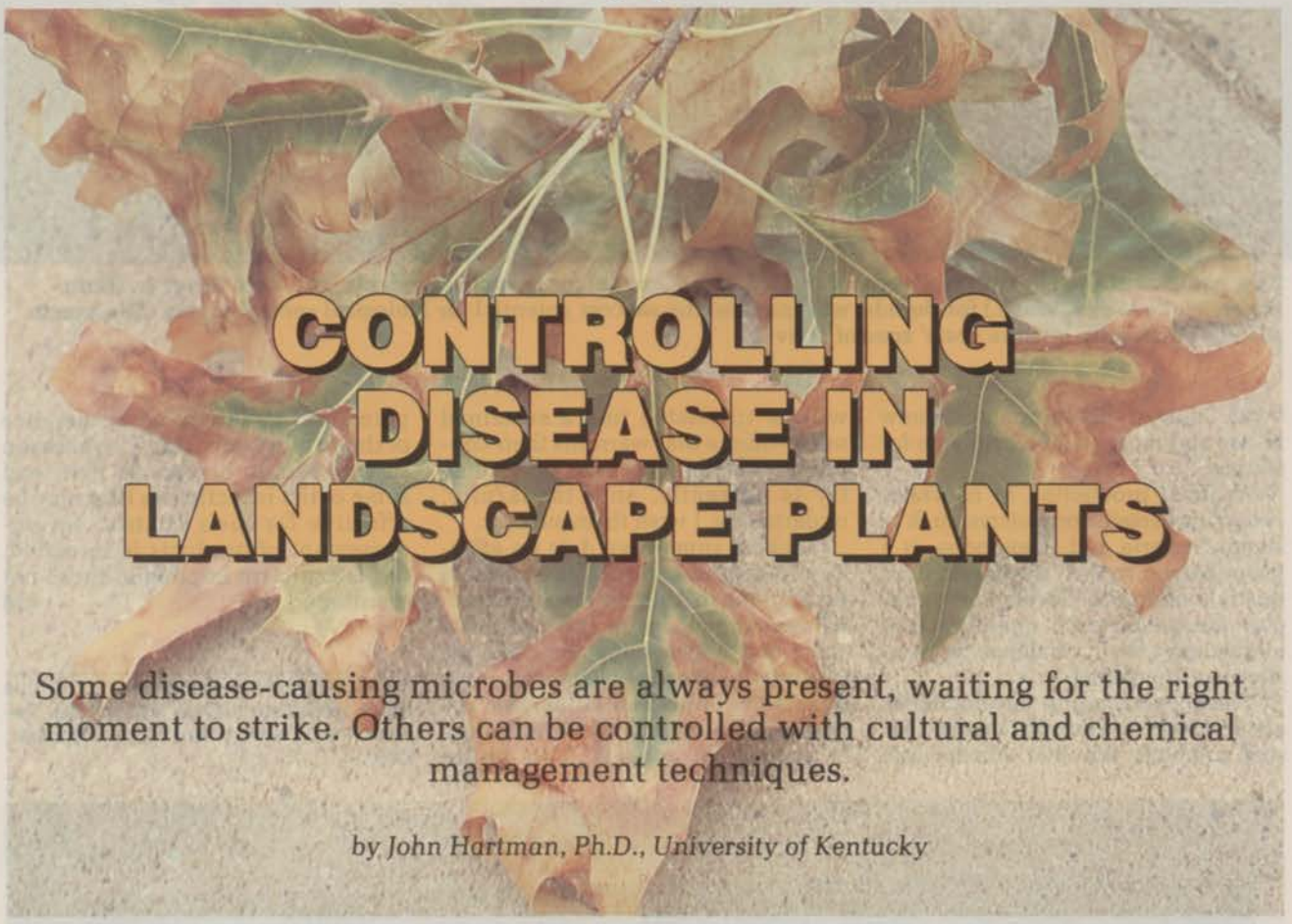

# CONTROLLING DISEASE IN LANDSCAPE PLANTS

Some disease-causing microbes are always present, waiting for the right moment to strike. Others can be controlled with cultural and chemical management techniques.

*by John Hartman, Ph.D., University of Kentucky*

Landscape plants represent a substantial investment in the aesthetic appearance of the home and commercial landcape. Plant diseases can severely affect the survival or aesthetic value of these plants. Landscape managers are acutely aware that preventive maintenance to control diseases of costly plantings is preferable to affording the cost of replacements.

## Invisible culprits

The causes of landcape plant diseases are often misunderstood. This is because they may be caused by microbes that are not easily seen, and because the diseases result from complex interactions between the landscape plants, the disease-causing pathogens, and the environment affecting the interactions.

Landscape managers need to be aware of several important concepts regarding plant diseases:

- Landscape plants differ in their disease susceptibility or resistance. Furthermore, susceptibility of these plants to disease can be altered by the growing conditions.
- Many pathogens such as fungi and bacteria, are living microbes, and cause infections and disease. However, some "diseases," such as iron deficiency, dieback, and decline are caused by adverse growing conditions. Disease-causing microbes often exist unseen in a dormant form, waiting for the right conditions to occur before beginning an infection. Some microbes that cause disease are almost always present, no matter how the landscape is managed, while others can be kept out of the landscape by intelligent management.
- Management of the landscape environment can have a profound effect on whether or not a disease will occur, and how damaging it will be. In general, rainy, foggy weather and poor drying conditions favor foliar diseases, and wet soils favor most root decay diseases. Almost any change in the way the landscape is managed will alter the disease situation, sometimes for benefit, and sometimes for harm.

## Biological and cultural control

There are many reasons why biological and cultural practices are preferred for landscape disease management. Reduced uses of chemical pesticides have evident environmental, worker safety, and public health value. Landscape diversity lends itself to custom tailoring of site specific disease control methods, which often favors biological and cultural techniques. Some cultural practices provide broad-spectrum disease management.

Landscape managers need to be aware of new plant disease outbreaks or changes in patterns of old diseases to effectively oversee the health of plantings. The following section describes a few diseases of woody plants that should be of concern to landscape managers.

## Pine tip blight

Severe branch dieback of pines in

## BIOLOGICAL AND CULTURAL CONTROLS FOR LANDSCAPE PLANT DISEASES

| DISEASE MANAGEMENT PRACTICE | DISEASES OR PATHOGENS AFFECTED |
|---|---|
| **Altering plant susceptibility** | |
| Use disease resistant cultivars and species. This biological control act is the safest and most effective way to control diseases. Many nurseries provide disease resistance information for their cultivars. | Resistant cultivars can be used for: juniper tip blight; flowering crababble scab, fire blight, cedar-apple rust, powdery mildew; horsechestnut leaf blotch; Dutch elm disease, and hawthorn rust. Examples of diseases controlled using resistant species: Verticillium wilt and crown gall. |
| Fertilize based on soil tests. Avoid excess nitrogen which promotes rapid growth and increased susceptibility. | Fire blight of flowering crabapple and pear, cotoneaster, and pyracantha; powdery mildews. |
| Dip roots of roseaceous plants, euonymous, and other susceptible plants in Galltrol-A or Norbac-84 (a suspension of *Agrobacterium radiobacter*) before planting. | This biological control for crown gall, used in nurseries, could be practical where large numbers of these plants are to be used in the landscape. |
| Keep trees and shrubs well watered, use mulch around the base of plants. | Dogwood anthracnose, shade tree declines. |
| Aerify compacted soil throughout the root zone, avoid salt applications, avoid construction injuries to roots. | Shade tree declines. |
| Avoid unnecessary injury to stems, trunks, and branches. | Dogwood anthracnose, wood decays, various canker diseases. |
| Protect plants from winter injury. | Boxwood canker, leaf spot. |
| **Modifying the landscape environment** | |
| Select well-drained planting sites. Because of the threat of root and crown rots, sites in which water tends to remain standing are not suited for most landscape plantings. | Phytophthora crown and root rot of azalea, rhododendron, and dogwood. |
| Select unshaded sites with good air movement for establishment of new plantings. Increase plant spacing and thin tree and shrub canopies to improve air movement and drying. Irrigate early in the day, and avoid the use of overhead irrigation. Control large weeds and nearby vegetation to speed foliage drying. | Rose black spot, flowering crabapple scab, dogwood anthracnose, powdery mildew of various plants. |

Source: Dr. Hartman

some landscapes is a symptom of diplodia tip blight, or pine tip blight. This is caused by the fungus *Sphaeropsis sapinae*. Austrian pines of cone bearing age are especially hard hit. Although the disease is normally more severe on stressed trees in the landscape, it has been very destructive to trees that seem to be growing in relatively good sites. Landscapers need to reconsider the uses being made of pines susceptible to tip blight.

Symptoms that characterize the disease include:

- stunted, straw-colored shoots with partly grown needles;
- crystallized, white resin on the infected shoot and on foliage below;
- tiny, black pycnidia (fungal fruiting bodies) on the base of dead needles;
- killed cones, showing abundant pycnidia on the scales; and
- individual dead lower branches.

Annual infections of buds, succulent candles, and immature needles occur in spring. These annual infections, which destroy the buds and shoots, cause a gradual decline of pines in the landscape. Austrian pine is very susceptible, however, mugo and Scots pine are also susceptible. White pine is much less susceptible and tip blight normally does little damage to it.

Prune out all infected twigs and branches before spring. Prune out all cones, even those on green, healthy branches, because they are an important source of fungal inoculum. If spraying is needed, use benomyl, Bordeaux mixture, or fixed copper fungicides. Timing of the three sprays is very important. Spraying should be done at bud break, as candles are beginning to elongate, and as needles are emerging from needle sheaths.

Use a spreader sticker to enhance fungicide retention on the foliage. Consider using better-adapted pines when replanting.

### Bacterial leaf scorch

Bacterial leaf scorch of landscape trees, caused by *Xylella fastidiosa*, has been a problem for oak, maple, sycamore, mulberry and elm trees in the Atlantic and Gulf coast states from New York to Texas. Recent reports suggest that the disease has now made inroads into the Midwest, affecting pin and red oaks.

Symptoms typical of bacterial leaf scorch include premature leaf browning and defoliation, and leaf marginal

**Diplodia tip blight is advanced on this Austrian pine. If spraying is needed, use benomyl, Bordeaux mixture or fixed copper fungicides.**

necrosis. These symptoms appear in late summer or early fall, and are associated with development of the pathogen, xylem inhabiting bacteria.

The disease is difficult to diagnose, and can be mistaken for other causes or water shortage. New diagnostic techniques, such as serological assays (ELISA test), special culture procedures, and electron microscopic observation are needed to detect and diagnose the disease.

In most cases, the disease progresses slowly, and infected trees decline gradually, giving the landscape manager time to begin growing replacements.

In addition, the disease, although spread by leafhopper insects, does not seem to spread rapidly from one tree to another. Recently, however, more rapid decline and death of sycamores from scorch is being reported.

Bacterial leaf scorch is difficult to control. Symptom remission in some trees will occur following injection with an antibiotic, but the remission is only temporary. For now, until new

## BIOLOGICAL AND CULTURAL CONTROLS FOR LANDSCAPE PLANT DISEASES

| DISEASE MANAGEMENT PRACTICE | DISEASES OR PATHOGENS AFFECTED |
|---|---|
| **Reducing the available pathogen** | |
| Before planting, insist on clean stock. Use disease-free plants from a reputable nusery. | Crown gall, Phytophthora root rot, dogwood anthracnose. |
| Avoid using planting sites that might be contaminated with pathogens and avoid adding contaminated compost or soil to the landscape. | Crown gall bacteria, nematodes, soil-borne fungi such as *Verticillium*, *Phytophthora*, and *Thielaviopsis*. |
| When replanting, avoid setting new trees and shrubs in the same spot where the previously sick or dead plant once grew. | Crown gall, Verticillium wilt, black root rot, Phytophthora root rot, root knot nematode. |
| Prevent movement of equipment, water, or people that might carry soil contaminated with disease-causing fungi, bacteria, or nematodes. Remember that irrigation water can carry pathogens. | Crown gall, Verticillium wilt, black root rot, Phytophthora root rot, root knot nematode. |
| Rogue out and destroy dead and dying plants. | Dutch elm disease, oak wilt, pine wilt nematode, Verticillium wilt of various plants. |
| Remove and destroy alternate host plants which may harbor the pathogen. | Cedar-hawthorn, cedar-quince, cedar-apple rust, pine needle rust, eastern gall rust. |
| Prune out and destroy all dead twigs and branches from trees and shrubs and remove fallen branches from the landscape. Prune diseased branches only when the foliage is dry, and if possible, during the dormant season. | Dogwood anthracnose, pine tip blight, juniper tip blight, fire blight of roseaceous plants, black knot, various twig and branch cankers. Therapeutic pruning for Dutch elm disease. |
| Cut roots between adjacent plants to stop root graft disease spread. | Dutch elm disease, elm yellows. |
| Rake up and destroy infected fallen leaves in autumn. | Maple anthracnose. |

Source: Dr. Hartman

# SOME CHEMICALS USED TO CONTROL DISEASES IN THE LANDSCAPE

| CHEMICAL/TRADE NAME | USES AND REMARKS |
|---|---|
| benomyl/Benlate | Fungicide with some systemic properties; effective against many diseases. Tolerant strains of gray mold, rose powdery mildew, and apple scab fungi now exist. Alternate or tank mix with other fungicides. |
| bordeaux mixture, fixed copper | General protectant fungicide for leaf spots and blights. Available in many formulations. Be cautious of possible phytotoxicity. |
| captan | General protectant fungicide for leaf spots. |
| chlorothalonil/Daconil 2787 | Broad spectrum protectant foliar fungicide used for flower blights, anthracnoses, leaf spots and blights, and needle casts. |
| copper sulphate pentahydrate/ Phyton 27 | Systemic fungicide and bactericide for Dutch elm disease and oak wilt control via trunk injection and several leaf spots and blights via foliar sprays. |
| ethoprop/Mocap | Nematicide for pre-and postplanting applications. |
| fenarimol/Rubigan | Locally systemic folear fungicide for black spot, rusts, powdery mildews, and scab. |
| ferbam | General protectant fungicide. Available in several formulations. May leave a black spray deposit on plant materials. |
| fosetyl-Al/Aliette | Systemic fungicide for Phytophthora root rot control. |
| iprodione/Chipco 26019 | Broad spectrum locally systemic fungicide for Botrytis blight, and leaf spots. |
| mancozeb, maneb | General foliar disease protectant fungicide. Available in several formulations. |
| MBC phosphate/Correx, Lignisan Fungisol, others | Soluble systemic fungicide injected into tree trunks for Dutch elm disease control. |
| metalaxyl/Subdue | Systemic soil drench fungicide for Phytophthora disease control. |
| methyl bromide | General soil fumigant; usually combined with chloropicrin. |
| methyl isothiocyanate + chlorinated hydrocarbons/Vorlex | General soil fumigant. |
| propiconazol/Banner | Systemic fungicide with eradicant properties. Used for apple scab, leaf spots, blights, powdery mildews, and rusts. |
| streptomycin | Antibiotic effective against bacterial diseases such as fire blight. Available in several formulations. |
| sodium methyldithio-carbamate/ Vapam, Busan | General soil fumigant; also used to prevent root graft transmission of Dutch elm disease. |
| sulfur | Powdery mildew fungicide. |
| thiabendazole/Arbotect | Systemic fungicide injected into tree trunks for anthracnose and Dutch elm disease control. |
| thiophanate-methyl/Topsin-M | Systemic foliar fungicide having properties similar to benomyl. |
| thiophanate-methyl + mancozeb/Zyban | Broad spectrum foliar systemic and protectant fungicide combination. |
| thiram | Foliar protectant fungicide. Many formulations available. |
| thiadimefon/Bayleton | Systemic foliar fungicide for rusts, powdery mildews, and some flower and leaf blights. |
| triforine/Funginex | Systemic fungicide for powdery mildews, black spot, and rusts. |
| vinclozolin/Ornalin | Protectant fungicide for Botrytis disease control. |
| zineb | General protectant fungicide. Several formulations available. |

Source: Dr. Hartman

## GENERAL CHEMICAL CONTROL ADVICE FOR LANDSCAPE PLANTINGS

| CONTROL PRACTICE | DISEASES OR PATHOGENS AFFECTED |
|---|---|
| Inspect the landscape regularly to detect disease outbreaks. Effective use of fungicides on an "as needed" basis requires close monitoring. | Any disease not being controlled with a regular spray schedule. |
| Be most attentive to early fungicide applications. For many diseases, the fugicides applied from bud break until full leaf which reduce primary inoculum are more important than fungicides applied in full leaf. | Sycamore, ash, and maple anthracnose, pine tip blight, dogwood anthracnose, flowering crabapple scab, many fungal leaf spots. |
| Diseases are traditionally controlled using protectant fungicides, however landscape managers need to know the capabilities of the new eradicant fungicides for destroying infections that have just begun. | Rose black spot, flowering crabapple scab, rust diseases of various plants, powdery mildew of various plants, Phytophthora root rot of various plants. |
| Use forecasting systems, if possible, so protectant sprays can be applied prior to infections, and eradicants before infections have gotten out of control. Monitor the weather and determine when infections have occurred or are likely to occur. | A good forecasting system has been developed for apple scab disease control. Remember that leaf moisture provides conditions favorable for many foliar diseases. Be prepared to spray more in rainy seasons, less in dry seasons. |
| Disinfect tools regularly when pruning to control disease. | Fire blight, Dutch elm disease. |
| Control insect vectors that carry disease-causing fungi, bacteria, nematodes, and viruses. | Pine wilt nematode, Dutch elm disease, and bacterial leaf scorch of trees. |
| Treat cankers with a soil-water paste. | Chestnut blight. |

Source: Dr. Hartman

controls are developed, we just simply have to live with the disease.

### The underground disease

Black root rot infects roots of many landscape plants, the most valuable being Japanese holly, blue holly, inkberry, yaupon holly, and American holly. Other ornamentals known to be susceptible include begonia, cyclamen, geranium, gloxinia, oxalis, phlox, poinsettia, sweet pea, verbena, and viola.

The first symptoms of black root rot include yellowing and marginal scorch of the foliage. Later, twigs or stems may die back and eventually the entire plant may die. The root system of the declining plant is stunted and decayed. Black lesions on the infected roots contrast sharply with the adjacent healthy white portions. Lesions may appear on the tips of feeder roots or elsewhere along the root. Symptoms on infected plants can sometimes be suppressed when plants are growing under high maintenance (plenty of fertilizer and water) regimes.

Black root rot is caused by *Chalara elegans* (formerly *Thielaviopsis basicola*). This fungus can persist indefinitely in the soil or it can survive as a saprophyte on plant debris.

- Plant only disease-free plants in the landscape. If new plants show blackened roots, the presence of *C. elegans* can be confirmed through microscopic examination or laboratory assay.
- Avoid planting susceptible plants in soils known to be infested with the fungus. Be aware that infected annual flowers grown in a bed the previous season can leave enough inoculum to infect new flowers or hollies.
- Badly-infected plants should be removed and the site replanted with a non-suseceptible host.
- There are no effective fungicide drenches available for controlling black root rot in the landscape.
- Good cultural practices may enable some plants to continue to grow in spite of the disease. Plants in the early stages of infection should be well-fertilized and watered.

### Dogwood anthracnose threat

Dogwood anthracnose, also called lower branch dieback, is caused by a species of the fungus *Discula*. This disease has received a great deal of publicity during recent years. It affected landscape and forest flowering dogwoods in the Northeast for many years (simultaneously infecting Pacific dogwoods in the Northeast.) Recently, the disease moved rapidly through the mid-Atlantic states to the Southern Appalachian region. There is some concern that it could move into the mid-South and Midwest.

Dogwood anthracnose causes purple-bordered leaf spots which coalesce to form tan blotches. The fungus infects twigs and branches, causing stem cankers, and can eventually move to the trunk. Eventually, infected trees may decline and die.

Maintain good growing conditions by watering, mulching, and avoiding unnecessary injury. Prune out diseased twigs and branches and trunk sprouts. Purchase plants only from a reputable nursery. Never transplant dogwood trees from the wild. Fungicides such as chlorothalonil may help to protect trees from infection.

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