

## NEEDLE BLIGHTS AND NEEDLE CASTS OF PINES

Pines in the Midwest are susceptible to several needle blights and casts that are caused by fungi that infect and kill (blight) the needles, causing them to be shed or cast prematurely. The three most serious blights and casts are Dothistroma needle blight (caused by *Dothistroma pini* [also known as *Scirrhia pini* in its sexual stage]), brown spot needle blight (caused by *Scirrhia acicola* and Lophodermium needle cast (caused by *Lophodermium seditiosum*). Two blights that are usually less widespread and serious are Jack pine needle blight (caused by *Davisomycella ampla* and affecting mainly *Pinus banksiana*) and needle blight of pine (caused by *Meloderma desmazierii*, a weak parasite that rarely causes notable loss of needles).

Table 1 lists the species of pine more commonly grown in the Midwest that are susceptible to these diseases.

Infection characteristically first occurs in the older, lower branches and works upward in successive years (Figure 1). When infection is severe, limbs over the entire tree can be infected. Repeated premature loss of needles not only disfigures a tree but can seriously reduce its vigor. Continued annual infection by one or more needle blights and casts can eventually kill even older trees. Disease epidemics of pines growing in windbreaks, ornamentals plantings, or nurseries have led to considerable economic losses. These needle diseases appear to be most damaging on highly susceptible strains of Scots pine grown for Christmas trees or on trees that are in poor vigor because of some site-related factor, insect injury, or other disease.

### Symptoms

Symptoms of these diseases are quite similar. In all case, fungi cause spotting or banding of the needles (Figures 2-4). As infection progresses, these areas gradually enlarge and merge, with the entire needle dying and turning brown or reddish brown, usually from the tip back. Depending on the fungus, infection may involve only current-season needles, only old needles, or both.



Figure 1. Scots pines in a Christmas tree nursery with characteristic defoliation by *Lophodermium* needle cast beginning on lower branches (Dr. D.H. Scott, Purdue Univ.).

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For further information concerning diseases of woody ornamentals, contact Nancy R. Pataky, Extension Specialist and Director of the Plant Disease Clinic, Department of Crop Sciences, University of Illinois at Urbana.

**DOTHISTROMA NEEDLE BLIGHT OR RED BAND DISEASE**

(*Dothistroma pini*; *Scirrhia pini* is the perfect or sexual stage). During autumn and early winter, circular to oblong, water-soaked spots appear on needles of all ages. The spots become yellow to tan, then brown to reddish brown, and may develop into reddish bands that gradually girdle the needle (Figure 2). The tip end of the needle turns brown while the base remains green. The dead tip may break off, leaving a short, blunt needle. As the blight progresses, the bases of the needles also die. Typically, clusters of needles on a shoot are uniformly infected.

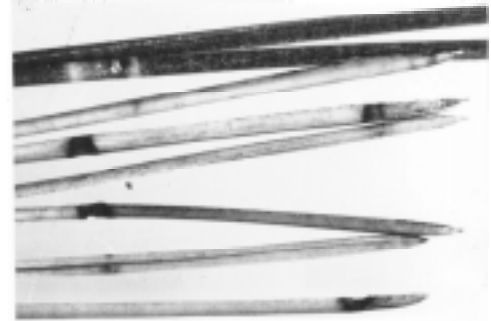


Figure 2. *Dothistroma* needle blight or red band disease.

Table 1. Species of Pine Commonly Grown in the Midwest That are Susceptible to Needle Blight and Needle Cast Diseases

| Disease                  | Species of pine ( <i>Pinus</i> ) affected  |
|--------------------------|--|
| Dothistroma              | Austrian ( <i>P. Nigra</i> ), ponderosa ( <i>P. ponderosa</i> ) and Mugo ( <i>P. mugo</i> ) needle blight are the most severely affected. Other susceptible pines include red ( <i>P. resinosa</i> ) and Scots ( <i>P. sylvestris</i> ).   |
| Brown spot needle blight | Most severely affected are the short needle varieties of Scots pine ( <i>P. sylvestris</i> ) such as Spanish and French Green. Other susceptible pines are Austrian ( <i>P. nigra</i> ), eastern white ( <i>P. strobus</i> ), and ponderosa ( <i>P. ponderosa</i> ).   |
| Lophodermium needle cast | Scots ( <i>P. sylvestris</i> ) and red ( <i>P. resinosa</i> ) are the two species most seriously affected. Short needle varieties of Scots pine (such as Spanish and French Green) are highly susceptible; long needle varieties, such as Scottish Highland and Austrian Hills, have greater resistance. Ponderosa ( <i>P. ponderosa</i> ) and Austrian ( <i>P. nigra</i> ) pines are also susceptible.            |
| Jack pine needle blight  | Jack pine ( <i>P. banksiana</i> ) can be severely defoliated. Eastern white ( <i>P. Strobus</i> ) is susceptible but less commonly infected.   |
| Needle blight of pine    | Jack ( <i>P. banksiana</i> ), limber ( <i>P. flexilis</i> ), Austrian ( <i>P. nigra</i> ), red ( <i>P. resinosa</i> ), eastern white ( <i>P. strobus</i> ), and Scots ( <i>P. sylvestris</i> ) pines are susceptible. The reddish tint and the banding of the needles are most distinctive and numerous on infected pines in the Pacific Northwest where the disease is often referred to as the red band disease. |

Infected needles drop prematurely, and usually infected second-year needles are cast before the current-season needles, sometimes in late fall of the year they became infected. However, spring and summer are usually the periods of greatest needle loss. Blighted first-year needles often are not shed until the summer following the year they were infected.

Infection is usually worse on the lower half of the tree, but in severe cases the entire tree may be uniformly infected. In early spring, black fruiting bodies (pycnidia and ascocarps) erupt through the epidermis of infected needles. These bodies may, however, appear as early as the autumn of the year of infection.

## BROWN SPOT NEEDLE BLIGHT

(*Scirrhia acicola*; imperfect stage is *Lecanosticta acicola*). In August and September, small gray-green to gray-black spots appear on the current-season needles. The spots later turn brown with yellow halos. They enlarge and may merge to form irregular, oblong areas. Often they are covered with pitch (Figure 3). Several weeks after the appearance of the spots, the infected needles begin to die back from the tips. By October and November, entire needles turn brown or orange-red, as if killed by fire, and many fall off. Some, however, remain on the tree until the following summer.

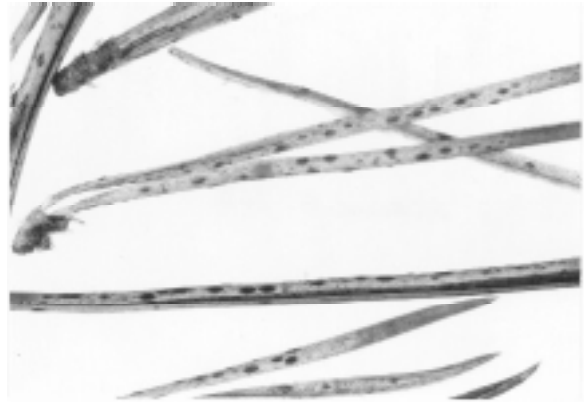


Figure 3. Brown spot needle blight on red pine.

Defoliation is most conspicuous on the lower branches, and particularly on the north side of infected trees. In late summer, small black fruiting bodies (pycnidia and ascocarps) form on the dead needles, both those on the tree and on the ground. Unlike the fruiting bodies of the *Lophodermium* needle cast fungus, these are not football-shaped, but are more oval. Also, the fruiting bodies protrude only slightly from the needle surface when wet. When dry, they are flush with the needle surface.

## LOPHODERMIUM NEEDLE CAST

(*Lophodermium seditiosum*; most reports dealing with outbreaks of *L. pinastri* almost invariably concern *L. seditiosum*). In late March or April, small brown spots with yellow halos appear on last year's needles. The spots enlarge, the entire needle begins to turn yellow, and by late spring it is brown. The dead needles are shed in early summer and throughout the growing season. In severe cases, most of the foliage of the previous year is shed by autumn, leaving only tufts of green, current-season needles at the tips of branches. Infection is usually worse on the lower half of the tree. When severe, the entire tree may be uniformly infected (Figure 1).

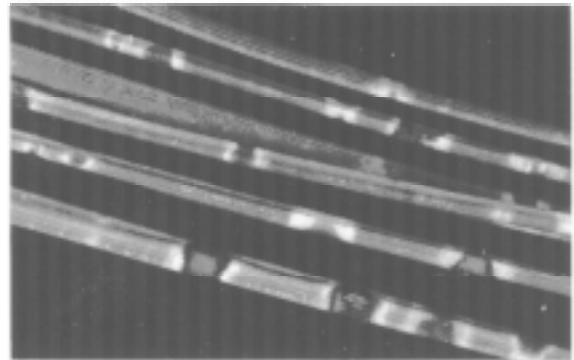


Figure 4. *Lophodermium* needle cast on dead pine needles.

In late summer, small black, football-shaped fruiting bodies (pycnidia and ascocarps) appear as conspicuous protrusions (particularly when wet) on the dead needles. The bodies have a characteristic lengthwise slit down their center. Sometimes, diffuse brown lines running across the needle appear with the fruiting bodies. These lines are characteristic of infection by *Lophodermium*.

## JACK PINE NEEDLE BLIGHT

(*Davisomycella ampla*; synonyms *Lophodermium pinastri* and *Hypodermella ampla*). One- and two-year-old needles become yellow, then brown, and are shed, leaving only the current-season's foliage on the twigs. Dark gray to black fruiting bodies (pycnidia and ascocarps) appear on the dead tips of the needles.

## NEEDLE BLIGHT OF PINES

(*Meloderma desmazierii*). Yellow spots appear on the needles in early spring from the previous year's infection. These spots turn brown and enlarge, giving severely infected trees a reddish tinge. Black fruiting bodies (ascocarps) appear at the tips of dead needles in February and ripen from May to July. Spores are spread during the summer and needles become infected. The yellow spotting, however, does not develop until the following spring. The characteristic formation of fruiting bodies at the tips of the dead needles is one way to distinguish this needle blight from that caused by *Lophodermium seeditiosum*.

### Disease Cycles

Two types of microscopic spores (conidia and ascospores) are produced in the fungal fruiting bodies (pycnidia and ascocarps) that develop beneath the epidermis of the needles. (The fruiting bodies can be seen easily with a 10X hand lens). When mature, the fruiting bodies erupt through the epidermis. Spores are released during rainy periods and infect healthy needles, usually through the stomates. Transmission is by air for *Lophodermium* needle cast spores and by splashing rain for *Dothistroma* and brown spot needle blights. The fungus mycelium then colonizes the tissues of the needle. In some instances, death of the needle does not occur until the growing season following the year of infection, and fruiting bodies do not mature until then. In other cases, death and the formation of fruiting bodies occurs in the fall of the year of infection.

## DOTHISTROMA NEEDLE BLIGHT

The fungus overwinters as fruiting bodies (pycnidia and ascocarps) on dead needles infected during the previous growing season. In late March the fruiting bodies enlarge, and by mid-May they mature and erupt through the needle epidermis. Microscopic spores (conidia and ascospores) are shed during rainy periods from mid-May to October, infecting second-year and older needles. Current-season needles do not become susceptible to infection until midsummer. The spores are transported short distances by splashing rain; few spores become truly airborne. Under special conditions, clouds may carry spores over long distances.

Germinating spores enter the needles through the stomates, and considerable growth of the fungus takes place in the stomatal pit before the internal tissues are penetrated. The minimum, optimum, and maximum temperatures for spore germination and mycelial growth are approximately 41, 64, and 77 °F (5, 18, and 25 °C), respectively. The period from spore infection to development of symptoms is six to twelve weeks, depending on environmental and host conditions. Fruiting bodies develop below the epidermis in the dead parts of the needles soon after they die. The fruiting bodies may enlarge sufficiently in the fall to split the epidermis, but generally they do not mature and produce spores until the following spring.

## BROWN SPOT NEEDLE BLIGHT

The *Scirrhia* fungus overwinters as fruiting bodies (ascocarps and pycnidia) in dead needles or parts of infected needles, or as vegetative mycelium in infected needles. In the spring, microscopic spores (conidia) are discharged during wet weather, and spore production increases until late summer. Spore transport is by splashing rain. Spores infect current-season needles, and the fungus mycelium colonizes the needle, eventually killing it by the end of the summer. The fungus spreads internally through the

nonspotted parts of the needle, particularly during the following March and April. By mid or late summer the entire needle dies and fruiting bodies develop in the epidermis.

#### LOPHODERMIUM NEEDLE CAST

The *Lophodermium* fungus overwinters as vegetative mycelium in needles infected the previous season. Fruiting bodies (ascocarps and pycnidia) develop during early summer, maturing by late summer. Spore discharge occurs from late summer to mid-fall. Spore transmission is by air currents. Spores germinate and infect the current-season needles. The pathogen remains as vegetative mycelium in the leaf tissue during the winter.

#### JACK PINE NEEDLE BLIGHT

Very little is known concerning the disease cycle of the *Davisomycella* fungus.

#### NEEDLE BLIGHT OF PINES

Very little is known concerning the disease cycle. The *Meloderma* fungus is generally considered to be a weak parasite.

### **Control**

1. Transplant only healthy nursery stock.
2. Maintain tree vigor by watering during droughts and fertilizing in fall or early spring based on a soil test report. Space plants to avoid crowding, and promote good air circulation around trees. Do not allow weeds or tall grass to grow up around the lower branches.
3. Destroy and burn or compost infected seedlings whenever feasible. Detection of *Dothistroma* needle blight is often difficult because the level of infection may be low and the symptoms do not develop until late summer.
4. Where possible, avoid: 1) establishing pine seed beds adjacent to older pines in the nursery, and 2) placing pine lining-out stock next to older pines in the nursery.
5. Carefully check pines in windbreaks and landscape plantings on the nursery grounds for evidence of needle blights and casts. If infected, they should be sprayed (see No. 9 below).
6. Identify disease early to minimize losses. Using the information given in the disease cycles outlined above, and the figures, check the pines at appropriate times when symptoms are expected to appear. Make plans for a spray program where this is feasible (see No. 9 below).
7. Shear healthy trees before infected trees. Pruning tools should be sterilized between trees by dipping in denatured alcohol (rubbing alcohol) for three minutes. Avoid shearing infected trees when the foliage is wet.
8. Avoid planting pine species and varieties that are highly susceptible (Table 1).

9. A suggested spray program to control needle blights and casts is given in Illinois Urban Pest Management Handbook, which is revised annually. When mixing and applying fungicides, it is important to apply a suggested chemical at the right time, using sufficient pressure to get uniform coverage of the needles. The manufacturer's directions and precautions on the container label should be carefully followed.