

## CHAPTER FIVE

# Lower Stem Canker

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## Disease and hosts

Lower stem canker is caused by the fungi *Fusarium roseum* and *Phoma eupyrena*. It occurs primarily on Douglas-fir, although it is also found on noble fir. The disease has been reported in bareroot nurseries in western Oregon and Washington. Infection begins some time after October on 1+0 or fall-transplanted plug +1 seedlings. Symptoms usually do not develop until spring. Lower stem canker appears to be the same disease described by Morgan as *Fusarium* stem rot of Douglas-fir in Oregon. However, it is different from *Phoma* blight (see Chapter 15), which is caused by *P. eupyrena* on true fir. Both these fungi are widely distributed in agricultural soils.

**Lower stem canker may be confused with:**  
**Pesticide damage**  
**Phoma blight**  
**Phytophthora root rot**  
**Upper stem canker**  
**Winter desiccation**

## Symptoms

Symptoms first appear on seedlings in the beginning of their second year, in late winter or early spring as temperatures begin to rise. Needles encased in soil turn brown (Figure 5-1). Then tops of infected seedlings turn yellow, and later, reddish-brown. A canker—a sunken



**Figure 5-1.** Early symptom of lower stem canker. Lower needles encased in soil turn brown just before bud break.

region of dead tissue—appears on the stem, usually at the site of a needle scar or a bud. The canker enlarges until the stem is girdled. The seedling wilts rapidly if girdling occurs after new growth is present (Figure 5-2). The disease generally occurs in distinct areas within the nursery where drainage is poor. It spreads along the length of seedbeds more rapidly than across the beds (Figure 5-3).

Damage is often particularly heavy in areas where repeated tractor use during wet weather has formed large, deep puddles between beds. Muddy water splashed from these puddles, along with splashed rain, causes soil to build up on the stems of seedlings, creating what are termed soil collars. Soil collars are always present on infected seed-

lings. The girdling canker is found under the soil collar (Figure 5-4), often near the lower branches.

The foliar symptoms of lower stem canker are similar to those of *Phytophthora* root rot. However, lower stem canker can be recognized by the presence of the distinct girdling canker on the lower stem and by the absence of root decay.

## Fungus biology

The two organisms that cause lower stem canker may act singly or together. *Fusarium roseum* is most commonly associated with the disease, whereas *Phoma eupyrena* may or may not be present. Both organisms form resistant chlamydo-spores, thick-walled resting struc-

tures that survive in the soil. Inoculum comes from these chlamydospores or from conidia brought in on contaminated equipment, blown soil, or possibly seed.

Infection occurs beneath soil collars—apparently a favorable environment for survival and germination of fungi. Large numbers of *Fusarium* and *Phoma* propagules have been isolated from soil collars of symptomatic seedlings. Spores germinate and infect needles, buds, and stem tissue lying beneath the soil collar. Once they have infected the main stem, these fungi readily form a girdling canker.

**Lower stem canker  
symptoms appear:  
2+0, Plug + 1  
Early spring**

## Loss potential

Lower stem canker was responsible for killing millions of bareroot seedlings in nurseries throughout the Pacific Northwest during 1980 and 1981. Mortality in subsequent years has been reduced, but significant losses occur yearly in nurseries in the region. Mortality from lower stem canker in three nurseries caused average losses of 4 percent and 3 percent of 2+0 seedlings during 1983 and 1984, respectively. Transplanted plug seedlings are also particularly susceptible, perhaps because of the succulent nature of such seedlings, combined with transplanting stress, soil buildup on stems from transplanting and subsequent irrigation, and transplanting in nonfumigated ground containing large populations of *Phoma* and *Fusarium*.

## Management

### CULTURAL

Reducing the buildup of soil collars on 1+0 or plug +1 seedlings is



**Figure 5-2.** Wilting of new flush because of a girdling canker beneath the soil collar on the lower stem.



**Figure 5-3.** Area of heavy damage from lower stem canker. The disease spreads lengthwise along beds more rapidly than across them.



**Figure 5-4. Encased soil was removed from this symptomatic seedling, then the cortex was lightly scraped. Brown (necrotic) cambial tissue of the canker is clearly seen.**

essential. This can be done by mulching or by allowing moss to grow on seedbeds by avoiding some types of herbicides. Both straw dust and a mixture of redwood bark and sawdust have been shown to prevent soil collars when applied to nursery beds at a depth of 2-3 inches before heavy fall rains begin. Tractor use should be limited in the winter, particularly in areas where puddles form, to prevent splashing of soil and water onto seedlings. Maintaining well-sloped beds will also prevent wet areas.

#### **CHEMICAL**

Many chemicals have been tested for control of this disease but none have significantly lowered mortality. This is probably because the chemicals do not adequately penetrate soil collars and because there is no systemic fungicide that can move from foliage to tissues beneath soil collars.

#### **Selected references**

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