

## ANTHRACNOSE DISEASES OF SHADE TREES

Anthracnose is the name given to a group of diseases that are caused by a number of morphologically similar fungi. The diseases cause tan to brown or black lesions on the leaves, stems, flowers, and fruits of various plants. The shade and forest trees most often affected in Illinois are ash, elm, maple, oak, sycamore, and walnut. While individual leaf lesions will cause minor damage, severely diseased trees are unsightly and defoliate prematurely. Damage to buds and stems occur on such trees as sycamore and white oak, sometimes causing disfiguration from the dieback of twigs and branches. Economic loss from anthracnose is usually caused by repeated annual defoliation and the dieback of twigs and branches, which weakens the trees and makes them more susceptible to other diseases, frost injury, and insect damage.

### Symptoms

On trees other than sycamore, anthracnose symptoms are mostly confined to the leaves. These symptoms vary from small, circular to irregular spots that are tan, dark brown, or black, to larger blotches that are usually associated with the midribs and veins (Table 1). Veinal necrosis is common on sycamore, ash, oak, and maple (Figure 2). When immature leaves are infected on trees such as oak, these leaves may become severely distorted (Figure 1). Young leaves may die and fall soon after a heavy infection. If a severe infection occurs early in the growing season and the trees defoliate, a new set of leaves may emerge, depending on the environment and the anthracnose fungus affecting the tree. Not only do sycamores show symptoms, but also their buds, shoots, and one-year-old twigs are commonly blighted



Figure 1. Distorted leaves caused by Anthracnose of White Oak (photo by Jim Kuntz).



Figure 2. Anthracnose of Ash (photo from NC State).

Four stages, which often overlap, may be identified in years when optimum temperature conditions exist for anthracnose development. Bud blight and twig blight occur before the leaves emerge in the early spring and kill either individual buds or the tips of one-year-old shoots. Later, fruiting bodies (pycnidia), the size of a pinhead, rupture the bark.

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A sunken girdling canker may form below the twig tip after leaf emergence and cause the death of young shoots. This symptom is often mistaken for frost injury. The lateral buds behind the dead twig will eventually produce new growth and a new flush of leaves, giving the tree a bushy appearance. Twig infection is not common but may occur in ash, elm, hickory, hophornbeam, linden, maple, oak, poplar, and walnut.

Bud blight and twig blight occur in April or early May. The buds may be killed before the end of dormancy because of a girdling canker that has formed below the buds. Twigs may be killed when the canker encircles the one-year-old twig.

Shoot blight begins after the leaves emerge and resembles frost injury. Leaves suddenly die and later drop from infected twigs. The severity of the blight depends on the temperature during the two-week period following the emergence of the first leaves. Damage is most prevalent when the average mean daily temperature (the average of the maximum and minimum temperatures) during this period is between 50° and 55°F (10° and 12°C). Above 60°F (15°C), little or no shoot blight takes place.

Leaf blotch or blight develops from fungus spores produced on the bud and twig blight cankers. The infections that result from these spores produce the leaf lesions commonly seen in early to mid-summer. As the fungus grows into the primary veins, larger brown leaf areas die. Eventually, the fungus grows down the petiole and into the main shoots where it overwinters.

## **Disease Cycle**

Anthracnose fungi that primarily attack the leaves commonly overwinter on the ground. When cool, moist spring weather occurs, spores (conidia or ascospores) produced on the dead leaves are spread by wind and splashing rains to newly emerging leaves where infection begins. After a short time lesions form, and a new generation of spores (summer spores or conidia) reproduce, again infecting the leaves. Intensification of the disease from summer spores is especially noticeable on walnut and ash, leading to pronounced early defoliation.

With fungi that attack both stems and leaves, overwintering commonly occurs within infected buds, the bark of twigs, and branch cankers. In prolonged cool spring weather, the conidia separate from the minute fruiting bodies (pycnidia) that form at these sites. Rain splash disperses the spores to emerging leaves, causing infection. Overwintering in twig cankers is advantageous for the fungus since it never loses contact with its host. Sycamore and oak anthracnose fungi operate in this manner, making them particularly difficult to control. From infected leaves, the fungus grows into the veins, through the petioles, and into the stem where it overwinters. In the spring, under proper environmental conditions, the growth of the fungus to form girdling cankers may result in the death of buds, twigs, and shoots. Later, summer spores form (in acervuli) and spread.

## **Control**

Since anthracnose diseases are rarely fatal, control measures may not be warranted depending on the value placed on the tree, the weather conditions when the leaves and twigs are growing rapidly, and the amount of disease expected.

## FOREST TREES

Practical control measures for trees growing under forest conditions are not available; however, some cultural control methods may reduce annual losses.

1. Since free water on plant surfaces is necessary for spore germination, penetration, and infection, practices designed to hasten evaporation may reduce disease.
2. Prune branches and remove trees in a densely planted plantation to allow better air movement, increase the sun's penetration, and to speed drying.
3. Select a good planting site with good air flow.
4. Anthracnose on young walnut trees is less severe in plantations fertilized with nitrogen fertilizers.

## SHADE AND ORNAMENTAL TREES

1. Sanitation, the removal and destruction of fallen leaves (a spore overwintering site and the source of some spores for early spring infections), reduces the potential for infection.
2. Infected twigs and branch cankers, a source of spores, should be pruned out.
3. All diseased plant parts should be buried, burned, or removed from the site to prevent reinfection.

**Procedures 1 through 3 above are recommended for anthracnose diseases of ash, birch, catalpa, dogwood, elm, hornbeam, hophornbeam, linden, poplar, and tuliptree.**

4. Trees that have a severe anthracnose infection and defoliate early may weaken and should be fertilized. Defoliation depletes the energy reserves of the tree and increases its susceptibility to other pests and diseases. Surface application of ammonium nitrate fertilizer at the rate of 18 pounds per 1,000 square feet, or of urea at 13 pounds per 1,000 square feet, is recommended. If grass is growing under the canopy of the tree, do not apply fertilizer until the grass is dry--the grass may "burn" otherwise. Apply the fertilizer with a cyclone spreader followed by an inch of water (600 gallons per 1,000 square feet) every 7 days for several weeks.
5. Resistant tree varieties should be used whenever possible. The London plane tree is notably less susceptible to anthracnose than the American sycamore; black and pin oaks are more disease resistant than white oaks.
6. Various fungicides can be used to control anthracnose on valuable trees, but chemicals rarely control this disease completely. Spraying can protect leaves from infection but it will not prevent the development of cankers on sycamores and oaks in which the fungus overwintered within the tree. A hand-held sprayer may be satisfactory for smaller trees, however, high-pressure spray equipment is required to treat larger trees. Apply a suggested fungicide two or three times, at 14-day intervals, starting at leaf emergence. Thorough coverage is required. The manufacturer's directions should be carefully followed. Spraying after the disease is evident will only protect healthy new leaves.

Table 1. Symptoms of Anthracnose on Various Shade and Forest Trees

Host	Typical Symptoms
Ash	Large, irregular, tan to brown lesions form on the expanded leaflets, especially along the margins and veins; leaves may become distorted and fall early. Trees weakened by repeated infection may become unsightly.
Birch	Small to large, round to irregular, light brown to dark brown lesions with yellow margins form on the leaves. The disease is seldom serious.
Catalpa	Small, brown to black lesions form on the leaves. The center of the lesion may drop out. The disease is rarely serious.
Dogwood	Small, round to angular, dark purple lesions form on the leaves. These lesions often drop out, producing "shot-holes." Reddish purple lesions form on the bracts; flowers are spotted and disfigured.
Elm	Small, round to irregular, grayish to black, shiny lesions form on the leaves; cankers may form in the twigs. Infected leaves turn yellow and, in wet years, premature leaf drop may be heavy.
Hickory	Small to large, irregular, reddish brown lesions with yellowish, indefinite margins form on the upper leaf surface and are dull brown on the lower surface. A severe infection may cause premature yellowing and leaf cast.
Hornbeam, Hophornbeam	Small to large, reddish brown (hophornbeam) or brown to gray brown (American hornbeam) lesions on the leaves that later merge causing leaf tips and margins to scorch and curl. Diseased leaves, especially on the lower branches, may drop prematurely. Reddish brown twig cankers on hophornbeam result in dead shoots with bleached, withered leaves.
Linden	Small, round to elongated, light brown spots with dark margins may enlarge along the veins. Petiole and twig cankers may form. In wet years, leaf loss may be severe.
Maple	Leaf symptoms are variable. Entire young leaves of Japanese maple may become blackened and shriveled. Purple to brown streaks may develop along the veins on Norway maple. Small to large, round to irregular, green brown or red brown areas develop along or between the veins of sugar, Norway, and Japanese maples. If numerous, the lesions may merge, affecting the entire leaf.
Oak	Leaf symptoms vary. Small, scattered brown lesions may form on red and black oak leaves. On white oaks, small to large, irregular, expanding brown blotches may form on the leaf. Infected leaves often appear scorched and distorted; twig cankers may cause dieback. The disease is most common on the lower branches of white oaks.

Table 1. (Continued)

Host	Typical Symptoms
Poplar, Cottonwood, Aspen	Dark brown to reddish brown spots and blotches on the leaves may result in a general yellowing or browning of the foliage. Tiny, pustular cankers form in green twigs which later die back. If severe, foliar browning and nearly complete defoliation may occur by early August. Seedlings in nurseries are killed.
Sycamore, London plane	Small to large, irregular, brown lesions form along the veins to the leaf edges. Girdled twigs, bud blight, and shoot dieback may occur in early to mid-spring.
Tuliptree or Tulip-poplar	Irregular brown leaf blotches with dark brown borders may develop. The symptoms usually appear late in the season.
Walnut, Butternut	Small to large, oval to round or irregular, dark brown to black lesions, some with yellow margins, may develop on the leaflets. Black sunken areas form on the nuts. Gray-brown lesions with reddish brown borders develop on the shoots. In wet years, severe defoliation may occur by early to mid-August.