

## 9. Gray Mold

Michael D. Srago and Arthur H. McCain

### Hosts

Gray mold, caused by the fungus *Botrytis cinerea* (sexual state: *Botryotinia fuckeliana*), has an extremely large number of hosts. In fact, nearly all forest tree seedlings are susceptible to some degree; but redwood, giant sequoia, and Monterey and Italian cypress are especially susceptible.

### Distribution

Gray mold is found in all the temperate regions of the world.

### Damage

Gray mold occurs sporadically in nurseries and greenhouses. In less susceptible species, losses are often confined to pockets of seedlings, but the disease can cause heavy mortality in highly susceptible species such as giant sequoia.

The disease also can originate or continue in storage facilities and transit, especially if temperatures are above 32 °F.

### Diagnosis

The fungus commonly infects young branches, particularly the lower shaded branches. Once established on a branch, it moves downward into the stem, killing the tissues it infects. In succulent 1-year-old stem tissue, look for black sunken cankers, usually low on the stem, which eventually girdle the stem (fig. 9-1). The portion of seedling above the girdled area dies (fig. 9-2).

During periods of high humidity, the fungus can be seen as a thin, gray web of mycelium on infected plant parts (fig. 9-3). Tufts of dark conidiophores grow from this mycelium and from infected tissue.



**Figure 9-1**—Stem canker (arrow) on redwood seedling resulting from branch infection by *B. cinerea*.



**Figure 9-2**—Tops of redwood seedlings killed by *B. cinerea*.



**Figure 9-3**—Web of mycelium of *B. cinerea* covering infected redwood seedlings (left).

The conidiophores produce clusters of spores. If they are not present on infected tissues, the spores will develop when the seedling is placed in a moist chamber. Spores are dark, ellipsoid to oval, and 6-18 x 4-11 microns in size.

The fungus also produces small, black sclerotia, which provide a means by which the fungus can overwinter. The sexual state of the fungus, *B. fuckeliana*, is also produced on the sclerotia; however, it is rarely seen in nurseries.

### Biology

Airborne spores are the primary means by which *B. cinerea* spreads.

*Botrytis* can grow within a range of temperatures from about 28 to 90 °F. However, it grows very slowly at the extremes and does best at temperatures from 70 to 77 °F. It is more active below 70 °F than it is above 77 °F. The fungus will survive if seedlings are refrigerated at temperatures near 32 °F. Refrigeration at this temperature will retard, but not completely stop, the development of the fungus.

Moisture is often a more limiting factor in disease development than temperature: the spores of the fungus require free water to germinate.

The disease is favored by cultural practices, such as high planting densities or lath shading, that limit air movement and raise the humidity around the seedling.

### Control

**Cultural**—Modify the environment to increase aeration and decrease humidity around the seedlings; this will reduce spore germination and growth of the fungus. Beneficial cultural practices include reducing

seedling density, improving air circulation, and irrigating less frequently or in the early morning.

**Chemical**—Numerous fungicides—including benomyl, chlorothalonil, and DCNA or dicloran—are effective. However, *Botrytis* has developed strains resistant to some fungicides, especially the systemic benzimidazole fungicides such as benomyl. Use several different fungicides, preferably with different modes of action, in rotation.

Standard spray programs for *Botrytis* in California and the Pacific Northwest involve foliar fungicides applied at 1- to 2-week intervals in greenhouses and at 2 to 4-week intervals in bareroot nurseries.

### Selected References

- Coley, J.R.; Verhoeff, D.; Jarvis, W.R. 1980. The biology of *Botrytis*. London, England: Academic Press. 318 p.
- Ellis, M.B. 1971. Dematiaceous hyphomycetes. Kew, England: Commonwealth Mycological Institute. 608 p.
- Halber, Max. 1963. *Botrytis* sp. on Douglasfir seedlings. Plant Disease Reporter. 47: 556.
- Smith, Richard S.; McCain, A.H.; Srago, M.D. 1973. Control of *Botrytis* storage rot of giant sequoia seedlings. Plant Disease Reporter. 57: 67-69.