

Foliage diseases of conifers

- More severe on seedlings
- Saplings (immature tree with a slender trunk)
- Small poles

Foliage diseases of conifers or evergreens are dangerous compared to leaf diseases of hardwoods or deciduous?

- Most conifers depend on 2-7 years growth of leaves
- Leaves lost are not replaced
- Complete defoliation is fatal

Plant pathogens attack leaves of conifers

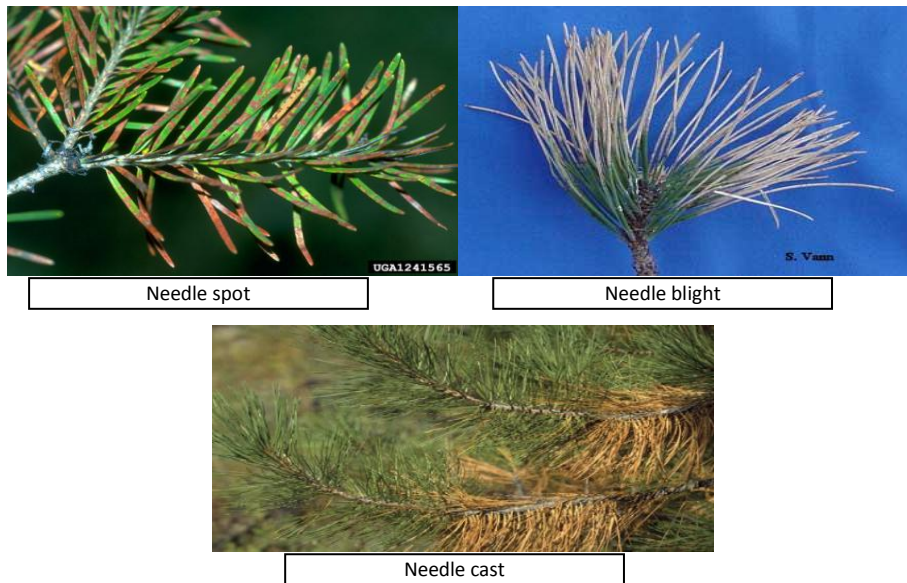
- Most pathogenic fungi affect either foliage of current season or older foliage, rarely both
- The fungi differ from their virulence from year to year according to climate conditions
- With age, conifers become more resistance to needle diseases
- Some trees are severely attacked others escape with little or no infection because of individual resistance
- When older needles are killed annually, the tree depend on needles of current season

Foliage disease categories of conifers

- Needle spot
- Needle cast
- Needle blight
- Needle rust

Needle spot, needle cast and needle blight

- Symptoms are closely related
- Individual infections occur at random areas resulting in the formation of dead area or spot



Needle cast?

Is the spread of an infection from one or more spots over the needle killing the entire needle and the tree responds by shedding (detaching) the infected needle. The result is a pile of dead needles on the ground around the base of the trunk and of the infected and dying needles on the tree.

Needle casts can affect:

- healthy as well as stressed trees
- trees planted in the wrong site
- pure and/or dense plantings
- young vigorous trees

Red band OR (Dothistroma needle blight)

Hosts

Over 30 species of pines are hosts of the disease, including:

Austrian, ponderosa, mugo, slash, Japanese black, and loblolly pines.

Symptoms

- Water soaked bands then red bands around needles
- brown needles that are green at the base
- needles that appear to have a "burnt" tip
- needle drop



Pathogen

The pathogen is the fungus:

Dothistromaseptospora

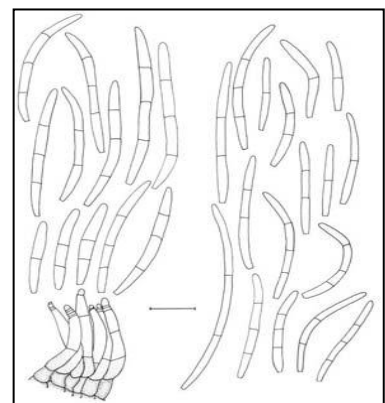
- Has sexual (perfect) stage:

Mycosphaerellapini

- In nature, only the pycnidia are found (imperfect stage)

Disease management

- Remove fallen needles
- Plant resistant species
- Chemical: one application in June covering all needles



Diplodia Blight of Pines

The disease is most damaging to plantings of both exotic and native pine species. The fungus is seldom found in natural pine stands. The disease kills current-year shoots, major branches, and ultimately entire trees. The effects of this disease are most severe in landscape, windbreak (fences), and park plantings.

Symptoms

The most conspicuous symptom of diplodia blight is brown, stunted new shoots with short, brown needles.

Needles on infected new shoots often become discoloured (tan, brown) while still encased in fascicle sheaths. Presence of resin droplets and one or a few very short needles are usually the first indications that a new shoot is infected.



Diplodia blight on a Fir tree



Stunted, brown needles on the tips of branches are a hallmark of Diplodia tip blight

Entire new shoots are killed rapidly by the fungus. Trees repeatedly infected have some branches killed back to the main stem. Repeated infections reduce growth, deform trees, and ultimately kill them.



Black dots (spore-producing structures of the Sphaeropsi fungus) are visible on cones from trees affected by Diplodia tip blight

New shoots throughout the crown may be infected, although damage is generally first evident in the lower crown. Usually infection varies considerably among major branches. Occasionally, after 2 or 3 successive years of infection, tree tops are extensively damaged. The damage is more severe in older plantings.

Damage may be confined to the new shoots, particularly on trees with shoots infected for the first time. The fungus will infect older stem tissues. On severely damaged trees, however, the fungus usually can be isolated from all segments of major branches.

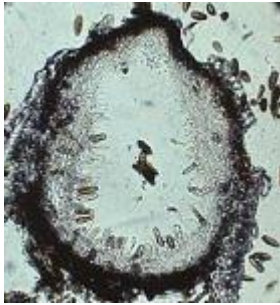
Although unwounded new shoots can be infected, the pathogen can infect both current-year and older tissues through wounds. The plants may be wounded by hail. Damages also have been associated with wounds made by insects. Tissues wounded during pruning or shearing operations may become infected. Wounded tissues remain vulnerable to the fungus infection for several days.

The pathogen

The disease is caused by the fungus *Diplodia pinea*.

Disease cycle

Small, black fruiting bodies (pycnidia), in which *D. pinea* spores develop, form on needles, fascicle sheaths, scales of second-year seed cones, and bark.



The fruiting bodies can be seen with a 10X hand lens. These black bodies, which erupt through the epidermis, usually are numerous at the base of needles and on scales of second-year seed cones. Fruiting bodies are easily found on short needles of shoots infected the previous year, particularly on those that have turned ashen-gray and are easy to detach. When rainfall is above normal in late summer, unusually high numbers of pycnidia may develop on current-year needles and second-year cones. In most years, however, pycnidia are not numerous on these needles and cones until the following spring.

Spores are dispersed from March to October. The spores are transparent at first and later become brown.



Highly moist conditions are needed for infection. Large numbers of spores are dispersed only during rainy periods and high relative humidities are required for spores to germinate and for germ tubes to grow and penetrate needles and

shoots. Once the fungus penetrates needles, tissues are rapidly destroyed, resulting in stunted shoots and needles.

New shoots of Austrian, ponderosa, and Scots pines are most susceptible during a 2-week period starting when buds begin to open and continue to be susceptible until about mid-June. Symptoms on new shoots can readily be detected in late May; extent of infection can be effectively determined in late June or July.

Second-year seed cones are initially infected in late May. Numerous fruiting bodies develop on infected second-year cones and the increased damage to older trees is probably related to this fungus buildup. Infected seed cones often are observed on otherwise healthy pines, which indicate that, on older pines, inoculum builds up on seed cones before new shoots are extensively infected.

Disease management

- When available, grow resistant pines
- Apply fungicide (Bordeaux mixture) to susceptible pines during the 2-week period; the time begins with the opening of buds (4-4-50 Bordeaux mixture means: 4 part copper sulphate, 4 part hydrated lime, and 50 part water)
- Avoid pruning or shearing of pine trees in plantings during periods when conditions are highly favourable for infection because of danger of infection through wounds.
- The old infected pines should be removed or pine seedling beds should not be located near such old, cone-bearing pines.

Foliage diseases of hardwoods

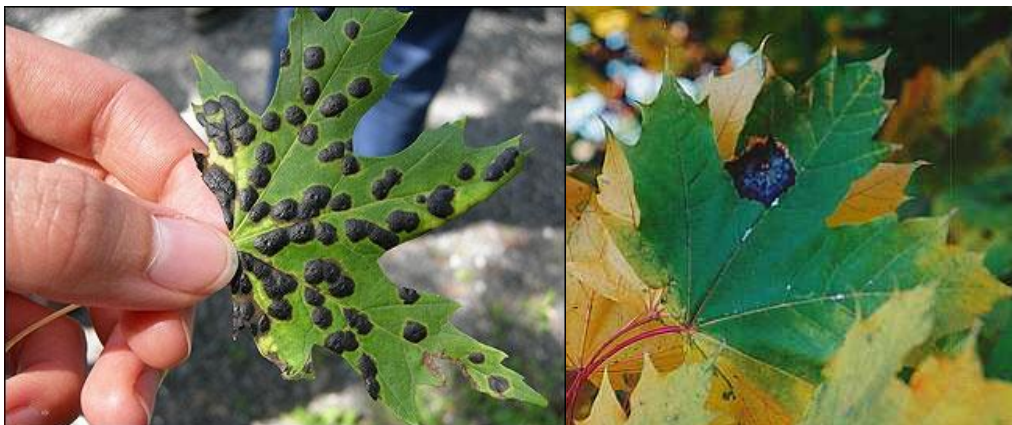
There are many diseases of the foliage of broad-leaved trees or hardwoods caused by parasitic fungi, which may also extend their activities to the flowers, fruits, and young twigs. Some hardwoods are attacked by foliage diseases year after year without suffering apparent injury. Leaf diseases are mainly important when defoliation results or when an attack is so heavy.

Leaf spots:

Leaf spots may be caused by fungi, bacteria, viruses, and also by insects and toxic gases. There are many examples:

Maple leaf spot-Tar spot of maple**Symptoms**

Tar spot is a very distinctive disease of maples. It causes round to irregular black, tar-like spots on infected leaves. These spots are not noticeable until late summer. Tar spots of maple are caused by two species of the fungus *Rhytisma* which produce different symptoms. The first species, *Rhytisma acerinum*, produces black, tar-like spots about 1.25 cm or more in diameter on the upper surface of infected leaves. The second species, *R. punctatum*, produces patches of small, 1mm wide spots and is often called speckled (dotted) tar spot. The thickened black spots are actually fungal tissue called stroma. Red, silver, Norway (including the varieties with red leaves) sugar and Manitoba maples as well as others are affected by tar spot diseases.





Pathogen

Rhytisma acerinum

R. punctatum

Both fungi, *R. acerinum* and *R. punctatum* survive between seasons on the fallen diseased leaves. In the spring, spores are produced within the black stroma and are carried by air currents to young maple leaves where they start new infections. Unlike many other foliar diseases, *Rhytisma* spp. do not continue to cause new infections throughout the summer. Infections first show up as yellow or pale green spots on the leaf surface in the early spring or summer. The black, raised tar-like spots of *R. punctatum* and *R. acerinum* develop within these spots by mid to late summer. Leaves, which are severely infected, may be drop.

Control

1. Rake up fallen leaves in the autumn and destroy or remove them from the yard. This to reduce the amount of diseases overwintered in plant debris
2. Use of fungicides by covering every single leaf of the infected tree.

Powdery mildews

Powdery mildews occur on a wide variety of plants and are caused by several genera of fungi belonging to the order Erysiphales, Ascomycota. They are obligate parasites. Many of them attack leaves, fruits and young twigs. They are unknown on conifers.

Powdery mildew is a disease that causes minimal long-term damage to trees in a forested environment. The forestry industry has traditionally dismissed the impact of this disease as a problem due to its minor effect upon the economic value of harvested stands.

Eucalyptus leaf diseases

Cryptosporiopsis leaf and shoot blight

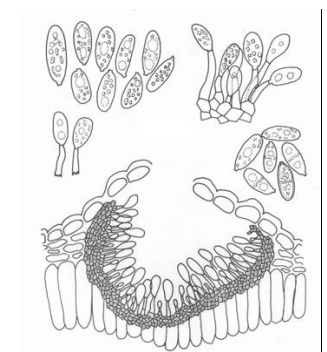
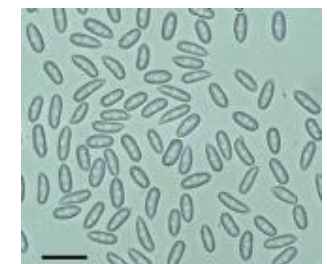
Impacts of the disease in plantations vary from scattered lesions, especially on lower crowns and wood shoots, to severe defoliation and death of shoots in the crowns of susceptible trees.

Symptoms

Symptom develops on both leaves and shoots of eucalypts. Leaf spots occur on both sides of the leaves and vary in size, shape and colour, within and between Eucalyptus species. For example, there are at least four lesion types on *E. camaldulensis*. These include large, brown, spreading necrotic lesions leading to a leaf blight symptom; circular or sub-circular spots 1–2 cm in diameter; irregular chocolate-brown or greyish spots covering much of the leaf area.

Irregular roughened or corky lesions with eruption and necrosis of epidermal tissue, sometimes localised along veins, on which the fungus fruits. Terminal shoots of young trees can be totally defoliated and are commonly blighted.

Conidiomata develop on foliar lesions on blighted shoots and have also been found associated with cankers on small-diameter



woody branches. Fruiting bodies are cup-shaped when moist with pigmented margins, bearing creamy masses of macroconidia.

The conidiomata are scattered irregularly on lesions and erupt through the epidermis or stem periderm but can be quite inconspicuous when leaves are dry.

Pathogen

The disease is caused by the fungus *Cryptosporiopsis eucalypti*. The pathogen can exist as a canker pathogen in woody stem tissue, so that inoculum persists during dry months when conditions are not favourable for leaf and shoot blight. During the onset of epidemic disease, leaf spots develop and affected leaves are eventually shed. The most damaging phase of the disease, however, is blight and dieback of terminal shoots. The typically conical shape of fast-growing plantation trees becomes flattened, main stems suffer dieback and multiple branching, apical dominance is reduced and growth can be stunted.

Macroconidia are thick walled and ellipsoid to elongate-ellipsoid in shape with distinctive protuberant attachment scars (Figs).

Disease management

The only effective method is selection of disease-resistant trees.