TRANSPORT AND CONTROL OF NEEDLECAST DISEASES OF CONIFER NURSERY STOCK

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ABSTRACT

Several needlecast diseases have recently caused severe damage in some conifer nurseries and plantations in the northeastern States. Brown spot disease (Scirrhia acicola) and Lophodermium pinastri of red and Scotch pines, Rhizosphaera kalkhoffii of Colorado blue spruce, and Swiss needlecast (Phaeocryptopus gaumanni) of Douglas-fir are discussed. The movement of infected conifer nursery stock is documented to show how a disease can be transported from one State to another. Several suggestions are offered to provide better detection and control of forest tree nursery diseases. An update of fungicide controls for Lophodermium needlecast is also presented.

INTRODUCTION

Forest nursery tree production in Wisconsin has been 20 to 40 million seedlings per year. These trees have been planted mainly for timber production. However, in the past few years a $15 million-a-year Christmas tree industry has developed in the State. Scotch pine is the most important species being grown for this purpose.

Christmas tree growers are now planting 1 to 2 million Scotch pine seedlings a year. Because regulations prevent Wisconsin State-owned nurseries from supplying stock to Christmas tree growers, much of the stock is supplied by private out-of-State producers. The transport of stock between States and the use of a non-native tree species such as Scotch pine have brought on new disease problems that not only threaten nurseries and Christmas tree plantations but also natural stands of conifers. Some examples of new disease problems will illustrate this.,

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NEW DISEASE PROBLEMS

Rhizosphaera Needlecast Disease of Colorado Blue Spruce

Rhizosphaera needlecast, caused by the fungus Rhizosphaera kalkhoffii, has caused severe defoliation of blue spruce Christmas trees in many Wisconsin! Minnesota, Indiana, and .Michigan plantations, A 1972 survey of 98 Wisconsin nurseries by the Wisconsin Department of Agriculture, Plant Industry Division, showed that 18 of the nurseries had Rhizosphaera-infected blue spruce, Distribution of infected nursery stock may be the reason why this disease is now so prevalent in blue spruce Christmas tree plantations.

Swiss Needlecast Disease of Douglas-Fir

A needlecast disease caused by the fungus Phaeocryptopus gaumanni has caused damage recently in Douglas-fir trees grown for Christmas trees in Wisconsin and Michigan, Douglas-fir is not native to these States and the Swiss needlecast had not been reported there until the introduction of Douglas-fir_ Here again, the disease was probably introduced on nursery stock,

Brown Spot Disease of Scotch and Red Pines

Brown spot, caused by Scirrhia acicola, was first recognized as a problem in Wisconsin Scotch pine Christmas tree plantations in 1966, Surveys made from 1967 through 1970 indicated that the disease was causing damage to Christmas trees in 55 plantations located in 16 counties. The fungus caused severe defoliation of these trees, especially on the bottom half of the crown, and resulted in unsalable trees. Outbreaks of brown spot also occurred in six other States (fig, 1),

Because brown spot disease was new to Wisconsin, there was concern that it might cause serious damage to susceptible native trees, Red pine growing among or near brown-spot-infected Scotch pine in Green, Grant, and Jackson Counties were lightly infected with brown spot, This was the first record of red pine as a host for brown spot.

In a test of 154 field-inoculated red pine seedlings, 152 became infected with brown spot, and there was heavy defoliation of older needles on many of them. Red pine seedlings are apparently more susceptible to brown spot than are older trees, Thus, nursery managers must be alert to prevent a serious outbreak of brown spot disease on their red pine seedlings because of the introduction of this new disease on Scotch pine.

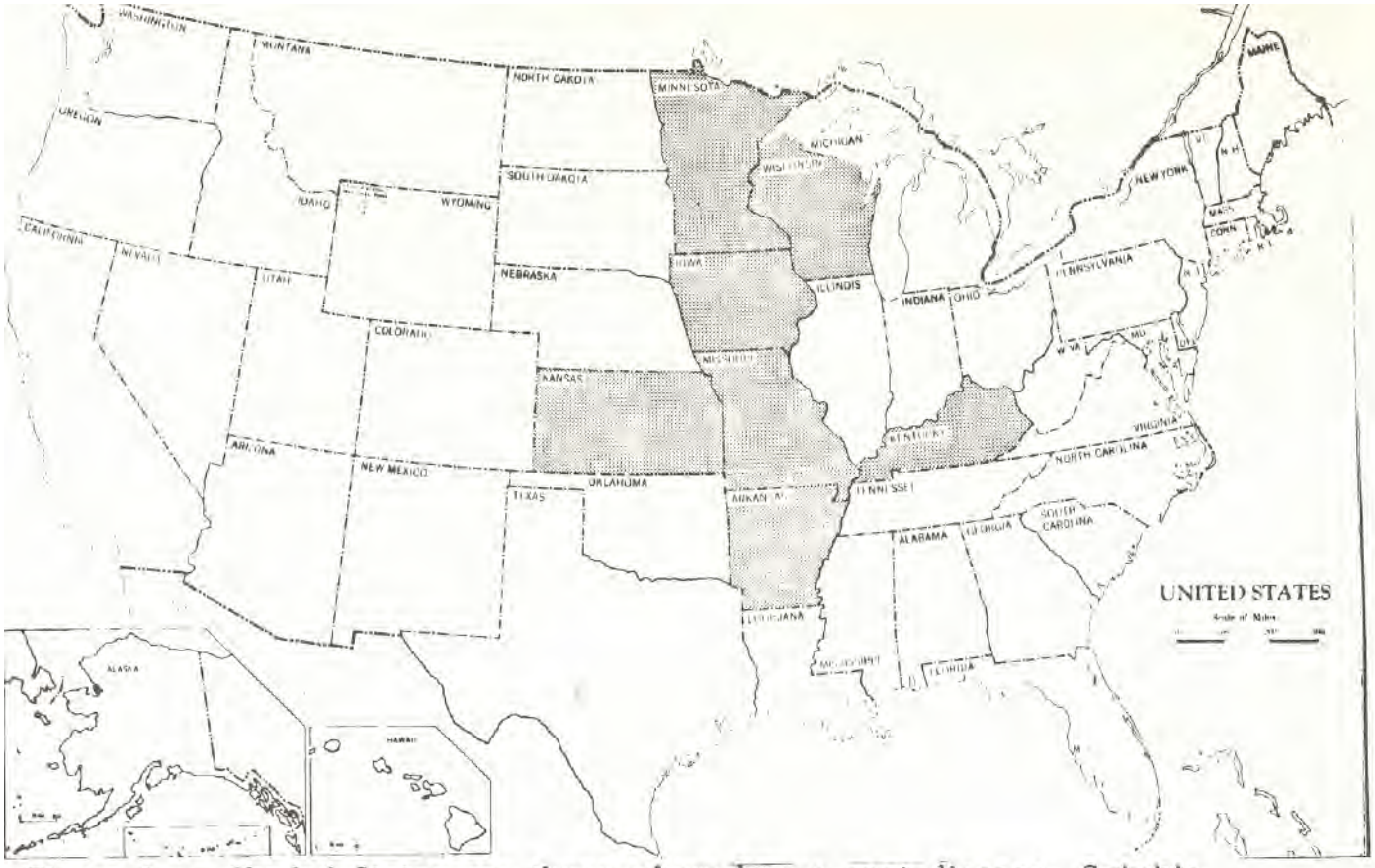


Figure 1. - Shaded States are those where brown spot disease, Scirrhia acicola, has caused damage in Scotch pine Christmas tree plantations.

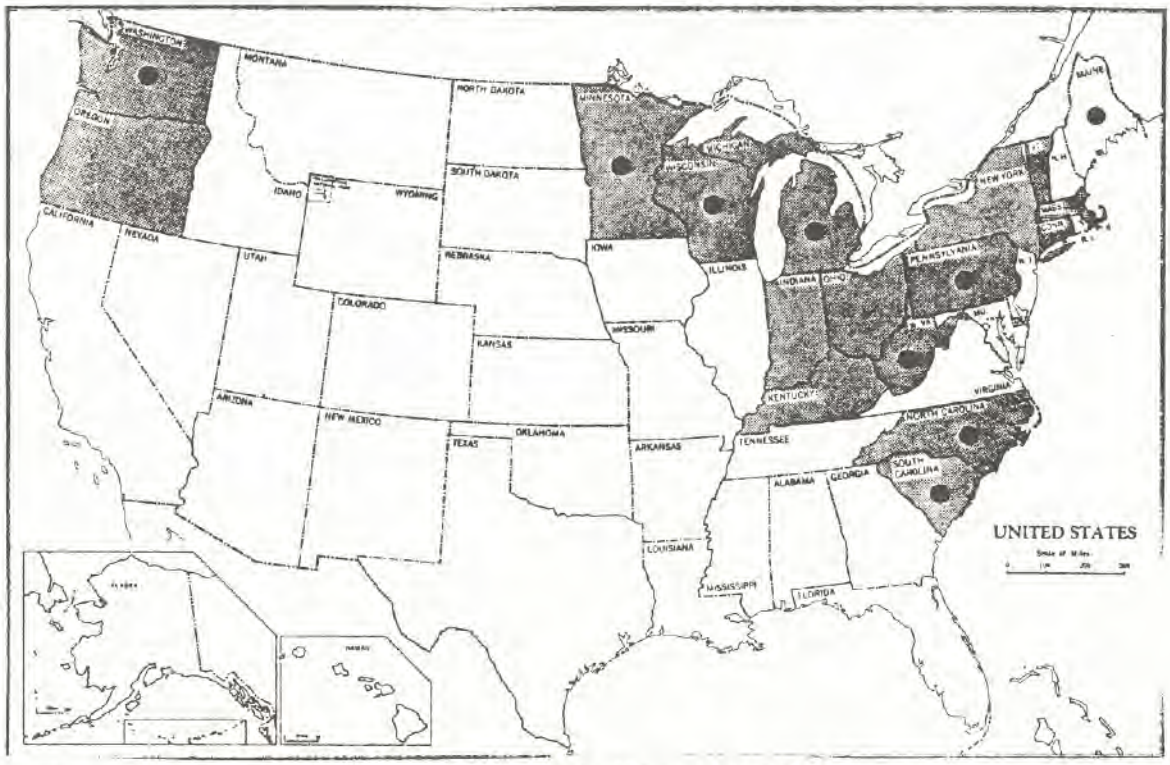


Figure 2. - Shaded States denote distribution of Lophodermium pinastri in Scotch pine Christmas tree plantations. States with black dots have had outbreaks of Lophodermium in nurseries growing red pine, Scotch pine, or both.

Lophodermium Needlecast Disease of Red and Scotch Pines

Lophodermium needlecast, caused by the fungus Lophodermium pinastri , is the most important recent disease problem in our conifer nurseries and Christmas tree plantations. The spread of this disease is a classic illustration of the problems resulting from movement of infected nursery stock,

An outbreak of Lophodermium in forest tree nurseries began in 1966, and by 1973 the fungus had killed or caused severe damage to several million red and Scotch pine seedlings in over 30 nurseries in 9 states, Nova Scotia, and Ontario (fig 2) Many of these nurser:es furnished stock for Christmas tree plantings . Thus, it was not surprising that an outbreak of Lophodermium began to damage Scotch pine in Christmas tree plantations in 1971. By 1973 thousands of Scotch pine in plantations had been defoliated in 16 States (fig. 2) and British Columbia,

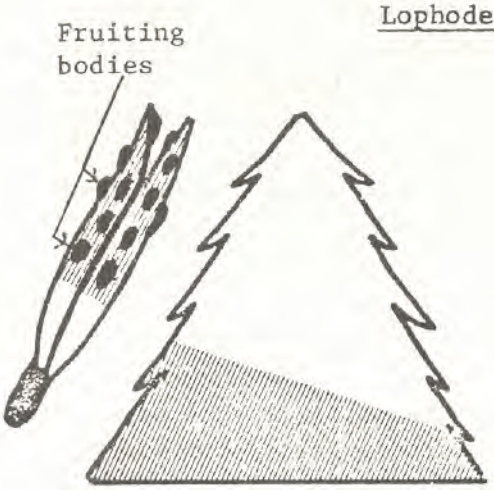
Lophodermium and brown spot needlecast diseases are most damaging to the short-needled varieties of Scotch pine such as the Spanish and French-green varieties. In addition, the Spanish variety is susceptible to winter burn in the northern States. Figure 3. illustrates the differences between these diseases and winter burn,

Red pine seems to acquire resistance to Lophodermium as the tree grows older, unlike Scotch pine which is susceptible at all ages This may be the reason we have not observed Lophodermium outbreak in red pine Christmas tree plantations even though heavy damage and mortality have occurred to red pine seedlings in many tree nurseries ,

The outbreak of Lophodermium in Scotch pine Christmas tree plantations in so many diverse locations was primarily due to infected nursery stock being shipped throughout the country. For the most part, nursery managers did not know they were shipping infected stock, To -understand why, we must look at the Lophodermium life cycle.

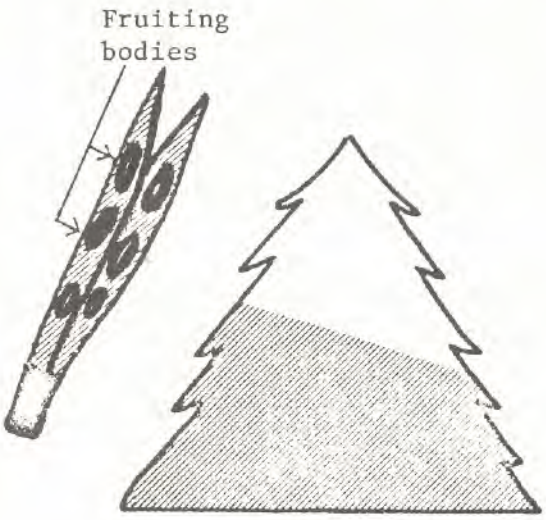
Although the needles are infected in the fall, to the untrained eye Scotch pine and red pine seedlings appear healthy until March or April, It is during these 2 months that many nurseries lift and ship stock to growers. Thus , nurserymen were unaware that they were shipping infected stock. By May, tiny but visible spots appear on the needles, With the advent of warm weather, the fungus begins growing **in** the infected needles and the needles turn yellow , then brown, as moisture is lost due to the fungus destroying the needle vascular system, This usually happens in May and June after the seedlings have been planted, Infected stock remaining in nurseries also turns brown in late May and June, and most of the dead needles fall off in June and July. If the tree is not killed, new buds will develop as usual. and the tree will survive,

Figure 3.--Comparison of symptoms and controls for brown spot, Lophodermium, and winter injury on Scotch pine in Wisconsin.



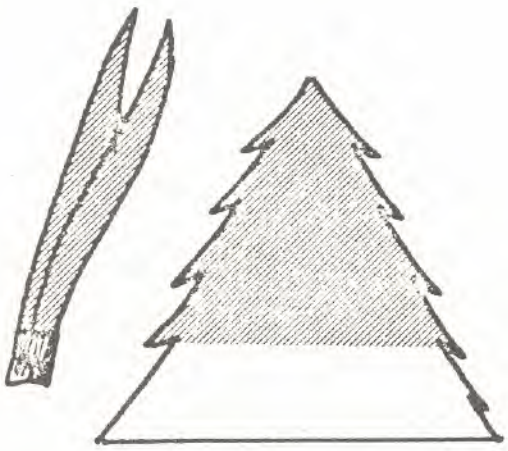
BROWN SPOT - Scirrhia acicola

SYMPTOMS - Needles brown in lower crown & north sides during August and September.
CAUSE - Fungus spores discharged in summer infect new needles.
CONTROL - June 15 and July 15 sprays of Bordeaux mixture or chlorothalonil.*



LOPHODERMIUM - Lophodermium pinastri

SYMPTOMS - Needles usually brown in lower crown, often below snowline in April and May.
CAUSE - Fungus spores discharged from August-October infect needles which turn brown the following spring.
CONTROL - July 25, August 15 & September 10 sprays of chlorothalonil or maneb in plantations and August 1, 15 & September 1, 15 in nurseries.*



WINTER INJURY

SYMPTOMS - Needles brown above snowline or south side in March or April.
CAUSE - Sunlight or wind-caused moisture loss.
CONTROL - No chemical control available. Wait to see if affected portion fills in. Avoid planting susceptible varieties such as Spanish Scotch Pine.

Shaded areas indicate portion of tree affected by disease.

* Chlorothalonil (Bravo W-75, Daconil 2787). Maneb (Manzate 200, Manzate D, Dithane M-22).

Fruiting bodies of Lophodermium develop on the dead needles in elate summer and fall, They are tiny, black, football-shaped structures with a longitudinal slit down the middle. During rainy weather in August and September, these fruiting bodies absorb moisture, the slits open, and fungus spores are forcibly discharged. If these windborne spores reach susceptible pine needles under favorable environmental conditions, they will germinate and infect the needles, The fungus overwinters in these needles and the cycle starts all over again in the spring when the needles brown-up and die.

The transport of Lophodermium on nursery stock from one part of the country to another has been documented several times. For example, in the spring of 1972 a Christmas tree grower in southern Wisconsin received a shipment of Scotchpine nursery stock from a Pennsylvania nursery, He planted the seedlings next to some high-quality 5 to 7-year old Scotch pine Christmas trees, The seedlings turned brown in May and Lophodermium fruiting bodies developed on the dead needles in August. The grower finally destroyed the trees to prevent the disease from spreading to the adjacent healthy trees that were soon to be harvested for Christmas trees, In 1973 the same grower ordered more Scotch pine seedlings, but from a different Pennsylvania nursery. When the stock arrived in Wisconsin the needles were already brown, Isolations from the needles revealed that the trees were heavily infected with Lophodermium. This time he did not plant the stock but destroyed it so it wouldn't pose a threat to his healthy plantation trees.

Transport of Lophodermium between nurseries has also been documented, For example, in 1970, 90 thousand Scotch pine seedlings from a Michigan nursery were transplanted in a Washington nursery, Shortly after the trees were planted, the foliage turned brown on almost 100 percent of the trees. Lophodermium was isolated from almost every tree tested. This, along with the fact that at least 10 Michigan nurseries had serious outbreaks of Lophodermium in 1969, is the reason why internursery shipment of stock is discouraged.

The North Central Forest Experiment Station has completed **its** fungicide research for Lophodermium control in nurseries and plantations,. Following is a brief update on the results of this research. More complete control recommendations can be obtained by writing the Station,

UPDATE OF LOPHODERMIUM FUNGICIDE CONTROLS

1. If you have a Lophodermium problem use maneb or chlorothalonil, as they are now both registered for this use.

2. Spray schedule for north-central and northeastern States .

   a. In nurseries , four sprays should be applied about August 1, 15 and September 1, 15 (fig. 4) .

   b. Three sprays should be applied in heavily infected Scotch pine Christmas tree plantations about July 25, August 15, and September 10. In lightly infected plantations (less than 100 trees) , apply only two sprays about August 1 and September 1.

3. Spray to cover all foliage and allow to dry before irrigation or next rain.

4. Do not spray during heavy winds or rain.

5. Use and dispose of fungicides safely; follow lab el directions .

Now that we have discussed some of the new disease problems that have developed in recent years , we would like to outline some helpful ways to prevent or solve problems in the transport and control of diseases on conifer nursery stock. Nursery diseases are sometimes difficult to detect and control. Therefore, an improved detection system is suggested.

Figure 4. - A hydraulic sprayer used by a Wisconsin Nursery to apply Maneb to red pine nursery beds for Lophodermium control. Hugo Sauer Nursery, Rhinelander, Wisconsin

SUGGESTIONS FOR DETECTION AND CONTROL

OF FOREST TREE NURSERY DISEASES

1. Train workers to be alert for and to recognize diseases„ Early disease detection and control often can prevent serious losses. In Wisconsin we have held periodic training sessions for nursery inspectors in the recognition of nursery diseases,. These sessions were organized by the Wisconsin Department of Natural Resources, and the North Central Forest Experiment Station and State & Private Forestry of the USDA Forest Service. A similar program could be initiated throughout the northeastern United States. The program could be based on highly successful training programs such as "Organization Management Training" or "The Instructor Training Course." State agencies and universities could help instruct and cover problems of local interest, but the main emphasis would be on detection and control of common nursery pest problems in the northeastern United States_

2. Nursery inspectors should familiarize themselves with important diseases so they can plan their nursery visits when disease symptoms are most apparent r Often nurseries are certified disease-free because they were examined at the wrong time,

3. Seek 'help from Forest Pest Management people or plant pathologists if you are unsure of your identification or what to do about a disease problem. Positive identification of a disease is essential if controls are to work effectively,

4. Do not ship infected nursery stock for outplanting,

5. Do not plant diseased trees or trees that are suspected to be diseased,,

6. Do not ship nursery stock between nurseries. Several diseases have been introduced from one nursery to another by this practice

7. Do not plant windbreaks of the same species as that being grown in nursery beds as they sometimes serve as reservoirs for diseases.

Use pesticides carefully and only when necessary to control a disease. If a pesticide is used, keep accurate records of its use and the results,

9, State & Private Forestry should continue to issue "Pest Alerts" and information on how to recognize forest and nursery pests

10. State & Private Forestry should annually review current pesticide practices in nurseries and issue a summary of the federally registered and approved uses of the major nursery pesticides that can be used for control purposes.

11. A manual entitled "Forest Nursery Diseases in the United States" will soon be published as a USDA Handbook. When this becomes available, each nursery manager should obtain a copy This publication will be useful for the identification and control of many important nursery tree diseases.