ROOT COLLAR NECROSIS OF COLORADO BLUE SPRUCE SEEDLINGS PLATO NURSERY, BONNERS FERRY, IDAHO

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During a recent visit with John Schwandt (Plant Pathologist-Idaho Dept. of Lands) and Tom Landis (Westwide Nursery Specialist-USDA Forest Service) to the Plato Nursery, Bonners Ferry, Idaho, a serious disease was found in beds of 2-0 bareroot Colorado blue spruce (Picea pungens Engelm.). Affected seedlings occurred in pockets and displayed foliage chlorosis and browning (figure 1). In several cases, affected seedlings also had their tips bent over and appeared wilted. Seedlings with necrotic foliage had extensively decayed root systems. Epidermal tissues were mostly black and easily sloughed off; such root systems lacked any fine root tips. Seedlings with chlorotic foliage had mostly healthy root systems, but they also often had a zone of black epidermal discoloration on the main taproot that extended from the groundline down several millimeters (figure 2). Above and below this necrotic zone, all tissues appeared healthy.

Although the symptom pattern looked like root disease, the concentration of necrosis just below the groundline was unusual and not indicative of root diseases commonly encountered. Therefore, isolations were made from this necrotic root collar tissue and also from necrotic root tips of seedlings with extensive wilt symptoms. Selected tissues were surface sterilized in 0.5 percent sodium hypochlorite (10 percent commericial bleach) and placed on four different media: 2 percent water agar, V-8 juice agar amended with antibiotics and fungicides (selective for Pythium), Komada's selective medium for Fusarium (Komada 1975) and Czapek-Streptomycin agar (C. E. Cordell, personal communication). Plates were incubated at 22-24°C under different light regimes, and emerging fungi were identified.

Results of isolations were similar on all media. Fusarium oxysporum Schlect. was the most frequently isolated organism, accounting for more than 75 percent of all isolations. This fungus was obtained from both necrotic root collar tissues and root tips. Cylindrocladium spp. were not isolated, although seedling symptoms were similar to those infected with these fungi (Cordell and Skilling 1975).

Association of F. oxysporum with root disease of bareroot seedlings is well documented (Bloomberg 1971; Gordon 1965). It has also been associated with stem or root collar rot of conifer seedlings (Brownell and Schneider 1983; Morgan 1983). However, in northern Rocky Mountain nurseries, the organism has most frequently been limited to necrotic roots (James 1983; James 1984). Apparently, the fungus was also capable of attacking 2-0 seedlings directly

below the groundline without first infecting feeder roots. After the root collar was killed, perhaps the fungus colonized the remainder of the root system, causing seedling death.

Control of Fusarium root disease in bareroot nurseries is best accomplished by soil fumigation and sowing pathogen-free seed (James 1986). Affected beds at the Plato Nursery had not been fumigated prior to sowing with Vapam®. However, drenching affected soils with benomyl was effective in reducing further spread and damage by the disease.

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Figure 1.--Pocket of bareroot blue spruce mortality caused by Fusarium oxysporum at the Plato Nursery

Figure 2.--Black necrotic epidermis located just below the groundline on blue spruce seedling with chlorotic foliage. Seedling was infected with Fusarium oxysporum.