

CROWN ROT

A Serious Disease of Hosta and Other Ornamentals



H

ostas are the top-selling herbaceous perennials nationwide thanks to their attractive foliage, endless diversity of shape and size, tolerance of shady areas, and minimal maintenance needs.

Few pests plague hostas in Iowa. Since the mid-1990s, however, a disease called crown rot has damaged many hosta plantings. This fungal disease, caused by *Sclerotium rolfsii*, can severely damage established hostas within a week, and is difficult to eradicate. Formerly restricted to warm, humid states in the southern United States, crown rot has now appeared in many Midwest gardens.

This bulletin explains how *S. rolfsii* has managed to spread into the Midwest, how it causes crown rot in hostas, and ways to manage the disease.





Symptoms

Symptoms begin to appear on hosta after prolonged hot, humid weather. The lower leaves begin to turn yellow, then brown, and wilt from the margins back toward the base (Figures 1, 2, and 3). The upper leaves may soon collapse, too. The wilted leaves can be easily pulled from the crown, because they have been attacked at the base of the petiole. The bases of these damaged petioles show a brown discoloration and mushy texture (Figure 4). Plants with less succulent stems, such as peony, are girdled at the base of stems, causing discolored and wilted leaves, but the stems may not collapse (Figure 5). Fluffy white threads (mycelium) of the crown rot fungus typically are present on the rotted tissue and surrounding soil (Figure 6). A closer look shows small spheres, about the size of mustard seeds, sprinkled on the soil (Figure 7). These tiny spheres, called sclerotia, allow the fungus to survive cold winters and other unfavorable conditions. As sclerotia mature, their color changes from white to a light tan or reddish brown.



FIGURE 1
A hosta bed showing the leaf yellowing typical of crown rot.



FIGURE 4
*Brown, softened tissue at the base of hosta petioles. Tiny, orange spheres on the soil surface below the petioles (see arrow) are sclerotia of the fungus *Sclerotium rolfsii*. Note penny for scale.*



C R O W N R O T



FIGURE 2
Close-up of a hosta with marginal yellowing and browning caused by crown rot.



FIGURE 3
Collapse and death of lower leaves of hosta, caused by crown rot attack at the bases of the leaf petioles.



FIGURE 5
*A wilted, collapsed peony (center) whose fronds were attacked at the base by *Sclerotium rolfsii*. The source of the fungus was a nearby, infected hosta.*



FIGURE 6
White mycelium (fungal strands) of Sclerotium rolfsii on the base of a hosta petiole severed by the fungus.



FIGURE 7
Sclerotia of Sclerotium rolfsii. Sclerotia are approximately 1 mm in diameter (about the size of mustard seeds) and vary in color from white to brick red.

How *S. Rolfsii* Causes Crown Rot

The crown rot life cycle begins with the germination of sclerotia (Figure 8). Mycelium fans out in all directions from the sclerotia, slowly growing across the surface of the soil

in warm, moist weather. When a host plant is nearby, the fungus exudes droplets containing oxalic acid and tissue-destroying enzymes. Oxalic acid poisons plants, causing their cell walls to break down.

C R O W N R O T

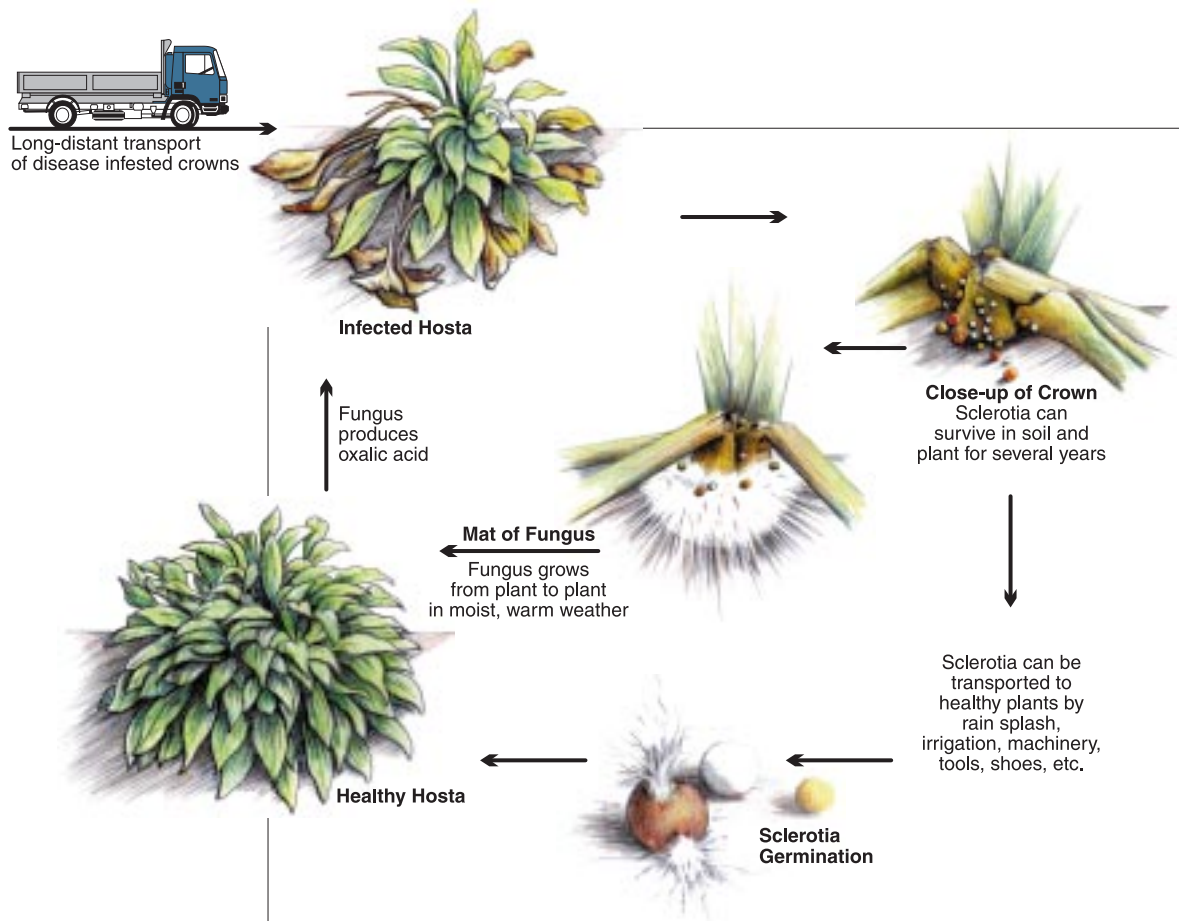


FIGURE 8
Disease cycle of crown rot on hosta.

When *S. rolsii*'s mycelium comes into contact with hosta, the oxalic acid kills the petioles at the base. With their support gone, the leaves begin to collapse. The stem bases, and the soil for several inches around the crown, can be covered with fluffy white mycelium. Mature mycelium begins to produce sclerotia. There is no required dormancy period, so newly formed sclerotia can produce new mycelium at once or remain dormant in the soil for years.

Sclerotia are hard-shelled survival structures. It was once thought that the cold winters of the Upper

Midwest would kill *S. rolsii*, but gardeners have seen crown rot spread through their plantings year after year. It now appears that *S. rolsii* sclerotia can survive temperatures well below freezing, either in plant debris or at the soil surface.

On the positive side, *S. rolsii* seldom produces microscopic spores like most other fungi. Without spores, it cannot spread by moving on air currents, but only as sclerotia in soil or plants, or by mycelium that grows slowly across the ground from plant to plant.



TABLE 1
Genera of herbaceous perennials known to be hosts for *Sclerotium rolfsii*. The plants on this list grow well in part sun to full shade in the Upper Midwest.

Ajuga–bugleweed
Anemone–windflower
Aquilegia–columbine
Arrhenatherum–oat grass
Asplenium–dragontail fern
Caladium–fancy-leaved caladium
Campanula–bellflower
Chrysogonum–goldenstar
Convallaria–lily-of-the-valley
Dicentra–bleeding heart
Digitalis–foxglove
Dryopteris–wood fern
Hemerocallis–daylily
Hosta–plantain lily, *hosta*
Lysimachia–loosestrife
Phlox–phlox
Ranunculus–buttercup
Vinca–periwinkle
Viola–violet, pansy

For a more complete listing of host genera, consult the following reference: Farr, D.F., Bills, G.F., Chamuris, G.P., and Rossman, A.Y. 1989. *Fungi on Plants and Plant Products in the United States*. American Phytopathological Society, St Paul, MN.

Spread of Disease

What are the circumstances behind crown rot's introduction into northern landscapes?

The answer is unknown, but one possibility is that *S. rolfsii* has been spread on contaminated nursery plants (Figure 8). Others point to the nonstop exchange of hostas among gardeners throughout the United States. Once crown rot has entered a planting it is easily spread by sclerotia clinging to soil on shoes, tools, and plant material.

S. rolfsii can affect more than 200 different plant genera, including ornamentals, fruits, and vegetables. Table 1 lists genera of ornamental plants susceptible to crown rot and, like hosta, adapted to partial to full shade environments. Many susceptible ornamentals, such as daylily (*Hemerocallis*), impatiens, ajuga, peony, and vinca, are often planted in the same beds as hosta, so the disease can move from hosta to neighboring plants.

Management

Effective management of crown rot requires combining several strategies. The most effective management practices are a combination of cultural tactics such as careful inspection before planting, sanitation to control spread, and choosing plants believed to be less susceptible (see Table 2). These methods will not cure infected hostas but can slow or stop the spread of disease.

Cultural Management of Crown Rot in the Landscape

Avoidance is one of the best crown rot management tactics. Simply put, no fungus means no disease. But how do you keep *S. rolfsii* away from your hostas?

TABLE 2
Genera of herbaceous perennials not known to be hosts for *Sclerotium rolfsii*. The plants on this list grow well in part sun to full shade in the Upper Midwest.

Acanthus–bear's breech
Aconitum–monkshood
Actaea–baneberry
Adiantum–maidenhair fern
Alchemilla–lady's mantle
Anaphilis–pearly everlasting
Aruncus–goatsbeard
Astilbe–false spirea
Cimicifuga–bugbane
Corydalis–corydalis
Disporum–fairy-bells
Epimedium–barrenwort
Erythronium–trout lily
Filipendula–meadowsweet
Gaura–gaura
Gentiana–gentian
Geranium–cranesbill
Hakonechloa–hakone grass
Hedera–ivy
Helleborus–hellebore
Heuchera–coral bells
Houttuynia–chameleon plant
Lamiastrum–yellow archangel
Lamium–dead nettle
Mertensia–bluebells
Myosotis–forget-me-not
Osmunda–royal fern
Pachysandra–spurge
Papaver–poppy
Polemonium–Jacob's ladder
Polygonatum–Solomon's seal
Polystichum–shield fern
Primula–primrose
Pulmonaria–lungwort
Pulsatilla–pasque flower
Sanguinaria–bloodroot
Stachys–lamb's ear
Thalictrum–meadow rue
Tiarella–foamflower
Tradescantia–spiderwort
Trillium–wake-robins
Trollius–globeflower



One key to avoiding crown rot is careful inspection. 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. Checking for these symptoms will reduce the risk of *S. rolsii* entering the garden.

If the problem is already present in landscape plantings, the contaminated area containing the infected hostas and soil should be quarantined, and care should be used to avoid spreading any soil or plant material outside of this zone. You can excavate soil in the contaminated area to a depth of at least 8 inches, discard the soil, and replace it with uncontaminated soil. But the time, labor, and expense of this tactic is discouraging, especially when the contaminated area is more than a few square feet in size. Do not transplant from the contaminated area, because sclerotia clinging to the roots and crown can start a new infection cycle in another part of the garden. All tools and implements should be washed thoroughly, and the wash water should go back into the contaminated bed. Some recommendations call for dipping tools in a 10 percent bleach solution for a few minutes to kill *S. rolsii*, but bleach is corrosive to tools and messy to work with. More important than bleaching is to scrub tools clean of all adhering soil. If you decide to use a bleach dip, clean your tools thoroughly beforehand.

Many growers mulch their hosta beds to help provide the consistently moist soil conditions that hostas prefer. Since the mycelium of *S. rolsii* can grow rampantly through moist mulch in warm weather, it may be helpful to maintain a mulch-free zone several inches wide around hosta crowns if crown rot has appeared in the planting. Some hosta growers also recommend planting crowns as high as possible, with

soil barely covering the roots, to reduce the odds that the vulnerable leaf petioles will come into contact with *S. rolsii* from the soil.

Switching to plants that are not susceptible to *S. rolsii* is another option. The problem is that so many types of plants are affected by crown rot that you need to choose carefully. Some ornamental plants not known to succumb to *S. rolsii*, but adapted to partial-shade to full-shade environments in the Upper Midwest, are listed in Table 2. Many of the plants in Table 2, although not confirmed to be hosts of *S. rolsii*, have not been tested for susceptibility to the fungus. Therefore, it is advisable to try them out on a limited basis before committing large numbers of plants to replace crown rot-killed hostas.

Many people have observed that some types of hostas seem to fare better than others against crown rot. However, crown rot resistance ratings are currently unavailable for hosta species and cultivars.

S. Rolsii Problems in Propagation and Production

A key to avoiding crown rot during plant propagation and production is careful inspection. Regularly examine plants for telltale leaf yellowing and collapse, sclerotia, softening and browning at the bases of petioles, and white mycelium around damaged tissue. Experienced hosta growers know that leaves can turn yellow for other reasons, such as heat stress or a fungal disease called *Rhizoctonia* root rot, but only *S. rolsii* crown rot will show the other symptoms as well. The Plant Disease Clinic at Iowa State University can help you confirm a diagnosis. You can mail a sample to the Clinic through your County Extension Office, or send it directly to the Clinic at 351 Bessey Hall, Iowa State University, Ames, IA 50011. Once you are convinced that the problem is crown rot, discard the symptomatic plants as well as the planting media and the pot.



Pre-plant fumigation of production fields with methyl bromide and chloropicrin can minimize problems with *S. rolfsii*. Fumigation is expensive, however, and methyl bromide use will be prohibited in the United States after the year 2005 due to recent Federal regulations. In general, home gardeners should avoid using fumigants, because these materials are dangerous to humans.

Fungicides are sometimes used to suppress *S. rolfsii* in hosta as well as other ornamental and food crops. A relatively new fungicide, flutolanil (sold as Contrast®), is labeled for use against this fungus on ornamental plants. Fungicides containing pentachloronitrobenzene (also known as quintozone or PCNB) typically are applied preventively to soil or media, either as a drench or as a granule. Trade names

of PCNB products labeled for control of crown rot on hosta include Terraclor®, Defend®, Pennstar®, Revere®, and PCNB®. Note that the labels of these products do not specifically mention hosta, but they are legal to use on hosta because hosta is included within the broad designation “ornamentals” on the labels. Since phytotoxic reactions to PCNB can occur, it is advisable to treat a small bed area or a small number of pots first, then check the hosta’s reaction, before attempting larger-scale treatments. To our knowledge, flutolanil and PCNB products labeled for use on ornamentals are available only through commercial pesticide dealers rather than at garden centers or other retail outlets. Sanitizing agents such as chlorine bleach have been used against crown rot, but these products are not legally labeled for this use.

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