

**MORTALITY OF CONTAINER-GROWN PONDEROSA PINE  
SEEDLINGS - NORTH WOODS NURSERY,  
ELK RIVER, IDAHO**

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Several container-grown ponderosa pine (*Pinus ponderosa* Laws.) seedlings at the North Woods Nursery, Elk River, Idaho died during the early part of the 1989 growth cycle. Affected seedlings were from the Idaho Department of Lands seedlot CO-01 and seemed to retain their seedcoats for prolonged time periods following germination and seedling establishment. Growers felt that infected seedcoats may be transferring pathogenic fungi to cotyledons during periods of seedcoat attachment. It was felt that pathogenic fungi might spread from infected cotyledons down to the main stem and into the roots, causing seedling mortality. This type of disease, called "cotyledon blight", is associated with pathogenic fungi spreading from infected seed following germination (James 1986).

Six diseased seedlings with varying amounts of stem and cotyledon necrosis and 17 seedcoats that had persisted on seedling cotyledons were analyzed for colonization by potentially pathogenic fungi. Seedlings were rinsed thoroughly under running tap water to remove adhering particles of growth media. They were then aseptically dissected into cotyledon, main stem, and root sections. Pieces from each section were aseptically cut from seedlings into 3-4 mm lengths, surface sterilized in a 10 percent bleach solution (0.525 percent aqueous sodium hypochlorite) for one minute, and rinsed with sterile, distilled water. Ponderosa pine seedcoats were similarly surface sterilized and rinsed. Seedling pieces and seedcoats were 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 at about 26°C for 5-7 days. Emerging fungi were examined microscopically and representative examples transferred to potato dextrose agar for identification using two standard taxonomic guides (Barnett and Hunter 1975; Nelson and others 1983).

Isolation results (table 1) indicated that *Botrytis cinerea* Pers.:Fr. was the most common colonizer of cotyledon and stem tissue from diseased seedlings. This fungus was also commonly isolated from seedcoats. *Botrytis* is a common inhabitant of greenhouses, where it may reside on various types of organic matter and commonly colonizes necrotic portions of seedlings (James 1984a; Jarvis 1989). The fungus spreads to nearby healthy tissues from necrotic plant parts and can cause seedling death.

Table 1. Colonization of container-grown ponderosa pine seedlings and seedcoats with selected fungi and bacteria at the North Woods Nursery, Elk River, Idaho.

Percentage Colonization

Fungi	Cotyledons	Seedlings <sup>1</sup>		Seedcoats <sup>2</sup>
		Stems	Roots	
<i>Fusarium acuminatum</i>	0	33.3	33.3	41.2
<i>Botrytis cinerea</i>	100.0	83.3	0	41.2
<i>Phoma eupyrena</i>	0	0	0	29.4
<i>Phoma herbarum</i>	0	0	0	11.8
<i>Alternaria</i> spp.	0	0	0	17.6
<i>Trichoderma</i> spp.	66.7	100.0	66.7	64.7
Unidentified bacteria	0	83.3	83.3	35.3

<sup>1</sup> Six diseased seedlings were analyzed

<sup>2</sup> 17 seedcoats were analyzed.

The only potentially pathogenic fungus isolated from the roots of diseased seedlings was *Fusarium acuminatum* Ell. & Ev. (table 1). This species also colonized almost half of the seedcoats analyzed. *Fusarium acuminatum* is commonly associated with root diseased, container-grown conifer seedlings (James 1985b, 1989; James and others 1988) and certain strains may be quite pathogenic (James and others 1986, 1988). It is likely that this fungus spread from infected seedcoats, colonized and killed cotyledons, and then spread down the seedling stem into roots. *Botrytis* was most likely a secondary colonizer of tissues killed by *Fusarium*.

Two species of *Phoma* (*P. eupyrena* Sacc. and *P. herbarum* Westend.) were also isolated from detached seedcoats (table 1). Both of these species have been associated with diseased conifer seedlings (James 1984b, 1985a; James and Hamm 1985; Kliejunas and others 1985). However, each may also be saprophytic (Boerema 1964; Dorenbosch 1970). Their occurrence on conifer seed is not unusual (James and Hamm 1985). However, since neither fungus was isolated from diseased seedling tissues, it is unlikely that they were involved with causing seedling disease.

Other organisms isolated from diseased seedlings or seedcoats included *Alternaria* spp., *Trichoderma* spp., and several types of unidentified bacteria. The first two groups are common saprophytic fungi which are often isolated from dead tissues. Numbers of bacteria were especially high on roots (table 1). Although these are not likely to cause root necrosis, it is possible that they colonized tissues weakened by other pathogenic organisms.

In conclusion, it appears that mortality of ponderosa pine seedlings at the North Woods Nursery was primarily due to infection by *Fusarium* which resided on seedcoats. Infected tissues were then colonized by *Botrytis* (above ground) and other saprophytes (bacteria, *Trichoderma*) below ground.

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