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# ANTHRACNOSE DISEASES OF TREES

Anthracnose diseases occur on many important shade and ornamental tree species throughout Connecticut every year, although the prevalence and severity of disease can vary with each season, site, and species. Anthracnose diseases are common on ash (*Fraxinus*), maple (*Acer*), oak (*Quercus*), and sycamore (*Platanus*). Less common are anthracnose of beech (*Fagus*), birch (*Betula*), elm (*Ulmus*), walnut (*Juglans*), and linden (*Tilia*). Anthracnose of dogwood (*Cornus*) is a particularly serious disease that is discussed in a separate fact sheet: http://www.ct.gov/caes/lib/caes/documents/publications/fact_sheets/plant_pathology_and_ecology/dogwood_anthracnose.pdf.

Anthracnose diseases are most noticeable on trees in the landscape, but they also occur on trees growing in natural woodlots and forests. These diseases are also called "leaf blights" or "leaf spots." The degree to which each tree or species is affected by disease is influenced by genetic factors, microclimate, and predisposition by other stresses (e.g., site, drought, excess water, winter injury), although water, in the form of rain, dew, or fog, is critical for infection and spread. Therefore, anthracnose diseases are most problematic during periods of extended cool, wet weather as leaves are emerging in spring.

The term "anthracnose" refers to diseases caused by fungi that produce spores (conidia) in fruiting structures called acervuli (Figures 1 and 2).

Figure 1. Arrows indicate fruiting structures, called acervuli, that are oozing spores of the sycamore anthracnose fungus.

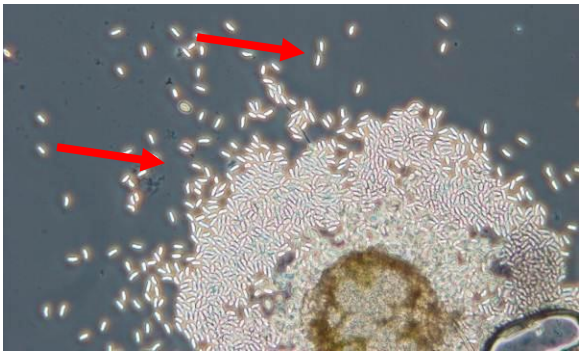

Figure 2. Arrow indicate spores (conidia) of the sycamore anthracnose fungus.

Anthracnose fungi typically overwinter in infected leaves on the ground. However, in some cases (e.g., sycamore anthracnose), the fungus also overwinters in buds, cankered branches, and twigs on the tree. Infections of leaves, flowers, fruit, and stem tissues can occur and are usually initiated in spring when new growth is emerging. However, new infections can also continue throughout the entire season, when the weather is favorable. Environmental conditions that are most favorable for disease development include periods of extended cool, moist, or wet weather.

Symptoms of anthracnose diseases range from minor, cosmetic spotting of leaves, to blighting of leaves and tender shoots, to dieback of twigs and branches. Symptoms also vary with the individual host and the causal fungus. Although symptoms of anthracnose are most obvious from mid-spring to early summer, additional cycles of infection can result in damage that is visible later in the growing season. As leaves and shoots mature and approach full-size, they become relatively resistant to infection.

Anthracnose diseases are generally considered aesthetic or nuisance problems. However, when infections are heavy, they can result in disconcerting levels of premature leaf drop and defoliation. Anthracnose diseases can also disfigure trees when infected twigs and branches die. This is more common after several successive years of disease. Most trees that drop leaves prematurely usually produce new shoots and leaves by mid-summer. Trees that are otherwise healthy can fortunately withstand several years of defoliation without long-term implications for tree health. However, anthracnose diseases can have a greater impact on trees that are newly transplanted or stressed.

**ASH ANTHRACNOSE:**

***Causal Agents:*** *Gnomoniella fraxini (Discula fraxinea)*

***Hosts:*** *Fraxinus* (black and white ash; green ash is fairly resistant)

***Symptoms:*** Symptoms develop on newly expanding shoots and leaves in spring. Tender shoots are blighted and killed during cool, wet weather. Infections on developing leaves first appear as water-soaked, irregular areas. These develop into brown, somewhat papery lesions (Figure 3). When infections are moderate, only portions of each leaflet are affected.

Figure 3. Symptoms of ash anthracnose. Note angular, necrotic lesions on leaflets that distort the overall appearance of the leaf.

This can give the leaf a distorted appearance, but leaves usually remain attached to the tree. When infections are heavy, entire leaves will turn brown and drop prematurely. Branches that have dropped their leaves usually produce new shoots and leaves by mid-summer.

**MAPLE ANTHRACNOSE:**

***Causal Agents:*** *Discula* sp., *Kabatiella apocrypta*

***Hosts:*** *Acer* (Japanese, Norway, sycamore, red or swamp, silver, and sugar maple).

***Symptoms:*** Symptoms vary with the species of maple affected. Narrow, purple to brown streaks develop along the veins of leaves of

Norway maples, whereas large, brown patches develop between the veins on sugar maple leaves. Symptoms on Japanese maples appear as light tan, papery spots in the leaf or as tan areas at leaf margins. Although symptoms vary with the type of maple, the symptoms that are common to most maples are irregular, dead areas on the leaves (Figures 4 and 5).

Figure 4. Symptoms of maple anthracnose on upper leaf surfaces.

Figure 5. Same leaves as in Figure 4, only this view is of lower leaf surfaces.

These areas can first appear as small spots that eventually enlarge and become V-shaped or delineated or defined by the veins. Affected tissues can be tan to brown and paper-thin (Figure 6). When infection is severe, the fungus enters the petioles and causes entire leaves to appear blighted, browned, and shriveled. Distorted leaves with maple anthracnose can be confused with frost (Figure 7), drought, and heat stress. Samaras can also develop necrotic or dead spots and drop. Significant leaf drop can occur in late spring but trees usually re-foliate by mid-summer.


Figure 6. Close-up of maple anthracnose angular lesion.

Figure 7. Frost damage to Japanese maple. Note marginal necrosis and distortion of the leaves.

**BEECH ANTHRACNOSE:**

***Causal Agents:*** *Apiognomonia erribunda (Discula umbrinella)*

***Hosts:*** *Fagus* (American and European beech)

***Symptoms:*** Early symptoms of beech anthracnose appear as irregular, brown spots on the leaves that are usually positioned on or between leaf veins (Figures 8 and 9). As the symptoms progress, the dark brown necrotic tissue expands to all interveinal portions of the leaf (Figure 10) and eventually large sections of the leaf become necrotic (Figure 11). Infected leaves will eventually drop from the tree.

Figure 8. Irregular, brown spots between the veins of beech leaves.

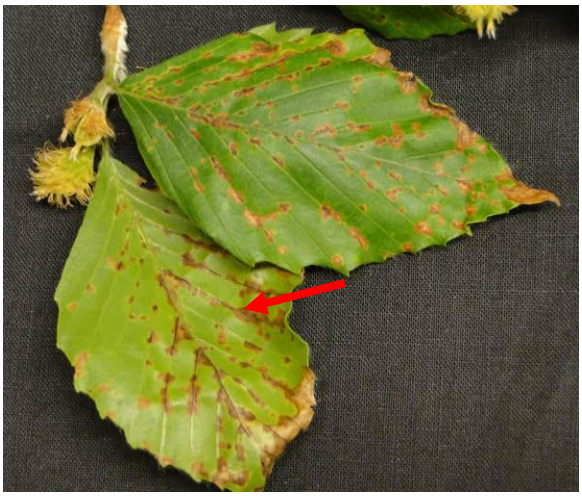

Figure 9. Necrotic lesions along veins of infected leaves (arrow).

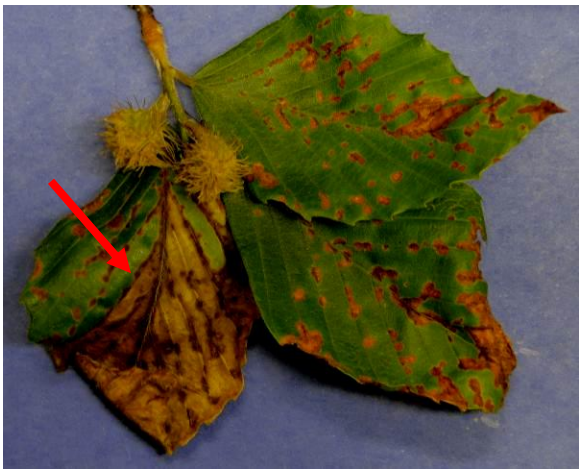

Figure 10. Large, brown blotches appear on heavily infected leaves (arrow).

Beech anthracnose symptoms can be confused with leaf scorch, a physiological disease associated with heat and drought. With anthracnose, the necrotic tissue expands from the inner portions of the leaf outward. With leaf scorch, the browning first appears along the leaf edges and expands inward.

**SYCAMORE ANTHRACNOSE:**

***Causal Agents:*** *Apiognomonia veneta (Discula platani)*

***Hosts:*** *Platanus* (sycamore, London plane)

***Symptoms:*** Probably the most common of all anthracnose diseases, sycamore anthracnose often occurs in three phases, each of which can result in different types of symptoms: 1) twig and branch cankers, 2) shoot blight, and 3) leaf blight. Weather patterns usually influence the severity of each phase. In the first phase, the fungus overwinters in twigs and buds. This results in cankers and bud death when the trees are dormant. During the shoot blight phase, new shoots are rapidly killed by the fungus as they expand. This symptom is particularly noticeable during or just after cool, wet periods in spring. Infected trees are visible in late spring, since they have distinctly sparse canopies, when compared

to surrounding species of healthy trees (Figures 11 and 12). These first two phases can be confused with frost damage.

In the final leaf blight phase, newly expanding leaves are infected and killed as they emerge (Figure 13). Leaves are most susceptible during the first few weeks of growth. Lesions often first appear along the veins of infected leaves (Figure 14). These areas expand into large, brown areas on the leaves (Figure 15) and into the petioles. Significant leaf drop can occur in late spring or early summer, although by mid-summer,

Figure 11. Sycamore trees with anthracnose and sparse canopies (arrows) are easily distinguished from other species of healthy trees with full green canopies in late spring.

Figure 12. Sycamore infections can be recognized by the sparse canopy, as the tree begins to leaf-out in the spring.

most trees will have re-foliated with a canopy of healthy leaves.

Figure 13. Infected leaves brown and drop prematurely.

Figure 14. Lesions of sycamore anthracnose first develop along the veins.

Figure 15. Lesions often enlarge to V-shaped, necrotic areas between veins.

**OAK ANTHRACNOSE:**

***Causal Agents:*** *Apiognomonia quercina (Discula quercina)*

***Hosts:*** *Quercus* (white, black, pin, burr, and scarlet oak)

***Symptoms:*** White oak is the most susceptible of all oak species. Although some twig and branch dieback can occur, the most common symptom appears as a blighting of newly expanding shoots and emerging leaves. Irregular, tan, papery, necrotic spots develop on the leaves as they develop and are often concentrated along the veins or at the margins of the leaves (Figures 16, 17, and 18).

When the spots are numerous, they coalesce and give the leaves a blighted appearance (Figure 19). Lesions can develop on petioles and green stems as the fungus colonizes these tissues (Figure 20). Heavily infected leaves become distorted and often drop prematurely by late spring or early summer. In most cases, trees are usually re-foliated by late summer.

Figure 16. Irregular, necrotic lesions are concentrated along the veins of oak leaves infected with anthracnose.

Figure 17. Close-up of necrotic anthracnose lesion on white oak.


Figure 18. Fruiting bodies (arrows) of the anthracnose fungus along the vein of the lesion in Figure 17.

Figure 19. Heavily infected leaves have a blighted appearance.

Figure 20. Petiole and stem lesions (arrows) on infected white oak.

## MANAGEMENT STRATEGIES FOR ANTHRACNOSE DISEASES:

Managing anthracnose diseases is most successful using a multifaceted strategy. These diseases are often effectively controlled by following good sanitary and cultural practices and are rarely serious enough to warrant chemical control.

- Anthracnose fungi overwinter in cankers on twigs and branches and to some extent, on fallen leaves. Because these serve as important sources of overwintering inoculum, symptomatic tissues should be pruned, raked, and/or removed as completely as practical. This practice reduces the number of fungal spores available to infect emerging shoots and leaves in spring and during the growing season.
- Maintain overall tree vigor by following sound cultural practices. These include watering, fertilizing (as determined by a soil test), mulching, and pruning.
- Although anthracnose diseases are usually considered to be more aesthetic than life-threatening, there are situations where they can be serious and cause permanent damage or even tree death. Newly transplanted trees or trees weakened by environmental or site-related stress are particularly sensitive to several years of repeated defoliation. In such cases, chemical control can be beneficial. Among the fungicides registered for homeowner use in Connecticut are thiophanate-methyl, chlorothalonil, copper sulfate pentahydrate, and mancozeb. Organic options for control include copper products, sulfur, *Bacillus subtilis* QST 713 strain (Serenade®), and potassium bicarbonate. The pesticide label will contain information on dosage rates, application intervals, and safety precautions. Since most anthracnose fungi infect in spring as the buds are swelling and new leaves and shoots are expanding, the first fungicide spray is applied at or just prior to bud break. Two or three additional sprays are subsequently applied at intervals specified by the label for the particular fungicide being used. Additional applications may also be necessary under unusually wet or prolonged spring conditions. Once symptoms of anthracnose are visible on the leaves it is usually too late for effective chemical control.

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