

CHAPTER TEN

# Charcoal Root Disease

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Charcoal root disease is caused by the fungus *Macrophomina phaseolina*. It occurs primarily in forest tree nurseries located in warm, lowland agricultural areas. The disease is absent from cool, high-elevation, forested areas and from the cool areas of the Pacific Coast. It has caused major losses

**Charcoal root disease may be confused with:**  
**Fusarium hypocotyl rot**  
**Fusarium root rot**  
**June beetle larvae damage**  
**Nematode damage**



**Figure 10-1.** *Macrophomina phaseolina* infection on a sugar pine seedling. Root infection is spreading to the hypocotyl.



**Figure 10-2.** Microsclerotia of *Macrophomina phaseolina* under bark on the stem of a dead slash pine seedling. Photo courtesy of USDA Forest Service, Forest Pest Management, Region 8.

up to 50 percent—in some California nurseries, but has been reported only once in a nursery in Oregon. In the West, sugar pine, Douglas-fir, giant sequoia, and true firs are highly susceptible. Ponderosa and Jeffrey pines are somewhat resistant. In California, the fungus is active when soil temperatures exceed 15 degrees C. The disease intensifies during hot summer weather because of the increased fungal activity and increased stress on seedlings.

The root's cortical tissues become infected (Figure 10-1), causing necrosis and blackening of root tips, lateral roots, and the root crown. The plant becomes stunted and yellowed, and dies. Masses of small, black, spherical resting structures (microsclerotia), visible with a hand lens, are formed in the dead inner

bark of the roots and lower stem (Figure 10-2). The microsclerotia are released into the soil after the roots decay. They remain dormant until they come into contact with new roots, and then germinate to initiate new infections.

Besides those seedlings that are killed in seedbeds, losses may occur when plants are culled or when

infected seedlings are transplanted, particularly if transplanted into warm soils.

No effective fungicides are available. Fumigation of the soil with a mixture of methyl bromide and chloropicrin before sowing greatly reduces levels of dormant microsclerotia and helps to control the disease. Eliminating weed hosts will reduce inoculum in the soil.

**Charcoal root disease symptoms appear:**  
**1+0, 2+0**  
**Spring through fall**

## Selected references

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