

ROOT DISEASE OF CONTAINERIZED SUBALPINE FIR SEEDLINGS -  
USDA FOREST SERVICE NURSERY, COEUR D'ALENE, IDAHO

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Subalpine fir (Abies lasiocarpa (Hook.) Nutt.) seedlings are grown in pine cell containers for reforestation of high elevation sites. Seedlings may be grown for two years in containers at the USDA Forest Service Nursery, Coeur d'Alene, Idaho because one year old seedlings are often too small. During the second growing season of a recent crop, several seedlings began to display foliar symptoms indicative of possible root disease problems (James 1985). Foliage of affected seedlings took on a general yellowing and the bottom needles became necrotic. Several severely-affected seedlings died because of the problem.

Eight seedlings with disease symptoms were collected for isolation of potential root pathogens. Seedlings were carefully extracted from their containers so as to minimize root damage. Roots were washed thoroughly under running tap water for a few minutes to remove adhering soil particles. Roots were then surface sterilized in a 10 percent aqueous sodium hypochlorite solution and rinsed with sterile distilled water. Root pieces 1-2 cm in length were aseptically cut from root systems and placed on a selective agar medium (Komada 1975). Ten root tip pieces and ten pieces randomly selected from lateral roots were plated per seedling. The base of each pine cell container was also sampled for root pathogens. Each base was aseptically cut into four pieces of approximate equal size and placed, inside surface down, on the selective medium. Plates were incubated for 7-10 days at about 24°C under cool, fluorescent light. Emerging fungi were transferred to potato dextrose agar for identification. Fusarium and Cylindrocarpon spp. were identified using the taxonomic guides of Nelson et al. (1983) and Booth (1966), respectively.

Table 1 describes foliar symptoms and isolation results for the eight sampled seedlings. Each of the sampled seedlings had roots which were colonized with Fusarium spp. Four of the seedlings likewise had roots colonized with Cylindrocarpon spp. as well. As with investigations on other conifer species (James 1985; James et al. 1987), root tips were colonized to a much greater extent with these fungi than other parts of the root system. Seedlings

Table 1. Infection of containerized subalpine fir seedlings from the USDA Forest Service Nursery, Coeur d'Alene, Idaho with Fusarium and Cylindrocarpon.

Seedling No.	Symptom Description	Percent Root Colonization			
		<u>Fusarium</u>		<u>Cylindrocarpon</u>	
		Tips	Others	Tips	Others
1	All necrotic	90	40	0	0
2	Top 2/3 green; Bottom 1/3 necrotic	100	10	0	50
3	All necrotic	100	100	0	0
4	All necrotic	100	60	0	0
5	Top 1/2 chlorotic; Bottom 1/2 necrotic	70	0	90	100
6	Mostly green; light chlorosis	10	0	0	0
7	Mostly chlorotic; Bottom 1/4 necrotic	20	0	90	40
8	Mostly chlorotic; Bottom 1/4 necrotic	30	0	60	20
Averages	-	65	26	30	26

with more necrotic foliage had greater root colonization with Fusarium. The one seedling with little evidence of disease (#6) have very little root infection. On the other hand, seedlings with large amounts of necrotic foliage had roots which were extensively colonized. Therefore, at least in this small sample, severity of foliar root disease symptoms were a rough indicator of extent of root colonization by Fusarium. This has not been the case in previous studies of containerized Douglas-fir, ponderosa, and lodgepole pine seedlings (James 1986; James and Gilligan 1988a).

Each of the 8 pine cell containers sampled were extensively colonized with Fusarium. Eighty-five percent of the pieces sampled (four/cell) were colonized. This confirms previous investigations which showed that Fusarium spp. are common colonizers of pine cell containers at the nursery (James and Gilligan 1988b). Cylindrocarpon was isolated from only one of the containers. Other fungi from the genus Trichoderma were isolated from 3 of the 8 sampled containers. These fungi are common soil inhabitants and may be antagonistic to pathogens, including Fusarium (Papavizas 1985).

The major species of Fusarium isolated from seedling roots and the inner walls of pine cell containers was F. oxysporum Schlect. The only species of Cylindrocarpon obtained was C. didymum (Hartig)Wollenw. These species have commonly been isolated from root diseased seedlings and containers in other investigations (James 1987a; James 1987b; James 1987c).

This investigation indicated that F. oxysporum was probably the major cause of mortality of containerized subalpine fir seedlings at the nursery. Some isolates of this species are readily capable of causing rapid disease of

containerized seedlings (James and Gilligan 1984). On the other hand, some may also be saprophytic. Without carefully controlled pathogenicity tests, it is unknown how virulent the isolates obtained from subalpine fir seedlings are. However, it is suspected that some are probably pathogenic enough to cause root disease of seedlings. Growing seedlings for another year in containers may have provided enough additional time for these fungi to elicit disease symptoms. Growers should be careful to cull any seedlings which display foliar chlorosis and necrosis so that severely diseased seedlings are not outplanted.

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