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TRICHOTHECIUM ROSEUM ON DOUGLAS-FIR CONES - DORENA TREE IMPROVEMENT CENTER, COTTAGE GROVE, OREGON

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Several Douglas-fir (*Pseudotsuga menziesii* (Mirb.) Franco) cones processed at the Dorena Tree Improvement Center in Cottage Grove, Oregon, were extensively colonized with mold fungi during the fall of 1990. Fungal colonization was at such high levels that seed extraction was difficult because much of the cone scales were "sealed" by the network of mycelial growth. Much seed could not be extracted because of the extensive mycelial growth over the cone surface.

Affected cones had noticeable fungal growth on their cone scales (figure 1). Fungal growth appeared mostly yellow to pink with a powdery texture. Mycelial strands were also evident on the inner surfaces of cone scales and within chambers where seed was located. Tufts of mycelium and deposits of spores were examined microscopically and aseptically deposited on potato dextrose agar for growth.

The most common fungus colonizing cone scales was *Trichothecium roseum* (Pers.) Link ex Gray. Descriptions of Domsch and others (1980) were used for identification (see Appendix for mycological characteristics). Two other fungal genera were also identified: *Penicillium* and *Trichoderma*. Both were present on all cones examined, but at much lower levels than *T. roseum*. Therefore, it is concluded that the major cause of problems with seed extraction was profuse colonization of Douglas-fir cones by *T. roseum*.

Trichothecium roseum has been previously implicated as an important contaminating fungus of Douglas-fir seed in the Pacific Northwest (Littke and Browning 1989). This species has world-wide distribution and is most commonly found in temperate forest ecosystems (Rifari and Cooke 1966). The fungus is found within and on the surface of forest soils (Badurova and Badura 1967; Jensen 1963) and is a common colonizer of both deciduous (Borowska 1966; Luppi-Mosca 1962) and conifer (Brandsberg 1967; Hayes 1965) litter. *Trichothecium roseum* has been found on seed of several conifer species, especially in the genus *Pinus* (Anderson 1986; James and Genz 1981, 1982). Some investigators consider the fungus a common saprophyte on the external surface of seed (Doyer 1938; Malone and Muskett 1964). However, others (Neergaard 1977; Urosevic 1961; Littke and Browning 1989) consider it an important attacker of seed which causes reduced viability and/or decay.

Other interesting characteristics of *T. roseum* include its ability to parasitize other fungi, including plant pathogens such as *Sclerotinia sclerotiorum* (Pohjakallio and Makkonen 1957; Rai and Saxena 1975). The species also readily produces anti-fungal metabolites (Brian and Hemming 1947; Dhingra and Khare 1973). Plant pathogenic behavior of *T. roseum* has been implicated in inoculation tests of greenhouse crops (Domsch 1963); the species is considered a primary pathogen of apples (Borecki and Profic 1962) and tomatoes(Welch and others 1975).

Figure 1. *Trichothecium roseum* growth and sporulation on scales of Douglas-fir cone from the Dorena Tree Improvement Center.

Contamination of Douglas-fir cones with *T. roseum* probably occurred during collection or transport. It is unknown whether this fungus can successfully colonize cones still attached to trees. If cones come into contact with either soil or forest litter, they may become contaminated with *T. roseum*. If a few cones become contaminated, the fungus may spread quickly to other cones during transport and storage. Burlap bags used to store cones may become contaminated with fungal inoculum. If such bags are not thoroughly cleaned and sterilized between use, it is possible that residual *T. roseum* inoculum could spread to newly collected cones. Bleach treatments and thorough drying of burlap bags will greatly reduce problems on fungal contamination.

Since *T. roseum* can probably cause serious seed deterioration which may result in poor performance and reduced germination (Littke and Browning 1989), treatment of contaminated seed is advisable. Surface sterilization within a bleach solution has proven effective in reducing level of seedcoat contamination (Littke and Browning 1989). Exposure of seed to running water rinses for at least 48 hours has also been useful (James and Genz 1981). Other possible seed treatments that may be effective include hydrogen peroxide and fungicides (James and Genz 1981). Problems of phytotoxicity on young germinants (Cooley 1983; Lock and others 1975) and detrimental effects on seed germination (Edwards and Sutherland 1979) have limited the efficacy of some seed treatments. The better approach is to initially prevent cone infection, rather than trying to reduce inoculum on contaminated seed.

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APPENDIX

MYCOLOGICAL CHARACTERISTICS OF *TRICHOTHECIUM ROSEUM*

Synonymy:

Trichoderma roseum Pers.
Hyphelia rosea (Pers. ex Gray) Fr.
Puccinia rosea (Pers. ex Gray) Corda
Dactylium roseum (Pers. ex Gray) Berk.
Trichodermia rosea (Pers. ex Gray) Kuntze
Cephalothecium roseum Corda

Description:

Forms fast-growing colonies, reaching 9 cm in diameter in 10 days when grown at 20 degrees C. (figure 2).

Colonies pinkish, and often zonate indicating a diurnal rhythum of growth (figure 2) (Etzold 1960; Sagromsky 1956).

Colonies appear powdery because of extensive production of conidia (figure 2).

Conidiophores erect, up to 2 mm long, 4-5 um wide, often with three septa in the lower part.

Conidia ellipsoidal to pyriform with obliquely-prominent truncate basal scar, 2-celled, the upper cell often slightly larger, hyaline, smooth and thick walled (figure 3).

Conidia measure 12-23 x 8-10 um.

Conidia are multinucleate, each cell containing 4-12 or more nuclei (Maksimova and Palmova 1969)

Good germinability of conidia depends on the equal distribution of the numerous nuclei in each cell (Palmova and Maksimova 1970)

Optimal temperature for growth is 25 degrees C. (range: 15-35 degrees C.) (Palmova Maksimova 1970).

Tolerates a wide pH range; at pH 4.0-6.5 excellent sporulation usually occurs (Kakkar and Mehrotra 1971).

Figure 2. *Trichothecium roseum* growing on potato dextrose agar for 10 days at 24 degrees C. under diurnal cycles of cool, fluorescent light.

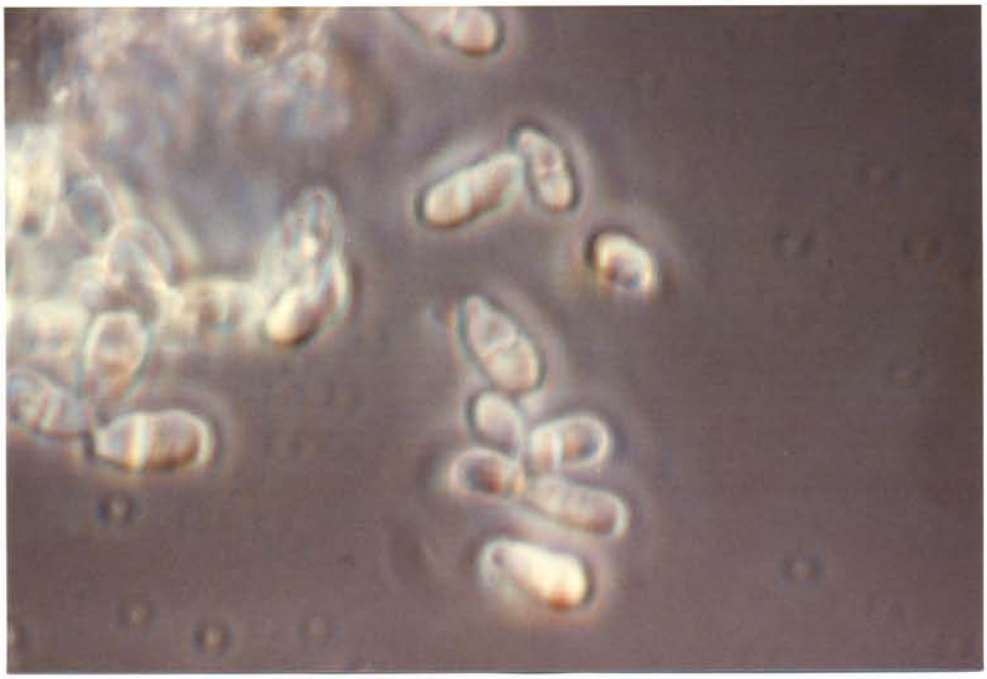

Figure 3. Conida of *Trichothecium roseum* showing their characteristic two-celled morphology with truncated basal scar (x450).