

Diseases of Hydrangea

The genus *Hydrangea* is composed of several native- and introduced-deciduous shrubs well known for their spectacular floral display and lustrous green foliage. The bigleaf hydrangea (*Hydrangea macrophylla*), native to Japan, is the most recognized and widely planted in Alabama landscapes. Blossoms of the many cultivars of this hydrangea range from white or pink to deep blue. Many cultivars of bigleaf hydrangea may not be winter-hardy very far above the Gulf of Mexico. The panicle hydrangea (*H. paniculata*) is also an introduction from Japan and China. The smooth (*H. arborescens*) and the oakleaf (*H. quercifolia*) are native to Alabama and are best adapted for use in partially shaded naturalized areas. Several selections of both hydrangea taxa are in the nursery trade, and typically the blooms are white.

Diseases can have a significant impact on the appearance, health, and market value of hydrangea. The common diseases found on hydrangea and recommended control procedures are described in this publication.

Powdery Mildew

Powdery mildew is reported on a wide range of hydrangeas including *Hydrangea serrata* as well as the smooth (*H. arborescens*), bigleaf (*H. macrophylla*), and panicle (*H. paniculata*) hydrangea. This disease is especially common on greenhouse-grown bigleaf hydrangea.



Figure 1. Powdery mildew on bigleaf hydrangea



Figure 2. Cercospora leaf spot on bigleaf hydrangea



Figure 3. Typical 'target spot' leaf spot and blight associated with anthracnose on bigleaf hydrangea

Powdery mildew is rarely seen on selections of the oakleaf hydrangea (*H. quercifolia*). Typically, disease-damaged hydrangeas are unmarketable. Powdery mildew also occurs in landscape plantings of hydrangea, but the symptoms



Figure 4. Symptoms of anthracnose on blossoms of bigleaf hydrangea

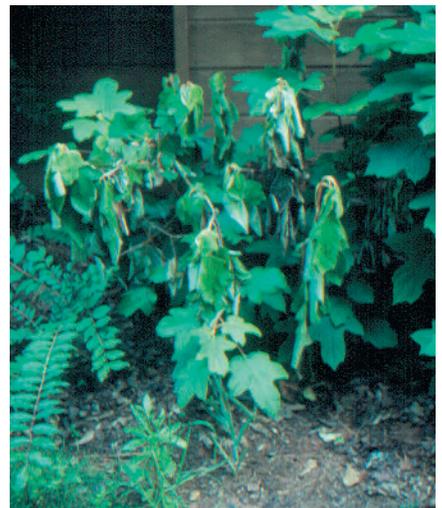


Figure 5. Armillaria root rot on oakleaf hydrangea



Figure 6. Phytophthora root rot, a common disease on container-grown oakleaf hydrangea

are often unobtrusive. The earliest sign of powdery mildew is the presence of small circular white patches with feathery edges randomly scattered across the lower surfaces of one or more leaves. The threadlike, almost clear hyphae of the causal fungus *E. polygoni* can easily be seen growing across the leaf surface with a hand lens. Yellow or purple blotches may also appear in the area of the colonies of *E. polygoni*, particularly on the upper leaf surface.

Under ideal conditions, these colonies will rapidly increase in size until the surfaces of the leaves and tender shoots are covered with the white, cottony hyphae of the powdery mildew fungus (figure 1). The foliage of such heavily diseased hydrangea is often stunted and off-color. The beauty and size of the floral display of powdery mildew-damaged hydrangea will also be greatly reduced.

On greenhouse-grown hydrangea, the powdery mildew fungus persists as hyphae on the foliage and may be spread by propagating cuttings from diseased plants. In the landscape, these fungi overwinter as hyphae or spores in buds. Numerous spores produced by *E. polygoni* are spread to healthy

leaves by air currents. Spore germination and infection of the leaves occur rapidly in the greenhouse and landscape when leaf surfaces are dry, the relative humidity approaches 95 percent, and temperatures are warm. In the landscape, warm days, cool nights, and light rainfall in the spring and fall favor disease outbreaks. Typically, frequent showers will suppress the development of powdery mildew.

In the greenhouse, nursery, and landscape, powdery mildew diseases are best managed by producing or establishing disease-resistant selections. Unfortunately, cultivars of the smooth, bigleaf, and panicle hydrangea resistant to powdery mildew have not been identified. However, the majority of the cultivars of bigleaf hydrangea commonly grown in the greenhouse for the commercial floral trade are susceptible to this disease.

Spacing plants to improve air circulation and installing fans, venting, and heating to reduce ambient-relative humidity in the greenhouse may help slow the onset and spread of powdery mildew. Also, remove any fallen leaves and other debris from the previous hydrangea crop. Finally, take cuttings for propagation from only healthy stock plants.

Cultural practices, such as those listed above, will not protect greenhouse-grown hydrangea from powdery mildew. Typically, protective fungicide applications should be started as soon as the first colonies appear on the lower leaf surface. Treatment should be continued at the intervals listed on the product label until the susceptible hydrangeas are shipped. In landscape plantings, fungicide treatments are suggested only on those hydrangeas whose foliage was heavily colonized by *E. polygoni* in previous years. For best results, be sure to wet both the upper and lower leaf surfaces with the fungicide suspension. Fungicides recommended for the control of powdery mildew on hydrangea are listed in Table 1. Refer to Extension publication ANR-500B, *Alabama Pest Management Handbook, Volume 2*, for additional information on fungicide recommendations for powdery mildew control.

Cercospora Leaf Spot

Cercospora leaf spot, a common disease in landscape plantings of hydrangea, may also heavily damage container-grown plants in the nursery. Disease outbreaks are rarely seen on

Table 1. Fungicides Cleared for the Control of Powdery Mildew on Hydrangea

Fungicide	Application Rate		Comments
	Per gal	Per 100 gal	
azoxystrobin Heritage 50W	—	1-4 oz.	Apply at first sign of disease and repeat at 14- to 28-day intervals as needed for control.
fenarimol Rubigan AS	—	3-5 fl. oz.	Apply every 10 to 14 days starting when disease is first seen on leaves. Use higher rate at shorter interval when disease is severe.
paraffinic oil Sun-Spray Ultrafine Oil	1%	—	Apply at first sign of disease and repeat every 7 to 10 days as needed.
thiophanate-methyl 3336 50W	1 T	12-16 oz.	Apply at first sign of disease on leaves and repeat every 10 to 14 days as needed. Use higher rate at shorter interval when disease is severe.
3336 4.5F	—	10-20 fl. oz.	
Halt 50W	1 T	—	

greenhouse-grown hydrangea. This disease also occurs on bigleaf, oakleaf, smooth, and panicle hydrangea. While *Cercospora* leaf spot rarely, if ever, kills the target plant, heavy spotting of the leaves and premature leaf shed is unsightly and may reduce plant vigor and flower bud set. This disease is often most noticeable on hydrangea in low-maintenance landscape plantings.

Scattered, small circular brown or purple spots first appear on leaves near the base of the plant. On the bigleaf hydrangea, the centers of these spots eventually turns tan to light gray in color and are surrounded by a brown or purple halo. The spots are usually about one-eighth to one-fourth inch in diameter. This combination of a pale center and dark margin is usually called a frog-eye leaf-spot pattern (figure 2). In contrast, the leaf spots on oakleaf hydrangea appear angular in shape and are dark brown to purple in color. Often, heavily spotted leaves turn yellow green and may fall to the ground. Typically, the spotting begins on the leaves at the base of the

plant and then gradually spreads upward through the canopy. Spotting of the leaves, which usually starts in midsummer, is most noticeable by early fall.

Fallen diseased leaves are the primary source of spores of the causal fungus *Cercospora hydrangeae*. These spores are spread to the healthy lower leaves by splashing water. Once *C. hydrangeae* is introduced into a planting of hydrangea, yearly outbreaks of this disease are likely to occur. Frequent late summer rain showers will not only greatly increase the rate of disease spread, but also intensify the level of leaf spotting and defoliation. Extended periods of drought will usually suppress disease development and spread.

In the landscape and container nursery, removing dead diseased leaves, applying enough nitrogen to maintain a moderate growth rate, and surface watering will help slow the development and spread of *Cercospora* leaf spot. Since the appearance of symptoms is usually delayed until late summer to early fall, protective fungicide sprays are rarely needed for the

control of this disease on hydrangea in the landscape or nursery. For effective control of *Cercospora* leaf spot with a fungicide, begin applications when spotting of the leaves is first seen and continue applying that treatment as needed. Typically, protective fungicide treatments are suggested only on highly valued plants that suffer noticeable damage every year. Fungicides registered for the control of *Cercospora* leaf spot are listed in Table 2. Additional information concerning application intervals and guidelines can be found on the product label. Also, refer to Extension publication ANR-500B, *Alabama Pest Management Handbook, Volume 2*, for additional information on recommended fungicides for the control of *Cercospora* leaf spot on hydrangea.

Anthracnose

Anthracnose occurs sporadically in landscape and field plantings of bigleaf hydrangea. The causal fungus *Colletotrichum gloeosporioides* can attack both the leaves and the blooms of hydrangea. Hot, wet weather conditions appear to favor

Table 2. Fungicides Cleared for Use on Hydrangea for the Control of *Cercospora* Leaf Spot

Fungicide	Application Rate		Comments
	Per gal	Per 100 gal	
azoxystrobin			
Heritage 50W	—	1-4 oz.	Apply at first sign of disease and repeat at 14- to 28-day intervals as needed for control.
chlorothalonil			
Daconil Ultrex	—	1.4 lb.	Apply when symptoms first appear on lower leaves and repeat every 10 to 14 days as needed. Use higher rate at shorter interval when disease is severe.
Daconil Weather Stik	1.4 t.	1½ pt.	
Daconil 2787 4F	2 t.	2 pt.	
mancozeb			
Dithane M-45 T/O	1 T	1.5 lb.	
Fore 80W	1 T	1.5 lb.	
Protect T/O	1 T	1.5 lb.	
myclobutanil			
Eagle T/O	—	3-6 oz.	
Immunox	1 fl. oz.	—	
thiophanate-methyl			
3336 50W	1 T	12-16 oz.	
3336 4.5F	—	10-20 fl. oz.	
Halt 50W	1 T	—	

Table 3. Fungicides Cleared for the Control of Anthracnose on Hydrangea

Fungicide	Application Rate		Comments
	Per gal	Per 100 gal	
chlorothalonil			
Daconil Ultrex	—	1.4 lb.	Apply when symptoms first appear on lower leaves and repeat every 10 to 14 days as needed. Use at shorter interval when disease is severe.
Daconil Weather Stik	1.4 t.	1½ pt.	
Daconil 2787 4F	2 t.	2 pt.	
thiophanate-methyl			
3336 50W	1 T	12-16 oz.	Apply at first sign of disease on leaves and repeat every 10 to 14 days as needed. Use higher rate at shorter interval when disease is severe.
3336 4.5F	—	10-20 fl. oz.	
Halt 50W	1 T	—	

disease development. Heavily fertilized hydrangea may be most sensitive to attack by *C. gloeosporioides*.

At first, the brown spots are circular or slightly irregular in shape and somewhat sunken on fleshy leaves of hydrangea. The center of these spots may reach 1 inch or more in diameter and turn light brown to tan in color. Alternating dark and slightly lighter rings of dead tissue often give the spots a bull's-eye or a target-spot appearance (figure 3). When larger spots border midvein or other major veins in the leaf, they become distinctly more angular in shape. Under ideal conditions for disease development, large, dark brown, irregular blotches may spread across the leaves and flower petals (figure 4). Unlike *Cercospora* leaf spot, symptoms of anthracnose may appear almost simultaneously on leaves and blooms in the lower and upper region of the plant canopy.

The causal fungus *C. gloeosporioides*, which has a broad host range that includes a wide variety of commonly grown woody shrubs and trees, overwinters in fallen diseased leaves and other plant debris. Following several days of wet, overcast weather, masses of spores ooze from fruiting bodies (acervuli) embedded in leaf debris. These spores are spread to the leaves and bloom clusters primarily by splashing water.

Penetration and colonization of host tissues occur most rapidly at temperatures of 75 to 90 degrees F. Frequent showers, dew, and prolonged periods of heavy fog increase the rate of infection and accelerate the appearance of symptoms. Diseased plants are the main source of anthracnose in landscape plantings of hydrangea.

Few options are available for controlling anthracnose on hydrangea. Taking cuttings from symptom-free plants will greatly reduce the risk of disease spread in container stock. Collecting fallen disease leaves and removing blighted blooms are also suggested. Since this disease appears to be more prevalent in large container or field plantings of intensively managed hydrangea, damaging outbreaks of this disease in residential landscapes are unlikely. Protective fungicide treatments, when applied at 10- to 14-day intervals during the summer, will protect vulnerable hydrangea from anthracnose. Fungicides registered for the control of this disease are listed in Table 3. Refer to the product label or Extension publication ANR-500B, *Alabama Pest Management Handbook, Volume 2*, for additional information.

Botrytis Blight

Botrytis blight, or gray mold, occurs primarily on greenhouse-grown hydrangea. Outbreaks of this disease can also be seen in

the landscape on hydrangea flower buds and blossoms. In the greenhouse and landscape plantings, several consecutive days of cloudy, humid, rainy weather favor the development of Botrytis blight. All species of hydrangea are susceptible to this disease, but damage is noted most often on the bigleaf hydrangea.

On hydrangea, symptoms are usually limited to the flower buds and especially the petals. The small water-soaked spots seen on the petals quickly expand into reddish brown irregular blotches. Brightly colored petals quickly fade to a brown, withered mass that is often covered with the fuzzy gray growth of the causal fungus *Botrytis cinerea*. Masses of gray spores can easily be seen with a hand lens. Leaf spotting can occasionally be seen where diseased petals or other debris have fallen on the leaves.

Given favorable environmental conditions, Botrytis blight can develop overnight. Cool, humid, wet conditions favor the rapid growth and reproduction of *B. cinerea*. The optimal temperature for the onset of Botrytis blight in the greenhouse is approximately 65 degrees F. The causal fungus survives almost indefinitely in plant debris. Spores produced on debris are easily dispersed to healthy tissue by wind currents and then quickly germinate. Normal greenhouse activities such as

Table 4. Fungicides Cleared for the Control of Botrytis Blight on Hydrangea

Fungicide	Application Rate		Comments
	Per gal	Per 100 gal	
iprodione			
Chipco GT	—	1-2.5 qt.	Apply during overcast, wet weather before symptoms are seen. Repeat at 7- to 14-day intervals as long as conditions are favorable for disease development in greenhouse. Use higher rate at shorter interval when risk of disease is highest. Remove spent blooms.
mancozeb			
Dithane M-45 T/O	1 T	1.5 lb.	
Fore 80W	1 T	1.5 lb.	
Protect T/O	1 T	1.5 lb.	
thiophanate-methyl			
3336 50W	1 T	12-16 oz.	
3336 4.5F	1 T	10-20 fl. oz.	
Halt 50W	1 T	—	

watering and shipping will greatly increase the numbers of spores in the air. Flower petals and other senescing or wounded tissues are most sensitive to attack by *B. cinerea*.

In the greenhouse, control of Botrytis blight involves using a combination of sanitation, cultural practices, and protective fungicides.

Greenhouse benches and beds should be cleared of debris or trash from the previous crop before bringing in fresh plant material. During the production cycle, continue disposing of diseased plants, spent blooms, and other debris. Treat wooden surfaces in propagation and production areas with 2 percent copper naphthenate or a similar surface disinfectant. Do not collect cuttings for propagation from diseased stock. Also, handle plants carefully to avoid unnecessary wounding of the leaves or shoots. If plants are irrigated with overhead sprinklers or by hand with a water breaker, stop watering early so the foliage dries by evening. Ventilate and heat incoming air in the evening to drive down the relative humidity to the point that greenhouse conditions no longer favor spore germination and infection. Finally, install a plastic film over production benches to block the UV radiation needed for spore formation by *B. cinerea*.

Fungicides will protect hydrangea from Botrytis blight only if used in combination with good management practices. Start treatments when the crop is beginning to bloom and continue until the crop is finished. Fungicides are available for use as smoke fumigants or foliar sprays. Some foliar-applied fungicides may leave an objectionable white residue on the leaves. Smoke fumigants may burn the petals of some floral crops. Some suggested fungicides and their treatment intervals are listed in Table 4. Additional information concerning Botrytis blight and its control can be found in Extension publication ANR-753, "Identification and Control of Botrytis Blight on Floral Crops and Woody Ornamentals."

Mushroom Root Rot

Mushroom root rot, which is also called Armillaria root rot, is a common disease in landscape plantings of hydrangea, particularly the oakleaf hydrangea. The causal fungi *Armillaria mellea* or *A. tabescens* are soil inhabitants that attack a variety of common shrubs and trees, particularly many oak species. These fungi are especially aggressive root rot pathogens on drought-stressed trees and shrubs.

The sudden wilting of one or more shoots that previously appeared healthy is often the first symptom of mushroom root rot on hydrangea (figure 5). After watering, these wilted leaves will not regain their normal form. The remaining shoots wilt within a few weeks and the diseased hydrangea quickly dies. White fan-shaped mats of fungal mycelia develop under the bark of the root collar at or just below the soil line. In addition, the characteristic black branched threadlike rhizomorphs of *Armillaria* fungi can usually be found on the surface of damaged roots and the root collar, as well as in the surrounding soil. Flattened black rhizomorphs may also be seen under the bark on the roots or root collar. In late fall after a heavy rain, clusters of up to 100 honey-colored mushrooms appear on the damaged roots or within the drip zone of the diseased shrub or tree.

Armillaria fungi are common soil inhabitants and often live in association of their hosts with no apparent damage. The fungi can colonize the roots of vigorous plants, but are more likely to attack shrubs previously weakened by drought or other stress factors. Although wounds on the roots are important infection sites, *Armillaria* fungi can also penetrate into undamaged roots and colonize the cambium

and sapwood. Mushroom root rot is often seen on hydrangea interspersed between diseased trees.

Good growing conditions are the best defense against mushroom root rot. Establishment of hydrangea on sites where they are best adapted and proper site preparation will reduce the risk of disease development. Also, avoid planting oakleaf hydrangea on sites where oaks or other trees have succumbed to mushroom root rot. During periods of summer drought, thoroughly water established hydrangea every 4 to 7 days. Fertilizing according to the results of a soil fertility assay is also suggested. Diseased hydrangea should be removed and destroyed. Fungicides will not control mushroom root rot.

Phytophthora Root Rot

Phytophthora root rot occurs primarily in container-grown oakleaf hydrangea. Other hydrangeas are also susceptible to this disease. Outbreaks of

Phytophthora root rot may also be seen in landscape plantings when diseased hydrangeas are established. The risk of root rot outbreaks in container-grown hydrangea is greatly increased by poorly drained potting media and excess watering.

Although symptom expression varies according to the degree of root colonization, the sudden wilting of the foliage on one to all of the shoots is often the first noticeable symptom of Phytophthora root rot (figure 6). Other symptoms of Phytophthora root rot on hydrangea may include a yellowing of the foliage, leaf shed, and stunting. The feeder roots on diseased hydrangea are brittle and brown rather than the normal off-white color. The area of discolored roots may encompass a part or the entire root system. When the causal fungi invade the crown, a brown discoloration of the tissues just below the bark may extend up the stem above the soil line.

Phytophthora root rot on hydrangea is caused primarily by the fungus *Phytophthora nicotiana* (formerly *P. parasitica*). This fungus is easily introduced into a nursery on unrooted or rooted cuttings, as well as on *P. nicotiana*-infected container stock. The fungus survives as resting body structures (oospores and chlamydozoospores) and mycelia in diseased roots, crowns, other crop debris, and contaminated potting media. Heaviest losses to root rot often occur on production beds, where water stands or flows around container stock. Overwatering or underwatering often contributes to the development of Phytophthora root rot.

The combination of sanitation and cultural practices, as well as protective fungicide treatments, will prevent root rot outbreaks in container-grown hydrangea. To prevent water from ponding around container stock, nursery production beds must be crowned and covered with black plastic and gravel. To avoid overwatering or underwatering,

Table 5. Fungicides Registered for the Control of Phytophthora Root Rot on Hydrangea

Fungicide	Rate Per 100 gal	Comments
fosetyl-Al Aliette T/O	6.4-12.8 oz. 2.5-5.0 lb.	Drench when transplanting liners or container stock and then as needed every 30 days. Apply approximately 2 pints of fungicide mixture per square foot of bed area. Foliar Spray: Apply as foliar spray every 30 days.
propamocarb Banol 66S	30 fl. oz.	Drench when transplanting liners or container stock. Apply 3 quarts of mixture to 10 square feet of bench or bed area.
thiophanate-methyl + etridiazole Banrot 40W	4-8 oz.	Drench when transplanting well-rooted liners or container stock before watering. Use 0.5 pint per 6-inch pot or sufficient volume of the fungicide mixture to wet media in container. Water immediately after treatment with at least one-half the drench rate. Repeat every 1 to 3 months as needed.
Banrot 8G	16 oz. 8-12 lb.	Dry Media Mix: Thoroughly incorporate into medium before planting well-rooted plants. Start follow-up drenches 1 month after potting or transplanting. Post-Plant Broadcast: Covers 1,000 square feet of bed area. Apply with a drop or cyclone spreader. See label for spreader settings.

separate plant material by container size and water needs. Also, account for daily rainfall when scheduling irrigation. Fertilize according to need. Finally, pot hydrangea in a fast-draining bark-based media.

As previously indicated, diseased stock plants and liners along with fungus-contaminated media are sources of *P. nicotiana*. Bark and other components should be stored on concrete or asphalt pads. If possible, do not recycle containers. Clear debris and disinfect propagation benches. Take cuttings from disease-free stock plants, and protect the rooted liners with fungicides.

In landscape plantings, the risk of root rot can be reduced by planting hydrangea on raised beds amended with aged pine bark or compost incorporated to a depth of 2 to 4 inches. Do not plant hydrangea in areas that flood after a heavy rain.

Fungicides are most effective in preventing outbreaks of Phytophthora root rot when combined with good management practices, but they will not cure hydrangea of this disease. Mixing a fungicide into the potting media before transplanting liners or container stock is an option. If a fungicide is not incorporated into the potting

media, applying a fungicide drench or spray after liners or container stock are transplanted and retreat at specified intervals until the crop is finished. Fungicides cleared for use for root rot control on hydrangea are listed in Table 5. For additional information concerning the control of Phytophthora root rot, refer to Extension publications ANR-571, "Phytophthora Root Rot on Woody Ornamentals," and ANR-500, *Alabama Pest Management Handbook, Volume 2*.



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Use pesticides **only** according to the directions on the label. Follow all directions, precautions, and restrictions that are listed. Do not use pesticides on plants that are not listed on the label.

The pesticide rates in this publication are recommended **only** if they are registered with the Environmental Protection Agency and the Alabama Department of Agriculture and Industries. If a registration is changed or cancelled, the rate listed here is no longer recommended. Before you apply any pesticide, check with your county Extension agent for the latest information.

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