

CONTAINERIZED LODGEPOLE PINE SEEDLING MORTALITY-
CONSOLIDATED SALISH & KOOTENAI TRIBAL FORESTRY GREENHOUSE,
RONAN, MONTANA

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Many container seedling nurseries in the Northern Rocky Mountains have recurring problems with diseases caused by Fusarium spp. Although these fungi can cause damping-off and similar diseases early in the life of a crop (James and Gilligan 1985; James et al. 1987), the most difficult diseases to control occur later when seedlings are several months old (James et al. 1988). Recently, several lodgepole pine (Pinus contorta Dougl.) seedlings at the Consolidated Salish & Kootenai Tribal Forestry Greenhouse in Ronan, Montana began to show disease symptoms. Symptoms included foliar chlorosis followed by necrosis and wilting. Wilting symptoms were indicated by twisting of needles and necrosis progressing from needle tips. Black necrotic lesions also appeared on the stem of some seedlings with advanced decline symptoms. Growers at the nursery were concerned about possible association of Fusarium spp. with these declining seedlings. Therefore, investigations were conducted to determine if and to what extent these fungi might be associated with the disease symptoms.

Seven seedlings were analyzed. Although most had advanced foliar symptoms indicative of root disease (James 1986), roots of the seedlings were not extensively decayed. There were usually few white root tips and the roots generally appeared water-soaked; however, epidermal tissues were securely attached and not easily sloughed off. Seedlings were carefully extracted from their Leach pine cell container and roots were washed thoroughly under running tap water to remove most adhering soil particles. Roots were then surface sterilized by immersion in a 10% aqueous sodium hypochlorite solution for 2 min. followed by rinsing with distilled water. Fifteen pieces of root (2-3 cm in length) were selected from each root system. Pieces included some root tips and some that were cut from within lateral roots. All pieces were aseptically extracted and placed on a selective medium for Fusarium (Komada

1975). Plates were incubated at about 24 degrees C for 7 days under cool fluorescent light. Fungi emerging from root pieces were identified using a standard taxonomic guide (Nelson et al. 1983).

Pine cell containers of each seedling were also analyzed for colonization by potentially pathogenic fungi. The bottom 3-4 cm of each container was aseptically cut and divided into 4 pieces of approximate each size. Pieces were placed inside surface down onto the selective Fusarium medium and incubated as described above.

Roots and containers of all seven lodgepole pine seedlings were extensively colonized with Fusarium oxysporum Schlect. On six of the seven seedlings, all fifteen root pieces were completely colonized with this fungus; on the other seedling, 13 of 15 sampled pieces were colonized. All pieces of pine cell containers sampled were completely colonized with this fungus as well. All isolations yielded what appeared to be the same strain of F. oxysporum; fungal colonies were morphologically similar and microscopic examinations revealed similar conidophore and conidial characteristics.

From these investigations, it appears that the likely cause of lodgepole pine seedling disease at the Tribal Greenhouse was infection by F. oxysporum. This nursery has had Fusarium-associated diseases in the past, but investigations into extent and importance of these diseases at the nursery have not been conducted. The problem of container colonization by Fusarium spp. has been encountered at several other nurseries (James and Gilligan 1988a; James et al. 1988). These fungi can readily colonize styroblock as well as Leach pine cell containers (James and Gilligan 1988b); standard cleaning techniques are often not adequate in reducing levels of Fusarium to acceptable levels. It is possible that contaminated pine cell containers had high levels of F. oxysporum from the previous crop at the Tribal Greenhouse.

Once Fusarium diseases are detected relatively late in the crop cycle, effective control is difficult. Fungicide applications are often not effective (James et al. 1988) and disease symptoms often progress rapidly when seedlings are stressed during setting of buds. The most effective control measures are preventive rather than therapeutic. The problem of container colonization by pathogenic fungi is probably very important at most nurseries; solving this problem may significantly reduce future disease problems.

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