the fall
- Diseased leaves on the ground should be raked and burned or removed
- All diseased canes should be pruned back to healthy wood
- During the growing season avoid overhead irrigation, which prolongs leaf wetness
- For chemical control see the Pest Management Guide

# Boxwood Decline

Boxwood decline is a term used for poor growth that is caused by a combination of factors such as drought, poor soils, deep planting, etc. as well as insect and disease issues.  It is a slow but progressive decline occurring commonly in large plants 20 years or more in age



Boxwood Decline.
Photo credit

Symptoms resemble those of root rot including poor, off colored growth, dieback, small leaf size, yellowing of interior foliage and premature leaf drop

External and internal stem discoloration usually accompanies the root rot phase of the disease

Plants dying from decline have vascular discoloration well up the main stem

# Boxwood Decline…con't

- Discoloration may be continuous or discontinuous in the stem
- Sections of the foliage of infected plants turn a light green color
- Foliage turns yellow and then straw-colored. By the time foliar symptoms are observed, the root system has been severely impaired by root rot
- Important to water plants deeply and regularly during drought
- Do not replant infested areas to English boxwood
- No fungicides have been found to be effective in controlling this disease

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# Early Blight



Photo credit: umn.edu

- May occur anytime during the growing season; generally more severe after blossom-set
- Develops first on the older leaves nearest the ground
- Can cause extensive defoliation, resulting in sunscalding of fruit and reduction in the number of fruit produced
- Formation of irregular, brown leaf lesions or spots that range in size up to ½ inch diameter
- Formation of dark, concentric rings within the lesion, giving the spots a target-like appearance

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Early Blight of Tomato

# Early Blight...con't

- Several lesions coalesce, causing the leaf to turn yellow, dry up, and fall off the plant
- Lesions may develop on both stems and fruit
- Overwinters in plant debris, on seed, or on weeds
- Spores of these fungi may be splashed or blown to tomato leaves

# Rhizoctonia Blight

- Turf grass disease; a soil born fungus that can also cause foliar blights on ornamentals
- Causes root rots, stem rots, damping-off
- Appears as roughly circular patches that are brown, tan, or yellow and range from 6” to several feet in diameter
- Host Grass Species: bentgrass, bluegrasses, fescues, ryegrasses
- Symptoms appear May to September



Lesion on stem of salvia caused by Rhizoctonia Rot on Ornamentals. Photo credit

Rhizoctonia Blight



Brown patch in turf grass. Photo credit

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# Rhizoctonia Blight…con't

- Leaves must be continuously wet for at least 10 to 12 hours for the brown patch fungus to infect
- Conditions favoring prolonged leaf wetness (and increased severity of disease) include:
  - Poor soil drainage
  - Lack of air movement
  - Shade
  - Cloudy weather
  - Dew
  - Over-watering, and watering in late afternoon
- Brown patch is particularly severe in turf that has been fertilized with excessive nitrogen

# Fireblight






Fireblight. Photo credit

Caused by a bacterium

- Serious disease of many ornamental species of Rosaceae family
- Varieties of apple, flowering crabapple, pear, pyracantha, and quince are highly susceptible
- Symptoms:
  - Blossoms and leaves wilt suddenly, turn dark brown to black, shrivel, and die
  - Infected fruit becomes leathery in appearance
  - Cankers on limbs are shrunken and dark brown to purplish in color
  - Severe infection appears to have been scorched by fire

# Fireblight  Control

- Prune out infection; sterilize tools; avoid excess nitrogen
- Plant resistant varieties
- Chemical control is not generally recommended for fire blight in home landscape situations

[Fireblight: Symptoms, Causes, Treatment]

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# Slime Mold



Photo credit

- Not a fungus, but a mold
- Develops in late spring or summer following soaking rains
- Usually found in mulched areas near homes and office buildings, but can appear in forested areas as well.
- Colorful growth occurs when the mold is beginning its fruiting stage
- The final notable stage is the "spore" stage
- Scoop up and throw away
- Do not attempt to water it away (disperses it)
- No chemical control is recommended

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Slime Molds

# Seiridium Canker



- The most damaging disease on Leyland cypress; plants of all sizes and ages are affected
- Cankers may form on stems or branches causing dieback
- Cankers appear as sunken, dark brown or purplish patches on the bark, often accompanied by extensive resin flow
- Twigs or branches killed by the fungus turn bright reddish brown
- Fruiting bodies of the fungus appear as small circular black dots barely visible

Seiridium Canker.
Photo credit

# Seiridium Canker…Con't

- Spores of the fungus are spread to other parts of an infected tree, or from tree to tree by water splash from rain or irrigation or on pruning tools
- No chemical control measures recommended
- Avoiding water stress and tree wounding may reduce infection
- Removal of infection:
  - Branches or twigs should be pruned and destroyed as soon as symptoms are noted
  - Prune at least one inch below the canker
  - Sterilize the pruning tools between cuts
- Affected plants should be removed and destroyed

# Blossom End Rot



Blossom End Rot. Photo credit

- Serious disorder of tomato, pepper, and eggplant
- A dry sunken decay on the blossom end (opposite the stem) of fruit; most commonly, when fruit is one-third to one-half full size
- Associated with:
  - Low concentration of calcium in the fruit
  - High amounts of competitive cations in the soil
  - Drought stress
  - Excessive soil moisture fluctuations
  - Rapid vegetative growth due to excessive nitrogen fertilization
- Control:
  - Maintain optimal soil pH; avoid over fertilization; avoid fluctuations in soil moisture; mulch or cultivate shallowly during drought; be certain calcium is sufficient
  - Because it is of a physiological nature, fungicides and insecticides are useless as control measures

# Septoria Leaf Spot

Septoria Leaf Spot. Photo credit




- May occur anytime during the growing season; generally becomes more severe after blossom-set
- Leaf spots develop first on the older leaves nearest the ground; small, water-soaked spots on the lower leaves
- Spots generally are smaller and more numerous than those resulting from early blight
- The center portion of the Septoria lesion turns light tan or gray while the margin remains dark
- Overwinters in plant debris, on seed, or on weeds
- Spores of these fungi may be splashed or blown to tomato leaves

# Phytophthora Root Rot

- Water mold fungus *Phytophthora*
- Infects rhododendron and azalea, boxwood, andromeda, mountain laurel, blueberry, camellia, juniper, and yew
- Symptoms:  retarded growth; drooping of foliage; dark or reddish brown discoloration of roots may extend up into the wood
- Severely affected plants wilt permanently and turn brown
- Disease development is favored by high soil moisture and soil temperatures of 80°F and above

[Phytophthora root rot]




Pictures from top: Wilting of rhododendron; Discoloration of twig; Upper leaf damage; Dieback on peony

[Photo credit]

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# Phytophthora Root Rot…con't

- Infected plants growing on sandy soils are generally not as seriously affected by the disease, whereas those growing on poorly drained soils wilt and die
- Plant in well drained soil; plant resistant varieties
- Chemical treatment: drenching soil around the healthy plants with a fungicide containing mefenoxam

# Viruses





Grapevine fanleaf virus.
Photo credit

- Transmitted mechanically (handling infected then healthy plants; tools) and by insects
- Symptoms:
  - Mosaic, the production of a blotchy light and dark green coloring in foliage
  - Mottle, variety of interesting line patterns in leaves;
  - Leaves also have narrow, “strappy" leaf blades that are curled and twisted; the leaves are thicker and more leathery than normal
  - The fruit exhibits mosaic/mottling and has warts (the yellow raised bumps); concentric ring patterns on fruit or leaves called Ringspot

# Environmental Factors
## Abiotic



Scorched leaves.
Photo credit:
colostate.edu

Common abiotic factors include

- Nutritional problems -
  Symptoms: discoloration (yellowing; chlorosis; reddening)
- Pesticide exposure -
  Symptoms: curling, cupping, twisting, distortion & marginal burning
- Environmental pollutants - (i.e. near coal burning plants; animal urine)
  Symptoms: wide range
- Adverse weather: cold injury; heat injury; drought stress; lightning

Knowing what happened recently in the environment is important to diagnosis



Herbicide damage.
Photo credit: wisc.edu

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# Plant Diseases of Regulatory Concern in Virginia*



Beech Leaf Disease
Information and photo credit

Causal Agent: *Litylenchus crenatae* (nematode)
Detected in Virginia: 2021
Controls: None



Chrysanthemum White Rust
Information and photo credit

Beech Leaf Disease
Causal Agent: *Puccinia horiana*
Detected in Virginia: Once since 1991, currently eradicated
Controls: Prevention; contact or systemic fungicides

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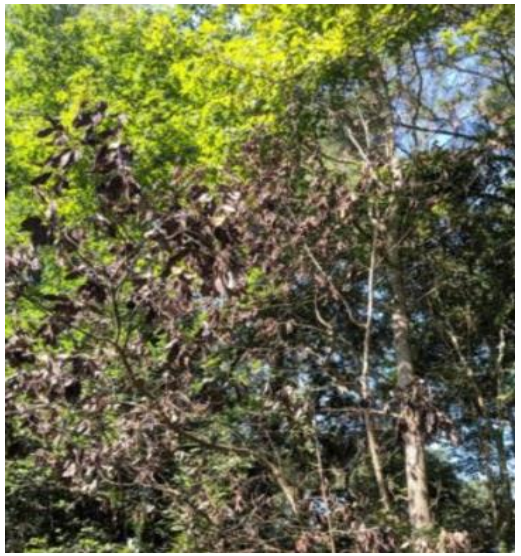
*VA Dept of Ag & Consumer Services

# Plant Diseases of Regulatory Concern in Virginia*



Boxwood Blight
Information and photo credit

Causal Agent: *Calonectria pseudonaviculata* (fungus)
Detected in Virginia: 2011
Controls: Preventative fungicides; remove infected shrubs & replant to resistant varieties



Laurel Wilt
Information and photo credit

Causal Agent: *Raffaelea lauricola* (fungus)
Detected in Virginia: Sept, 2024
Controls: Don't transport firewood across state or county lines; insecticides for insect vectors

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# Plant Diseases of Regulatory Concern in Virginia*







Sudden Oak Death
Information and photo credit

Causal Agent: *Phytophthora ramorum* (fungus)
Found on West Coast ONLY
Controls: None; Don't transport firewood across state lines







Vascular Streak Dieback of Woody Ornamentals
Information and photo credit

Causal Agent: *Ceratobasidium theobromae* (fungus)
Detected in Virginia: 2023; mainly maple, redbud and dogwood
Controls: no recommended pesticide or cultural treatments for home owners

*VA Dept of Ag & Consumer Services

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# Plant Disease Clinic (PDC) at VT

Services Provided by the Plant Disease Clinic

- Diagnosis of fungal, bacterial and nematode diseases
- Preliminary diagnosis of viral diseases
- Diagnosis of abiotic problems
- Emailed diagnostic reports, including control recommendations
- (Nonweedy) plant and mushroom identification

# How to prepare & Send a Sample to the PDC

- Don’t send on a Friday
- Don’t put the form in with the sample
- Make sure the diagnostic form is complete

VCE Plant Disease Diagnostic Form

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# End of Slide Set

This is the end of the slides on Plant Diseases.

You can continue to next slide: ‘Suggested Readings’

OR

Click on the house below to return to the Navigation Page

# Suggested Readings

Note: While there are many websites outside of our Virginia Cooperative Extension resources that have good information, that information may not be applicable for your geographic area. This is especially true regarding the life cycle and treatment times for insects.

- Plant Diseases (2 pages of links to articles)
- Guide to Common Problems: Tomato Problem Solver

# Tests of Knowledge

Apply What You Have Learned

Help Desk Quiz

Plant Diseases in Virginia Quiz

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# Apply What You Have Learned

1. Name one abiotic factor that has caused plant problems in your yard / garden
2. Describe one example of an environmental / physical cause of plant problems in your garden / yard
3. What type of cultural management have you used to manage plant diseases?
4. What type of mechanical management have you used to manage plant disease

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# Help Desk Quiz

1. All holly and azalea bushes planted in front of the house slowly dying over multiple years. No insects or pathogens noted on above ground plant tissue but roots noted growing everywhere on top of soil surface.

2. Green, lush backyard lawn spotted with numerous small pale areas. No insects or diseases noted in photos.

3. Leaves on basil plants turning yellow, then brown, followed by curling and wilting.

4. Yellow stippling and brown needles on Spruce tree in homeowner's yard. Client has been noting needle discoloration for several seasons, primarily on the bottom 1/3 of the tree.

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# Help Desk Quiz Continued

Answers on next slide

5. Leaf drop and dead stems on boxwood during the past 3 years. Client seeking confirmation of Boxwood blight. Photos requested from client to enable accurate diagnosis.

6. Tomato plants turn yellow, wilt, and then die.

7. Dogwood leaves and flower bracts have tiny spots with a reddish or purplish border. In some cases, the tan center falls out leaving a hole.

Click to return to 'Tests of Knowledge Page'

# Help Desk Quiz Answers

1. Roots growing on the soil surface indicates heavy, compacted soil, wet soils, and/or erosion. The shrubs were situated too close to the foundation and there was insufficient distance between shrubs, not uncommon when too little spacing is provided during planting when young. Environmental stress made shrubs susceptible to fungal root rot pathogens.
   Recommendations: Replace with root rot resistant holly's or other non-susceptible shrubs. When replanting, maintain a distance at least 3 foot from the foundation and follow recommended isolation distances between plants as per planting instructions to allow for future growth and expansion. Chemical control methods ineffective once disease is established.
2. Further questioning of client revealed use of the lawn by the family dog for urination.
   Recommendations: If the affected area is not completely dead, increase irrigation amount and/or frequency to help dilute salts. If dead, re-seed. Train the dog to use a non-turf area in the landscape.
3. Basil plants were diagnosed with the downy mildew fungal disease.
   Recommendations: Plant less susceptible varieties Basil varieties, reduce leaf moisture by using drip irrigation vs. overhead irrigation, water early in the mornings so foliage dries quickly, and allowing enough space between plants to increase air circulation. Remove infected plants from the garden.

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# Help Desk Quiz Answers

4. Spruce trees are highly susceptible to Rhizosphaera needle cast fungus and spruce mites, with needle cast being the most likely causal agent given the focused area of symptoms. Mites are physically mobile and can spread to upper branches of the tree. Both problems commonly occur in spruce trees under stress.
   Recommendation: Onsite assessment by a certified arborist to assist in identifying potential environmental stressors that are contributing factors to these problems.
5. The boxwoods did not have boxwood blight as the client assumed, rather, the "boxwoods" were subsequently identified as Japanese holly bushes upon receipt of plant samples.
   Recommendation: This case illustrates the importance of correct plant identification via photos and/or plant samples from clients in order to provide the appropriate diagnosis and control recommendations.
6. Tomato plants were diagnosed as having Fusarium, a soil borne fungal pathogen that cannot be controlled with fungicides.
   Recommendations: Plant tomato varieties resistant to the disease, discard infected plants, and/or rotate out of tomatoes for several years in that location.



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# Help Desk Quiz Answers

7. The dogwood was suffering from a disease known as spot anthracnose caused by a fungal pathogen. The disease is most severe under high rainfall amounts as the flower buds are opening and as the leaf buds are opening. The fungus survives in the shoots and on the fruit.
   Recommendations: Several hybrids of Kousa and flowering dogwood (e.g. 'Stellar' series), are resistant to both anthracnose and powdery mildew fungus, another serious fungal pathogen of dogwood. Azoxystrobil, Chlorothalonil, Mancozeb, and Neem oil are a few examples of fungicides, among others, that will provide control of anthracnose if applied at appropriate intervals.

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# Credits

This module was developed by Phyllis Turner, PhD, Extension Master Gardener; Updated by Melinda Mulesky, PhD, Extension Master Gardener

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