# FUSARIUM ASSOCIATED WITH SEEDBORNE DISEASES OF PONDEROSA PINE SEEDLINGS AT THE MONTANA STATE NURSERY, MISSOULA

by

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ABSTRACT

Three species of Fusarium (F. sporotrichioides, F. acuminatum, and F. sambucinum) were commonly isolated from seed, dislodged seedcoats, and recently damped-off ponderosa pine seedlings at the Montana State Nursery. Although pathogenicity tests were not conducted, it is suspected that at least some of these Fusaria are responsible for pre- and post-emergence damping-off losses at the Nursery.

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During the early stages of the spring-summer crop of containerized ponderosa pine (Pinus ponderosa Laws.) seedlings at the Montana State Nursery, growers noticed abundant whitish-pink mycelial growth of an unknown fungus over the surface of several containers. Pre- and post-emergence damping-off losses had not been unusually high and seedling mortality did not appear to be associated with the superficial mycelial growth. Fungal sporulation was evident on several recently discarded seedcoats located on the surface of containers. Cotyledon blight arising from attached seedcoats was occasionally found.

Captan (N-(Trichloromethylthio)-4-cyclohexene-1,2-dicarboximide) was applied to the containerized seedlings, resulting in reduced superficial mycelial growth. The seedlings were later treated with benomyl (Methyl 1-(butylcarbamoyl)-2-benzimidazolecarbamate) after which fungal growth was almost eliminated.

Collections were made of recently damped-off seedlings and seedcoats with prominent fungal sporulation. These were placed on a selective medium for Fusarium (Komada 1975), incubated at about 22°C under cool fluorescent light for 5-7 days and examined for Fusarium. Taxonomic keys used for identification of species included those of Booth (1971) and Gerlach and Nirenberg (1982).

To test the occurrence of Fusarium on ponderosa pine seed, a representative seedlot (lot 878 - Flathead National Forest) was sampled. Seed were subjected to three treatments (table 1). Samples of the peat-vermiculite soil mix used to grow seedlings (Martins® Peat) were also placed on the selective medium for Fusarium. All plates were incubated from 5-8 days at about 21°C under 12-hour diurnal cycles of cool fluorescent light. Species of Fusarium were identified using the taxonomic guides listed above.

Background levels of Fusarium on pine seed were low (table 1). Similar low levels were previously reported on ponderosa pine from another nursery (James and Genz 1982). These fungi were located both on the outside of the seedcoat (treatment 1) and within the endosperm (treatment 2). Previous work (James and Genz 1982) confirmed presence of Fusarium spp. within pine seed. The seed surface sterilization procedure used (10 percent bleach) reduced but did not eliminate Fusarium contamination.

virulent (James and Gilligan 1984). However, additional pathogenicity tests are warranted for this and the other Fusarium species isolated from ponderosa pine to help elucidate their role in causing conifer seedling diseases. There are probably separate strains of each species, which may differ in their ability to cause diseases (Booth 1971).

It is interesting to note that F. oxysporum Schlect. was not isolated from any of the infected seed or seedlings. This is probably the most common Fusarium species associated with conifer seedling diseases (James 1985), and the fact that it was not recovered is unusual. This may indicate that many diseases of conifer seeds and seedlings are caused mostly by a complex of Fusarium species rather than only one or two.

## LITERATURE CITED


Booth, C. 1971. The genus Fusarium. Commonwealth Mycological Institute, Kew, Surrey, England. 237 p.

Gerlach, W. and H. Nirenberg. 1982. The genus Fusarium - a pictorial atlas. Paul Parey, Berlin. 406 p.

Hancock, J. G. 1983. Seedling diseases of alfalfa in California. Plant Disease 67: 1203-1208.

James, R. L. 1985. Diseases of conifer seedlings caused by seedborne Fusarium species. Paper to be presented at the Conifer Tree Seed in the Inland Mountain West Symposium, Missoula, MT., August 1985.

James, R. L. and D. Genz. 1982. Evaluation of fungal populations on ponderosa pine seed. USDA Forest Service, Northern Region Rept. 82-22, 21 p.

James, R. L. and C. J. Gilligan. 1984. Studies of Fusarium associated with containerized conifer seedling diseases: pathogenicity tests of isolates from the Alpine Nursery, Kalispell, Montana. USDA Forest Service, Northern Region Rept. 84-14, 29 p.

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

Seemuller, E. 1968. Untersuchuugen uber die morphologische und biologische Differenzierung in der Fusarium - sektion sporotrichiella. Mitt. Biol. Bundesanst. Land-Forstwirtsch. Berlin-Dahlem 127. 1-93.

Vaartaja, O. and W. H. Cram. 1956. Damping-off pathogens of conifers and caragana in Saskatchewan. Phytopathology 46: 391-397.

## APPENDIX

Description of Fusarium species isolated from ponderosa pine seed and seedlings from the Montana State Nursery, Missoula.

Fusarium sporotrichioides Sherb. - Isolates 85-40A, 85-40C, and 85-40E.

- all isolates obtained from sporodochia on ponderosa pine seed.
- colonies very fast growing, reaching 7.5 cm diameter in 4 days at 25°C on potato dextrose agar (PDA).
- aerial mycelium abundant, at first whitish, later becoming yellowish and pink.
- pigmentation at first rose colored, later deep carmine to reddish brown.
- sporodochia do not form on PDA and form only sparsely on carnation leaf agar (CLA) as cream-flesh colored with a very slight orange tinge.
- conidiophores densely branched, producing two types of microconidia: (1) pyriform and (2) ovoid-fusoid and slightly falcate.
- macroconidia falcate, widest in the upper third, tapering at both ends, with a comparatively short and strongly bent apical cell and an often indistinct foot cell; mostly 5 septate.
- chlamydospores abundant, mostly intercalary in chains, globose to subglobose.

Fusarium acuminatum Ell. and Kellerm. - Isolates 85-42A, 85-47, and 85-48.

- all isolates from either the seedcoat or endosperm of ponderosa pine seed.
- colonies fast growing, reaching 6.5-7.5 cm diameter in 4 days at 25°C on PDA.
- aerial mycelium abundant, whitish to pink; some isolates with slight ochre tinge.
- pigmentation deep carmine, especially pronounced at surface of agar.
- sporodochia formed abundantly on PDA and CLA; salmon to bright orange in color.
- no microconidia formed.
- macroconidia thin, highly falcate with a moderately elongated, pointed apical cell and a distinctly predicellate basal cell, mostly 3-5 septate.
- chlamydospores abundant, mostly intercalary in hyphae, in pairs or short chains.
- abundant brown to violet sclerotial bodies formed on PDA and CLA.

Fusarium sambucinum Fuckel - Isolate 85-40D

- isolate from sporodochia on seedcoat of ponderosa pine seed.

- colonies fast growing, reaching 6.0-7.0 cm diameter in 4 days at 25°C on PDA.

- aerial mycelium abundant, floccose, whitish to rose colored. Some sectors may become appressed and moist with age.

- pigmentation rose to deep carmine.

- sporodochia formed abundantly on PDA and CLA, flesh to slightly salmon in color.

- microconidia generally not formed; when present, aseptate and circular.

- macroconidia abundant, rather uniform in size, falcate, mostly 3-5 septate, generally wider in the upper third with a constricted apical and distinctly pedicellate basal cell.

- sclerotid bodies abundantly formed on PDA and CLA, formed as rough, cauliflower-like, stilboid plectenchyma, red to violet in color.