



# Guide for Control of Annual and Perennial Flower and Ground Cover Diseases in the Landscape

by John Hartman and Mary Witt

Herbaceous flowering plants are an asset to almost any landscape. Healthy plants are essential to maintaining a desirable aesthetic appearance. This publication suggests ways to control important infectious diseases of flowers and ground covers commonly grown in Kentucky.

## *Disease Identification*

Diseased plants may show one or more of the following symptoms: leaf spot, blight, scorch, yellowing, stem and root decay, wilt, swellings, malformations and galls, and dieback. To control any of these problems, you need to know the cause.

Plants may show poor health due to adverse growing conditions like drought, flooding, winter cold, poor soil, excess fertilizer, mineral element deficiency, toxic chemicals, air pollution, and mechanical injuries. On the other hand, they may have an infectious disease, caused by specific microorganisms or pathogens like bacteria, fungi, viruses, and nematodes.

## *Disease Control*

To treat diseases caused by adverse growing conditions, you try to correct whatever factors caused the problem. You may change how much you water or mulch or what you add to your soil. You may provide better drainage or cold protection or change many other kinds of cultural or environmental factors.



*Zonal Rust—Geranium*



*Bacterial Spot—Zinnia*

To control infectious diseases, you do the following:

- Exclude the pathogen (cause of disease) from the landscape. To do so, use only disease-free plants and bulbs and pathogen-free seeds. Carefully examine plant materials before planting and reject those showing disease symptoms.
- Reduce the amount of pathogen in the landscape. Remove and destroy diseased plants and rotate different kinds of flowers in specific beds so that pathogens don't build up. Disinfect equipment by using 10 percent bleach or 70 percent alcohol and soil by using chemical fumigants such as Vapam. Steam, dry oven, or microwave treatments can be used for small soil quantities. Destroy pathogens in or on plant materials by using heat or fungicide dusts. Provide growing conditions unfavorable for pathogens. Control leafhoppers, aphids, and thrips that vector diseases.
- Use disease-resistant species and cultivars. Also, improve plant vigor to create greater resistance to stress-related diseases.
- Protect plants from attack by pathogens by using chemical sprays and dusts.

## *Treatment and Control of Diseases of Specific Flowers*

**ALL PLANTS** (diseases common to many species of flowers and ground covers)

### • *Botrytis blight (fungus)*

**Symptoms:** Dead blotches appear on leaves, flowers, and stems. Stems may rot and plants collapse. Flower buds may fail to open. Diseased flowers decay and fall prematurely. Affected areas may be covered with fuzzy fungal growth and spores.

**Control:** Destroy old plant debris in the fall. Avoid wetting foliage. Prune out nearby shading vegetation. Provide adequate plant spacing. Use fungicides such as chlorothalonil, dicloran, ferbam, iprodione, mancozeb, maneb, thiophanate-methyl, vinclozolin, or mancozeb + thiophanate-methyl. Read the label for lists of specific plants allowed for each fungicide.

### • *Foliar nematodes (nematodes)*

**Symptoms:** Areas bounded by veins turn brown and die, forming a patchwork or long streaks of dead tissue on the leaves.

**Control:** Avoid introducing infected plants into the nursery or landscape. Remove and destroy infected plants. In nurseries, oxamyl can be used to treat plants.

### • *Nematode diseases (mainly root-knot)*

**Symptoms:** Plant growth is stunted, and plants decline. Roots have abnormal swellings or knots.

**Control:** Gently remove and destroy infected plants. Use crop rotation if the soil in a bed becomes infested. Soil fumigation may be an option for commercial applications. Fenamifos nematicide may benefit some plants. See label for application instructions and list of plants cleared.

### • *Southern stem blight (fungus)*

**Symptoms:** Plants wilt and die in patches in the bed. Small, brown to yellow-brown, spherical sclerotia may be observed clinging to rotted stems at the base of the plant. The sclerotia are often embedded in white fungal mycelium on the stem surface.

**Control:** Remove dead plants and 6 inches of surrounding soil and replace with clean soil or use another kind of plant. In nurseries, PCNB fungicide can be used.

### • *Powdery mildew (fungus)*

**Symptoms:** White, powdery spots appear on leaves and stems. White fungal growth may cover entire leaf surface. Older leaves generally affected first.

**Control:** Avoid crowding plants. Grow susceptible plants in a sunny location; prune out nearby shading vegetation. Avoid wetting foliage. Sprays of dodemorph, fenarimol, thiophanate-methyl, triadimefon, wettable sulfur, ziram, or mancozeb + thiophanate-methyl are effective for powdery mildew control. Read the label for lists of specific plants allowed for each fungicide.

### • *Rhizoctonia root and stem rot (fungus)*

**Symptoms:** Seedling and bedding plant roots and stems show brown decay. Wirestem may develop.

**Control:** Begin with sterilized soil, clean equipment, and disease-free plant materials. Soil drenches containing iprodione, PCNB, thiophanate-methyl, or ethazole + thiophanate-methyl will prevent infections. Read the label for lists of specific plants allowed for each fungicide.

### • *Water-mold root, stem, and crown rot (fungus)*

**Symptoms:** Roots or lower stems and crown decay. Tops wilt, yellow, or die back. May occur on seedlings or in the bed.

**Control:** Improve planting site drainage. Remove and destroy infected plants. Begin seedlings using sterilized soil and clean equipment. Soil drenches containing ethazole, fosetyl-Al, metalaxyl, propamocarb, or ethazole + thiophanate-methyl will prevent infections. Read the label for lists of specific plants allowed for each fungicide.

### • *White mold (fungus)*

**Symptoms:** Plants collapse following a soft, mushy decay at the base of the stem. Dark, irregular sclerotia resembling small raisins may be found inside the rotted stem.

**Control:** Remove and destroy infected plants and sclerotia.

## AJUGA

### • *Crown rot (fungus)*

**Symptoms:** Plants wilt and die in patches in the bed. Small, brown, spherical sclerotia may be observed clinging to rotted stems.

**Control:** Remove dead plants and 6 inches of surrounding soil and replace with clean soil or use alternate ground cover. In nurseries, PCNB fungicide can be used.

## ASTILBE

### • *Fusarium wilt (fungus)*

**Symptoms:** Plants turn yellow, wilt, and die. Wilting is often one-sided in the plant or even in the branch or leaf, with one half yellow and the other half remaining green.

**Control:** Remove dead plants and surrounding soil and replace with clean soil.

## BEGONIA

### • *Botrytis blight (fungus)*

See under ALL PLANTS.

### • *Powdery mildew (fungus)*

See under ALL PLANTS.

### • *Rhizoctonia root and stem rot (fungus)*

See under ALL PLANTS.

### • *Water-mold root, stem, and crown rot (fungus)*

See under ALL PLANTS.

## CANNA

### • *Bud rot (bacteria)*

**Symptoms:** Leaves blacken as they unfold. Stem and flower buds may decay.

**Control:** Select rootstocks from healthy plants. Keep young growth dry. Don't crowd plants in the bed.

## CHRYSANTHEMUM

### • *Leaf spot (fungus)*

**Symptoms:** Small, dark brown spots appear first on lower leaves. Leaves may become blighted, shrivel, and die. Dead leaves may hang on the plant.

**Control:** Avoid wetting foliage. Spray plants at first indication of disease using captan, chlorothalonil, ferbam, maneb, mancozeb, ziram, or mancozeb + thiophanate-methyl.

### • *Powdery mildew (fungus)*

See under ALL PLANTS.

## COLUMBINE

### • *Leaf spot (fungus)*

**Symptoms:** Dark, irregular spots on leaves.

**Control:** Rake up and destroy old leaves at the end of the season.

### • *Mosaic (virus)*

**Symptoms:** Leaf mottling, stunting, reduced flowering.

**Control:** Remove and destroy infected plants.

## DAHLIA

### • *Mosaic (virus)*

**Symptoms:** Mottled yellow and green leaves. Stunting and dwarfing of plants.

**Control:** Dig up and destroy infected plants. Plant only tubers from healthy plants. Control aphid vectors.

### • *Powdery mildew (fungus)*

See under ALL PLANTS.

## ENGLISH IVY

### • *Leaf spot and stem canker (bacteria)*

**Symptoms:** Dark brown, angular spots on leaves and stems.

**Control:** Prune out and destroy diseased vines. Avoid unnecessary watering. The cultivar Gold Dust is considered resistant and the cultivars California, Eva, Gold Heart, Manda Crested, Perfection, Sweet Heart, and Telecurl are considered tolerant to bacterial leaf spot.

### • *Leaf spot (fungus)*

**Symptoms:** Brown, circular to irregular spots on leaves.

**Control:** Pick off infected leaves. Apply fixed copper fungicides as needed.

## GERANIUM

### • *Bacterial stem rot, leaf spot, and blight (bacteria)*

**Symptoms:** Irregular spots develop at first, often in the form of a yellow or tan V-shaped lesion with dark leaf veins at the leaf edge. Then larger areas of the leaf are killed. Stems appear blackened and may decay, causing leaf yellowing and wilt.

**Control:** Purchase only disease-free seedlings or cuttings. Remove and destroy infected leaves. Avoid replanting in the same bed next year. Avoid wetting foliage.

### • *Botrytis blight (fungus)*

See under ALL PLANTS.

### • *Zonal Rust (fungus)*

**Symptoms:** Reddish-brown lesions appear in circular patterns on leaves. Dusty reddish spores can be brushed from spots.

**Control:** Avoid wetting foliage. Provide sunny growing location. Use only disease-free cuttings. Prevent infections by spraying with ferbam, mancozeb, oxycarboxin, or triadimefon.

## GLADIOLUS

### • *Corm rot (fungus)*

**Symptoms:** Brown, sunken, decayed areas present on corms.

**Control:** Avoid injury when digging. Store corms at 35°F to 40°F in dry location. Dust corms with captan, dicloran, or PCNB before planting.

### • *Mosaic (virus)*

**Symptoms:** Mottled green and yellow areas on leaves; abnormal flower streaking.

**Control:** Destroy diseased plants. Control aphid vectors.

## IMPATIENS

### • *Rhizoctonia root and stem rot (fungus)*

See under ALL PLANTS.

## IRIS

### • *Leaf spot (bacterial)*

**Symptoms:** Water-soaked spots; sometimes develop into brown streaks.

**Control:** Remove and destroy leaves in late fall. Fixed copper sprays may be beneficial.

### • *Leaf spot (fungus)*

**Symptoms:** Small, brown leaf spots have a gray center, sometimes surrounded by a water-soaked margin. As spots enlarge, leaf becomes blighted.

**Control:** Cut and destroy leaves in the fall. Spray with chlorothalonil, ferbam, iprodione, mancozeb, thiophanate-methyl, or triadimefon fungicides.

### • *Soft rot (bacteria)*

**Symptoms:** Leaves may wilt and die, or die back from the tips. Rhizome shows soft, slimy decay.

**Control:** Control insect borers that create injury for entry of bacteria. Dig up and destroy infected rhizomes. Cut out rotted areas if only partly decayed.

## LIATRIS

### • *Stem rot (fungus)*

See white mold, under ALL PLANTS.

**Symptoms:** Stem decay. Dark, raisin-shaped fungal sclerotia present in rotted stem.

**Control:** Remove and destroy infected plants.

## LILY

### • *Botrytis blight (fungus)*

See under ALL PLANTS.

## MARIGOLD

- ***Botrytis blight (fungus)***

See under ALL PLANTS.

- ***Rhizoctonia root and stem rot (fungus)***

See under ALL PLANTS.

## NARCISSUS

- ***Basal rot (fungus)***

**Symptoms:** Basal layers of bulb show a brown, dry decay.

**Control:** If bulbs are dug, avoid injuries. Dry them rapidly. Discard decayed bulbs.

## PACHYSANDRA

- ***Leaf and stem blight (fungus)***

**Symptoms:** Brown blotches and blighting of leaves. Dark stem and stolon cankers may also be present.

**Control:** Lift out and destroy severely infected plants. Thin out planting to provide good air movement. Spray containing fixed copper, mancozeb, or mancozeb + thiophanate-methyl may provide control.

## PEONY

- ***Botrytis blight (fungus)***

See under ALL PLANTS.

- ***Bud blast (abiotic)***

**Symptoms:** Young buds turn dark and dry up while still small.

**Control:** Usually due to poor growing conditions (i.e., potassium deficiency, drought, cold spring weather, excess shade, too deep planting). Supply good growing conditions.

- ***Leaf blotch, red spot (fungus)***

**Symptoms:** Glossy, dark purple spots appear on leaf's top surface during moist weather. The lower surface is brown.

**Control:** Avoid wetting foliage. Destroy infected foliage at season's end. Remove nearby shading vegetation. Spray with fixed copper, mancozeb, or maneb.

## PETUNIA

- ***Botrytis blight (fungus)***

See under ALL PLANTS.

- ***Rhizoctonia root, stem, and crown rot (fungus)***

See under ALL PLANTS.

## PHLOX

- ***Powdery mildew (fungus)***

See under ALL PLANTS. Use resistant cultivars.

## RUDBECKIA

- ***Powdery mildew (fungus)***

See under ALL PLANTS.

## SHASTA DAISY

- ***Powdery mildew (fungus)***

See under ALL PLANTS.

## SNAPDRAGON

- ***Rhizoctonia root, stem, and crown rot (fungus)***

See under ALL PLANTS.

- ***Rust (fungus)***

**Symptoms:** Reddish brown, powdery pustules on leaves, stems, and seed pods. If infections are numerous, leaves turn brown and die.

**Control:** Space well for good ventilation and low humidity. Keep leaves dry. Ferbam, maneb, mancozeb, propiconazole, and ziram fungicides control rust.

## TULIP

- ***Botrytis blight or fire (fungus)***

See under ALL PLANTS.

## VINCA (periwinkle)

- ***Stem canker and dieback (fungus)***

**Symptoms:** Dark, brown to black girdling lesions appear on lower stems and shoots. Tops wilt and die.

**Control:** Remove and destroy affected stems. Thin stand to promote better aeration. Treat plants and soil with a spray of iprodione, mancozeb, or mancozeb + thiophanate-methyl.

## VIRGINIA CREEPER (five-leaved ivy)

- ***Leaf spot (fungus)***

**Symptoms:** Brown, angular spots with reddish brown margins appear on leaflets.

**Control:** Hand pick infected leaves. Apply fixed copper fungicide in spring just before new growth appears.

## YARROW

- ***Powdery mildew (fungus)***

See under ALL PLANTS.

## ZINNIA

- ***Leaf spot (bacteria)***

**Symptoms:** Small, brown spots surrounded with yellow halo appear on leaves.

**Control:** Avoid splashing water. Use commercially grown, disease-free seed.

- ***Leaf spot (fungus)***

**Symptoms:** Purple-brown spots develop on foliage. Spots are circular to irregular and may show gray centers. Severe infection causes leaf blighting. Stem infection may lead to plant death.

**Control:** Space plants well. Avoid wetting foliage. Sprays with ferbam, iprodione, maneb, mancozeb, or mancozeb + thiophanate-methyl prevent infections.

- ***Powdery mildew (fungus)***

See under ALL PLANTS.

## *Examples of Fungicides*

Below is a list of fungicides, each followed by some trade names under which it is marketed. Use this guide to find

chemicals required for your particular need.

**Benomyl:** Benomyl WP.

**Bordeaux:** A mixture of copper sulfate (bluestone) and spray lime in water. The first figure in the formula is copper sulfate in pounds, the second figure is spray lime (hydrated lime) in pounds, and the third figure is water in gallons.

Mixing instructions: Fill tank 1/2 to 3/4 full of cold water. Add desired amount of hydrated lime and mix thoroughly. Add dissolved copper sulfate and mix thoroughly. Fill tank with the rest of the water and use immediately after mixing. If lumping occurs, strain mixture.

**Captan:** Orthocide, Captan Wettable Fungicide, Captan 50W.

**Chlorothalonil:** Daconil 2787, Bravo, Multipurpose Fungicide.

**Dicloran:** Botran.

**Dodemorph acetate:** Milban.

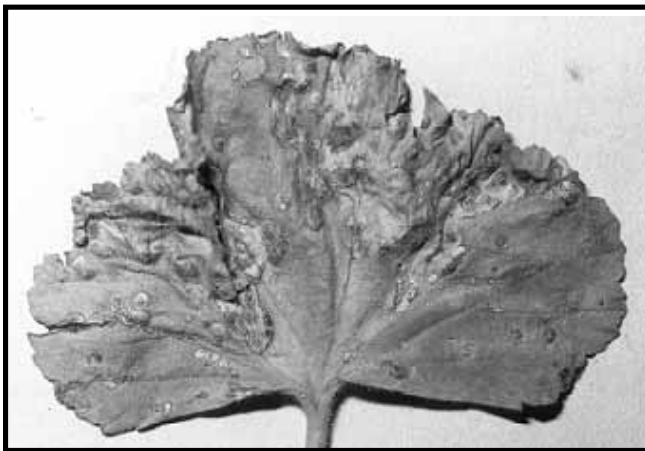
**Ethazole (etridiazole):** Truban.

**Fenamifos:** Nemaicur (nematicide).

**Fenarimol:** Rubigan.

**Ferbam:** Fermate, Ferbam, Carbamate.

**Fixed copper:** Tri-basic Copper Sulfate; Basic Copper Fungicide, Corona 53, Ortho Copper 53 Fungicide, Basic Copper Sulfate, Copper Hydroxide; Kocide 101, Kocide 202.



*Bacterial Blight—Geranium*

**Folpet:** Phaltan, Chevron Folpet, Fungitrol 11, Ortho Rose and Garden Fungicide, Stauffer Folpet.

**Fosetyl-Al:** Aliette WDG.

**Iprodione:** Chipco 26019, Rovral.

**Mancozeb:** Fore, Dithane M-45, Mancozeb, Penncozeb, Protect T/O.

**Maneb:** Dithane M-22, Maneb, Maneb Garden Fungicide.

**Metalaxyl:** Subdue.

**Oxycarboxin:** Plantvax.

**PCNB:** Cleary's PCNB, Terrachlor.

**Propamocarb:** Banol.

**Propiconazole:** Banner, Immunex.

**Sulfur, wettable:** Corosul S, Magnetic "95," Micro Flotox Wettable Sulfur, Dusting Sulfur.

**Thiophanate-methyl:** Cleary's 3336WP, Fungo Flo, Domain.

**Thiophanate-methyl plus ethazole:** Banrot.

**Thiophanate-methyl plus mancozeb:** Zyban, Duosan.

**Triadimefon:** Bayleton, Strike.

**Triforine:** Funginex.

**Vinclozolin:** Ornalin, Ronilan, Curalan.

**Ziram:** Ziram

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Issued 9-88; Revised/Printed 6-96, 2000 copies; 12000 copies to date.