FUNGAL COLONIZATION OF PONDEROSA PINE AND DOUGLAS-FIR SEED USDA FOREST SERVICE NURSERY, COEUR D'ALENE, IDAHO

R. L. James
Plant Pathologist

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

Nursery Disease Notes #83

January 1989

During germination tests of seedlots to be sown for the 1989 seedling crop at the USDA Forest Service Nursery, Coeur d'Alene, Idaho, two lots of ponderosa pine (Pinus ponderosa Laws.) and one of Douglas-fir (Pseudotsuga menziesii [Mirb.]Franco) exhibited very low germination. In addition, these seedlots had more than normal mold growth that developed during germination tests. Nursery managers were concerned that these seedlots may have been contaminated with large amounts of pathogenic fungi which might have been responsible or poor germination and may affect their performance after sowing. Therefore, the three lots were analyzed in the laboratory for presence of potential pathogens.

Randomly selected seed from each of the three seedlots were aseptically placed directly on a selective agar medium for Fusarium spp. (Komada 1975) to assay for presence of fungal organisms on seedcoats. Two hundred seed were thus assayed per seedlot. In addition, 20 seed from each lot were aseptically dissected and their endosperms carefully removed and placed on the selective agar medium. Plates with seed and endosperms were incubated at about 22°C for 7-10 days under diurnal cycles of cool fluorescent light. After incubation, seed and endosperms were examined for colonization by selected fungi. Percent colonization by each group of fungi were calculated. Selected isolates of Fusarium were transferred to potato dextrose and carnation leaf agar for identification using the taxonomic scheme of Nelson et al. (1983).

Seed assay results are summarized in table 1. Levels of Fusarium were generally very low on seedcoats (about 1 %). Somewhat higher values were found within endosperms; however, sample sizes were small. The most common species of Fusarium isolated from seed was F. oxysporum Schlecht. Fusarium acuminatum Ell. & Ev. was isolated less frequently. Most seed of all three lots were extensively colonized with Penicillium spp. Other fungi found on seed included Trichoderma, Botrytis cinerea Pers. ex Fr., Phoma sp., Alternaria sp., and Mucor sp. Most of these organisms are usually saprophytic and would not be

expected to greatly reduce seed germination nor cause diseases of young seedlings.

Table 1. Occurrence of selected fungi on seedcoats and endosperms of ponderosa pine and Douglas-fir seed - USDA Forest Service Nursery, Coeur d'Alene, Idaho[1].

Seedlot[2]	Fungi[3]						
Seedcoats	FUS	TRI	PEN	BOT	PHO	ALT	MUC
PP 04-6677	1.0A[5]	25.0A	99.5A	3.5A	0.5A	0	0
PP 14-6662	0.5A	0.5B	100.0A	1.0A	9.5A	0	0
DF 03-6695	1.5A	3.0B	99.5A	3.5A	6.0A	1.0	0.5
All Lots	1.0	9.5	99.7	2.7	5.3	0.3	0.2
Endosperms[4]							
PP 04-6677	5.0	0	100.0	0	0	0	0
PP 14-6662	5.0	0	85.0	0	0	0	0
DF 03-6695	0	0	95.0	5.0	20.0	20.0	0
All Lots	3.3	0	93.3	1.7	6.7	6.7	0

1 Values in table are percent of sampled seed colonized with appropriate fungi.

2 Colonizing external seedcoat surfaces; 200 seed/lot.

3 FUS = Fusarium spp. PHO = Phoma spp.
TRI = Trichoderma spp. ALT = Alternaria sp.
PEN = Penicillium spp. MUC = Mucor sp.
BOT = Botrytis cinerea

4 Colonizing surface of endosperm within seedcoat; sample = 20 seed/lot

5 Within each column, numbers followed by the same capital letter are not significantly different (P=0.05) using Tukey's Multiple Range Comparison Test. Sample sizes were insufficient for statistical analyses of fungi colonizing seed endosperms.

Occurrence of B. cinerea on a fair amount of ponderosa pine and Douglas-fir seed was interesting. Although this fungus has been detected on conifer seed

previously (James, Gilligan and Reedy 1988), it has not generally thought to be a seed-borne problem (James 1984). It often becomes common within greenhouses toward the end of crop cycles and causes disease problems when seedling canopies are full and cool, wet environmental conditions prevail. It is possible that this pathogen is introduced into greenhouses at low levels on contaminated seed; the fungus may exist saprophytically on differnt types of organic debris and be available for widespread infection when host and environmental conditions are conducive to its development. Since this fungus has the capacity to grow very rapidly, it is possible that it was responsible for the excessive "mold" growth encountered during germination tests of these seedlots.

Results of this investigation indicated that pathogenic fungi were probably not responsible for the poor germination of these ponderosa pine and Douglas-fir seedlots. Other factors, such as seed development and maturation, were probably involved.

LITERATURE CITED

James, R. L. 1984. Biology and management of Botrytis blight. In: Murphy, P. M. (compiler). Proceedings: Intermountain Nurseryman's Assoc. 1983 Conf. USDA Forest Service, Intermountain Forest and Range Exp. Sta., Gen. Tech. Rept. INT-168. pp. 39-43.

James, R. L., C. J. Gilligan and V. Reedy. 1988. Evaluation of root diseases of containerized conifer seedlings at the Champion Timberlands Nursery, Plains, Montana. USDA Forest Service, Northern Region. Rept. 88-11. 21p.

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.