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FUNGAL LEAF SPOT DISEASES OF SHADE AND ORNAMENTAL TREES IN THE MIDWEST

All shade trees are attacked by one or more fungi that cause scattered, rather definite, round to oval, angular, or irregularly shaped spots on the leaves (Figure 1). These spots usually become conspicuous from late June through August. Leaf spots are the most common diseases of shade and ornamental trees. Most of these diseases are favored by cool weather, light and frequent rains, fog or heavy dews, high humidity, and crowded or shady plantings.

Figure 1. Phyllosticta Leaf Spot on silver maple. Note symptoms as described in Table 1 (courtesy Donald G. White, U of IL).

A few spots on the leaves do little harm to a tree and are far more unsightly than they are injurious. However, leaf spot infections that start early in the growing season can lead to premature defoliation. If it occurs over two or more successive years, it can seriously weaken a tree, reduce its growth, and increase its susceptibility to bark borers, winter injury, and other diseases. Leaf spots commonly increase in number and size in late summer and early autumn as the leaves begin to senesce. The occurrence of a leaf spot disease late in the growing season generally does not seriously affect the health of a tree. Certain leaf spots have special names, such as anthracnose, black spot, downy spot or white mold, ink spot, spot anthracnose, leaf blister or curl, scab, shot-hole, sooty blotch, and tar spot.

Symptoms

Most leaf spot diseases develop as small, scattered, circular to oval dead areas in the leaves; usually tan, dark brown, yellow, gray, purple, or black. Some spots are raised, shiny, and coal black, others may drop out leaving ragged holes; some are marked with light and dark concentric zones. Numerous spots develop yellow, purple, red, or reddish brown to black margins; and later, in damp weather, increase in size and number and merge into large, angular to irregular dead areas. Dark areas and speck-sized, fungus-fruiting bodies (known as pycnidia, acervuli, and perithecia) commonly form in the dead tissues of many older spots. Heavily infected leaves may turn yellow to brown, wither, and drop early, weakening the tree. Occasionally, some leaf spotting fungi deform or kill flowers, buds, fruits, twigs, or even small branches (Figures 2-5).

For further information contact Nancy R. Pataky, Extension Specialist and Director of the Plant Clinic, Department of Crop Sciences, University of Illinois at Urbana-Champaign.

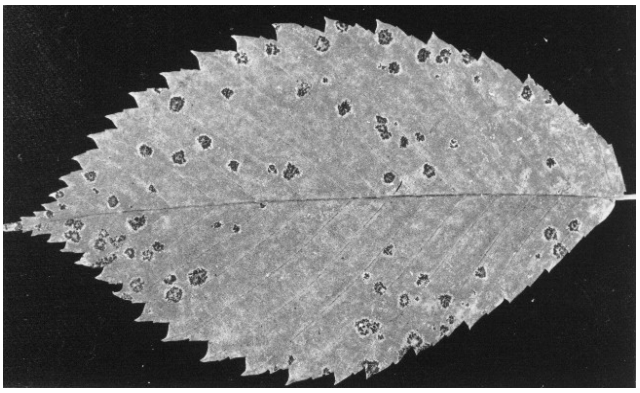

Figure 2. Black leaf spot of American elm. Diseased spots are raised, rough, and scablike (IL Nat. Hist. Survey).

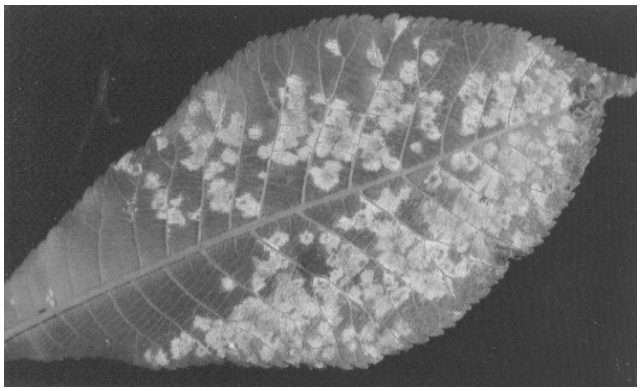

Figure 3. White mold or downy spot of black walnut. Yellowish blotches on the upper leaf surface; glistening frosty growth on lower leaf surface (Purdue University).

Cause and Disease Cycle

Many leaf spot diseases are caused by fungi that overwinter in fallen leaves. Other fungi overwinter in infected buds, fruits, twigs, and branch cankers. In most cases a fungus that causes a certain leaf spot attacks only one species of tree; a few may attack several species.

Figure 3. Leaf blotch of horse chestnut. Reddish brown areas; narrow yellowish margins form on leaflets.

From early spring into summer, microscopic spores are produced in tremendous numbers on the surface of the leaves or in speck-sized pycnidia, acervuli, and perithecia embedded in the diseased leaf tissue. The spores are spread primarily by air currents, splashing rains, and insects to newly emerging leaves of susceptible trees where, in the presence of free water, the spores germinate and penetrate, and infection begins. Depending on the fungus, there may be one or several cycles (generations) of the pathogen in one growing season.

Although infected leaves and other plant tissue harboring the fungus usually persist from one growing season to the next, the cool, rainy periods in early to mid-spring are often not long enough for the fungus to grow, multiply, and infect new leaves. Consequently, the presence and severity of leaf spot diseases are variable from year to year. Leaf spots are most likely to develop when there are extended periods of cool, moist weather during April, May, and June when the new leaf growth is expanding.

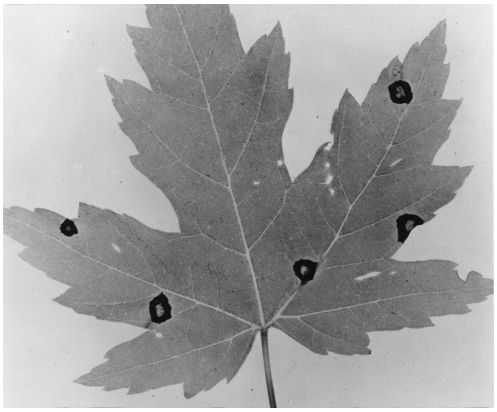

Figure 4. White mold or downy spot of black walnut. Yellowish blotches on the upper leaf surface; glistening frosty growth on lower leaf surface (Purdue Univ).

Species of fungi that most commonly cause leaf spot diseases belong to the following genera: *Alternaria, Ascochyta, Cercospora, Ciborinia, Coccomyces, Coniothyrium, Coryneum, Cristulariella, Cylindrosporium, Discochora (Guignardia), Elsinoe* (anamorph: *Sphaceloma), Entomosporium* (telemorph: D*iplocarpon), Gloeosporium* (various synonyms)*, Gnomonia (Apiognomonia, Stegophora), Hendersonia, Marssonina, Microstroma,*

Monochaetia, Mycosphaerella, Phyllosticta, Physalospora, Rhytisma, Septogloeum, Septoria, Taphrina, Tubakia (synonym*: Actinopelte),* and *Venturia.* These genera include over 1,000 species of fungi capable of producing leaf spots on various woody plants.

Table 1 lists the most common genera of fungi that cause leaf spot diseases, the host trees attacked, and the general symptoms of each disease.

Control

Protective control measures are **not** generally warranted for most leaf spots. Although the fallen leaves are often collected and then composted, burned, or hauled away with the trash, there is little evidence to show that these practices will significantly reduce infection the following spring and summer.

1. In early spring, properly fertilize trees that have been severely defoliated in previous years. Surface applications of ammonium nitrate fertilizer at the rate of 18 pounds per 1,000 square feet or urea at 13 pounds per 1,000 square feet are recommended. Apply the fertilizer with a cyclone spreader. Fertilization will help to stimulate vigorous growth, as will watering thoroughly (soil should be moist to a 12-inch depth) at weekly intervals during extended dry periods.

2. Prune trees regularly to thin out dense crowns. Remove weak, diseased, insect-infested, or dead wood and crossing or rubbing branches. Proper pruning will promote air movement, speed drying of the leaves, and help to stimulate vigorous growth.

3. In most years, the weather is not favorable for severe disease development and, in most cases, leaf spot diseases are not especially harmful. Therefore, for the control of most leaf spot diseases, protective fungicidal sprays are generally not recommended unless the health of the tree is in danger. However, there are a few common leaf spot diseases that can be controlled by using fungicidal sprays. In these cases, two or three applications are needed at 7- to 21-day intervals, usually as soon as the buds start to open and the leaves begin to expand, and **long before** the leaves are visibly infected. Spraying fungicides after the disease appears will reduce secondary infections but will not eliminate infections that have already occurred. Additional sprays may be necessary following prolonged rainy periods.

   For detailed spray schedules, read Illinois Homeowners Guide to Pest Management. The container label will tell you whether a fungicide can be used on a specific tree. When applying any disease-control chemical, carefully follow all directions and precautions as printed on the container label. Too much fungicide can injure trees, especially under certain weather conditions.

4. Some species and varieties (cultivars) of shade and ornamental trees are resistant to some leaf spot diseases. The following list names species that are resistant to various diseases: buckeye and horse chestnut to leaf blotch (*Discochora* or *Guignardia aesculi*); crabapple to scab (*Venturia inaequalis*); willow and poplar to one or more rusts (*Melampsora* species); elm to black spot or anthracnose (*Stegophora* or *Gnomonia ulmea*); red, shingle, and bur oaks to anthracnose (*Apiognomonia quercina*, anamorph: *Discula quercina*); London plane tree to anthracnose (*Apiognomonia veneta*, anamorph: *Discula platani*); and hawthorn to Entomosporium leaf spot or blight (*Diplocarpon mespili*, anamorph: *Entomosporium mespili*)

Table 1. Common Fungi Responsible for Leaf Spot Diseases in Midwestern Shade and Ornamental Trees

Fungal	Trees	General Symptoms
Alternaria	Ash, boxelder, catalpa, cherry, elm, holly, locust, magnolia, maple, mountain ash, pear, plum, poplar	Small, circular to angular, often zoned brown spots that may drop out, leaving shot-holes.
Ascochyta	Ash, boxelder, butternut, catalpa, dogwood, golden-chain, pea tree, walnut, willow	Small, circular to irregular spots with gray to tan centers and a dark border. May appear targetlike.
Cercospora	Alder, almond, apple, apricot, ash, aspen, beech, boxelder, buckeye, butternut, catalpa, cherry, cottonwood, dogwood, elm, golden-chain, hawthorn, hazelnut, hickory, holly, honey locust, hop tree, horse chestnut, Kentucky coffee tree, linden, magnolia, maple, mulberry, oak, osage-orange, pawpaw, peach, pear, pecan, persimmon, London plane tree, plum, poplar, prickly ash, redbud, Russian olive, smoke tree, sourwood, sweet gum, sycamore, tree of heaven, tupelo, walnut, willow	Circular to angular, small to large, gray or brown spots with dark margins. Some spots may drop out, leaving ragged shot-holes. The spots may be numerous and cause the leaf to turn brown and fall prematurely. Spray applications to control diseases caused by species of *Cercospor*a are rarely, if ever, needed.
Ciborinia	Aspen, chestnut, cottonwood, oak, poplar, willow	Round to oval, brown then inky black spots. Thin, saucerlike nearly black sclerotia form in dead tissue and later drop out.
Coccomyces	Almond, amelanchier, apricot, beech, cherry, oak, plum	Circular, dark purplish to reddish brown spots that turn brown and drop out, leaving ragged shot-holes; or leaves turn yellow and fall early.

Fungal	Trees infected	General symptoms
Coniothyrium	Apple beech, crabapple, elder, elm, hawthorn, hickory, holly, magnolia, mock orange, mulberry, pear, persimmon, quince	Round to angular or irregular, brown or grayish brown spots often with a dark border. Black specks (pycnidia) form in older lesions. When severe, leaves turn yellow and fall early.
Coryneum	Almond, apricot, cherry, elm, peach, pear, plum	Small dead spots that drop out leaving typical shot-holes. Gummy cankers cause dieback of twigs.
Cristulariella	Alder, amelanchier, apple, ash, boxelder, butternut, catalpa, cherry, dogwood, elm, hickory, linden, London plane tree, magnolia, maple, pawpaw, peach, pecan, sassafras, sourwood, sycamore, tree of heaven, tulip tree, walnut	Small to large, roundish to angular, yellow-gray to grayish brown spots or blotches with concentric rins and dark margins giving a targetlike pattern. Affected leaves may fall prematurely. Most common in shady locations.
Cylindrosporium	Alder, ash, birch, boxelder, chestnut, elm, hackberry, hawthorn, hazelnut, hophornbeam, hornbeam, locust, oak, tulip tree, walnut, willow	Small, circular brown spots form in the leaves. Spraying is rarely, if ever, needed to control these leaf spot diseases.
Elsinoe, anamorph: **Sphaceloma**	Apple, aspen, catalpa, cherry, cottonwood, dogwood, hickory, holly, linden, magnolia, oak, pear, pecan, persimmon, poplar, willow	Tiny, round to irregular, tan to purplish red or black spots, often with a narrow dark border. The centers may drop out giving leaves a ragged or deformed appearance. Scabby spots may appear on petioles, green stems, flowers, and fruit.
Entomosporium, telemorph: **Diplocarpon**	Amelanchier, apple, crabapple, hawthorn, mountain ash, pear, photinia, quince	Small, irrgular, reddish to dark brown or gray spots with raised black dots (apothecia). Lesions may merge to form large dead blotches. Severely spotted leaves turn yellow and drop from mid-July to late August.

Fungal	Trees infected	General symptoms
Gloeosporium, numerous synonyms	Alder, ash aspen, beech, birch, boxelder, catalpa, elm, hawthorn, hazelnut, holly, hophornbeam, hornbeam, linden, locust, maple, persimmon, London plane tree, poplar, oak, redbud, smoke tree, sweet gum, sycamore, tree of heaven, tulip tree, willow	Small to large, circular to irregular, tan to dark brown, reddish brown, purplish brown, or black areas in leaves, often along the margins and veins. Spots often have yellow to dark brown margins. Leaves may be distorted, wither and drop early. Twig cankers develop on hophornbeam.
Gnomonia, synonyms: **Apiognomonia** and **Stegophora**	Birch, butternut, elm, hazelnut, hickory, linden, maple, oak, pecan, London plane tree, sycamore, walnut, zelkova	Small to large, circular to irregular, light to dark brown or black spots and blotches commonly form along the veins (grayish to black spots on elm). Leaves commonly drop early. Twig cankers develop on London plane tree, oak, and sycamore.
Guignardia	Buckeye, horse chestnut, poplar	Small to large, irregular, reddish brown blotches with bright yellowish margins.
Hendersonia	Almond, apple, ash, hawthorn, hickory, magnolia, pear, quince	Round to angular or irregular, tan to brown spots with dark borders. Black specks (pycnidia) form in older lesions.
Marssonina	Ash, aspen, birch, boxelder, butternut, chestnut, cottonwood, crabapple, hickory, Kentucky coffee tree, maple, oak, poplar, walnut, willow	Small, circular to irregular, yellow to dark brown or coal black spots, that later enlarge and often have a yellow or dark margin. Spots may drop out, leaving small holes. Premature defoliation occurs.
Microstrom	Beech, butternut, hickory, pecan, walnut	Large, pale yellowish blotches on the upper leaf surface that turn dark brown. A glistening, frosty growth forms on underleaf surface. Witches' brooms may form near branch tips.
Monochaetia	Apple, buckeye, chestnut, elm, hawthorn, hickory, horse chestnut, maple, oak, witch hazel	Large round spots with pale green or yellowish centers and reddish brown margins; may become targetlike.

Fungal	Trees infected	General symptoms
Mycosphaerella	Apple, apricot, ash, aspen, beech, cherry, cottonwood, elm, hawthorn, hickory, linden, magnolia, mulberry, oak, pawpaw, peach, pear, pecan, persimmon, London plane tree, poplar, plum, redbud, sourwood, sycamore, tulip tree, tupelo, walnut, willow, witch hazel	Circular to angular or irregular, off-white, reddish, purplish or brown spots and blotches that develop deep brown centers with a conspicuous border. Minute, black, fungus-fruiting bodies (perithecia) form in the older diseased areas.
Phyllosticta	Alder, amelanchier, apple, apricot, ash, aspen, beech, birch, boxelder, buckeye, catalpa, cherry, chestnut, cottonwood, crabapple, dogwood, elm, ginkgo, hackberry, hawthorn, hazelnut, hickory, holly, hop tree, hornbeam, horse chestnut, Kentucky coffee tree, linden, locust, magnolia, maple, mountain ash, mulberry, oak, osage-orange, pawpaw, peach, pear, pea tree, pecan, persmimmon. London plane tree, plum, poplar, redbud, Russian olive, sassafras, sycamore, tulip tree, tupelo, tree of heaven, willow, witch hazel	Circular to angular or irregular, small to large, grayish, tan to dark brown or black spots with or without a conspicuous margin. Some spots may drop out, leaving ragged holes in the leaf. Severe infection may induce premature yellowing and casting of leaves. Black specks or fungus-fruiting bodies (pycnidia) develop in the centers of older spots. Spray applications are rarely, if ever, needed to control leaf spot diseases caused by species of *Phyllosticta*.
Physalospora	Alder, apple, birch, catalpa, chestnut, crabapple, hawthorn, holly, maple, mountain ash, peach, pear, persimmon, willow	Minute purple specks enlarge to form reddish brown, circular to oval spots. Later, dark brown concentric rings form in the enlarging spots.

Fungal	Trees infected	General symptoms
Rhytisma	Boxelder, holly, maple, tulip tree, willow	Oval to irregular, yellow-green spots that become shiny, coal black, thickened, raised, and often wrinkled.
Septogloeum	Alder, elm, hackberry, hazelnut, maple, oak, poplar, willow	Small, circular to irregular, white or gray to brown spots develop in the leaves.
Septoria	Alder, apple, ash, aspen, birch, boxelder, buckeye, chestnut, cottonwood, crabapple, dogwood, hawthorn, hazelnut, hickory, hophornbeam, maple, mountain ash, oak, pawpaw, pear, pea tree, pecan, London plane tree, plum, poplar, prickly ash, redbud, Russian olive, sassafras, sweetgum, sycamore, willow	Small, circular to angular, white, grayish, tan, brown, or purplish spots, commonly with a dark border. Dark specks (pycnidia) are scattered in the centers of older lesions. Spray applications are rarely, if ever, needed to control hop tree, horse chestnut, magnolia, leaf spot diseases caused by species of Septoria.
Taphrina (leaf blister or curl,	Alder, amelanchier, apricot, aspen, birch, buckeye, cherry, cottonwood, elm, hawthorn, hazelnut, hophornbeam, hornbeam, horse chestnut, maple, oak, peach, pear, plum, poplar, willow	Small, circular to angular, white, grayish, tan, brown, or purplish spots, commonly with a dark border. Dark specks (pycnidia) are scattered in the centers of older lesions. Spray applications are rarely, if ever, needed to control
Tubakia	Ash, chestnut, maple, oak, sassafras, sweet gum, tupelo	Minute, oval to irregular, dark brown to black sooty spots between the veins that may merge to form large, irregular dead areas.
Venturia	Apple, apricot, ash, aspen, birch, cottonwood, crabapple, hawthorn, maple, mountain ash, oak, peach, pear, plum, poplar, willow	Dull, smoky gray spots that become velvety, olive green to olive brown, then dark brown to black, infected leaves commonly wither and drop early.

[a]For complete information on synonyms of fungal names see Hawksworth et al, (1981) Dictionary of the Fungi, 7th ed, and the taxonomic monographs it cites.