Sustainable Urban Landscapes

# Hosta Diseases and Pests

**Hostas are the top-selling herbaceous perennial plants nationwide thanks to attractive foliage, endless diversity of shape and size, tolerance of shady areas, and minimal maintenance needs. Another reason for this popularity is that hostas have relatively few pest problems. However, several diseases and pests can reduce plant vigor and aesthetic value. This publication will help hosta producers, retailers, landscapers, and home gardeners to identify common diseases and invertebrate pests affecting hosta and to manage them effectively.**

# Contents



**Two major pests on hosta—slugs and petiole rot.**


## Acknowledgements

*Cover image*
Bob Solberg
Green Hill Farm, Inc.
North Carolina

*Background image*
(p.2, p. 14)
Roger Hammond
The Magnolias Gardens
England

*Anthracnose*
Bob Solberg
Green Hill Farm, Inc.
North Carolina

*Virus*
Agdia Inc., Elkhart, IN

B.E. Lockhart
University of Minnesota

M.L. Daughtrey
Cornell University

S.W. Scott
Clemson University

James A. LaMondia
University of Connecticut

*Slug*
R. Douglas, Wisconsin

*Prepared by*
Daren Mueller,
Mark Gleason,
and Donald Lewis
Iowa State University

Steve Jeffers
Clemson University

Brooke Edmunds
and Colleen Warfield
North Carolina State University

Jean Williams-Woodward
University of Georgia

*Editor*
Barb Abbott

*Designer*
Micki Nelson

# Diseases caused by fungi

## Anthracnose

Anthracnose, caused by several fungi in the genus *Colletotrichum*, is the most widespread foliage disease of hosta. Infection can degrade appearance (Fig. 1), but plants seldom are killed. Disease development is favored by extended periods of leaf wetness (rain, dew, or overhead irrigation) and warm temperatures.

### Symptoms

The anthracnose fungi cause large, irregular spots with dark borders. The centers of spots often fall out, and leaves become tattered (Fig. 2). Under certain conditions, these spots can grow together, causing entire leaves to die back.

### Management

Integrating multiple management strategies is most effective. Cultural practices that help manage anthracnose include regular irrigation early in the day, keeping plants cool, and removing infected leaves.

Fungicides are recommended on sites where anthracnose has been a problem and should provide protection of new growth. To be effective, however, fungicides need to be applied before symptoms appear. The effectiveness and number of sprays required for control will vary with weather conditions and the product used. Among the fungicides registered for use are chlorothalonil, iprodione, mancozeb, and thiophanate-methyl.

In nurseries, all foliage can be removed several months before the targeted sales date. In North Carolina, for example, anthracnose symptoms typically appear in mid- to late July. If foliage is removed at this time, new leaves will develop when weather conditions generally are less favorable for anthracnose than in spring and early summer.

Although no hosta varieties have been reported to have high levels of resistance to anthracnose, certain varieties (e.g., 'Tokudama' ) are particularly susceptible.

## Other foliage diseases

Other foliage diseases are caused by species of *Cercospora, Alternaria,* and *Phyllosticta* fungi. These fungi cause leaf spots that often are distributed randomly across the leaf during warm, rainy weather. Cercospora leaf spot (Fig. 3) is very common in the southeastern U.S. Leaf spots are tan to reddish with a darker rust-colored border and develop primarily in mid- to late-summer. Leaf spots reduce aesthetic value but seldom kill plants.

**Figure 1. Anthracnose harms the appearance of leaves.**

**Figure 2. Lesions caused by anthracnose fungi.**

**Figure 3. Lesions caused by *Cercospora* fungi.**

**Figure 4. Sclerotia and mycelium of *Sclerotium rolfsii* var. *delphinii*.**

**Figure 5. Sclerotia and mycelium at base of petiole.**

**Figure 6. Leaves collapsing from petiole rot.**

Practices that reduce the amount of time leaves remain wet can help suppress disease development and pathogen spread. Foliage applications of fungicides such as azoxystrobin, chlorothalonil, copper hydroxide, or myclobutanil also help reduce leaf spots and should be applied when leaf spot symptoms are first seen. Removal of diseased leaves and leaf debris can help reduce disease in subsequent crops.

## Petiole rot

Petiole rot, caused by *Sclerotium rolfsii* var. *delphinii*, can rapidly damage or kill hosta plants and is difficult to eradicate. Small spheres produced by the fungus, called sclerotia, are about the same size as mustard seeds (Figs. 4, 5). These tiny spheres allow the fungus to survive cold winters and dry-weather periods. When warm (80-90° F), rainy weather occurs and hosta are nearby, sclerotia become active and produce stringy white threads called mycelium. When the mycelium comes into contact with hosta plants, the fungus exudes droplets containing oxalic acid and tissue-destroying enzymes, killing the petioles at the base. Mature mycelium begins to produce sclerotia. As sclerotia mature, the color changes from white to light tan or reddish brown.

*Sclerotium rolfsii* var. *delphinii* has spread to many parts of the U.S. on contaminated plants. Once petiole rot has entered a planting it is easily spread by sclerotia clinging to soil on shoes, tools, and plant material.

### Symptoms

Symptoms appear after warm, rainy weather. The outer leaves turn yellow, then brown, and wilt from the margin back toward the base (Fig. 6). The inner leaves soon may collapse, too. Wilted leaves detach easily from the crown because they have been attacked at the base of the petiole. The bases of these damaged petioles are brown and have a mushy texture (Fig. 5). Mycelium and sclerotia of the fungus typically are present on the rotted tissue and surrounding soil.

### Management

Effective management of petiole rot requires a combination of strategies. These include careful inspection before planting, sanitation to control spread, and choosing plants that are less susceptible. A key to avoiding petiole rot is careful inspection of planting stock. Before purchasing or transplanting, examine plants for yellow, wilted lower leaves, sclerotia on the soil surface, softening and browning at the bases of petioles, and white mycelium around damaged tissue.

If petiole rot already has appeared in a planting, control becomes more difficult because sclerotia can remain dormant in the soil for years. The area containing infected hostas and contaminated soil should be quarantined, and care should be used to avoid spreading soil or plant material outside of this zone.

Many growers mulch hosta beds to help provide the consistently moist soil conditions that hosta prefer. Since the mycelium of *S. rolfsii* var. *delphinii* can grow quickly through moist mulch in warm weather, it may be helpful to maintain a mulch-free zone several inches wide around hosta crowns if petiole rot has appeared in the planting.

Fungicides are sometimes used to suppress *S. rolfsii* var. *delphinii* in hosta. Depending on the specific compound used, fungicides can be applied preventively to soil or media, either as a drench or as a granule. PCNB products and flutolanil are registered for use on ornamentals and are effective against petiole rot on hosta.

## Phytophthora foliage blight (and root rot)

*Phytophthora* species are fungus-like microorganisms that survive in soil and soilless container mixes. Growth and development are favored by wet or saturated soils or container mixes. Because of this affinity for wet soil, *Phytophthora* spp. often are called "water molds." They cause root and crown rots as well as foliage and flower blights on many ornamental plant species worldwide. Until recently, they were not known to attack hosta. However, *Phytophthora nicotianae* causes both foliage blight and root and crown rots on hostas grown in nurseries in the southeastern U.S.; similar diseases may occur in landscapes.

### Symptoms

*Foliage blight.* Small water-soaked spots appear on parts of the leaf where moisture collects (e.g., irrigation water, rain, dew)—often at the union of the petiole and leaf blade (Figs. 7, 8). Under favorable conditions, lesions expand to cover much of the surface area on infected leaves. The older, center part of a diseased area becomes brown and dry while the outer advancing margin appears dull green and water-soaked.

*Root and crown rot.* Plants grow slowly and are stunted compared to healthy plants of the same age, and foliage becomes chlorotic and may wilt. Affected plants eventually die. Below ground, root hairs are lacking, root systems overall are smaller than normal, and diseased roots are discolored (various shades of brown to black) and necrotic. If the infection moves into the crown, a brown, moist decay will be evident when the crown is split.

**Figure 7. Phytophthora foliage blight.**

**Figure 8. Phytophthora foliage blight.**

**Figure 9. Above-ground symptoms of Fusarium root and crown rot.**

**Figure 10. Healthy roots and crown.**

**Figure 11. Roots and crowns infected with *Fusarium* spp.**

**Management**

Purchase and plant only healthy, vigorous hosta plants that are free of disease symptoms. Then, keep plants healthy by preventing infection from occurring. Foliage blight can be avoided by keeping the pathogen off the leaves. Do not irrigate plants with water sources that may be contaminated with *Phytophthora* spp. (for example, recycled irrigation water and ponds that catch runoff water). Planting location is very important when trying to prevent Phytophthora root and crown rot. Do not plant hostas in areas where soils stay wet for prolonged periods.

Plants with root and crown rots should be removed from the landscape or nursery and destroyed. On plants with foliage blight, however, diseased leaves often can be removed without having to destroy the entire plant.

Fungicides applied before infection will protect plants if the problem is particularly severe. Dimethomorph and phosphites/phosphorous acid/phosphonate products are effective against both foliage blight and root and crown rot diseases. Additional products effective against root and crown rot are mefenoxam, metalaxyl, and etridiazole.

## Fusarium root and crown rot

As the name implies, Fusarium root and crown rot (FRCR) attacks the roots and crowns of hosta plants. This disease has been a problem primarily in nurseries, but it also affects plants in the landscape. FRCR is caused by several species of fungi in the genus *Fusarium*, but *F. hostae* is by far the most important species attacking hosta plants. The species that cause FRCR on hosta may be present naturally in the soil but probably were introduced to nurseries and landscapes on diseased hosta plants. Spores of these fungi are capable of surviving in soil for long periods, so once introduced they persist indefinitely.

*F. hostae* invades hosta plants most effectively through wounds—often wounds that occur during the propagation process. Infected plants then serve as a source of inoculum for other plants, either in the nursery or in the landscape. Disease development is favored by dry soil conditions and temperatures between 60 and 80°F.

**Symptoms**

FRCR causes symptoms on both the above-ground and the below-ground parts of hosta plants. Symptoms on the foliage result from severe infection of the roots and crown. Hosta plants with FRCR typically have leaves that turn yellow and then tan and become withered (Fig. 9).

The number of roots per plant and the size of the root system overall are reduced, and the outer layer of root tissue may be decayed. However, the most diagnostic symptoms are seen when the crown is split open. A healthy crown should be

cream to white in color and have lots of healthy white roots (Fig. 10). A hosta crown with FRCR has pockets of brown, dry decay, and roots close to the crown are white with brown to black discoloration of the center of the root (Fig. 11). Diseased plants often are stunted and unthrifty and may be slow to emerge in the spring or when cut back.

**Management**

Purchase and plant only healthy, vigorous hosta plants that are free of disease symptoms. Then, keep plants healthy by preventing infection from occurring. Once plants are infected, the pathogen cannot be eliminated and diseased plants should be removed and destroyed. Because the fungus invades through wounds, use good sanitation practices whenever plants are divided and avoid unnecessary wounding to the roots and crowns when plants are transplanted. Use disinfestants to sanitize tools and work surfaces during propagation. Plants that have been divided or wounded can be dipped in a fungicide suspension before planting. Products registered as pre-plant dips that are particularly effective against *Fusarium* spp. include thiophanate-methyl and thiabendazole. Drenching with fungicides around plants growing in containers or in the landscape is not very effective. However, dipping plants before transplanting and then drenching immediately after transplanting will minimize infection by *Fusarium* spp. The most effective fungicides for drenching are thiophanate-methyl, fludioxonil, and azoxystrobin. Several other cultural practices will limit development and spread of FRCR. When growing plants in containers, use peat-based container mixes and avoid using mixes with more than 50 percent pine bark. Plants growing in pots or in the landscape should be kept well-watered because FRCR is favored by dry soil conditions.

# Diseases caused by bacteria and viruses

## Bacterial soft rot

Bacterial soft rot of hosta can be caused by several species of *Erwinia*, including *Erwinia carotovora* subsp. *carotovora*, *E. carotovora* subsp. *atroseptica*, and *E. chrysanthemi*. Bacterial soft rot occurs in both gardens and nurseries, particularly following very cold winters where plants may have been damaged by ice or freezing temperatures. In areas with mild winters, hosta plants sometimes are refrigerated to satisfy cold dormancy requirements. In the Southeast U.S., refrigerated storage results in increased plant size and earlier, more uniform crop emergence than overwintering the crowns outdoors. Refrigeration typically lasts for 4 weeks at 39°F. However, dropping the temperatures within the refrigerated coolers to 32°F for

**Figure 12. Bacterial soft rot—initial symptoms.**

**Figure 13. Bacterial soft rot—leaves collapse.**

**Figure 14. Bacterial soft rot—advanced symptoms.**

**Figure 15. Symptoms caused by HVX.**

**Figure 16. Symptoms caused by HVX.**

**Figure 17. Symptoms caused by INSV.**

24 hours can increase the development of bacterial soft rot. Soft rot bacteria enter plant tissue primarily through wounds caused by freeze damage or during the propagation process. However, they also may enter through natural openings such as stomata. Dividing plants can spread the bacterium into the freshly made wound and cause bacterial soft rot. Warm temperatures (80 to 86°F), high relative humidity, and poorly draining soils are additional conditions favorable to bacterial soft rot development. The bacteria can survive in infected tissues, on contaminated tools, and occasionally in soil. *Erwinia* spp. also have been recovered from nursery irrigation ponds and run-off water. Irrigation with *Erwinia*-contaminated water can introduce the bacterium into production areas. The bacterium also can survive along the veins and petioles of hosta leaves without causing disease. Once the bacteria enter the plants, disease symptoms develop under favorable environmental conditions.

**Symptoms**

The bacteria causing soft rot release enzymes into the infected tissue, causing it to become watery and soft with an unpleasant aroma resembling that of dead fish. Symptoms are characterized by yellow, wilted leaves, a soft rot at the base of petioles resulting in plant collapse, and eventually plant death (Figs. 12,13,14).

**Management**

Bacterial soft rot management relies on following strict sanitary practices. Avoiding excessive wounding when separating hosta plants may reduce *Erwinia* infection. When separating hosta plants, all infected plants should be discarded, and all knives or other nursery tools, hands, and work areas should be cleaned regularly using disinfestants.

In addition, plants in refrigerated storage should be maintained at low relative humidity with adequate air circulation. Maintaining cold storage temperatures at 39°F can satisfy cold dormancy requirements and effectively prevent bacterial soft rot.

Treatment of symptomless plants with copper-containing bactericides to reduce bacterial populations is not effective at reducing disease development if temperatures within refrigerated facilities or natural environmental conditions reach 32°F. Chemical treatments do not eliminate bacteria from the foliage.

## Virus diseases

Viruses are very tiny particles, too small to be seen except under an electron microscope. Viruses are incapable of reproducing on their own; instead, they invade plant cells and induce these host cells to produce more virus particles. They then cause disease in plants by disrupting normal cell function, which results in symptom development and a

decline in plant health.
Viruses cannot attack plants and invade plant cells on their own; they must be carried from a diseased plant to a healthy plant. Once transmitted to a healthy plant, virus particles multiply in plant cells. Therefore, the key to virus infection is successful transmission.

Viruses can be transmitted during vegetative propagation if an infected plant is used as the source of propagation material. They also can be transmitted mechanically by moving plant sap that contains virus particles. This typically occurs when leaves are wounded during routine cultural practices, and sap from a diseased plant is moved to wounded leaves on healthy plants. Viruses also can be carried in seeds and pollen and by pests that feed on plants and move infected plant sap from plant to plant, like nematodes, insects, and mites.

**Symptoms**
Viruses cause a range of symptoms on hosta leaves (Figs. 15-23). Viruses often shorten the lifespan of plants or reduce growth, but they rarely are lethal. Symptoms may be severe on some hosta varieties and mild or latent on other varieties.

Environmental conditions also may affect the intensity of symptom expression. In addition, more than one virus can infect a single plant. In such cases, symptoms are caused by both viruses simultaneously—which can complicate diagnosis. Virus infection and subsequent symptom expression on hostas reduce the aesthetic value of the plants, but to date, the impact on overall plant health is unclear.

*Hosta virus X* (HVX) was the virus found most commonly in hostas during a survey conducted in Midwestern states in 1996. Symptoms of this virus include mosaic, chlorosis, and necrosis on leaves; severely affected leaves may wither and die (Figs. 15, 16). In addition to vegetative propagation, HVX can be transmitted mechanically by hands, on tools, and on other equipment that comes into contact with virus-contaminated plant sap.

*Impatiens necrotic spot virus* (INSV) is the virus observed most commonly on hostas in the Southeastern states. Symptoms typically are discrete circular spots composed of concentric rings, alternating in color between green and off-white, which look like a bull's-eye. These spots can vary in size and may grow together to form irregularly shaped areas when a leaf is heavily infected (Figs. 17, 18). In addition to vegetative propagation, INSV is transmitted by thrips.

*Tomato ringspot virus* (ToRSV) produces chlorotic spots of various shapes and sizes on hosta leaves; spots have indefinite margins that fade from yellow to green (Fig. 19, 20). In addition to vegetative propagation, ToRSV is transmitted by root-feeding nematodes and possibly by pollen.

**Figure 18. Symptoms caused by INSV.**

**Figure 19. Symptoms caused by ToRSV.**

**Figure 20. Symptoms caused by ToRSV.**

**Figure 21. Symptoms caused by tobacco rattle virus.**

**Figure 22. Symptoms caused by tobacco rattle virus.**

**Figure 23. Symptoms caused by ArMV.**

*Tobacco rattle virus (TRV)* produces mottling, chlorosis, necrosis, and ringspots (Figs. 21, 22). TRV is spread by a nematode and has a very wide host range.

*Arabis mosaic virus* (ArMV) has been detected infrequently in hostas in the U.S. Currently, this virus is classified as a regulated plant pathogen by the USDA-APHIS-PPQ. If this virus is detected, diseased plants will be quarantined and destroyed. Symptoms caused by ArMV are not distinctive; they may appear as chlorotic spots and flecks or patches of mosaic (Fig. 23).

Other virus-like symptoms that have been observed on hosta foliage but not confirmed to be caused by virus infection include chlorotic spots, chlorosis of the veins, yellowing, distortion, and necrosis.

**Management**

The best method to manage virus diseases is to avoid introducing these pathogens into the nursery or landscape. Only virus-free plants should be used for propagation to avoid transmitting viruses to new plants. Carefully inspect all hostas for any evidence of virus symptoms before buying and planting them. This will not be possible if the plants are obtained as dormant crowns. Therefore, it is important to purchase plants only from reputable sources known to provide certified, inspected, or pathogen-free plants.

If symptomatic plants are found in a nursery or landscape, they should be removed and destroyed so the virus cannot be transmitted to healthy plants. Weeds are known to harbor many different types of viruses. Although little is known about the weed hosts of most hosta viruses, it is good practice to keep weeds out of hosta plantings.

There are no pesticides available to control virus diseases in plants. However, applications of insecticides to control thrips populations may limit transmission of INSV where this virus is a concern. Likewise, application of pre-plant nematicides or fumigants to soils in plant beds may reduce populations of soilborne nematodes that can transmit certain viruses. Currently, there are no nematicides registered for use on established hosta plants or other ornamental crops.

# Nematodes and other pests

## Foliar nematodes

Foliar nematodes are microscopic worms in the genus *Aphelenchoides* that move, by a swimming motion, in thin films of water that form on plant leaves and stems. Foliar nematodes enter leaf tissue through stomata. Once inside the leaf, the nematodes feed and reproduce. In addition to feeding on plant cells, nematodes lay eggs within the leaf tissue. Once the eggs hatch, nematodes exit damaged leaves and swim to new feeding sites. Nematodes can be moved from plant to plant in drops of splashing water as well

as unintentionally by gardening tools or even by growers handling plants.

**Symptoms**

Foliar nematodes cannot penetrate the major leaf veins, so damage is limited to areas between the major veins. This results in the characteristic streaking or striping pattern seen on infected leaves. Foliar nematode damage initially appears as stripes of light green to yellow leaf tissue running parallel to and bordered by the major leaf veins, often forming a V-shaped pattern of damage on individual leaves (Figs. 24, 25). Symptoms typically show up on the older, lowest leaves first. The affected leaf tissue becomes tan and necrotic over time and may drop out or tear, giving the leaves a tattered appearance (Fig. 26). Leaf symptoms are most pronounced during mid-summer to early fall, when foliage nematode populations typically reach their highest levels of the season.

**Management**

The most effective management strategy is prevention. Carefully inspect plants for symptoms prior to introducing them into a nursery or landscape, and buy from reputable growers.

Reducing leaf wetness will help prevent the spread of foliar nematodes since they require water on the surface of the plant to move. Removing leaves that show foliar nematode damage can dramatically reduce the population of foliar nematodes and will help prevent spread. Foliar nematodes can survive for long periods of time in a desiccated state, so it is important also to remove and destroy any dead leaves from infected plants. Nematodes also can survive in the crown tissue, which makes control more problematic.

Heat treatments have been shown to be effective at eradicating foliar nematodes from infected plants and may be practical in situations where a small number of plants are infested. In cold climates, heat treatments have been effective when done in the fall, immediately followed by replanting. However, a late winter treatment may be more appropriate in warmer climates in case dormancy is broken.

Remove all leaves as close to the crown as possible, and forcefully wash off soil from the roots using a strong stream of water. Dip the crown and roots in hot water (~123° F) for approximately 4-8 minutes, followed by a dip in cold water. Carefully monitor the water temperature to avoid damaging the plants. Pot or plant the heat-treated plants immediately after the cold water dip. Plants adjacent to infested plants also should be heat-treated. Because foliar nematodes can survive in the soil for a period of time, replanting in another location is recommended. Currently there are no nematicides or insecticides labeled for outdoor use to control foliar nematodes on ornamentals.

**Figure 24. Foliar nematode damage.**

**Figure 25. Initial symptoms from foliar nematodes.**

**Figure 26. Advanced symptoms of foliar nematode damage.**

**Figure 27. Root knot nematode damage to roots.**

**Figure 28. Slug feeding damage.**

**Figure 29. Slug feeding damage.**

## Root knot nematodes

Hostas also are susceptible to infection by root-parasitic nematodes. The most common are root knot nematodes (*Meloidogyne* spp.). Newly hatched nematode larvae occur freely in the soil until they penetrate a host plant, typically at the root tips. Once the nematodes become established inside the root tissue, the nematodes do not move. A female will lay her eggs inside the root; after hatching, the larvae may either move into the soil and seek a new host or remain and continue to develop in the same root. Secretions produced by nematode feeding stimulate an abnormal growth of plant cells, resulting in the characteristic root swellings or galls.

### Symptoms

Knots or small galls of root tissue are the most common and easily recognized symptom caused by root knot nematodes. In addition, it is not uncommon to see branched root tips (Fig. 27). Because damaged roots interfere with a plant's ability to take up water and nutrients, plants may appear stunted, wilt easily under stress, and may show signs of nutritional deficiency.

### Management

Because root knot nematodes remain in roots during most of their lifecycle, they can be spread easily to new locations through vegetative propagation of infested plants. Therefore, care should be taken to inspect plants prior to introducing them into a landscape or nursery. Avoid replanting in an infested area.

For nurseries, a rotation with a non-susceptible host, such as small grains, may reduce nematode populations. Increasing the amount of organic matter in the soil can increase the diversity of microbes in the soil, which may provide some natural control of root parasitic nematodes. Soil solarization also may reduce root knot nematode populations in the soil.

There are a few biological nematicides labeled for control of root knot nematodes. However, very little is known about their effectiveness.

## Slugs

Hosta growers always seem to have more than their share of slugs. During drought years, slugs almost disappear from sight. Prolonged periods of wet weather, however, have the opposite effect and numbers become noticeable.

The grey garden slug, *Agriolimax reticulatum*, starts very small (less than one-quarter inch) and grows to almost 1 inch in length.

Slugs require a damp environment to survive. They are protected from drying by hiding during the day and feeding at night. Slugs may be found during the daytime by looking under boards, rocks, mulch, debris, or the foliage of low, dense plants.

At night you can see them slowly gliding on a secretion of mucous or slime, eating large, irregular holes in the plant foliage. When slugs are abundant, considerable damage may accumulate on certain hostas (Figs. 28, 29). Damage is usually most severe on thin-leafed varieties or in the white margins and centers of variegated varieties.

**Management**
There is no single, foolproof remedy for slugs, although several common practices can help. Start by cleaning debris from the garden to eliminate slug hiding places. Remove heavy leaf litter, boards, bricks, unnecessary mulch, and other damp debris in contact with the ground. Dense ground covers that are harboring slugs can be thinned to promote sunshine, air circulation, and drying.

Minor slug problems can be controlled by hand picking. Check carefully around the base of damaged plants and favored hiding places. Night checking with a flashlight or leaving "trap sites" may improve your efficiency. A mild solution of vinegar or ammonia can be sprayed on individual slugs. This, like the apparently factual urban legend of sprinkling salt on slugs, will kill individual slugs but is too labor-intensive for complete success.

Beer is a well-known trap attractant for slugs, though any fermenting or yeast-containing liquid appears to work. The traditional trap design is to bury a shallow pan in the soil with the top edge level with the soil surface. Renew the beer or attractant regularly and empty the pan of trapped slugs frequently.

Chemical treatment occasionally may be necessary. Chemical control of slugs requires a special type of pesticide called a molluscicide. Slug baits can be effective when used in conjunction with the other methods discussed above.

The most commonly available baits contain metaldehyde and/or carbaryl combination in liquid, granular, or pelleted baits. These baits can be hazardous if carelessly used where children and pets can be exposed. A newer snail and slug bait contains iron phosphate, an ingredient that is nontoxic to children, pets, and wildlife.

Do not pile slug bait in mounds or clumps.Thinly scatter bait in small spots or narrow strips around susceptible plants and moist, protected locations. Treat at the first sign of damage. Baiting is less effective during very hot, very dry, or cold times of the year.

## Steps for avoiding the introduction of pathogens

Only pathogen-free plants should be used for propagation to avoid transmitting diseases to new plants.

Carefully inspect all hosta plants and soil surfaces for any evidence of diseases or pathogens before buying and planting. Careful inspection of foliage will not be possible if the plants are obtained as dormant crowns. Therefore, it is important to purchase plants only from reputable sources known to provide certified, inspected, or pathogen-free plants.

If symptomatic plants are found in a nursery or landscape, they should be removed and destroyed so the pathogen cannot be transmitted to other healthy plants in the surrounding area.

## Pesticide use

The use of various pesticides is suggested as an option for control of several diseases and slugs. This bulletin lists common names of pesticides rather than trade names. These lists are not inclusive. Verify that products are labeled for use on ornamentals and for the specific problem you need to control. Read and follow all label directions. Also, some products may not be purchased at garden centers or other outlets but are available only

# Glossary

| | |
|---|---|
| **bacterium (pl. bacteria)** | a prokaryotic, microscopic, single-celled organism |
| **blight** | general and rapid killing of leaves, flowers, and stems |
| **chlorosis (adj. chlorotic)** | yellowing of normally green plant tissue because of a decreased amount of chlorophyll, often as a result of disease or nutrient deficiency |
| **crown** | junction of root and stem of a plant, usually at the soil line |
| **desiccate** | to dry out thoroughly |
| **disinfestant** | an agent that eliminates contaminating organisms on the surfaces of animate or inanimate objects (e.g., pruning equipment). Products such as sodium hypochlorite (e.g., bleach) hydrogen dioxide, isopropyl alcohol, and quaternary ammonium can be used to clean knives or other nursery tools. Quaternary ammonium is not effective against growth of *Erwinia* spp. |
| **foliage** | of or relating to a leaf or leaves |
| **fungicide** | a compound that is toxic to fungi |
| **fungus (pl. fungi)** | a eukaryotic organism that requires a source of organic nutrients, is commonly composed of threadlike mycelium, and reproduces by asexual and/or sexual spores |
| **gall** | an abnormal swelling of plant tissue |
| **latent** | present but not evident or active |
| **mosaic** | a viral symptom resulting in light and dark areas in the leaves |

| | |
|---|---|
| **mycelium (pl. mycelia)** | the threadlike filaments constituting the vegetative body of a fungus |
| **necrosis (adj. necrotic)** | death of plant cells or tissues through injury or disease |
| **nematode** | a roundworm that may be parasitic on animals or plants or may be free living in soil and water |
| **petiole** | the stem at a leaf that attaches to the main stem of a plant |
| **root hair** | extension of an epidermal cell, greatly expanding the surface area of the root so that minerals and water are more easily absorbed |
| **sclerotium (pl. sclerotia)** | a dense mass of branched mycelium that is capable of remaining dormant for long periods |
| **solarization** | a simple non-chemical technique that captures radiant heat energy from the sun, causing physical, chemical, and biological changes in the soil. These changes lead to control or suppression of soilborne plant pathogens, insect pests, and weed seeds and seedlings. |
| **spore** | a reproductive body of fungi and lower plants |
| **stoma (pl. stomata)** | one of the small pores in the leaf or stem through which gases and water vapor pass |
| **symptom** | an external and internal reaction or alteration of a plant as a result of a disease |
| **thrips** | small to minute sucking insects with narrow feathery wings if any; they feed on plant sap and many are destructive |
| **USDA-APHIS-PPQ** | a Federal agency that safeguards agriculture and natural resources from the risks associated with the entry, establishment, or spread of animal and plant pests and noxious weeds |
| **vegetative propagation** | asexual reproduction; in plants, the use of liners, cuttings, bulbs, tubers, and other vegetative plant parts to grow new plants |
| **virus** | a submicroscopic agent that causes disease and multiplies only in living cells, composed of nucleic acid and usually a protein coat |



IOWA STATE UNIVERSITY
University Extension
SUL 14 March 2005

NC STATE UNIVERSITY
A&T STATE UNIVERSITY
COOPERATIVE EXTENSION
*Helping People Put Knowl dge to Work*

AG-637

CLEMSON
EXTENSION
SUL 14

The University of Georgia
**Cooperative Extension Service**
Bulletin 1260



**Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Stanley R. Johnson, director, Cooperative Extension Service, Iowa State University of Science and Technology, Ames, Iowa.**
**File: Hort & LA 2-1**