Photo 1: This spruce tree is affected with a variety of problems including Rhizosphaera needlecast. However, a multitude of problems is leading to "spruce decline" and ultimate death.

Photo 2: The lower branches of this spruce are losing needles and dying. Although Rhizosphaera needlecast may cause these symptoms, the primary problem is the lethal Phomopsis canker.

Photo 3: The needles of these nursery container spruce trees began turning brown and were "casting" from the tree in January. Initially presumed to be a needlecast disease, the problem is actually "winter burn". All trees would recover with time.

The Plant Doctor's LANDSCAPE TIPS

By David L. Roberts, Ph.D, *Senior Academic Specialist, College of Agriculture and Natural Resources, Michigan State University*

RHIZOSPHAERA NEEDLECAST OF SPRUCE

INTRODUCTION:

Rhizosphaera needlecast of spruce is caused by the fungus, *Rhizosphaera kalkhoffii* Bubak. The name "needlecast" originates from the symptom that occurs when the host plant's needles are infected by the fungus and are subsequently "cast" (dropped) from the tree. Various conifers are susceptible to their own specific needlecast diseases.

Rhizosphaera needlecast is without doubt the most common needlecast disease on spruce in the Midwest. Colorado blue spruce is the most susceptible species. Spruces, such as Black Hills, that share genetic material with Colorado blue spruce also tend to be susceptible. White spruce is also attacked by Rhizosphaera. Black spruce, Engelmann spruce, Sitka spruce, Serbian spruce and Norway spruce may be but are generally not attacked by this fungus. The disease has also been reported on Austrian, mugo and eastern white pine, on Western Hemlock and on Douglas fir, but if these reports are valid they must be exceedingly rare.

The disease may be confused with natural fall needle drop, spruce spider mite damage, pine needle scale, shading effects, drought, various branch dieback diseases such as Cytospora and Phomopsis cankers, as well as other issues (Photos 1-3). It is not unusual to find Rhizosphaera and other diseases on the same tree. Sometimes the combination of problems can result in "spruce decline" (Photo 1).

DISEASE SYMPTOMS AND CYCLE:

Technically, infection of spruce needles by Rhizosphaera may occur from early spring (April) through October. However, most infection occurs in the early spring when abundant moisture from spring rains favor spread of fungal spores and infection of needles. At the predominant time of infection, the previous years' needles are exposed to infection, sometimes before buds and current year's needles have expanded. Hence, the disease is more prominent on older foliage (Photo 4). If the season exhibits abundant rainfall into mid/late spring, summer and/or fall or if landscape trees are exposed to frequent irrigation and poor aeration, current year's foliage may also be affected.

Infected needles may remain green for some time after infection but become yellow (Photo 5) with time. Eventually, needles become purplish-brown (Photo 5) and are subsequently cast from the trees. The transition from infection to yellow needles to purplish brown needles and casting may take several months to a year. Fruiting (reproductive) bodies of the fungus may be observed protruding from natural needle openings called stomata (Photo 6); the presence of the fruiting bodies aids in diagnosis of the disease. If early infections are the predominant event, the current year's growth may appear unaffected while previous years' needles are lost (Photo 4). If current and previous year' foliage are affected, then, the branches may appear dead the following year, after needles are cast. I would not consider Rhizosphaera needlecast a lethal disease; the disease may

Photo 4: Typical of Rhizosphaera needlecast, the older needles on this spruce tree have been affected first. Healthy spruce will typically retain 3-5 growth years of needles.

Photo 5: The yellow needles on the branch on the left are infected by Rhizosphaera. Eventually, the yellow needles will become purplish brown (right) and will be cast from the tree.

Photo 6: A diagnostic feature of Rhizosphaera needlecast is the presence of fruiting (reproductive) bodies of the fungus protruding from the stomata of the needles. The fruiting bodies may be evident on green, yellow and brown needles.

attack for several years and branches may recover. However, several years of aggressive defoliation may result in branch death. In rare situations, the entire tree (especially small trees) may be killed. Bare branches may signify severe needlecast, canker diseases or other problems. Canker disease usually kills branches while, initially, Rhizosphaera-infected branches remain viable. Check for viability by scraping the bark on branches and observing for the green succulent layer directly beneath the bark.

Needles on lower branches are most commonly affected by Rhizosphaera because these branches remain damp the longest and infection is most likely. Landscapes that utilize frequent irrigation may be conducive for Rhizosphaera infections. Also, those landscapes with poor air movement that results in prolonged leaf wetness are more susceptible to Rhizosphaera and other foliar diseases.

RHIZOSPHAERA MANAGEMENT:

Rhizosphaera needlecast can be managed several ways. Where practical, avoid planting highly susceptible spruce trees, such as Colorado blue spruce and related varieties. Where susceptible trees are already on-site, avoid excessive irrigation that continually wets the needles and promotes infections. Also, design landscapes so that good light penetration and air movement promotes rapid drying of foliage. In some situations, applications of broad-spectrum fungicides during the spring may be warranted to help prevent infections by the Rhizosphaera fungus. With protection, trees may recover.

For more information, please feel free to email David Roberts at robertsd@msu.edu or contact a professional plant health care provider. The author, MSU and MGIA do not endorse any particular products. If using pesticides, be sure to read and follow label directions.

Development of Landscape Tips was sponsored by MSU and MGIA.

MICHIGAN GREEN INDUSTRY ASSOCIATION

MICHIGAN STATE UNIVERSITY

NEW NEEDLECAST DISEASE IN MICHIGAN

A new needlecast has been found in Michigan by Dr. Dennis Fulbright, Department of Plant Pathology at Michigan State University. The needlecast was initially called Stigmina (pronounced Stig-meeena) needlecast, but the causal fungus will probably be reclassified as Mycosphaerella as its identity is further elucidated using DNA technology. Little is known about this needlecast, but its cycle is presumed to be similar to that of Rhizosphaera. Management of Stigmina (Mycosphaerella) is also presumed to be similar to Rhizosphaera. When viewing magnified Stigmina-infected needles, the fruiting bodies will appear "hairy" (Photo 7) as opposed to the smooth-looking fruiting bodies of Rhizosphaera.

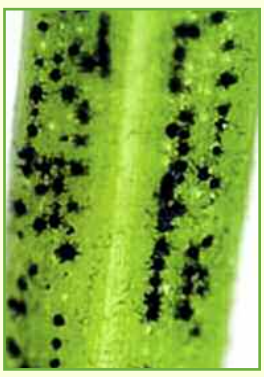

Photo 7: Stigmina (Mycosphaerella) is a new, discovered needlecast disease of spruce in Michigan. With the aid of a magnifying device, the fruiting bodies of Stigmina appear "hairy" compared to Rhizosphaera. (Photo credit: Dr. Dennis Fulbright, MSU)