SCLERODERRIS CANKER THREATENS PINES IN THE NORTHEAST

by Darroll D. Skilling, Principal Plant Pathologist, USDA Forest Service, North Central Forest Experiment Station, 1992 Folwell Avenue, St. Paul, Minnesota 55108

ABSTRACT.--A new more virulent strain of the fungus Gremmeniella abietina, the causal organism for Scleroderris canker, has recently been found in New York and Vermont. The potential of this new strain to rapidly spread across northern North America makes this disease a major threat to future pine management in this area.

SCLERODERRIS CANKER IS NOT a new problem in the Northeast. The fungus responsible for this disease, Gremmeniella abietina (Lagerb.) Morelet = Scleroderris lagerbergii Gremmen, was identified in the Northeast in 1967 by French and Silverborg. At that time, however, damage was primarily in trees less than 10-years-old. Although losses in red pine (Pinus resinosa Ait.) were serious in young stands, trees more than 2 m tall seemed to be resistant to the disease. In the Lake States (Minnesota, Wisconsin, Michigan) damage was especially serious in young red pine and jack pine (P. banksiana Lamb.) plantations due to the planting of infected nursery stock. By 1974, fungicide control measures for protecting nursery stock were standard practice (Skilling and Waddell 1974), and plantation losses from infected nursery stock were no longer a major problem.

In 1975, Setliff et al. reported that G. abietina was killing large red and Scotch pine (P. sylvestris L.) in northern New York State. Trees up to 18 m in height were reported to be dying from the disease. Instead of acting as a disease of juvenile stands, the disease now showed the ability to act as a major killer of pine plantations throughout their entire rotation.

In early 1976, a cooperative research project was established between the New York State Department of Environmental Conservation and the USDA Forest Service to study the biology of G. abietina in New York (Skilling 1977). Our objectives were: (1) to find out why Scleroderris canker was acting as a more virulent fungus in New York and then (2) to find out what could be done to reduce its impact on the conifer forests of the Northeast.

Our preliminary work was on the fungus itself. Was the organism different from the one we had previously worked with in the Lake States and the Northeast prior to 1975 and, if so, was this difference responsible for its increased virulence in larger trees? We compared mycelial isolates from the tops of infected trees in New York with isolates from the Lake States and found that the fungus differed in mycelial characteristics between the two areas. Serology studies of New York isolates showed that they were identical to isolates from Norway and Finland, but were different from any other isolates previously found in North America (Dorworth et al. 1977). We now call these two strains the Lake States and European strains--actually both are present in New York.

During 1976 we also found Scleroderris canker caused by the European strain of G. abietina in three plantations in Vermont. By early 1978 50 plantations were infected.

In 1976 and 1977, we focused our research on the biology of the European strain to answer the following questions: What species are susceptible? When does infection take place? What is the importance of site and climatic factors on disease development? We now have the answers to some of these questions. So far every species of pine we have exposed has been infected to some degree, including western and southern pines. In general the hard pines are more susceptible than the 5-needled pines. In addition to the pines, we have found infection on Douglas-fir [Pseudotsuga menziesii (Mirb.)), Fraser fir (Abies fraseri (Pursh) Poir., Japanese larch [Larix leptolepis (Sieb. & Zucc.) Gord., white spruce [Picea glauca (Moench.) Voss, black spruce (P. mariana) (Mill.) B.S.P., and Norway spruce (P. abies) Karst. So far no infection has been observed on red spruce (P. rubens) Sarg. or balsam fir (A. balsamea) (L.) Mill.

Our host infection study showed that the primary infection period was during June and July. However, infection can take place from early May to late October. Because the infection period is so long, any thought of an economical disease control using one or two fungicide sprays seems highly unlikely.

At present the most promising method of control is through selection of immune or resistant species that can be used in future forest plantings. Dr. Owe Martinsson, from the Royal College of Forestry in Sweden, gave us seed from 15 full-sib families of Scotch pine that have shown resistance to Scleroderris in Sweden. The seedlings from this seed will be screened for resistance

in the spring of 1978. A similar study with jack pine seed was established in 1977 in cooperation with Dr. Richard Jeffers, Forestry Sciences Laboratory, North Central Forest Experiment Station, and Drs. C. W. Yeatman and C. F. Dorworth, Canadian Forestry Service. Some of the 26 jack pine provenances included in this study have shown resistance to the Lake States strain of G. abietina. These seedlings will be screened against both strains of Scleroderris in 1978. At this point we will not be doing any breeding work for Scleroderris resistance but will be pushing ahead to rapidly screen for resistant species as well as resistant provenances within species that can be used for establishing plantations.

Magasi and Manley (1974) found that the Lake States strain of G. abietina could be spread into uninfected areas on cut Christmas trees. In 1977, we verified Dr. Magasi's work and showed that cut Scotch pine Christmas trees infected with the European strain of G. abietina would produce viable spores the following spring and, if present near a susceptible host, could spread the fungus into new areas.

Because of the high risk of spreading Scleroderris canker into uninfected areas, a series of quarantines were established in 1977 to prevent the movement of infected stock. These included State quarantines in New York, Vermont, and Minnesota, a U.S. regulatory action, and a Canadian general quarantine. Although quarantines are not solutions, they can help reduce the spread of the disease.

In 1977 approximately 15,000 hectares were infected with Scleroderris canker in northern New York State and, by 1978, infection was found in 20 additional townships. The disease has already killed several hundred hectares of red and Scotch pine.

The potential exists for rapid spread of the European strain of Scleroderris throughout North America At this time we feel that it could soon become one of our most serious forest disease problems.

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