Pine needle diseases: Brown spot and Lophodermium needlecast

M.F. HEIMANN, G.R. STANOSZ, and G.L. WORF

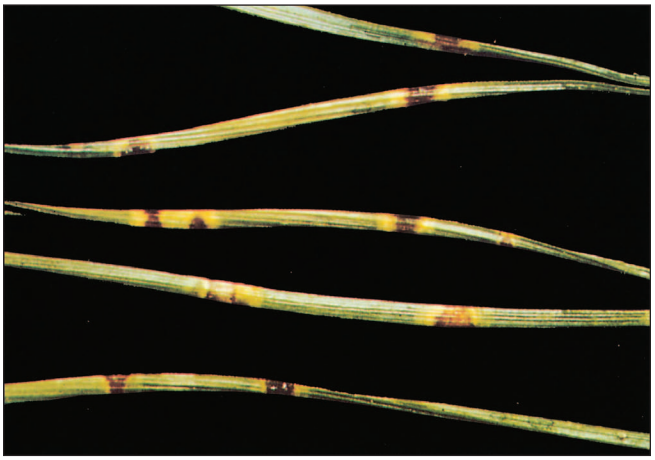
Brown spot and Lophodermium needlecast attack short-needled varieties of Scotch pine—their primary host—and red (Norway) pine. They have also infected certain other species, but not seriously in Wisconsin. Serious outbreaks of brown spot have developed in many Christmas tree plantations and some nurseries in Wisconsin since 1966, when chemical control became necessary to protect the crops. Ornamental pines have also suffered heavy infections on occasion. Lophodermium needlecast has been present for many years in Wisconsin, but became serious on red and Scotch pine at about the same time as brown spot. Both diseases can make Christmas trees unmarketable and can kill seedlings. A severe attack can ruin the beauty of these trees in an ornamental setting.

These two diseases are discussed together because they share several symptoms, many hosts, and certain control measures. They are distinct diseases, however, and we caution you to distinguish between them because control measures differ in some important ways.

Symptoms and effects

Both diseases appear first as bar-like spots on needles. These are gray-black at first but usually turn brown with yellow margins before they are detected. Later the entire needle turns yellow, then brown, and may fall off—hence the term "needlecast," which applies to both diseases. This is the most conspicuous and damaging stage of disease development.

On this branch, brown needles, infected with Lophodermium needlecast, are interspersed with healthy needles.



Needlecast infections typically produce brown spots or "bars" across the needles with yellow margins on either side.

Seedlings may be infected uniformly, but older trees show most infection at ground level, with disease development progressing upward. It is often more prevalent on the shady or north side of the tree. Older (interior) needles of a branch are the most likely to show the symptoms. When severe needle loss occurs, only current season needles may remain on the tree, and lower branches may be virtually bare. New needle growth may appear on tips of branches, ahead of brown, dead needles.

The key to distinguishing brown spot from Lophodermium needlecast in the field is to notice the time of year when the symptoms occur. Brown spot-infected needles turn brown in the fall; Lophodermium-infected needles turn brown in the spring.

Infection by the brown spot fungus occurs in early summer. Spots on needles begin appearing in August and September and soon afterwards the needles die back and turn brown. Spots on needles may become resin-soaked. The fruiting bodies develop after needles turn brown, and they produce spores during rainy periods. Needle drop is heaviest in the fall, though some may still occur the following spring.

Lophodermium infection occurs during late summer or fall, but the symptoms become most apparent in early spring. The characteristic bars develop in late March or April, and the needles turn brown in April and May as the fungus spreads. Buds are not killed on older seedlings and larger trees. By mid-June new growth from these buds may mask the brown needles, but this growth is weaker than usual, as is the entire tree. Continued infection by either disease can make the tree quite unattractive.

An experienced observer can identify these needle diseases in the field with reasonable confidence. However, specific identification is not always possible and may require the assistance of a diagnostic laboratory. If you desire a diagnosis, collect a representative sample of branches with both diseased and healthy needles and take them to your county Extension office.

Needlecast diseases can be confused with several other problems or situations often encountered in the field. Seasonal loss of three-year-old needles, which usually occurs in the fall and which does not damage the tree, may appear similar to the casual observer. See Extension publication *Evergreen Condition: Seasonal Needle Drop* (A2614) to identify this normal condition. Evergreens are also subject to yellow or brown discoloration from winter injury. Winter injury often occurs above the snow line, in contrast to Lophodermium, which may appear below the snow line. Injury by atmospheric constituents such as sulfur dioxide and ozone can cause sudden yellow or red discoloration of current season foliage during midsummer. Other factors might also be involved.

Cause

The fungus *Mycosphaerella dearnessii* causes brown spot, and the fungus *Lophodermium seditiosum* (formerly *L. pinastri*) causes Lophodermium needlecast. Spores of these fungi develop in the black fruiting structures on infected needles and are released during wet weather. Splashing rain and contaminated pruning tools spread the spores. Wind can carry Lophodermium spores several hundred feet, and windbreaks may serve as local sources of inoculum for either disease. Infected nursery stock is responsible for long distance spread, although increased nursery stock inspection is helping to reduce this form of spread.

We do not understand fully why these diseases have increased so markedly in the last few decades, but several factors may help explain. Short-needled Scotch pine varieties, which are much more susceptible than long-needled varieties, have increased in popularity. The diseases may have spread inadvertently through distribution of infected nursery stock, and meanwhile more damaging strains of the fungi may have evolved. The Wisconsin Department of Agriculture, Trade, and Consumer Protection, the Wisconsin Department of Natural Resources, and the U.S. Forest Service conduct cooperative survey and inspection efforts to ascertain the severity of the diseases and to control them in plantations and nurseries.

Control

Early detection and prompt application of control measures can prevent epidemic losses. The Forest Service has developed effective control measures for Christmas trees and nursery stock. They are the basis of suggestions we offer here for ornamental evergreen protection as well. Further information for Christmas tree and nursery growers is available from the DNR and the Forest Service.

Cultural

Start with disease-free planting stock. Consider growing resistant varieties if they will suit your needs. Avoid planting the highly susceptible short-needled varieties of Scotch pine, 'Spanish' and 'French Green.' Longer-needled Scotch pine varieties are more resistant. Do not shear or prune wet trees. Disinfest shearing tools by dipping them in denatured alcohol for 3–5 minutes after working on infected trees.

Chemical

If you have detected an infection and it appears the disease may build up due to prolonged wet periods, or if you desire disease-free stock, we recommend chemical controls. Treatments for the two diseases differ in timing, number of applications required, and the choice of fungicides. Timing is critical for effective treatment because the fungicides must be present on the foliage at the time the spores are present. Treatment after infection occurs is of no value.

Once the diseases are brought under control on ornamentals, you should be able to omit applications in years when the weather is dry during the infection period. Where the disease has been severe, commercial growers may prefer to continue the spray programs for several years to avoid economic loss. Effective treatment will eventually result in healthy foliage.

Brown spot control. Chlorothalonil (Bravo or Daconil) and fresh Bordeaux mixture are both effective controls for this disease. We do not suggest using spreader-sticker additives.

Chlorothalonil is the simpler to use if it is available. Use according to label directions for a dilute spray or a mist blower, whichever you plan to use. Apply with enough pressure to wet the foliage thoroughly.

Commercially prepared Bordeaux mixes are available on the market, but they are not nearly as effective as fresh Bordeaux. If you prepare Bordeaux for dilute spraying or home applicators, you must use it on the day of preparation for greatest effectiveness.

You should make the first application for brown spot control when the needles are half-grown, or about mid-June. We suggest a second application 3 weeks later during unusually wet years and on trees with severe infections. Apply on a quiet, dry day so that the foliage is covered thoroughly and has time to dry before the next rain or irrigation.

Lophodermium control. Chlorothalonil (Bravo or Daconil) is registered and effective against this disease. Use according to label directions. Nursery stock should be sprayed four times at 2-week intervals, beginning about August 1. For larger trees (8–18 ft), two or three applications of either chemical are suggested at 3-week intervals. Begin the treatment when temperatures remain above 80°F, typically about mid-July, and continue until early September. Two applications should be adequate for lightly infected trees.

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