

**MORTALITY OF YOUNG, CONTAINER-GROWN
PACIFIC SILVER FIR SEEDLINGS
NORTH WOODS NURSERY, ELK RIVER, IDAHO**

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Pacific silver fir (*Abies amabilis* (Dougl.)Forb.) seedlings grown in containers at the North Woods Nursery, Elk River, Idaho from seedlot 1707-791 (Wenatchee National Forest) experienced greater than normal post-emergence damping-off and root disease-associated mortality during the early part of the 1989 growing season. During June, losses became noticeable and affected seedlings were found scattered throughout the seedlot.

Samples of diseased seedlings and selected coats of germinated seed (deposited on the surface of growing media) were analyzed for presence of potentially pathogenic fungi. Fourteen diseased seedlings and 16 seedcoats were analyzed. Seedlings were washed thoroughly under running tap water to remove particles of growing media. Tap roots and stems were aseptically cut into pieces about 2-3 mm in length. These pieces were surface sterilized in a 10 percent bleach solution (0.525 percent aqueous sodium hypochlorite) for one minute and rinsed with sterile distilled water. Seedcoats were likewise surface sterilized and rinsed. Seedling pieces and seedcoats were aseptically placed on an agar medium selective for *Fusarium* spp. and closely related fungi (Komada 1975). Plates were incubated under diurnal cycles of cool, fluorescent light for 5-7 days. Emerging fungi were examined under the microscope and selected examples transferred to potato dextrose agar and carnation leaf agar for identification using standard taxonomic guides (Barnett and Hunter 1972; Gerlach and Nirenberg 1982; Nelson and others 1983).

Isolation results (table 1) indicated that all sampled diseased seedlings and nearly all detached seedcoats (87.5 percent) were colonized with *Fusarium* spp. The most commonly isolated species was *F. acuminatum* Ell. & Ev., which has commonly been associated with and capable of causing root diseases and damping-off of conifer seedlings (James and others 1986, 1988). Other isolated species included *F. solani* (Mart.)Appel & Wollenw., *F. sambucinum* Fuckel, and *F. heterosporum* Nees. It was interesting that *F. oxysporum*, which is commonly associated with conifer seedling diseases (James and others 1988), was not isolated. *Fusarium solani* has previously been reported on several species of conifer seedlings, including Douglas-fir (James 1983a), western white pine (James 1983b), and Engelmann spruce (James and Gilligan 1985). *Fusarium sambucinum* has frequently been isolated from ponderosa pine (James 1985), western larch (James 1987, 1989) and Douglas-fir (James and others 1988) seedlings. However, pathogenicity tests have indicated that this is usually not an aggressive pathogen on conifer seedlings (James and Gilligan 1984; James and others 1988).

Table 1. Colonization of diseased Pacific silver fir seedlings and detached seedcoats by selected fungi at the North Woods Nursery, Elk River, Idaho.

Percent Colonization		
Fungi	Seedlings ¹	Seedcoats ²
All <i>Fusarium</i>	100.0	87.5
<i>Fusarium acuminatum</i>	78.6	50.0
<i>Fusarium solani</i>	14.3	37.5
<i>Fusarium heterosporum</i>	14.3	18.8
<i>Fusarium sambucinum</i>	7.1	6.2
<i>Phoma eupyrena</i>	0	12.5
<i>Trichoderma</i> spp.	14.3	50.0

¹ 14 diseased seedlings sampled.

² 16 detached seedcoats sampled.

This is the first report of *F. heterosporum* being associated with disease of conifer seedlings. This species has been reported on hardwood tree species within the genera *Acer* and *Malus*, however, not as a nursery pathogen (Farr and others 1989). *Fusarium heterosporum* is described as a potential pathogen of gramineous hosts (Farr and others 1989; Gerlach and Nirenberg 1982). It may be involved in pathogenesis of silver fir seedlings at the North Woods Nursery. However, controlled pathogenicity tests are required to properly define role of this species in disease initiation. A detailed description of *F. heterosporum* is included in the Appendix.

Other fungi isolated from either diseased seedlings or detached seedcoats included *Trichoderma* spp. and *Phoma eupyrena* Sacc. *Trichoderma* spp. are common soil-borne saprophytes which may be competitive with or antagonistic toward pathogenic fungi (Papavizas 1985). *Phoma eupyrena* is a soil-borne fungus capable of being pathogenic under certain circumstances (Janke and Zott 1983; James and Hamm 1985; Kliejunas and others 1985). However, this species is usually not very aggressive (James and Hamm 1985) and most likely was not involved in causing disease of the silver fir seedlings.

In conclusion, it appears that several *Fusarium* species were the cause of mortality of Pacific silver fir seedlings at the North Woods Nursery during 1989. These fungi most likely were introduced into container operations on infected seedcoats.

Disease impact can be reduced by treating seed to reduce levels of fungal contamination. Running water rinses for 48 hours and treatments with bleach are generally effective (Dumroese and others 1988). If damping-off is noticed after seedling emergence, fungicide treatments with benomyl or chlorothalonil may be necessary.

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APPENDIX

Fusarium heterosporum Nees.

Synonymy:

Fusarium roseum Lk. emend. Snyd. & Hans.

Fusarium congoense Wollenw.

Colony morphology: colonies fast growing on PDA, reaching 7.5 - 8.0 cm diameter in 8 days at 25°C. Aerial mycelium abundant, floccose to felt-like. Mycelium white to pink. The undersurface is light orange to tan in color.

Sporodochia: orange sporodochia develop as the culture ages.

Conidia: microconidia are absent; macroconidia are sickle-shaped, narrowed at both ends and pedicellate.

Conidiophores: branched and unbranched monophialides.

Chlamydospores: relatively sparse, mostly intercalary, and in chains.