STORAGE MOLD OF BAREROOT ENGELMANN SPRUCE SEEDLINGS

R. L. James
Plant Pathologist

Cooperative Forestry and Pest Management
USDA Forest Service
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During the spring of 1984, personnel on the Swan Lake Ranger District, Flathead National Forest, discovered extensive molding on bareroot Engelmann spruce (Picea engelmanni Parry) seedlings that were to be planted. These seedlings were grown at the USDA Forest Service Nursery, Coeur d'Alene, Idaho and lifted during November 1983. They were initially stored at the Nursery, but transferred during the winter and stored for 2-3 months at the cold storage facility on the District. Storage temperatures were about 0-3°C.

Losses were greatest on the shorter seedlings, which had more of their foliage covered by mold (figure 1). Affected foliage was matted together with black mold and extensively decayed. Initially, about 10 percent of the seedlings were affected, but by early June, 85-90 percent of the stored spruce seedlings were culled because of the mold. It appeared that disease incidence increased when seedlings were transferred from the cooler to the mister. Initially, only one seedlot (2941) was affected, but eventually all lots became infected.

Samples of molded seedlings were analyzed in the laboratory to determine identity and growth characteristics of the causal fungus. Standard isolation techniques revealed presence of Fusarium, Cylindrocarpon, and Rhizoctonia. However, the major associated fungus failed to grow at room temperatures (22-24°C) and was only isolated when plates were incubated at low temperatures (3-5°C). When affected foliage was incubated at these low temperatures, a whitish grey mycelium grew profusely. Unfortunately, this fungus failed to sporulate on media (water agar and potato dextrose agar) or on seedling foliage. Diurnal light cycles also did not induce sporulation. Therefore, the fungus could not be identified.

The causal fungus behaved similar to common snow mold fungi that develop on conifer foliage underneath snow cover during the winter. Two of the most common of these snow mold fungi (Herpotrichia nigra Hartig, Neopeckia coulteri (Pk.) Sacc.) grow only at near freezing temperatures, but usually sporulate on host tissues (Hepting 1971; Simms 1967) and therefore, can be readily identified.

Several groups of fungi capable of causing damage to stored conifer seedlings have been identified (Sutherland and Van Eerden 1980). Included are numerous non-sporulating forms. Many of these organisms are soilborne; inoculum was probably introduced onto spruce foliage from soil particles deposited on shoots during lifting or from soil adhering to roots. The fungus seemed to originate from the roots or lower shoot portions of seedlings and spread upward.

Unfortunately, storage mold on spruce seedlings during 1983-84 was not a one-time occurrence. There have since been several reports of similar molding on this and other conifer species in the Region, although damage has not been as severe. Damage may be reduced by storing seedlings at -2 to -3°C, thereby completely restricting development of mold fungi. If molding of certain lots is excessive, protective fungicides applied to each seedling may be warranted. Such treatments are costly, particularly if seedlings are removed from storage and treated. Also, past experience with fungicide treatments have yielded erratic results (Hopkins 1975). Therefore, probably the best cost-effective procedures to reduce losses from storage molds include proper storage temperatures, reduced storage time, and taking care to reduce or eliminate soil on seedling foliage.

LITERATURE CITED

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Figure 1.--Engelmann spruce seedling infected by an unknown storage mold fungus. The fungus caused matting and decay of foliage.