STORAGE MOLD OF BAREROOT DOUGLAS-FIR SEEDLINGS
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Bareroot seedlings are usually lifted when dormant in the fall and outplanted during the spring of the following year. During the period between lifting and outplanting, seedlings are stored at low temperatures. When boxes of seedlings are opened after storage, mold may be evident on some seedlings. Every year there is probably some level of mold on stored seedlings, however, during some years losses from storage mold problems can be extensive (James 1986).

Several lots of bareroot Douglas-fir (Pseudotsuga menziesii Franco) seedlings grown at the USDA Forest Service Nursery, Coeur d'Alene, Idaho were found to have greater than normal storage mold problems when boxes were opened prior to outplanting in the spring of 1988. Samples of moldy seedlings were submitted to the Pest Management Laboratory for analysis of associated organisms.

Affected seedlings displayed blackened foliage and water soaking of tissues, indicative of fungal invasion. Some superficial mycelial growth and sclerotial production was also evident. Symptomatic foliage tissues were washed thoroughly to remove soil particles which were commonly covering needles. Foliage was then placed in moist chambers and incubated at about 24 degrees C for 5 days under cool fluorescent light. Necrotic or water-soaked twig and stem tissues were washed under tap water, surface sterilized in 10% aqueous sodium hypochlorite, rinsed with sterile distilled water, and plated onto water agar. Plates were incubated as described above and emerging fungi transferred to potato dextrose agar for identification.

Botrytis cinerea Pers. ex Fr. was commonly sporulating on foliage samples and isolated from twig and stem tissues. This fungus was most likely the source of superficial sclerotia that were often seen on molded needles. Other fungi identified on molded tissues included Alternaria, Epicoccum, Penicillium, and several non-sporulating organisms.

It appeared that B. cinerea and perhaps some other fungi were responsible for the molding of Douglas-fir seedling tissues during storage. Soil particles which were common on seedling foliage probably provided an important source of fungal inoculum which resulted in molding. Temperatures within boxes during storage are usually kept below those at which most fungi become active. However, B. cinerea can actively grow and sporulate at 1-2 degrees above freezing (Verhoeff 1980). Therefore, it is important to keep temperatures inside boxes below freezing in order to prevent development of this fungus. Reducing the amount of soil contaminating seedling foliage will also be important in reducing future storage problems (Sutherland and Van Eerden 1980). Reducing the time seedlings are kept in storage will also be helpful.

Seedlings with fungal growth on their foliage following storage are often not seriously affected. As long as stem tissues are not invaded (do not have necrotic lesions) and buds are healthy, outplanted seedlings are probably not adversely affected by some molding of needles. Once seedlings are outplanted and foliage dries out, organisms such as B. cinerea which may be present on needles should die and new foliage should not become infected. On the other hand, seedlings with evidence of fungal invasion of stem and twigs should probably be culled prior to outplanting.

Fungicide treatment of seedling prior to, during, and after storage to reduce mold problems has usually not been effective or necessary (Hopkins 1975; Sutherland and Van Eerden 1980). Controlling soil contamination and environmental conditions during storage are usually more effective in reducing storage mold problems.

LITERATURE CITED

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