

## SUNBELT SYNDROMES

Landscape manager's guide to diseases  
cool and warm-season trees and ornamentals

by Donald J. Blasingame, extension plant pathologist, Mississippi State University

**T**he southern U.S. is blessed with an ideal environment for the growth of most ornamentals plants. Unfortunately, the same environment is also ideal for the development of a number of disease agents, especially fungi.

In a short article it is impossible to list all ornamentals grown in this region and the diseases that attack

them. Rather, we will list nine of the more common ornamentals grown in the sunbelt and the major disease problems they face.

### Azaleas

**Azalea Petal Blight:** This disease is largely confined to azaleas grown in the southern coastal states from Maryland to Texas. Indian and

Kurume azaleas are especially susceptible.

The disease first appears as small, water-soaked spots on the petal. These spots sometimes give the flower a freckled appearance.

Under favorable conditions the spots enlarge rapidly and cause the flower to become limp and eventually collapse. The entire flower appears to "melt down" and tends to cling to the foliage rather than fall to the ground as spent healthy flowers.

Petal blight often affects the blooms of entire plants within a matter of a few hours, progressing so rapidly that it destroys the beauty of the plant overnight.

The fungus lives from season to season on infected blossoms in the mulch. Therefore, to control flower blight, one must remove all the old mulch from around the plants and replace with new mulch before the plants begin to bloom. Drench the soil with Terraclor in early January using one cup of 75 percent WP in enough water to wet 100 sq. ft.

When the blossoms begin to open, apply either Thylate, Bayleton, or Zyban as a blossom spray. Additional applications may be needed during the blooming period.

**Twig Die-Back:** Several fungi are associated with this disease complex.

These fungi normally enter the plant through either bud or leaf scars. The die-back organism may kill a few inches of the twigs or, if untreated, consume the entire plant.

To control die-back one must prune and destroy all infected branches. Remember that the normal pruning period for these plants is just after blooming. Since the infection period is just after the bloom season, one must continue his spray program for petal blight beyond the blooming period.

**Leaf Gall:** Leaf and flower gall is a common disease on azaleas and camellias in the south. The fungus may infect the developing leaves, stems, and flowers—causing severe distortion, swelling, and thickening of the plant parts.

As the galls form, the infected parts may become white or light green. The



Above, azaleas afflicted with petal blight. Petal blight sometimes affects the blooms of entire plants within a few hours. Below, entomosporium leaf spot of photinia. Once established, the disease is difficult to control.

disease may be particularly severe during cool, moist weather.

The best control is to remove the galls when first noticed, at a time when only a few galls are present.

There may be situations where removing galls is not practical. In such cases, a spray program may control the disease. Spray the plants once before the new leaves are unfurled using Maneb, Captan, or Zineb. Apply at 14-day intervals during the spring or as long as young leaves are present.

## Boxwood

**Boxwood Blight (Canker):** The term *branch and twig blight*, is used to describe the problem of twigs or entire branches dying when the remaining parts of the plant appear healthy. Leaves may shed prematurely leading to the death of the twig. The affected foliage takes on a light, straw color.

Several fungi are associated with boxwood blight in the south. To ensure maintenance of healthy plants where blight is a problem, one must utilize an annual program of pruning, sanitation, and spraying. The annual removal and burning of all dead leaves and twigs lodged in and around the plants is important.

Several applications of a broad-spectrum fungicide—Daconil, Maneb, or fixed copper—have been effective in preventing most blighting problems.

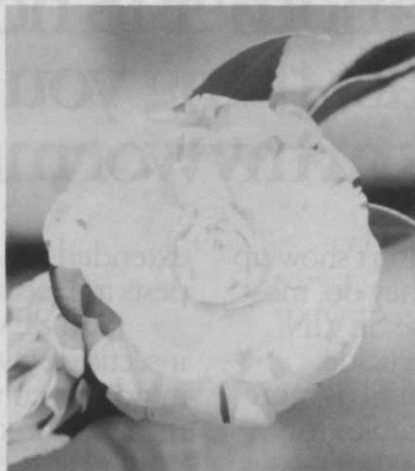
The first application should be made when the plants are pruned, followed by a second application when new growth is approximately one-half completed. The remaining applications can be made at various intervals depending upon further disease development.

**Nematodes:** Nematodes are small, worm-like organisms that attack a plant's root system. Boxwoods grown in the south are susceptible to a number of nematodes including rootknot, lesion, spiral, stubby-root, lance, and ring.

The weak nematode-affected plants gradually decline. If nematodes are suspected, a soil nematode analysis is needed to determine the types and population of the nematodes present.

Few chemicals are available for the homeowner's use in controlling nematodes. In some cases it is more practical to replace infested plants with a different variety of plant that is not affected by the disease.

**Phytophthora Root Rot:** Off-color foliage followed by sudden wilting



Ring spot virus of camellia causing variegated flower color.

and death of the entire plant is characteristic of this disease. Yews, rhododendrons, and a large number of other woody ornamental plants are also subject to *Phytophthora*. It is extremely difficult to rid infected plants of this disease.

The disease is more severe in poorly drained soil. Although Subdue and several other soil fungicides are labeled, chemical control is difficult.

## Camellia

**Flower Blight:** This blight is confined to the flowers which turn brown and drop. Most species and varieties of camellias appear to be equally susceptible to this blight.

The control of camellia flower blight, although caused by a different fungus, is similar to that for azalea petal blight.

**Die-Back:** A canker and die-back of camellias is widespread and frequently destructive in the southern states. The fungus normally enters through wounds or through natural openings such as scars left by abscising leaves or petals in the spring.

Once inside the plant the fungus moves down the twigs causing a gradual die-back. If left untreated the organism will move back to the main stem and kill the plant.

To control, prune and destroy all cankered twigs. Surgical removal of diseased portions may be effective when the cankers occur on a plant's main stem. Use tree paint containing a fungicide to cover all cut areas.

A fungicide application shortly after the blooming season can protect the plant from entrance of the fungus through natural openings. Materials such as benomyl or daconil have

proven to be effective.

**Leaf Gall:** The symptoms and control of leaf gall on camellia are similar to those that occur on azaleas.

**Virus Diseases:** The several diseases appearing on camellias normally appear as variegation or yellowing in the leaf or flower. Not all yellowing of camellia leaves is a result of a viral infection. They may indicate a type of nutritional disorder.

Plants suspected of harboring a virus should be discarded or at least isolated from healthy plants. Care should be taken while pruning so that suspected plants are pruned last to prevent spreading the virus to healthy plants.

**Six steps for healthy camellias:** A successful camellia disease control program requires a well-planned, integrated plan. Here is an example of such a program that will help reduce many of the camellia diseases:

1. Buy only disease-free plants. Isolate new plants from existing plants for three to six months to check for any possible disease development.
2. Take cuttings from current season's growth from the top of healthy plants.
3. Root in a disease-free environment. If possible, use a sterile rooting medium.
4. Prune plants properly. Do the major pruning just after the flowering period. Paint the wounds properly with a pruning paint.
5. Use good cultural practices such as:
  - proper air circulation;
  - correct amounts of fertilizer.Over fertilization causes problems, especially when plants are most susceptible to die-back;
  - mulching when possible;
  - removing and destroying diseased or spent flowers.
6. Use chemical controls. In areas where flower blight and die-back are problems, follow an annual spray program along with the previous suggested practices.

## Dogwood

**Anthracnose:** Spot anthracnose is a serious disease that attacks flowers, leaves, young shoots, and berries.

The flowers are usually malformed and covered with small, circular reddish to purple spots. The margins of these spots are normally much darker in color than the centers.

Leaf infection occurs after the blooming season is over. Heavily infected young twigs may die back sev-

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## PLANT DISEASE DEVELOPMENT CALENDAR

PLANTS	DEVELOPMENT OR DISEASE	PATHOGEN SCIENTIFIC NAME	PLANT PARTS AFFECTED	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
<b>Trees</b>															
Crab Apple	Flowering														
	Cedar apple rust	Gymnosporangium sp.	leaves												
	Fire blight	Erwinia amylovora	shoots												
	Powdery mildew	Podosphaera leucotricha	shoots												
	Scab	Venturia inaequalis	fruit leaves												
Dogwood	Flowering														
	Anthraxnose	Elsinoe corni	leaves flowers												
	Leaf spot	Septoria floridiae	leaves												
	Scorch	Physiological	leaves												
Oak	Flowering														
	Anthraxnose	Gnomonia veneta	leaves												
	Leaf blister	Taphrina caerulescens	leaves												
	Rust	Cronartium sp.	leaves												
Pine	Flowering														
	Eastern gall rust	Cronartium quercuum	branches trunk												
	Fusiform rust	Cronartium fusiforme	branches trunk												
	Needle cast	Hypoderma lethale	needles												
	Needle rust	Coleosporium sp.	needles												
Red Bud	Flowering														
Red Cedar	Cedar apple rust	Gymnosporangium sp.	branches												
Red Maple	Flowering														
	Anthraxnose	Gloeosporium apocryptum	leaves												
Saucer Magnolia	Flowering														
Sycamore	Anthraxnose	Gnomonia platani	shoots												
<b>Woody Plants</b>															
Azalea	Flowering														
	Leaf gall	Exobasidium vaccinii	leaves												
	Petal blight	Ovulinia azaleae	petals												
Camellia japonica	Flowering														
	Flower blight	Sclerotinia camelliae	flower												
	Leaf gall	Exobasidium camelliae	shoot												
Camellia sasanqua	Flowering														
	Leaf gall	Exobasidium camelliae	shoot												
Crape Myrtle	Flowering														
	Powdery mildew	Erysiphe lagerstroemiae	leaves flowers												
Forsythia	Flowering														
Pyracantha	Fire blight	Erwinia amylovora	shoots												
Rhododendron	Flowering														
	Leaf gall	Exobasidium vaccinii	shoots												
	Dieback	Phytophthora cactorum and other species	young shoots												
Rose	Flowering														
	Black spot	Diplocarpon rosae	leaves												
	Botrytis	Botrytis cinerea	flowers stems												
	Powdery mildew	Sphaerotheca pannosa	leaves												

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eral inches from the tips.

The fungus can survive from year to year on these dead twigs. If die-back is severe, the dead twigs should be removed before a spray program is begun.

Anthraxnose control requires early application of fungicides prior to blooming. A regular spray program is required for good control. Monthly applications of fungicides such as Benlate, Maneb, Captan, or Zyban can be applied during March, April, May, and September.

**Nectria Canker:** This fungus attacks dogwoods as well as other hardwoods in the southeast.

The first symptom is usually a dark area on the bark with a water-soaked appearance. These areas will begin to swell, resulting in a great deal of bark splitting. Infected areas may be a few inches to several feet in diameter and can completely gird the trunk.

Cankers are targets for insects and are easily broken during heavy winds. Control is difficult after infection occurs.

If the canker is small, cut the tissue back to healthy wood and paint with a wound dressing. Severely affected trees should be removed. No effective chemical controls are available.

## Gardenia

**Canker:** Symptoms of this fungus disease are yellowing, wilting, shriveling, and falling of leaves and buds. The cankers girdle the stems causing die-back. Cankers may enlarge to twice the size of the normal stem.

The fungus gains entrance through mechanical injuries so care should be taken when pruning the plants or mowing to prevent the disease from spreading.

Spraying with a broad-spectrum fungicide—Maneb or Daconil—soon after pruning is recommended.

**Sooty Mold:** Sooty mold is a frequent problem on leaves of evergreen shrubs such as azaleas, camellias, and gardenias.

The black, powdery coating develops on leaves and twigs during the cool, moist weather of late winter and early spring and fall.

There are several fungi or molds that grow in the sugary dew left on plants by insects such as aphids, scale, white flies, and others that suck sap from plants. This honey dew or sugary substance may occur on low shrubs where insects are not feeding but where the material falls from larger shrubs or overhanging limbs of trees.

## Junipers resistant to phomopsis and twig blight

<i>Juniperus chinensis</i>	
cv.	Femina*
	Iowa
	Keteleeri*
	Pfitzeriana Aurea
	Robusta
var.	sargentii
cv.	sargentii, cv. Glauca
	Shoosmith
<i>Juniper horizontalis</i>	
cv.	Depressa
cv.	Depressa Aurea
	Procumbens
<i>Juniper scopulorum</i>	
cv.	Silver King
<i>Juniper virginiana</i>	
cv.	Tripartita*
<i>Juniperus communis</i>	
cv.	Ashfordii
	Aureo-spica*
var.	depressa*
cv.	Hulkjaerhus
	Prostrata Aurea
	Repanda
var.	saxatilis
cv.	Suecica*
<i>Juniper sabina</i>	
cv.	Broadmoor
	Knap Hill
	Skandia
<i>Juniper squamata</i>	
cv.	Campbellii
var.	Fargesii*
cv.	Prostrata
	Pumila

\*Also reported resistant to cedar-apple rust.

The fungi that cause sooty mold do not attack the plants directly but derive their nutrients directly from the honey dew itself. These fungi will also grow on honey dew on walls, sidewalks, fences, automobiles, or anything where honey dew is present.

Control of sooty mold is indirectly achieved by controlling the insects that produce this sugary material. Once sooty mold has been established it is not easy to remove.

The best method is to soak affected plants in a water and detergent mixture by using one tablespoon of household liquid detergent per gallon of water and spraying on these plants. Wait for a few minutes and then wash the material off with a strong stream of water.

You may have to repeat the procedure several times. However, once completed, control of the insects should begin.

## Holly

In the South, holly is subject to attack

by only a few disease-causing organisms. Many times poor appearance of plants is often caused by improper planting, dry weather, cold weather, and planting varieties that are not adapted to the area.

The amount of damage from disease on hollies can be minimized by giving plants ample growing space and pruning out all diseased twigs and branches as they appear.

**Tar Spot:** Yellow spots appear on the leaves of American and English hollies late in the spring. These later turn reddish-brown and finally, by fall, a dark black color.

If at all possible, all diseased leaves should be burned. Make several applications of a broad-spectrum fungicide such as Maneb, Ferbam, or a copper fungicide.

**Die-Back and Canker:** There are several fungi that cause die-back and canker of holly. These are usually noted as sunken areas on the twigs and stems that cause varying degrees of die-back of young twigs.

Prune and destroy all diseased twigs and begin a spray program with a broad-spectrum fungicide such as Maneb or copper fungicide. Repeat at weekly intervals until all new growth is established.

## Junipers

**Twig Blight:** Juniper twig blight, also known as Phomopsis blight, infects several species of juniper and arbovitae growing in the southeast.

Early disease symptoms consist of yellowing and dying of the scale leaves, especially the tips. This is followed by a progressive die back of the new growth. Small black lesions are formed on the stems and cankers may form on the woody stems especially near a side branch.

In the southeast, twig blight spreads rapidly during periods of rainy, humid weather in the spring and fall. During dry weather, prune as much of the infected branches as possible and destroy.

Research has shown some varieties are more tolerant to twig blight than others.

Protective fungicides should be used frequently to protect new foliage. In most cases applications can be limited to periods in which flushes of new growth occur.

Fungicides shown to be effective in controlling twig blight are copper fungicides (such as copper sulphate), benomyl (Benlate), or Zyban. A spreader sticker should be added to

the spray for best results.

**Cedar-Apple Rust:** In areas where apples and red cedar grow together, the cedars may become covered with hundreds of galls an inch or more in diameter.

Infection occurs on the leaves which stimulates the development of the gall. The second spring after infection, the galls form numerous, long, yellow, tongue-like outgrowths during warm, rainy weather.

The spores from these galls are spread by wind to leaves of nearby apples which may become seriously diseased and fall prematurely. The damage to red cedar is usually not serious.

## Photinia

**Photinia Leaf Spot:** The major problem on photinia (red top) grown in the south is *Entomosporium* leaf spot. The fungus attacks old growth as well as new succulent tissue. The spots occur on both lower and upper surfaces of the leaf and are usually surrounded by a purple to red margin. As they mature these lesions will have a gray center.

Once the disease is well established, it is sometimes very difficult to control. For successful control, a good spray program, along with sanitation and pruning, must be carried out.

Diseased plants should be pruned in the spring just before they put on new growth. Prune out as much of the diseased areas as possible. Remove and burn any fallen leaves beneath the plant that may contain disease.

As the leaves begin to unfold, start the spray program and continue on a 10- to 14-day schedule throughout the early part of the growing season.

Effective fungicides against this disease include Maneb, Funginex, Zineb, or copper fungicides.

## Roses

Many different disease agents affect roses in the southeast. To adequately control these diseases the landscaper or grower must recognize these diseases and be able to control either by variety selection, sanitation, or chemical control.

**Black Spot:** As the name implies, the disease's most prominent symptoms are black spots on either side of the leaves. A number of other diseases cause dark spots on the leaves but you can distinguish black spot by the darker color and the fringed borders of the spots.

There is usually a great deal of yellowing and chlorosis associated with the disease. Black spot causes premature leaf drop and may result in severe defoliation. The black spot fungus may weaken plants and make them more susceptible to other disorders.

Although rose varieties may vary in their susceptibility to the fungus, no variety is completely immune. Hybrid teas are generally more susceptible than other varieties.

The first step toward controlling black spot is sanitation. If only a few leaves show symptoms these should be removed and destroyed. Since the fungus overwinters in leaves and canes, remove all diseased leaves from around the plants at the end of the growing season.

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*If severe pruning does not eradicate the virus, it is best to remove the plant. The virus may be transmitted either by pruning instruments or by insects.*

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Before new leaves appear in the spring remove and burn old mulch and replace with fresh mulch.

A regular spray program throughout the growing season is usually necessary for control. You may want to use one of several fungicides including Maneb, Moncozeb, benomyl, chlorothalonil, funginex, or Zyban.

All give acceptable control of black spot if applied on weekly intervals during the spring and at two-week intervals during the dry part of the summer.

Once plants become severely infected, the fungicides are of little value other than keeping the disease from spreading. Therefore, regular spraying and thorough coverage are important.

**Die-Back and Stem Canker:** Die-back and stem canker are really a complex of diseases since they are caused by several different types of fungi. However, identifying these diseases is not of great importance since the control is very much the same for all.

The die-back phase of the disease appears as a black sunken lesion that causes death of the terminals of the cane. Die-back normally gets established through wounds.

When pruning be sure to dip all pruning tools in a 70 percent solution of denatured alcohol or household liquid bleach diluted one part bleach to four parts water.

The fungicides effective in controlling black spot will also control die-back and canker.

**Powdery Mildew:** A white powdery fungus growth on the surface of leaves, buds, or stems or roses usually indicates powdery mildew. Infection on young leaves may cause curling and sometimes a purple discoloration.

Badly infected flower buds do not open properly. Most sanitation procedures for the control of other rose diseases are also valuable in controlling powdery mildew.

When the disease is a problem, spray dormant plants with commercial lime sulfur (1:15).

During the growing season you can hold powdery mildew in check by spraying with benomyl, cycloheximide (Acti-dione), or wettable sulfur. Be sure to add a spreader sticker and follow label directions closely.

**Viruses:** There are several virus diseases that attack roses in the south. The symptom expressed will depend on the type of virus present.

Some of the mosaic viruses will cause pale to bright yellow spots on the leaves. Occasionally, ring spots will occur or some type of light yellow zig-zag pattern across the leaf. Also, the mosaics will result in a puckering of the younger leaves.

Some of the streak viruses will produce a brown to reddish ring pattern in the leaves. Brown or green rings may also occur on some of the canes.

Generally speaking, the viruses cause little loss of plant vigor. Nor does it affect flower production. The major problem is with discoloration and deformity of the foliage.

Occasionally symptoms may be masked during hot weather. Infected roses should not be used for budding or grafting. Propagators can use heat treatment of root stock to rid the plants of most viruses.

If virus symptoms do occur on established plants, severe pruning may eradicate the virus. If this is not successful, it is best to remove the plant since the virus may be transmitted to healthy plants either by pruning instruments or by insects. **WT&T**

## TACTICALLY SPEAKING...

by C.C. Powell, professor of plant pathology, Ohio State University

**P**athogenic organisms such as fungi or bacteria commonly attack and infect stressed plants that may already show symptoms of a non-infectious disease condition.

When the pathogen is present, the health imbalance and stress of infectious disease are added to that of the previously existing non-infectious disease. There are disease organisms that are so pathogenic that they will vigorously attack even growing and reasonably healthy plants.

Nevertheless, stress management can promote the management of infectious as well as non-infectious dis-

ease problems. This is why pathologists often emphasize "disease."

Control or prevention tactics that are truly "holistic" plant health management concepts fall into three integrated areas: selection tactics, cultural or care tactics, and pesticide use tactics.

### Control or prevention tactics (plant selection):

Using resistant varieties is an important disease management tactic in much of agriculture.

Plant selection tactics are a phase of plant health management that have

been difficult to successfully implement. New plants or cultivars are constantly being developed. They are bred or selected because of beauty or other growth characteristics over and above those relating to disease.

When considering a plant's future healthfulness, you should consider its known susceptibilities to particular pests and diseases, and its known tolerance or ability to handle environmental imbalances.

For instance, a new crabapple susceptible to scab would not be a wise choice. In the same way, a crabapple with scab resistance but questionable tolerance of dry sites would be an equally poor choice.

The plant lists in Table 1 illustrate the use of plant selection to prevent plant disease.

**TABLE 1**  
**Ornamental Plants Resistant to Some Common Diseases<sup>1</sup>**

### I. FLOWERING CRABAPPLES:

The following cultivars are moderately to highly resistant to powdery mildew, scab, fireblight and rust:

Bob White	Ormiston Roy
Centurian	Red Baron
Coralburst	Red Jade
Donald	Sargent
Donald Wyman	Sentinel
Inglis	Tina
M. halliana 'Parkmanii'	White Angel
M. hupenhensis 'Tea'	White Cascade
Molten Lava	

### II. JUNIPERS:

The following varieties are believed to be at least moderately resistant to twig blight and to rust:

J. chinensis 'Hetzii'	J. horizontalis 'Wiltonii'
J. chinensis 'Keteleeri'	J. procumbens
J. communis	J. squamata 'Meyeri'
J. horizontalis 'Douglasii'	J. virginiana 'Tripartita'
J. horizontalis 'Plumosa'	

### III. TREES:

The following types are resistant to Verticillium wilt disease:

Ceridophyllum sp.-katsura	Malus spp.-flowering crabapples
Carpinus spp.-hornbeams	Morus sp.-mulberry
Crataegus spp.-hawthorns	Plantanus spp.-plant trees
Ginkgo biloba-ginkgo	Quercus spp.-oaks
Gleditsia sp.-honey locusts	Salix spp.-willows
Liquidambar sp.-sweetgum	Sorbus aucuparia-European mountain ash

### Control or prevention tactics (cultural activities):

Cultural activities to modify environments may be the most important ways to manage plant health.

For example the most common reason for poor urban landscape plant health may be bad root-soil environments. Many soil environments, for many reasons, are not able to support the continued growth and functioning of healthy roots. Compacted soils, poor aeration, and nutrient or pH imbalances are stresses often encountered.

The integrated cultural tactics used to correct poor root health are increasing the root-shoot ratio (usually done by pruning back shoots), extensive irrigation and fertilization programs, and/or a restructuring of the root environment.

Restructuring the root environment recently has been emphasized throughout the country, especially where soils tend to be heavy and poorly drained.

Such root environmental improvement has been called *vertical mulching* or *core aeration*.

Vertical mulching may be the most effective root stress management tool practiced. Drilling holes into the soil, around fibrous root growth areas of trees and shrubs, can correct several imbalances and thus is applicable in a variety of situations.

<sup>1</sup>These lists are not complete. They are intended as guides to assist in plant selection decisions. In some instances, listed plants are susceptible to other disease, insect or environmental problems. Thus, it may not be wise to plant them even though they are resistant to a specific common disease.

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TABLE 2

**Some common diseases of woody ornamentals and fungicides that can be used for control<sup>1</sup>**

HOST	DISEASE	FUNGICIDES
Azalea	Blight and dieback	Dithane M-45, FORE, Kocide 101, Zyban, Duosan
Crabapple	Scab	Benlate, Tersan 1991, Daconil 2787, Dithane M-45, FORE, Phaltan, Zyban, Duosan
Dogwood	Leaf Spot	Benlate, Tersan 1991, Daconil 2787, Dithane M-45, FORE, Zyban, Duosan
Hawthorne	Leaf spot	Benlate, Tersan 1991, Daconil 2787, Dithane M-45, FORE, Zyban, Duosan
Juniper	Tip blight	Benlate, Tersan 1991, Dithane M-45, FORE, Zyban, Duosan
Hawthorne	Rust	Bayleton, Daconil 2787, Dithane M-45, FORE, Zyban, Duosan
Lilac	Powdery mildew	Benlate, Tersan 1991, Bayleton, Karathane, Triforine, Zyban, Duosan
Maple	Leaf spot	Dithane M-45, FORE
Pachysandra	Blight	Kocide 101, Dithane M-45, FORE, Zyban, Duosan
Pine	Tip blight	Benlate, Tersan 1991
Pyracantha	Scab	Benlate, Tersan 1991, Daconil 2787, Kocide 101, Zyban, Duosan
Roses	Black spot	Benlate, Tersan 1991, Captan, Daconil 2787, Kocide 101, Dithane M-45, FORE, Phaltan, Triforine, Zyban, Duosan, Manzate 200

<sup>1</sup>This list is presented for information only. No endorsement is intended for products mentioned, nor is criticism meant for products not mentioned. Registration data derived from labels and from the National Pesticide Information Retrieval Service. Before using any pesticide, read and follow all label directions.

Vertical mulching can improve aeration, improve drainage of excess water, improve penetration of water into dry soils, and provide places for roots to grow and proliferate.

### Control or prevention tactics (using pesticides):

Last in integrated control or prevention tactics are those involving pesticides. Remember that pesticides only are effective when pests or infectious diseases are truly the cause of the problem. Table 2 gives some chemicals that are used against common ornamentals diseases.

Pesticides are only effective if several rules are followed.

First, the correct material must be selected. This depends on correct diagnosis and identification of the pathogen or pest.

Second, the chemical must be applied at the proper time of year and frequently enough to protect plant material adequately.

Third, pesticides must be applied properly over plant surfaces.

The rules depend on your making correct decisions based on correct knowledge.

The following chemicals are commonly used for control of diseases of trees and ornamentals:

#### Benomyl (Benlate, Tersan 1991)

This systemic fungicide is effective against apple scab, powdery mildews, botrytis, anthracnose, and other leaf-spots commonly seen on landscape plants. A good spreader-sticker is necessary for best results from sprays.

#### Bordeaux Mixture (Bordo-Mix)

This older copper-based fungicide controls a broad range of activity. It is labeled for control of many leaf spots and blights on all ornamentals. Use of Bordeaux mixture leaves a residue and may be phytotoxic to some crops.

#### Captan (Orthocide)

This broad-spectrum fungicide has limited registrations for use on ornamentals. It is effective on certain foliar

diseases.

#### Chlorothalonil (Daconil 2787)

Daconil 2787 is quite good for control of leaf spotting fungi on ornamentals. It is commonly sold as a flowable formulation.

#### Cupric hydroxide (Kocide 101, Kocide 404)

These are "fixed copper" fungicides, quite safe to users but potentially damaging to plants. They have a wide range of activity against many leaf spots and blights.

#### Cycloheximide (Actidione-PM)

This antibiotic material is effective for powdery mildew and rusts but may cause plant injury, especially spotting of new foliage on roses.

#### Dodemorph (Milban)

This EC fungicide is currently registered for powdery mildew control on a few ornamentals. Make sure to wear eye protection when using this restricted-use material. Do not mix Milban with other chemicals in the spray tank.

#### Fenarimol (Rubigan)

Fenarimol is a locally-systemic fungicide for the prevention or therapeutic control of powdery mildew in commercially-grown field or greenhouse roses, and in a few other field-grown ornamental crops. A 12.5 percent emulsifiable concentrate, it can be tank mixed with properly labeled wettable powder fungicides when needed. To avoid growth effects (phytotoxicity), use the lower end of dosage ranges given on the label whenever possible. Lower dosages are also recommended under cool, foggy, or overcast conditions.

#### Ferbam

This broad-spectrum carbamate fungicide, registered for control of several leaf spots, rusts and blights, is somewhat difficult to wet. The black color may leave a conspicuous residue, especially on flowers.

#### Folpet (Phaltan)

Folpet, a close relative of Captan, provides good control of certain leaf spots on ornamentals.

#### Iprodione (Chipco 26019)

Many ornamentals can be sprayed with this 50 percent WP fungicide for control of botrytis blights and a few other diseases.

#### Mancozeb (FORE, Dithane M-45, Manzate 200)

This is a coordination product of maneb fungicide and a zinc salt, registered for the control of leaf spots and blights. The product is a broad-spectrum material but does leave a heavy

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# DISEASE CONTROL GUIDE

residue. The label on the wettable powder mancozeb sold as FORE and Dithane M-45 has recently been expanded to include many common diseases of trees and shrubs.

## Streptomycin (Agrimycin, Agri-strep)

This antibiotic is effective for control of some bacterial plant pathogens. Because of the diversity of bacterial diseases, check the label for specific uses. The product may cause plant damage.

## Thiophanate-ethyl (3336-F)

As the trade name indicates, this is a 4-pound per gallon flowable product. Similar in mode of action to benomyl, it is labeled as a foliar spray for anthracnose, botrytis, and a few other diseases of ornamentals.

## Thiophanate-m plus mancozeb (Zyban, Duosan)

This broad-spectrum, systemic-contact fungicide consists of a 15 percent WP thiophanate-methyl, 60 percent WP mancozeb mixture. It is labeled for professional use only on many herbaceous and woody ornamentals in greenhouses or fields. A good spreader-sticker is recommended for use on

hard-to-wet foliage. You may not want to use the product on French Marigold or Gloxinia.

## Triadimefon (Bayleton)

This systemic fungicide is quite effective for its labeled uses, primarily involving powdery mildew and rust diseases. Labeled directions must be followed closely. Overdoses of Bayleton will stunt plants and darken foliage.

## Triforine (Funginex)

This EC fungicide wets foliage well without the need for additional spreader-sticker. This may be a key to its effectiveness but you should avoid excessive runoff while spraying. Eye protection is needed when using the material.

## Vinclozolin (Ornalin)

This 50 percent WP fungicide is effective for control of Botrytis spp. and Sclerotinia spp. on ornamental herbaceous, woody, and bulb crop. Similar in action to iprodione fungicide, it is said not to leave as noticeable a residue. It is labeled for professional use only.

## Zineb (Dithane Z-78)

For leaf spots, rusts, and blights,

use this product a a foliar spray. It should be reapplied every seven days until the disease is under control.

## The application

Scheduling fungicide sprays into routine management programs is a difficult subject which has been approached in many different ways by many different practitioners.

Generally, most combine two fungicides to get the broad spectrum of disease control needed when trying to service diversely-planted landscape accounts.

Over the years, many landscapers have found that a combination of mancozeb fungicide plus a fixed copper fungicide has given good results.

This is especially important where control of bacterial fire blight is needed because of close spacings of large blocks of susceptible plants (such as crabapples, cotoneasters, or pyracantha). Generally, these bacterial diseases are not successfully controlled with sprays because of the need to spray frequently throughout the rainy periods of the growing season.

Many landscapers, on the other hand, have gained from a combination of mancozeb plus benomyl. The combination provides long lasting, broad-spectrum control of most common ornamental plant diseases.

The new product Zyban is a combination very similar in mode of action to mancozeb plus benomyl.

Both Bayleton and Daconil 2787 are effective products that are probably best used alone.

Many landscapers and nurserymen are alternating one of the above combinations with either Daconil 2787 or Bayleton, applying sprays monthly or bi-weekly depending on prevalence of rainy weather.

## Not much change

Whereas you may think that the world of fungicides has changed in recent years, you must realize that the basic approaches and the usefulness of chemicals in the landscape to control infectious diseases has remained essentially the same.

Preventive spray programs with proper intervals between applications are the secrets to successful disease management.

Obtain labels of the new products, study them, and see how they will fit into your disease management program.

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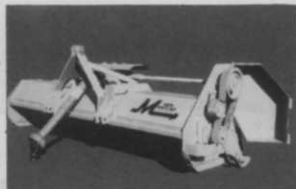
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