ROOT DECAY OF CONTAINER-GROWN WESTERN LARCH SEEDLINGS WESTERN FOREST SYSTEMS NURSERY, LEWISTON, IDAHO

R. L. James
Plant Pathologist

USDA Forest Service
Northern Region
1201 Ironwood Drive
Coeur d'Alene, ID 83814

Nursery Disease Notes #110

April 1990

During removal of the 1989 crop from containers at the Western Forest Systems Nursery, Lewiston, Idaho, several western larch (***Larix occidentalis*** Nutt.) seedlings were found with root decay. Affected seedlings lacked foliar symptoms of disease, such as chlorotic or necrotic foliage. Decay was associated with extensive superficial growth of fungal mycelium, particularly within the interface between roots and inner walls of containers. Much of this mycelial growth was concentrated near the tops of plugs. Decayed roots were not extensive, i. e. many of the roots over which the mycelial growth was evident were not decayed. Those roots that were decayed appeared blackened and water-soaked with epidermal and cortical tissues being easily removed.

Examination of root systems of affected seedlings revealed common infection with ectomycorrhizal fungi. Most root tips just below the root collar were mycorrhizal with a prominent fungal mantle. Most roots with the superficial mycelial growth described above were also mycorrhizal.

Many soil-borne pathogenic fungi are capable of causing the type of root decay described above. Several ***Fusarium*** spp. have been shown to incite root decay in different coniferous species (James and others 1989). ***Cylindrocarpon*** spp. have also frequently been associated with decay of conifer seedling roots, particularly in western white pine (James and Gilligan 1990). Both groups of fungi may cause decay of root systems without eliciting disease symptoms (James and Gilligan 1988a, 1988b, 1990). Therefore, several western larch seedlings with evidence of root decay were evaluated for presence of these potential decay organisms on affected roots.

Seeding roots were washed thoroughly under running tap water for several minutes to remove adhering particles of growing media. Pieces of root about 2-3 mm in length were aseptically cut from within and adjacent to areas where root decay was most prominent. Pieces were surface sterilized

in a 10% bleach solution (0.525% aqueous sodium hypochlorite) for 1 minute, rinsed with sterile, distilled water, and placed on agar media. Three different types of media were used for isolations: a selective medium for ***Fusarium*** and related root pathogens (Komada 1975), a selective medium for water molds (***Pythium*** and ***Phytophthora*** spp.) consisting of V-8 juice amended with several antibiotics and fungicides, and standard non-selective potato dextrose agar (PDA). Plates with Komada's medium and PDA were incubated under diurnal cycles cool, fluorescent light at about 26°C for 7-10 days. Plates with V-8 juice agar were incubated in the dark at about 24°C for 3 days. Selected fungi emerging from root pieces were transferred to PDA slants for identification to genus using the guide of Barnett and Hunter (1972). Isolates of ***Fusarium*** were incubated on PDA and carnation leaf agar for identification using the taxonomic scheme of Nelson and others (1983). *Phoma* isolates were identified using descriptions of Dorenbosch (1970).

Isolations failed to yield consistent associations with potentially-pathogenic fungi. ***Fusarium oxysporum*** Schlecht. was isolated from only one seedling (and just one piece of root from this seedling). ***Phoma eupyrena*** Sacc. was isolated from two-thirds of the sampled seedlings, but only about 17% of the root pieces sampled. Isolations on V-8 juice agar failed to yield water mold fungi. Roots isolated on PDA yielded mostly ***Trichoderma***, ***Penicillium***, and several types of saprophytic fungi in the order Mucorales. Other than some unidentified bacteria, these were the only organisms associated with root decay of western larch seedlings.

The preponderance of ***Thelephora***-like mycorrhizal associations with decayed roots indicate that these associations may have at least contributed to the occurrence of decay. ***Thelephora terrestris*** Ehr. is one of the most common mycorrhizal symbionts associated with conifer seedlings (Zak 1964; Zak and Marx 1964). These fungi can be very aggressive and grow prolifically, sometimes smothering the foliage of infected seedlings (Hacskaylo 1965; Sutherland and others 1989). However, they are usually not considered important decayers of seedling tissues (Sutherland and others 1989). Therefore, it is not known if or to what level these mycorrhizal fungi might have been involved in the decay of larch seedling roots from the Western Forest Systems Nursery.

It is possible that the root decay was not caused by commonly-encountered pathogenic fungi. Another possibility might be anaerobic organisms that tend to proliferate in water-saturated environments that may occur in container seedlings. In any event, decay was not due to commonly-encountered root pathogens.

LITERATURE CITED

Barnett, H. L. and B. B. Hunter. 1972. Illustrated genera of imperfect fungi. Burgess Publishing Co., Minneapolis, MN. 241p.

Dorenbosch, M. M. J. 1970. Key to nine ubiquitous soil-borne ***Phoma***-like fungi. Persoonia 6:1-14.

Hacskaylo, E. 1965. ***Thelephora terrestris*** and mycorrhizae of Virginia pine. Forest Science 11:401-404.

James, R. L., R. K. Dumroese, C. J. Gilligan and D. L. Wenny. 1989. Pathogenicity of ***Fusarium*** isolates from Douglas-fir seed and container-grown seedlings. Idaho Forest, Wildlife and Range Exp. Sta. Bull. No. 52. 10p.

James R. L. and C. J. Gilligan. 1988a. Association of ***Fusarium*** with non-diseased containerized ponderosa pine seedlings at the USDA Forest Service Nursery, Coeur d'Alene, Idaho. USDA Forest Service, Northern Region. Rept. 88-5. 10p.

James, R. L. and C. J. Gilligan. 1988b. Occurrence of ***Fusarium*** on the roots of nondiseased bareroot Douglas-fir seedlings - USDA Forest Service Nursery, Coeur d'Alene, Idaho. USDA Forest Service, Northern Region. Rept. 88-12. 4p.

James, R. L. and C. J. Gilligan. 1990. Root decay of container-grown western white pine seedlings - Plum Creek Nursery, Pablo, Montana. USDA Forest Service, Northern Region. (In press).

Komada, H. 1975. Development of a selective medium for quantitative isolation of ***Fusarium oxysporum*** from natural soil. Rev. Plant Prot. Res. 8:114-125.

Nelson, P. E., T. A. Toussoun, and W. F. O. Marasas. 1983. ***Fusarium*** species: an illustrated manual for identification. The Pennsylvania State University Press, University Park. 193p.

Sutherland, J. R., G. M. Shrimpton and R. N. Sturrock. 1989. Diseases and insects in British Columbia forest seedling nurseries. Canada-British Columbia Forest Resource Development Agreement Rept. 065. 85p.

Zak, B. 1964. Role of mycorrhizae in root disease. Ann. Rev. Phytopathol. 2:377-392.

Zak, B. and D. H. Marx. 1964. Isolations of mycorrhizal fungi from roots of individual slash pines. Forest Science 10:214-222.