FUNGAL COLONIZATION OF WESTERN LARCH SEED - NORTH WOODS NURSERY, ELK RIVER, IDAHO

R. L. James
Plant Pathologist

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

Nursery Disease Notes #69

August 1988

Disease problems of containerized seedlings may often be associated with poor seed (James 1986). Poor quality seed may have low germinative capacity and also may harbor high populations of organisms that are capable of causing diseases of young seedlings. Fusarium spp. have often been identified as contaminating conifer tree seed and causing disease problems when infected seed are sown (James 1987b).

Production of container stock at the North Woods Nursery, Elk River, Idaho has been affected by Fusarium-associated diseases as has other container nurseries in the Northern Rocky Mountains (James 1987a). Although losses have not been high, these diseases have been troublesome. Following the spring 1988 sowing, higher than usual damping-off losses were encountered within a particular seedlot of western larch (Larix occidentalis Nutt.) at the Nursery. This was an IDL (Idaho Dept. of Lands) lot (# PO 56) being grown for contract. Germination tests indicated an average rate of 58 %; therefore, 5-7 seeds were sown per cell in new 4A styroblocks. This sowing resulted in mortality within an average of 45 cells per tray by early May. Growers were concerned that perhaps seed contaminated with Fusarium may have been responsible for the poor performance of this seedlot. Therefore, investigations were conducted to elucidate extent of colonization of seed by Fusarium and several other groups of fungi.

Bulk seed and some that was removed from sown cells but had not germinated were sampled. In addition, debris (wings, resin globules, cone scales, etc.) from both seed collections were also sampled. Seed and debris was aseptically placed on a medium selective for Fusarium (Komada 1975) and incubated for 7-10 days at about 24 degrees C under cool fluorescent light. Emerging fungi were identified; those within the genus Fusarium were classified as to species using the taxonomic scheme of Nelson et al. (1983).

Isolation results are summarized in table 1. More than 50 percent of the seed and debris sampled were infected with Fusarium spp. Higher levels of Fusarium were detected in samples from sown cells, although those from bulk seed were much higher than normally expected from conifer seed (James 1987b). Figure 1 shows seed incubated on the selective medium infected with Fusarium. Corresponding with high levels of Fusarium were low levels of Trichoderma, which may be competitors or antagonists of fusaria. Other fungi isolated included several species of Penicillium and a variety of other saprophytic organisms included in the "other" category in table 1.

Table 1. Colonization of western larch seed from the North Woods Nursery with selected fungi.

	Percent Seed Colonized			
	Fusarium	Trichoderma	Penicillium	Other
Basic Seed (Bulk)				
Sample size: 500	42.2	4.6	66.7	43.8
Seed From Cells				
Sample size: 187	91.4	9.1	27.8	35.3
Debris From Bulk				
Sample size: 50	58.0	12.0	76.0	42.0
Debris From Cells				
Sample size: 13	53.8	7.7	7.7	69.2
Totals				
All Seed	55.6	5.8	56.0	41.5
All Debris	57.1	11.1	61.9	47.6

Several species of Fusarium were isolated from seed and debris, including F. oxysporum Schlect., F. acuminatum (Ell. & Ev.)Wollenw., F. sambucinum Fuckel, F. tricinctum (Cda.)Sacc. and F. nivale (Fr.) Ces. Most of these species are probably potentially pathogenic to conifer seedlings, although some individual isolates are undoubtedly saprobes (James et al. 1988a).

Results of this investigation indicates that the larch seed sown at the Nursery had very high levels of Fusarium contamination which probably contributed to the poor performance of the affected seedlot. This would include not only poor germination but also higher than normal pre- and post-emergence damping-off losses, resulting in too many empty cells. Since new styroblock containers were used, carryover inoculum within old containers did not contribute to the disease problems encountered.

Several procedures to reduce amounts of Fusarium and other potentially pathogenic fungi on conifer seed have been developed (James 1987b). Unfortunately, many chemical seed treatments adversely affect seed viability. Alternative treatments that do not reduce germination are currently being developed. These include hot water treatments (using microwaves)(James et al. 1988b) and proper concentrations of surface sterilants such as sodium

hypochlorite (standard bleach) and ethanol (Dumroese et al. 1988). Such treatments will reduce amounts of seedcoat contamination, but will not likely affect fungi that have penetrated into seed endosperms.

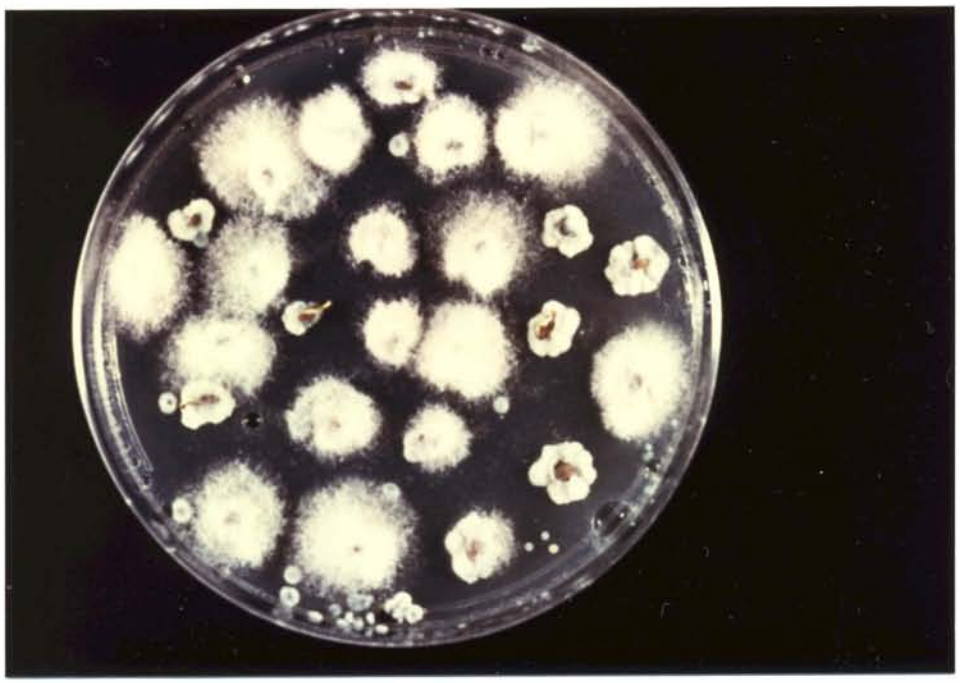

Figure 1. Fusarium spp. growing on western larch seed incubated on a selective medium for 7 days.

LITERATURE CITED

Dumroese, R. K., R. L. James and D. L. Wenny. 1988. Douglas-fir seed treatments: effects of germination and seedborne diseases. In: Proceedings of the 1988 Western Forest Nursery Council Conf. (In press).

James, R. L. 1986. Diseases of conifer seedlings caused by seed-borne Fusarium species. In: Shearer, R. C. (compiler). Proceedings: Conifer Tree Seed in the Inland Mountain West Symposium. USDA Forest Service, Intermountain Res. Sta., Gen. Tech. Rept. INT-203. pp.267-271.

James, R. L. 1987a. Containerized grand fir seedling mortality, North Woods Nursery, Elk River, Idaho. USDA Forest Service, Northern Region. Nursery Dis. Notes #58. 4p.

James, R. L. 1987b. Occurrence of Fusarium on conifer tree seed from Northern Rocky Mountain nurseries. In: Landis, T. D. (tech. coord.). Proceedings: Combined Western Forest Nursery Council and Intermountain Nursery Assoc. Mtg. USDA Forest Service, Rocky Mountain For. and Range Exp. Sta., Gen. Tech. Rept. RM-137. pp. 109-114.

James, R. L., R. K. Dumroese, C. J. Gilligan and D. L. Wenny. 1988a. Epidemiology of Fusarium on containerized Douglas-fir seedlings. 3. Pathogenicity of selected Fusarium isolates from Douglas-fir seed and seedlings. USDA Forest Service, Northern Region (In preparation).

James, R. L., C. J. Gilligan, R. K. Dumroese and D. L. Wenny. 1988b. Microwave treatments to eradicate seedborne fungi on Douglas-fir seed. USDA Forest Service, Northern Region. Rept. 88-7. 8p.

Komada, H. 1975. Development of a selective medium for quantitative isolation of Fusarium oxysporum from natural soil. Rev. Plant Protec. 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.