College of Agriculture, Food and Environment
Cooperative Extension Service

Plant Pathology Fact Sheet **PPFS-OR-H-01**

Managing Diseases of Herbaceous Ornamentals

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This guide provides suggestions for symptom recognition and management approaches to common diseases of herbaceous plants in residential and commercial plantings.

Disease Identification

Herbaceous landscape ornamentals can succumb to various adverse factors, including infectious and non-infectious diseases. Infectious diseases are caused by microorganisms, such as fungi, fungus-like water molds, bacteria, nematodes, viruses, and phytoplasmas. Abiotic or non-infectious diseases may be attributed to unfavorable growing conditions, which can include nutritional deficiencies, improper soil pH, extreme temperatures, excessive soil moisture, or drought.

Regardless of the cause, affected plants may display one or more of the following symptoms:

- blight
- dieback
- distortion
- galls
- leaf spots
- scorch
- stem/root decay
- stunted growth
- wilt
- yellowing/discoloration

In order to determine the proper course of action for treatment, it is essential to accurately identify the specific cause(s). For assistance with diagnosis, refer to the resources listed at the end of this publication and/or contact your county Extension agent.

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Disease Management

Management of plant diseases in the landscape, nursery, and greenhouse usually involves a combination of cultural practices. Fungicides are sometimes warranted, but the following cultural management practices should be adopted regardless of fungicide program (whether no-spray, low-spray, organic, or conventional).

Exclusion

Avoid introduction of pathogens into a planting:

- Purchase and plant only healthy material (transplants, seeds, and bulbs).
- Carefully examine foliage, stems, roots, and bulbs for symptoms of disease or presence of pathogenic propagules prior to planting.
- Reject plant material appearing unthrifty or showing disease symptoms.

Planting and cultural practices

Following good cultural practices can aid in disease prevention.

- Select plant species and cultivars tolerant to local heat and cold extremes.
- Use disease resistant or tolerant cultivars whenever possible, especially if there is a history of disease.
- Provide adequate spacing to allow for air circulation, taking into consideration plant size at full maturity. Poor air circulation can result in high humidity within plant canopies, prolonged leaf wetness, and soggy soils that can be conducive to disease development and pathogen spread.
- Maintain plant vigor by promoting plant health; this will enable plants to better resist diseases and stress-related problems. Water plants during drought, fertilize according to soil test results, and mulch (where applicable) to maintain soil moisture and regulate soil temperatures.

Sanitation

Elimination (removal and destruction) of diseased plants and plant material reduces the source of inoculum by reducing the number of propagules (fungal spores, bacterial cells, and virus particles) that can initiate disease. Sanitation minimizes the spread of disease to healthy plants and removes overwintering structures that infect in spring. (Refer to *Landscape Sanitation*, PPFS-GEN-04)

- Pruned plant parts, fallen leaves, and culled plants should be removed from the growing site and destroyed.
- Do not compost diseased plant material or soil because incomplete composting may result in the survival of disease propagules.
- Equipment, such as pruners, trowels, shovels, and containers should be disinfested after they come into contact with diseased plant material or infested soil, especially when bacterial, phytoplasma, and viral pathogens may be present. Bleach (10% solution), rubbing alcohol (70%), or a commercial greenhouse sanitizer can be used to disinfest tools; rinse tools before storing to help prevent corrosion.
- Small quantities of soil can be sterilized using steam, a dry oven, or a microwave.

Crop rotation

Some soilborne pathogens (*Phytophthora, Fusarium, Rhizoctonia, Sclerotinia*, etc.) can build-up and survive for long periods (in some cases, for many years) in soils. Rotate to tolerant or resistant plant species or cultivars.

Fungicides

Plants can be protected from disease using fungicides, bactericides, and/or nematicides; they are used as preventatives. Once plants are infected, fungicides will not cure diseased plants.

- Check product label to be sure both host and disease are listed; apply only as directed on the label.
- Managing insects that vector disease (e.g. leafhopper, aphids, and thrips) with insecticides can be effective in some instances.
- Commercial greenhouses should consider applying fungicides to nearby healthy plants once disease is detected and managed.
- Contact a local county Extension agent for current pesticide recommendations.

Leaf, Bud, Flower, and Stem Diseases

Disease/ hosts	Cause	Symptoms	Management
Bacterial			
Bud rot			
Canna	*Xanthomonas cannae*	Leaves blacken as they unfold. Stem and flower buds may decay.	▪ Select rootstocks from healthy plants. ▪ Avoid overhead irrigation. ▪ Do not crowd plants; provide adequate spacing for air circulation, and thin plants as they mature. ▪ Rogue symptomatic plants. ▪ Use recommended bactericides.
Leaf spots			
Iris	*Xanthomonas tardicrewscens*	Water-soaked spots form on leaves; spots may develop into brown streaks.	▪ Remove and destroy infected plant parts. ▪ Maintain dry foliage and buds; avoid overhead irrigation. ▪ Thin plants to improve air circulation. ▪ To avoid spreading bacterial inoculum, never work with wet plants. ▪ Do not plant or propagate infected plant material. ▪ Fixed copper sprays may help protect healthy plants.
Mum/ Chrysanthemum	*Pseudomonas cichorii*	Small dark brown to black spots appear first on lower leaves; spots become irregular as they enlarge. Disease may spread up on just one side of the plant. Flowers may also become infected.	
Zinnia	*Xanthomonas campestris*	Small brown spots surrounded by yellow halos appear on leaves.	

JOHN HARTMAN, UK

JOHN HARTMAN, UK

BACTERIAL LEAF SPOT ON MUM (CHRYSANTHEMUM)

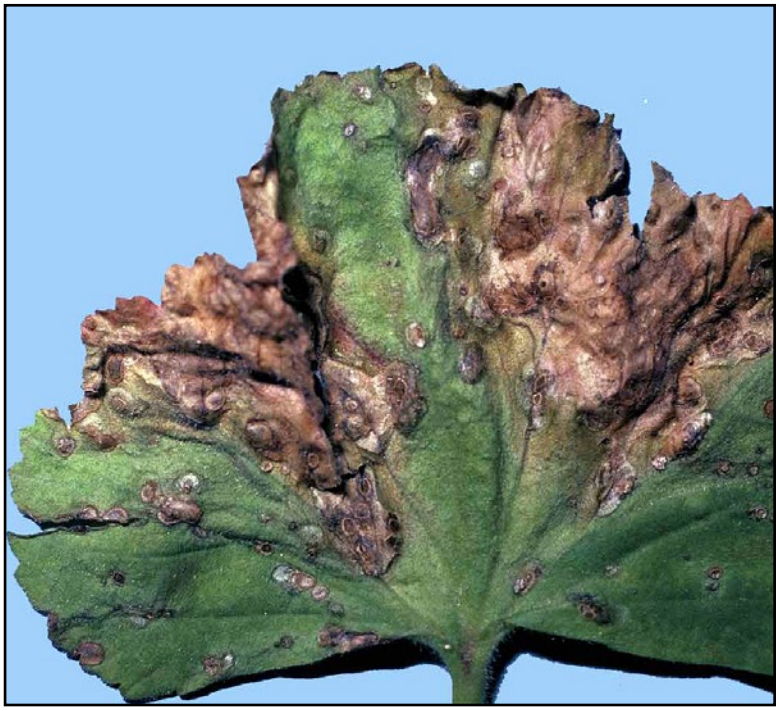
Leaf, Bud, Flower, and Stem Diseases

Disease/ hosts	Cause	Symptoms	Management
Bacterial			
Leaf spot & stem canker			
English ivy	*Xanthomonas campestris*	Watersoaked spots that become dark brown and angular form on leaves; petioles and stems turn black and die.	▪ Practice sanitation throughout the growing season; prune, clean-up, and destroy plant debris as symptoms develop, especially in autumn. ▪ Provide adequate spacing for air circulation. ▪ Maintain dry foliage; avoid overhead watering. ▪ Use disease-resistant cultivars when available. Replace susceptible plant material with tolerant species/cultivars when appropriate.
Stem rot, leaf spot & blight			
Geranium	*Xanthomonas pelargonii*	Initially irregular-shaped spots develop on leaves. Wilting of leaf margins results in formation of yellow or tan V-shaped lesions with dark leaf veins; lesions expand to kill larger areas of leaves. Stems appear blackened and may decay, causing leaf yellowing and wilt.	

John Hartman, UK

Cheryl Kaiser, UK

Cheryl Kaiser, UK

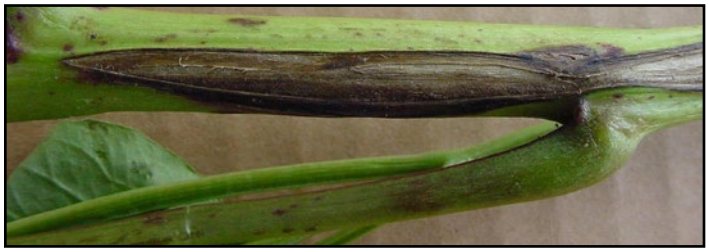


Bacterial leaf spot and blight (geranium)

Leaf, Bud, Flower, and Stem Diseases

Disease/ hosts	Cause	Symptoms	Management
Fungal			
Anthracnose			
Daylily, dianthus, hosta, ivy, liriope, peony, phlox, vinca, and others	*Colletotrichum* spp., *Gloeosporium* spp.	Large irregular spots (white to tan with darker borders) develop on foliage; cankers or sunken lesions can form on leaf and flower stems, resulting in dieback.	▪ Practice sanitation throughout the growing season; prune, clean-up, and destroy plant debris as symptoms develop, especially in autumn. ▪ Provide adequate spacing for air circulation. ▪ Maintain dry foliage; avoid overhead watering.
Leaf spots; Leaf blotches			
General (many hosts)	*Alternaria* spp., *Ascochyta* spp., *Cercospora* spp., *Cladosporium* spp., *Corynespora* spp., *Septoria* spp.,	Fungal leaf spots occur on many hosts as tan or brown circular to irregular spots; spots may expand to encompass large portions of leaves. Some fungal spots may have a darker margin.	▪ Use disease-resistant cultivars when available. Replace susceptible plant material with tolerant species/cultivars when appropriate. ▪ Apply fungicides as needed to protect new growth. -- Once plants are infected, fungicides will not cure disease. -- Remove diseased plant parts and thin plants as needed before applying fungicides. -- When applying fungicide to plants with waxy foliage, a wetting agent (adjuvant/surfactant) can be added so sprays adhere to foliage. -- Check fungicide label to be sure both host and pathogen are listed.

RK Jones, NC State University, Bugwood.org



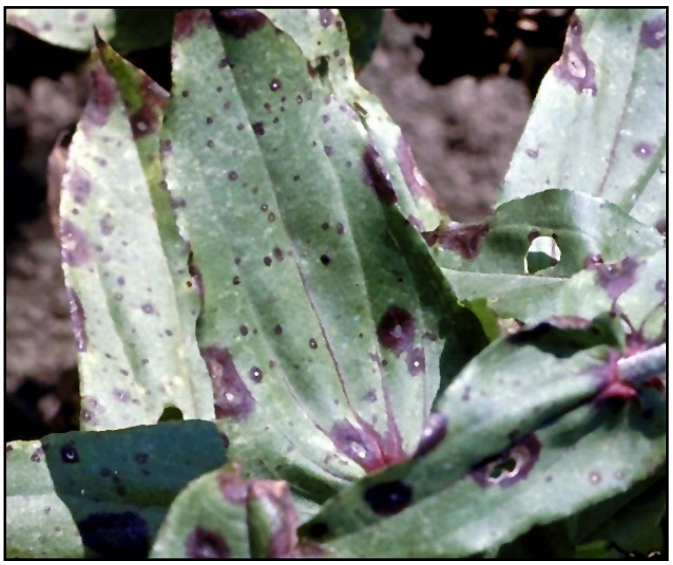
Paul Bachi, UK

Paul Bachi, UK

Anthracnose (Lirope, left; Peony, above)

Leaf, Bud, Flower, and Stem Diseases

Disease/ hosts	Cause	Symptoms	Management
Fungal			
Leaf spots; Leaf blotches (cont'd)			
English ivy	*Phyllosticta* spp.	Brown, circular to irregular spots develop on leaves.	▪ Practice sanitation throughout the growing season; prune, clean-up, and destroy plant debris as symptoms develop, especially in autumn. ▪ Provide adequate spacing for air circulation. ▪ Maintain dry foliage; avoid overhead watering. ▪ Use disease-resistant cultivars when available. Replace susceptible plant material with tolerant species/cultivars when appropriate. ▪ Apply fungicides as needed to protect new growth. -- Once plants are infected, fungicides will not cure disease. -- Remove diseased plant parts and thin plants as needed before applying fungicides. -- When applying fungicide to plants with waxy foliage, a wetting agent (adjuvant/surfactant) can be added so sprays adhere to foliage. -- Check fungicide label to be sure both host and pathogen are listed.
Iris	*Mycosphaerella macrospora (Didymellina macrospora); Heterosporium* spp.	Small, brown leaf spots with gray centers develop; may be surrounded by a water-soaked margin. As spots enlarge, leaves becomes blighted.	
Mum/ Chrysanthemum	*Alternaria* spp., *Cercospora* spp., *Septoria* spp.	Small, dark brown spots appear first on lower leaves. Leaves may become blighted, shrivel, and die. Dead leaves may hang on diseased plants.	
Zinnia	*Alternaria zinniae*	Circular to irregular purple-brown spots develop on foliage; spots may have gray centers. Severe infection results in leaf blight. Stem infections can lead to plant death.	



JOHN HARTMAN, UK

FL DIVISION OF PLANT INDUSTRY, FL DEPT. OF AGRICULTURE & CONSUMER SERVICES, BUGWOOD.ORG

ALTERNARIA LEAF SPOT (ZINNIA, LEFT); SEPTORIA LEAF SPOT (MUM/ CHRYSANTHEMUM, RIGHT)

Leaf, Bud, Flower, and Stem Diseases

Disease/ hosts	Cause	Symptoms	Management
Fungal			
Powdery mildew			
Many plants, especially aster, begonia, dahlia, mum, peony, petunia, phlox, rudbeckia, shasta daisy, spirea, yarrow, and zinnia	*Erysiphe* spp., *Golovinomyces* spp., *Oidium* spp., and others	White, powdery spots appear on upper leaf surfaces and stems; white fungal growth may eventually cover entire leaf surfaces. Older leaves are generally affected first.	▪ Practice sanitation throughout the growing season; prune, clean-up, and destroy plant debris as symptoms develop, especially in autumn. ▪ Provide adequate spacing for air circulation. ▪ Maintain dry foliage; avoid overhead watering. ▪ Use disease-resistant cultivars when available. Replace susceptible plant material with tolerant species/cultivars when appropriate. ▪ Apply fungicides as needed to protect new growth. -- Once plants are infected, fungicides will not cure disease. -- Remove diseased plant parts and thin plants as needed before applying fungicides. -- When applying fungicide to plants with waxy foliage, a wetting agent (adjuvant/surfactant) can be added so sprays adhere to foliage. -- Check fungicide label to be sure both host and pathogen are listed.
Red spot			
Peony	*Cladosporium paeoniae*	Glossy, dark purple spots appear on upper leaf surfaces during moist weather; spots on the under surface are brown. Reddish lesions may also develop on stems and petioles.	

JOHN HARTMAN, UK

SHERYL PIRONE

POWDERY MILDEW (ZINNIA, LEFT; PHLOX, RIGHT)

Leaf, Bud, Flower, and Stem Diseases

Disease/ hosts	Cause	Symptoms	Management
Fungal			
Rust			
Aster, delphinium, iris, daisy, daylily, hollyhock, snapdragon, and others	*Puccinia* spp., *Coleosporium* spp.	Reddish-brown powdery pustules form on leaves, stems, and seed pods. Leaves turn brown and die when infections are numerous.	▪ Practice sanitation throughout the growing season; prune, clean-up, and destroy plant debris as symptoms develop, especially in autumn. ▪ Provide adequate spacing for air circulation. ▪ Maintain dry foliage; avoid overhead watering. ▪ Use disease-resistant cultivars when available. Replace susceptible plant material with tolerant species/cultivars when appropriate. ▪ Apply fungicides as needed to protect new growth. -- Once plants are infected, fungicides will not cure disease. -- Remove diseased plant parts and thin plants as needed before applying fungicides. -- When applying fungicide to plants with waxy foliage, a wetting agent (adjuvant/surfactant) can be added so sprays adhere to foliage. -- Check fungicide label to be sure both host and pathogen are listed.
Zonal rust			
Geranium	*Puccinia pelargonii-zonalis*	Reddish-brown lesions appear in circular patterns on foliage. Dusty reddish spores can be brushed from spots. Leaves yellow, dry, and drop prematurely.	

SANDRA JENSEN, CORNELL UNIVERSITY, BUGWOOD.ORG

PAUL BACHI, UK

ZONAL RUST (GERANIUM, LEFT); RUST (HOLLYHOCK, RIGHT)

Leaf, Bud, Flower, and Stem Diseases

Disease/ hosts	Cause	Symptoms	Management
Fungal			
Botrytis blight/Gray mold			
Many plants, including begonia, geranium, lily, marigold, peony, periwinkle, petunia, snapdragon, tulip, and zinnia	*Botrytis cinerea*	Dead blotches appear on leaves, flowers, and stems. Stems may rot causing plants collapse. Flower buds may fail to open; diseased flowers that open become decayed and drop prematurely. Affected plant tissues may be covered with gray fuzzy fungal growth and spores.	▪ Practice sanitation throughout the growing season; prune, clean-up, and destroy plant debris as symptoms develop, especially in autumn. ▪ Provide adequate spacing for air circulation. ▪ Maintain dry foliage; avoid overhead watering. ▪ Use disease-resistant cultivars when available. Replace susceptible plant material with tolerant species/cultivars when appropriate.
Leaf & stem blight			
Pachysandra	*Volutella pachysandricola*	Brown blotches appear on leaves; dark cankers may form on stems. Leaves die as foliar blotches expand and cankers girdle stems.	▪ Apply fungicides as needed to protect new growth. -- Once plants are infected, fungicides will not cure disease. -- Remove diseased plant parts and thin plants as needed before applying fungicides. -- When applying fungicide to plants with waxy foliage, a wetting agent (adjuvant/surfactant) can be added so sprays adhere to foliage. -- Check fungicide label to be sure both host and pathogen are listed.

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MC SHURTLEFF, UNIVERSITY OF IL, BUGWOOD.ORG

VOLUTELLA LEAF AND STEM BLIGHT IN PLANTING (PACHYSANDRA, TOP LEFT) AND CLOSE-UP OF VOLUTELLA STOLON LESIONS (LOWER LEFT); BOTRYTIS BLIGHT/GRAY MOLD (MARIGOLD, ABOVE)

Leaf, Bud, Flower, and Stem Diseases

Disease/ hosts	Cause	Symptoms	Management
Fungal			
Web blight/Rhizoctonia aerial blight			
Boston fern, mum, pansy, periwinkle, vinca, etc.	*Rhizoctonia solani*	Brown, dried lesions appear on leaves; these spread to involve large portions of leaves. Under humid conditions, a fine webbing of fungal mycelia covers blighted portions of plants.	▪ Completely remove and destroy infected plants. ▪ Plant only healthy planting material. ▪ Do not crowd plants; provide adequate spacing for air circulation, and thin plants as they mature. ▪ Protectant fungicides can be used in commercial plantings.
Water molds (Fungus-like organisms; Oomycetes)			
Phytophthora aerial blight			
Pansy, vinca	*Phytophthora* spp.	Irregularly-shaped, watersoaked, light brown spots develop on leaves. Disease can spread rapidly over large portions of plants. Once stems are girdled, plant death follows.	▪ Remove and destroy infected plants promptly. ▪ Avoid overhead irrigation. ▪ Do not crowd plants; provide adequate spacing for air circulation, and thin plants as they mature.

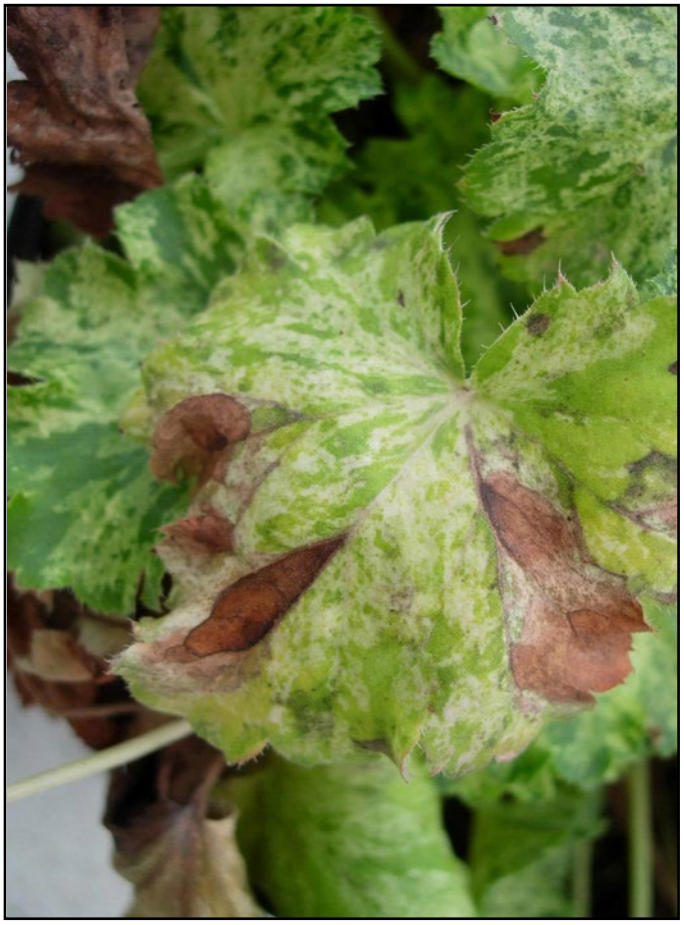
Nicole Ward Gauthier, UK

Nicole Ward Gauthier, UK

Web blight (mum/chrysanthemum, left) and close-up of Rhizoctonia fungal strands (right)

Leaf, Bud, Flower, and Stem Diseases

Disease/ hosts	Cause	Symptoms	Management
Nematodes			
Foliar			
Many plants, including anemone, coral-bells, geranium, hosta, iris, peony, and phlox	*Aphelenchoides* spp.	Areas bounded by veins turn brown and die, forming a patchwork or long streaks of dead tissue on leaves.	▪ Do not introduce infected plants into planting site. ▪ Remove and destroy diseased plants. ▪ Chemical treatment is available for commercial use.



Elizabeth Bush, Virginia Tech, Bugwood.org

NC State University, Plant Pathology Archive, Bugwood.org

NCSU, Plant Pathology Archive, Bugwood.org

Foliar nematode (coral bells, above; hosta, upper & lower right)

Leaf, Bud, Flower, and Stem Diseases

Disease/ hosts	Cause	Symptoms	Management
Other			
Aster yellows (phytoplasma)			
Aster, cosmos, coreopsis, echinacea, marigold, mum, petunia, purple coneflower, snapdragon, vinca, zinnia, etc.	Aster yellows phytoplasma	Leaves become discolored (light green, yellow, white, red or purple) and stunted. Flowers are small and deformed; may never color properly. Stems are weak and may form a clump (witches broom).	▪ Plants will not recover; completely remove and destroy infected plants. ▪ Remove nearby perennial weeds that can serve as a source of inoculum.
Bud blast (abiotic)			
Peony	Usually due to poor growing conditions (e.g., potassium deficiency, drought, cold spring weather, excess shade, planted too deeply, etc.).	Young buds turn dark, dry up, and fail to open.	▪ Promote plant vigor by providing good growing conditions (proper planting, fertilization, irrigation, etc.)

WHITNEY CRENSHAW, CO STATE UNIVERSITY, BUGWOOD.ORG

WHITNEY CRENSHAW, CO STATE UNIVERSITY, BUGWOOD.ORG

ASTER YELLOWS (COSMOS, LEFT; MARIGOLD, RIGHT)

Leaf, Bud, Flower, and Stem Diseases

Disease/ hosts	Cause	Symptoms	Management
Other			
Mosaic; Ringspot (virus)			
Columbine, dahlia, gladiolus, petunia, and others	Various viruses, including alfalfa mosaic virus (AMV), cucumber mosaic virus (CMV), dahlia mosaic virus (DMV), and tobacco mosaic virus (TMV)	Leaves become mottled with dark and light green areas or develop yellowish-green ringspots. Plants may be stunted and flowering reduced. Gladiolus flowers become abnormally streaked.	▪ Remove and destroy infected plants immediately. ▪ Plant only healthy planting material. ▪ Control aphid vectors.

Vascular Wilts and Root, Crown & Lower Stem Diseases

Disease/ hosts	Cause	Symptoms	Management
Fungal			
Black root rot			
Many plants, including marigold, pansy (viola), periwinkle, petunia, ranunculus, and zinnia	*Thielaviopsis basicola*	Affected plants are stunted, slow growing, and less vigorous than healthy plants due to decaying roots. Plants wilt and turn yellow as the disease progresses. Brown to black lesions develop on roots; they are in sharp contrast to healthy white roots.	▪ Do not introduce diseased plants into planting. ▪ Infected plants should be removed and destroyed; dig up as much of the rootball and surrounding soil as possible. ▪ Replant site with tolerant/resistant plants or cultivars.

Anette Phibbs, WI Dept. of Agriculture, Trade & Consumer Protection, Bugwood.org

Elizabeth Bush, Virginia Tech, Bugwood.org

Alfalfa mosaic virus (petunia, left); Black root rot (zinnia, right)

Vascular Wilts and Root, Crown & Lower Stem Diseases

Disease/ hosts	Cause	Symptoms	Management
Fungal			
Fusarium wilt			
Astilbe, mum, petunia, and others	*Fusarium oxysporum*	Plants turn yellow, wilt, and die. Yellowing and wilting may affect only one side of a plant; a branch or leaf may also be half yellow, while the other half remains green.	▪ Do not introduce diseased plants into planting site. ▪ Infected plants should be removed and destroyed; dig up as much of the rootball and surrounding soil as possible. ▪ Replant site with tolerant/resistant plants or cultivars.
Southern stem blight			
Many plants, including hosta, phlox and rudbeckia; on ajuga, this disease is referred to as 'ajuga crown rot'	*Sclerotium rolfsii; S. delphinii*	Plants wilt and die in patches in plant beds. Small, brown to yellow-brown spherical sclerotia may be observed clinging to rotted stems at the base of plants. Sclerotia are often embedded in white fungal mycelium on the stem surface.	

CHERYL KAISER, UK

JOHN HARTMAN, UK

DAVID LANGSTON, UNIVERSITY OF GA, BUGWOOD.ORG

AJUGA CROWN ROT IN AJUGA PLANTING (LEFT) AND POTTED PLANT (UPPER RIGHT); CLOSE-UP OF SCLEROTIA (LOWER RIGHT)

Vascular Wilts and Root, Crown & Lower Stem Diseases

Disease/ hosts	Cause	Symptoms	Management
Fungal			
White mold/Timber rot			
Many plants, including aster, begonia, geranium, liatris, peony, petunia, and zinnia	*Sclerotinia* spp.	Plants collapse following a soft, mushy decay at the base of stems. Hard, black, irregular sclerotia resembling small raisins may be found inside rotted stems and on the ground.	▪ Do not introduce diseased plants into nurseries or landscapes. ▪ Infected plants should be removed and destroyed; dig up as much of the rootball and surrounding soil as possible. ▪ Replant site with tolerant/resistant plants or cultivars.
Rhizoctonia root & stem rot			
All plants	*Rhizoctonia solani*	Seedlings, roots, and lower stems develop brown lesions and decay. Plant tops yellow and wilt. Wirestem (constricted, wiry stem) may develop, especially in older plants.	▪ Practice sanitation throughout the growing season; prune, clean-up, and destroy plant debris as symptoms develop, especially in autumn. ▪ Provide adequate spacing for air circulation. ▪ Maintain dry foliage; avoid overhead watering. ▪ Use disease-resistant cultivars when available. Replace susceptible plant material with tolerant species/cultivars when appropriate.

Jody Fetzer, MD Capital & Planning Commission, Bugwood.org

Kenny Seebold, UK

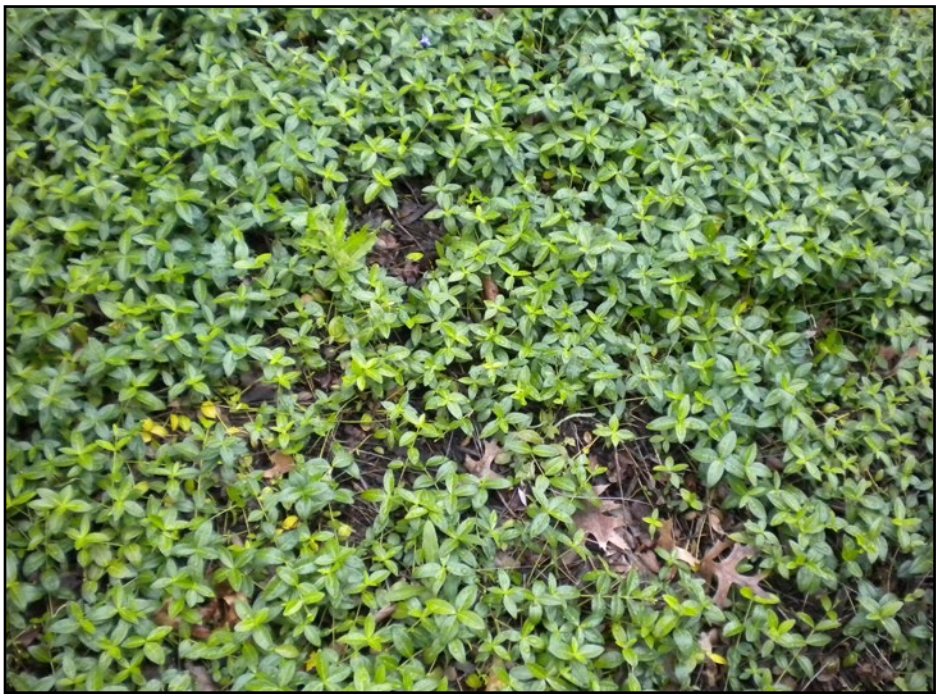
RK Jones, NC State University, Bugwood.org

White mold (zinnia, left), close-up of sclertium (upper right), and Rhizoctonia stem rot (petunia, lower right)

Vascular Wilts and Root, Crown & Lower Stem Diseases

Disease/ hosts	Cause	Symptoms	Management
Fungal			
Stem canker & dieback			
Periwinkle (vinca)	*Phoma exigua*	Dark, brown-to-black lesions girdle lower stems and shoots. Foliage and stems wilt and die.	▪ Practice sanitation throughout the growing season; prune, clean-up, and destroy plant debris as symptoms develop, especially in autumn. ▪ Provide adequate spacing for air circulation. ▪ Maintain dry foliage; avoid overhead watering. ▪ Use disease-resistant cultivars when available. Replace susceptible plant material with tolerant species/cultivars when appropriate. ▪ Apply fungicides as needed to protect new growth. -- Once plants are infected, fungicides will not cure disease. -- Remove diseased plant parts and thin plants as needed before applying fungicides. -- Check fungicide label to be sure the host and pathogen are listed.

Elizabeth Bush, Virginia Tech, Bugwood.org



Bruce Watt, University of Maine, Bugwood.org

Stem canker & dieback (periwinkle/ vinca) in planting (left) and close-up of diseased stem (right)

Vascular Wilts and Root, Crown & Lower Stem Diseases

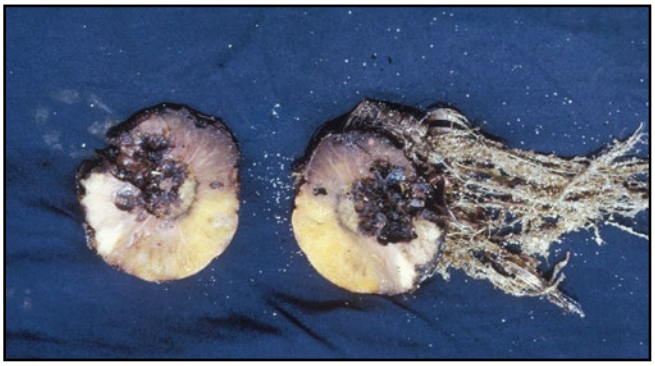
Disease/ hosts	Cause	Symptoms	Management
Water molds (Fungus-like organisms; Oomycetes)			
Root, stem & crown rots			
All plants	*Pythium* spp., *Phytophthora* spp.	Roots, lower stems, and/or crown decay. Plant tops yellow, wilt, and die back.	▪ Improve surface and subsoil drainage. ▪ Once plants are infected, they cannot be cured. Remove and destroy diseased plants, as well as root balls and surrounding soil. ▪ Specialized soil drenches may be used to protect nearby healthy plants against infection. Read package label for specific plants that can be treated.
Nematodes			
Root knot nematode			
Many plants, including petunia	*Meloidogyne* spp.	Plant growth is stunted, and plants decline. Roots have abnormal swellings or knots.	▪ Do not introduce diseased plants into planting site. ▪ Once plants are infected, they cannot be cured. Infected plants should be removed and destroyed; dig up as much of the rootball and surrounding soil as possible. ▪ Replant site with tolerant/resistant plants or cultivars.

Jeffrey Lotz, FL Dept. of Agriculture & Consumer Services, Bugwood.org

Root knot nematode (petunia)

Bulb, Corm & Rhizome Diseases

Disease/ hosts	Cause	Symptoms	Management
Bacterial			
Soft rot			
Iris	*Erwinia* spp.	Leaves may wilt, turn brown at the tips, and then die. Rhizomes develop a soft, slimy rot.	▪ Control insect borers, which create wounds for entry of bacteria. ▪ Remove decayed portions of rhizomes and, when necessary, entire plants.
Fungal			
Basal rot			
Narcissus	*Fusarium* spp.	Basal portion of bulb shows a brown, dry decay. Infected plants are stunted with yellow leaves.	▪ Avoid injuring bulbs when digging; dry them rapidly before replanting. ▪ Discard decayed bulbs.
Corm rot			
Gladiolus	*Fusarium* spp.	Brown, sunken, decayed areas develop on corms.	▪ Avoid injuring corms when digging. ▪ Store corms in a dry location that is 35°F to 40°F. ▪ Dust corms with a fungicide before planting.



Dept. of Platn Pathology, NC State University, Bugwood.org

RK Jones, NC State University, Bugwood.org

Iris soft rot (left), Fusarium bulb rot (narcissus, upper right), and Fusarium corm rot (gladiolus, lower right)

Additional Resources

- Plant Pathology Extension Publications--Herbaceous Ornamentals
http://plantpathology.ca.uky.edu/extension/publications#HERBACEOUSORNAMENTALS

- Plant Pathology Extension Publications--Greenhouse
http://plantpathology.ca.uky.edu/extension/publications#GreenhouseCrops

May 2017

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Revised from the original fact sheet, *Guide for Control of Annual and Perennial Flower and Ground Cover Diseases in landcscapes* (ID87), written by John Hartman, Mary Witt, and Cheryl Kaiser