

**TIP DIEBACK OF CONTAINER-GROWN
ENGELMANN SPRUCE SEEDLINGS -
NORTH WOODS NURSERY, ELK RIVER, IDAHO**

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At the North Woods Nursery, Elk River, Idaho, container-grown Engelmann spruce (*Picea engelmanni* Parry) seedlings were found which displayed necrotic dieback of their growing tips. Several examples of seedlings with dieback symptoms were evaluated for presence of organisms associated with the symptoms.

Necrosis started with the penultimate needles, just below the growing tip. Necrosis progressed so that entire needles were dead and the growing tip bent over. In advanced stages, purple-colored lesions formed on the main stem; tissue associated with lesions were decayed. This decay helped promote bending of growing tips. Roots of several affected seedlings were closely examined and found to be healthy (white growing tips and with no apparent cortical decay). Although none of the affected seedlings had been killed, presence of necrotic tops made seedlings appear unhealthy. Affected seedlings would probably be culled prior to shipment.

Necrotic tip tissues were washed thoroughly under running tap water and placed in a petri dish moist chamber to promote sporulation of associated fungi. Some tissue on the edge of necrotic stem lesions was aseptically cut and placed on potato dextrose agar after being surface sterilized with a 10-percent bleach solution (0.525 percent aqueous sodium hypochlorite) for 1 minute. All plates were incubated at about 24°C for 5 days under diurnal patterns of cool, fluorescent light. Fungi sporulating on necrotic tips in moist chambers and those emerging from necrotic lesion tissues were identified using a standard taxonomic guide (Barnett and Hunter 1972).

The most commonly encountered fungus associated with necrotic tips of seedlings was *Botrytis cinerea* Pers. ex Fr. This fungus colonized nearly all necrotic tissues and was also found sporulating on green needle tissue, especially adjacent to necrotic areas. *Botrytis* was also consistently isolated from stem lesion tissue. Other fungi found sporulating on necrotic tissues included *Alternaria*, *Penicillium*, *Trichoderma* and *Phoma* spp.

Tip dieback symptoms, especially the bending of tips, were similar to those produced by *Sirococcus* tip blight (caused by *Sirococcus strobilinus* Preuss) (Smith 1975; Sutherland and others 1989). This pathogen commonly occurs on Engelmann spruce seedlings, and may be seed-borne on this species (Mitchell and Sutherland 1986; Sutherland and others 1981). Container-grown seedlings are especially damaged by this fungus. Therefore, it was surprising not to find *Sirococcus* associated with tip dieback symptoms at the North Woods Nursery.

It appears that *Botrytis* was the major cause of the disease, although this fungus is usually not an aggressive pathogen on the tips of seedlings. *Botrytis* usually attacks necrotic tissues at the base of seedlings after the crowns close (where ideal moisture conditions exist) (James 1984). The fungus then spreads from necrotic needles into healthy tissues. Because it usually remains concentrated at the base of seedlings, occurrence of *Botrytis* on the tips of young seedlings was not expected. It is possible that other factors initiated needle necrosis and that *Botrytis* was only a secondary colonizer.

Young spruce seedlings may be susceptible to heat damage when they are actively growing (Sutherland and others 1989). It is possible that some seedlings were damaged by abnormally high temperatures within greenhouses. Another possibility is toxicity from chemicals, such as fungicides, although growers at the North Woods Nursery use chemicals sparingly. One other possibility was that *Phoma* spp. were responsible for initial tissue necrosis. These fungi are capable of causing tip necrosis of conifer seedlings (James and Hamm 1985); however, past experience indicates that they are much more common as pathogens of bare-root nursery stock (James 1980, 1986).

In conclusion, it appears that tip dieback of Engelmann spruce seedlings at the North Woods Nursery was the result of pathogenesis by *Botrytis*. This fungus apparently spread from necrotic needles into stems of seedlings and were beginning to initiate lesions. However, damage was very light and scattered and treatment with fungicides was not justified. Removal of symptomatic seedlings would probably be the best way to reduce risk to other seedlings.

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