PHOMA TIP BLIGHT OF BAREROOT ENGELMANN SPRUCE SEEDLINGS MONTANA STATE NURSERY, MISSOULA

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During the 1989 growing season at the Montana State Nursery in Missoula, top necrosis of several 2-0 bareroot Engelmann spruce (**Picea engelmanni** Parry) seedlings was noted. Affected seedlings commonly had "soil collars", i. e., aggregates of soil that covered their stems and lower foliage. This build up of soil was due to rain and/or irrigation splash of surrounding soil. Although soil was especially thick around the base of seedlings, most necrosis was concentrated near seedling tips. However, when examined under the microscope, soil particles were prominent over most foliage near necrotic areas. Lesions initially started at the base of needles and extended to needle tips. Tissues within lesions were at first chlorotic, but later turned necrotic. Mycelial strands were evident within necrotic tips, often connecting necrotic needles together in a mycelial network. Damaged terminal buds had extensive resin exudation. Purple lesions with associated resin exudation were found on the main stem of some seedlings, especially near damaged tips.

Several seedlings were analyzed for colonization of damaged tissues by potentially pathogenic organisms. Seedling tops were washed thoroughly under running tap water for several minutes to remove soil particles. Needle and stem tissues were then aseptically dissected into pieces about 3-4 mm in length. Tissues on the edge of necrotic lesions were mostly sampled. Foliage pieces were surface sterilized in a 10 percent bleach solution (0.525 percent aqueous sodium hypochlorite) for 1 minute and rinsed with sterile distilled water. They were then either placed in moist chambers (sterile petrie plates with moistened filter paper) or placed on an agar medium commonly used for root pathogens (Komada 1975). This agar medium was used in lieu of standard non-selective potato dextrose agar because it restricts growth of most bacteria and many common saprophytes. Moist chambers were incubated under diurnal cycles of cool fluorescent light for 3 days at about 24°C. Agar plates were incubated under the same conditions for 5-7 days. Representative examples of fungi from moist chambers and agar plates were transferred to PDA for identification using standard taxonomic guides(Barnett and Hunter 1972; Domsch and others 1980; Sutton 1980).

The most commonly encountered fungus associated with tip blight of Engelmann spruce seedlings was **Phoma eupyrena** Sacc. This fungus was often found sporulating on necrotic tissues incubated within moist chambers

and was also frequently isolated from tissues incubated on Komada's medium. Some moist chamber tissues also produced **Botrytis cinerea** Pers:.Fr., but at much lower levels than **P. eupyrena**.

Phoma eupyrena is a common soil-borne fungus that may be an important nursery pathogen under the right conditions (Hansen and Hamm 1988; James and Hamm 1985). This species is often associated with "soil collars" around the base of seedlings (James 1979; Kliejunas and others 1985). **Phoma eupyrena** apparently colonizes seedling tissues from soil particles deposited on or around seedlings. The fungus may be quite aggressive when attacking seedling tissues (Janke and Zott 1983), particularly if seedlings are stressed (Hansen and Hamm 1988; James 1979; Kliejunas and others 1985). The fungus often concentrates its activity near the tip of seedlings (James 1980, 1986, 1987); entire seedlings may be killed, especially if they are small (James 1980, 1986, 1987, 1989).

Phoma eupyrena is usually killed by soil fumigation (James and Hamm 1985). However, the fungus may readily spread from nearby non-fumigated seedbeds, particularly when carried with light soils. Although seedbeds at the Montana State Nursery were fumigated prior to sowing Engelmann spruce, apparently **P. eupyrena** reinvaded these beds and built up high enough populations to cause disease problems to seedlings. This pathogen has previously been detected at this nursery in non-fumigated areas (James 1986). Avoiding buildup of soil around the base of seedlings by using mulches or improving seedling growth during the first growing season (by carefully manipulating fertlizer regimes or introducing mycorrhizal symbionts) are ways to reduce damage from this disease (Kliejunas and others 1985). The pathogen can also be controlled by proper application of fungicides (Kliejunas and others 1985), although this approach may be less effective than providing conditions which are non-conducive to disease occurrence.

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