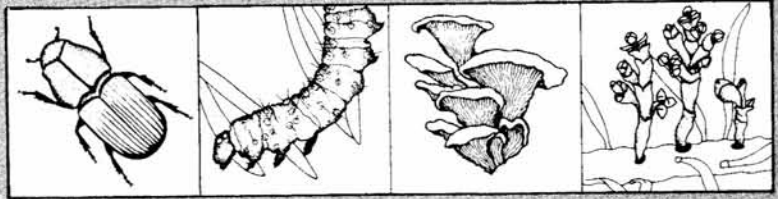


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FUSARIUM ROOT DISEASE OF WESTERN WHITE PINE SEEDLINGS AT THE COEUR D'ALENE NURSERY, IDAHO

by

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ABSTRACT

Root disease of 2-0 western white pine seedlings occurred at the Coeur d'Alene Nursery in 1982 within seedbeds fumigated with methyl bromide and chloropicrin. Although losses were not substantial, there were several groups of dead seedlings within affected seedbeds. Fusarium oxysporum was most often isolated from diseased roots. Other Fusarium species, including F. solani and F. roseum were isolated less frequently. Characteristics of Fusarium root disease in bareroot nursery stock are discussed.

INTRODUCTION

Seedbeds at the Coeur d'Alene Nursery in Idaho are routinely fumigated with mixtures of methyl bromide and chloropicrin prior to sowing each new crop. Fumigation is designed to eliminate soil insects, nematodes, weed seeds, and plant pathogens (Miller and Norris 1970). Since soil fumigation was instituted, losses from soilborne pathogens have been greatly reduced. However, some seedlings are occasionally killed by soil pathogens in fumigated seedbeds (James 1982). This report describes the occurrence of root diseases on 2-0 western white pine (Pinus monticola Dougl.) seedlings within fumigated seedbeds during 1982.

OBSERVATIONS

Dying seedlings, reddish-brown in color, appeared in groups (fig. 1). Affected seedlings often occurred adjacent to nonstocked or poorly stocked portions of seedbeds. Occurrence of chlorotic seedlings adjacent to either green (healthy) or reddish-brown (necrotic) seedlings was not common. Externally, roots from recently killed seedlings were black. Xylem root tissues were light brown and appeared water soaked. Root hairs or ectomycorrhizae were missing on necrotic seedlings.

Isolations from necrotic roots yielded primarily three species of Fusarium (F. oxysporum (Schl.) em. Snyder & Hans.; F. solani (Mart.) App. & Wr. em. Snyder & Hans.; F. roseum (Lk.) em. Snyder & Hans.). Fusarium oxysporum was isolated most frequently, and is believed to be responsible for most of the damage. A variety of saprophytic fungi, including Alternaria, Penicillium, Phoma, and Trichoderma were also isolated. Tests to evaluate pathogenicity of the Fusarium isolates were not conducted.

The other Fusarium species isolated from root-diseased white pine seedlings have commonly been associated with F. oxysporum in forest nursery soils (Edmonds and Heather 1973). Fusarium roseum is usually saprophytic or a secondary invader of seedlings infected with F. oxysporum (Williams 1975). However, this fungus has also been reported as causing stem lesions on young Douglas-fir seedlings (Morgan 1983). Fusarium solani is also often associated with F. oxysporum in nurseries (Hodges 1962; Landis 1976). It is usually considered secondary and not as aggressive on conifer seedlings as F. oxysporum. However, F. solani by itself can cause seedling root diseases (Merrill et al. 1981).

Although soil fumigation usually keeps losses from Fusarium root disease at acceptable levels, sometimes additional measures are needed. Fungicide sprays have been used to reduce disease incidence, but effectiveness has been variable. For example, Cooley (1980) found that high rates (151 lbs/ha) of Banrot® reduced losses of sugar pine (Pinus lambertiana Dougl.). However, she also found that captan, benomyl, and low rates (62 lbs/ha) of Banrot® were ineffective. Benomyl was also ineffective against Fusarium root disease in trials at the Coeur d'Alene Nursery (Williams 1975). On the other hand, Bloomberg and Lock (1974) reported that captan was effective when applications were properly timed to correspond to periods of greatest seedling susceptibility.

In addition to fungicides, several cultural practices may be useful in reducing damage from this disease. Fall sowing will help avoid contact between soil inoculum and seedlings during their most susceptible stage (Cooley 1982). Inoculation with mycorrhizae may help protect seedlings from Fusarium infection (Sinclair et al. 1975). Reducing nitrogen fertilization during seedling emergence will lessen the chances of infection (Cooley 1982; Sinclair et al. 1975). Bare fallowing results in lower soil organic matter, Fusarium populations, and resulting disease (Sutherland and Van Eerden 1980). Removal of recently killed seedlings from seedbed areas will also help reduce inoculum. Care should be taken to avoid reintroducing Fusarium into fumigated soil through irrigation water (Cooley 1982) and infested seed (Bloomberg and Trelawny 1970; Graham and Linderman 1983). Also, fumigation done properly when soil temperatures and moisture content are conducive to rapid and extensive penetration of fumigant will help reduce disease losses.

This publication refers to pesticides. It does not contain recommendations for their use, nor does it imply that the uses discussed have been registered. All uses of pesticides must be registered by appropriate State and/or Federal agencies before they can be recommended. CAUTION: Pesticides can be injurious to humans, domestic animals, desirable plants, and fish or other wildlife--if they are not handled or applied properly. Use all pesticides selectively and carefully. Follow recommended practices for the disposal of surplus pesticides and pesticide containers.

LITERATURE CITED

- Bloomberg, W. J.
1966. The occurrence of endophytic fungi in Douglas-fir seedlings and seeds. *Can. J. Bot.* 44: 413-420.
- Bloomberg, W. J.
1971. Diseases of Douglas-fir seedlings caused by Fusarium oxysporum. *Phytopathology* 61: 467-570.
- Bloomberg, W. J.
1973. Fusarium root rot of Douglas-fir seedlings. *Phytopathology* 63: 337-341.
- Bloomberg, W. J.
1976. Distribution and pathogenicity of Fusarium oxysporum in a forest nursery soil. *Phytopathology* 66: 1090-1092.
- Bloomberg, W. J. and W. Lock.
1974. Importance of treatment timing in the control of Fusarium root rot of Douglas-fir seedlings. *Phytopathology* 64: 1153-1154.
- Bloomberg, W. J. and J. Trelawny.
1970. Effect of thiram on germination of Douglas-fir seed. *Phytopathology* 60: 1111-1116.
- Brownell, K. H. and R. W. Schneider.
1983. Fusarium hypocotyl rot of sugar pine in California forest nurseries. *Plant Disease* 67: 105-107.
- Cooley, S. J.
1980. Evaluation of three fungicides to reduce Fusarium root rot at the Medford Forest Nursery. *USDA For. Ser., Pacific Northwest Region.* 9 pp.
- Cooley, S. J.
1982. Evaluation of the fungicide Banrot to prevent root rot of sugar pine seedlings. *USDA For. Ser., Pacific Northwest Region.* 10 pp.
- Edmonds, R. L. and W. A. Heather.
1973. Root diseases in pine nurseries in the Australian Capital Territory. *Plant Dis. Repr.* 57: 1058-1062.
- Graham, J. H. and R. G. Linderman.
1983. Pathogenic seedborne Fusarium oxysporum from Douglas-fir. *Plant Disease* 67: 323-325.
- Hodges, C. S.
1962. Black root rot of pine seedlings. *Phytopathology* 52: 210-219.