

42. Fusarium Hypocotyl Rot

Philip B. Hamm and Everett M. Hansen

Hosts

Hypocotyl rot, caused by *Fusarium oxysporum*, occurs on Douglas-fir, ponderosa pine, sugar pine, white fir, red fir, and Russian olive.

Distribution

The disease is known to occur in nurseries in western Oregon and Washington and in California.

Damage

Seedlings affected by the disease are usually killed, and losses can sometimes be significant.

Diagnosis

Random mortality begins in seedbeds from June through October (fig. 42-1), but most mortality occurs in July and August.

Top symptoms are similar to those caused by *Fusarium* root rot (see chapter 7) except that lesions caused by hypocotyl rot occur on the stem at or just above the groundline and the roots remain healthy. Just as the tops begin to fade, look for a discolored region on the hypocotyl between the groundline and the cotyledons (fig. 42-2). The lesion quickly expands, killing the top while the roots remain healthy. Subsequently, the roots become discolored and decay so that they resemble roots infected by *Fusarium* spp. Seedlings generally remain erect, though the most distal portion may be wilted.

White mycelium with pink or orange spore pustules can be seen occasionally on infected seedlings at or below the groundline. Two types of spores (conidia) are produced. Macroconidia are hyaline, multicellular, sickle shaped, and



Figure 42-1—Douglas-fir seedlings killed by *Fusarium* hypocotyl rot. Note random distribution of dead seedlings.



Figure 42-2—Douglas-fir seedling (right) affected with *Fusarium* hypocotyl rot. Note distinct discoloration on stem due to lesion development (arrow) below cotyledon. Healthy seedling on left.

27-66 x 3.5-5 microns. Microconidia are hyaline, oval to ellipsoid, and 5-12 x 2.2-3.5 microns.

Biology

Fusarium oxysporum forms thick-walled chlamydospores in the organic debris of previous crops. Chlamydospores germinate in the presence of exudates from susceptible tissue. Presumably, they function as the primary inoculum.

Evidence suggests that chlamydospores are carried in windblown dust, on equipment, or on contaminated seeds. Infection apparently occurs shortly after seed germination, but symptoms usually do not develop until midsummer. Conidia are formed on infected hypocotyls, but it is not known if these serve as secondary inoculum.

In the Northwest, *Fusarium* root rot appears to be most common in nurseries that do not regularly fumigate. Hypocotyl rot, on the other

hand, can be prevalent in fumigated soils. This evidence suggests that infections originate from inoculum introduced after fumigation.

Control

Cultural—Mortality has been associated with increasing soil temperatures, possibly correlated with seedling moisture stress. Irrigate less frequently but more thoroughly to ensure deep moisture penetration. This type of watering reduces disease losses by decreasing the moisture stress on seedlings.

Chemical—A number of fungicides have been tested to control this disease-with limited success. Control is most effective when seedbeds are treated with benomyl at 2-week intervals, beginning after emergence and continuing through September. Efficacy of late-season applications has not been demonstrated.

Selected References

- Brownell, K.H.; Schneider, R.W. 1983. *Fusarium hypocotyl root rot of sugar pine in California forest nurseries*. *Plant Disease*. 67: 105-107.
- Coolley, S.J.; Kanaskie, A. 1986. Evaluation of seven fungicides to control canker diseases of bare-root Douglas-fir in Pacific Northwest nurseries. For. Pest Manage. Rep. R6-86-14. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region. 23 p.
- Hamm, P.B.; Hansen, E.M.; Kanaskie, A.M. 1985. Symptomology of the "top blight" diseases of Douglas-fir bare-root seedlings in the Pacific Northwest. [Abstract.] *Phytopathology*. 75: 1367.
- Hansen, E.M.; Hamm, P.B. 1988. Canker diseases of Douglas-fir seedlings in Oregon and Washington bareroot nurseries. *Canadian Journal of Forest Research*. [In press.]