MORTALITY OF CONTAINERIZED WESTERN LARCH AND WESTERN REDCEDAR SEEDLINGS AT THE INTERMOUNTAIN RESEARCH STATION, MOSCOW, IDAHO

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Western larch (Larix occidentalis Nutt.) and western redcedar (Thuja plicata Donn.) seed were sown in early May 1986 to produce containerized seedlings for use in genetic studies at the Forestry Sciences Laboratory, Intermountain Research Station, Moscow, Idaho. Approximately 18,000 Leach® super cells were sown with these two species. During late June and early July, many seedlings began to turn purple and, upon close examination, definitive constrictions were found at the base (just above the ground line) of affected seedlings (figure 1). Tissues around this constriction were necrotic, although roots of most affected seedlings appeared healthy (figure 2). As the constriction developed, the top of affected seedlings often fell over (figure 1) and eventually died.

Isolations were made from necrotic tissues within and adjacent to the constriction. Tissues were surface sterilized in 0.5% aqueous sodium hypochlorite (10% commercial bleach) and placed on four different media, some of which were selective for possible pathogens (table 1). Plates were incubated at room temperature (22-24°C) under various diurnal light regimes and emerging fungi identified.

Isolation results are summarized in table 1. Major fungi isolated from necrotic tissues included Alternaria, Penicillium, Phoma, Fusarium, and Trichoderma. Alternaria was the most prevalent organism isolated from larch seedlings, whereas Penicillium was encountered more frequently on cedar seedlings. Consistent isolation of common seedling pathogens was not found, although Alternaria spp. have been implicated as possible pathogens of conifer seedlings (James 1985).

A summary of treatments on these containerized seedlings (table 2) indicate frequent fungicide treatments, particularly after seedlings began to show foliar coloring and stem necrosis. Fungicides were also routinely applied shortly after seeding to reduce damping-off, which was found only at low levels.

Shortly after sowing in May, ambient outdoor temperatures became very high after a period of cool weather. It is possible that greenhouse temperatures also became high and emerging seedlings could have been damaged. It is also possible that fungicides, especially dicloran, contributed to seedling damage.

Young western larch seedlings are particularly sensitive to high temperatures and certain fungicides. It seems that cambial and phloem tissues were killed relatively early in seedling development. Although xylem tissues continued to conduct water and nutrients, phloem activity was curtailed. Necrotic tissues were likely colonized by weakly pathogenic fungi, such as Alternaria, which contributed to the breakdown of structural cells. The result was a constriction above the ground line followed by seedling death.

In the future, similar losses can probably be avoided for larch by earlier sowing (during cooler periods) and by limiting fungicides until seedlings have become established. Little is known about the susceptibility of young redcedar seedlings to high temperatures and fungicides, but apparently they are affected. If damping-off becomes a problem, benomyl may be applied, but it is not recommended that dicloran be used on young larch seedlings because of its possible phytotoxic effects (James and Woo 1984). Damping-off and root disease losses can also be reduced by proper seed treatments prior to sowing (James 1986).

Figure 1.--Constriction at the base of containerized western larch seedling. Foliage above the constriction had a purplish tinge and the seedling bent over at the constriction.

Figure 2.--Constriction at the base of containerized western redcedar seedling (arrow). Roots of affected seedling appear healthy.

Table 1.--Results of isolations from necrotic stem tissues of western larch and and western redcedar seedlings.

Western larch	Media[1]			
Seedling number	PDA	CM/P	WA/C	KOM
1	P[2]	P	P	P
2	P/B	A/N	P	N
3	A	A	A	A
4	B	A/N	A	A/N
5	A	A	A	P/A
6	A/B	A/N	A	P/N
7	P	P/N	P/B	P
8	Ph	N	B	F
9	Ph/B	P	-	P
10	B	Ph	-	A/N
Western redcedar				
1	T/A	A	-	A
2	P	B	-	P
3	P/B	P/B	-	P

[1]PDA = Potato dextrose agar; CM/P = Cornmeal agar amended with pimaricin (for Pythiaceous fungi); WA/C = Water agar amended with cycloheximide; KOM = Komada's selective medium

for Fusarium.

[2]Fungi: P = Penicillium spp.; B = unidentified bacteria; A = Alternaria sp.; Ph = Phoma spp.; F = Fusarium sp.; T = Trichoderma sp.; N = no organisms.

Table 2.--Sequence of treatments to containerized western larch and western larch and western redcedar seedlings.

Date	Treatment
5/6	Seed sown
5/6 - 5/12	Treated with benomyl (Benlate®) at the rate of one-half tablespoon/gallon of water.
5/16	Treated with ethazol (Truban®) at the rate of one-quarter tablespoon/gallon of water and rinsed with an equal amount of water.
5/23	Treated with benomyl (Benlate®) at the rate of one-half tablespoon/gallon of water.
5/23	Treated with dicloran (Botran®) at the rate of one-half tablespoon/gallon of water.
5/30	Treated with benomyl (Benlate®) at the rate of one-half tablespoon/gallon of water.
6/6	Treated with benomyl (Benlate®) at the rate of one-half tablespoon/gallon of water.
6/24	Treated with benomyl (Benlate®) at the rate of one-half tablespoon/gallon of water.
6/24	Treated with dicloran (Botran®) at the rate of one-half tablespoon/gallon of water.
6/27	Fertilized (20-20-20) at rate of 13 1/2 ounces/gallon of water.
7/3	Fertilized (10-30-20) plus $FeSO_4$ at rate of 10 ounces/gallon and 3 lbs. $FeSO_4$.
7/5	Treated with benomyl (Benlate® and Tersan®) each at the rate of one-half tablespoon/gallon of water.

LITERATURE CITED

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