

TIP BLIGHT OF BAREROOT PONDEROSA AND LODGEPOLE PINE SEEDLINGS-
USDA FOREST SERVICE NURSERY, BEND, OREGON

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Tip blight of bareroot pine seedlings commonly occurs within forest tree nurseries in the Northern Rocky Mountains. Previous investigations have implicated several fungi as probably causing tip blight symptoms. These include *Sirococcus strobilinus* Preuss. (James 1983; James 1985c; James 1986; Schwandt 1981), *Sphaeropsis sapinea* (Fr.) Dyko and Sutton (= *Diplodia pinea* (Desm.) Kicky. (James 1983; James 1984, James 1985a), and species of *Phoma* (James 1983; James 1984; James 1987b; James 1987c; James and Hamm 1985). In most cases damage has not been extensive and usually only a few scattered seedlings are affected. Exceptions include extensive occurrence of *Sirococcus* in a nursery in northern Idaho (Schwandt 1981) and *Diplodia* tip blight in a nursery in north central Idaho (James 1984; James et al. 1987).

Recently, investigations were conducted on a severe tip blight disease problem of bareroot 2-0 ponderosa (*Pinus ponderosa* Laws.) and lodgepole (*P. contorta* Dougl.) pine at the USDA Forest Service Nursery in Bend, Oregon (Cooley, unpublished). Cooley found that most affected seedlings were infected with species of *Phoma* and *Fusarium* with these fungi restricted to necrotic tissues on the above-ground portion of diseased seedlings. She did not isolate either *S. strobilinus* or *S. sapinea* from symptomatic seedlings.

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As a followup to this work, diseased seedlings were collected from the Nursery during the summer of 1987 for analysis of associated fungi. Collected seedlings had characteristic tip dieback symptoms, primarily with their leaders being affected (Figs. 1 and 2). However, in a few seedlings, stem tissues below the leaders were convoluted and distorted (Fig. 3) with their tips unaffected. Several seedlings with tip and stem necrosis were collected and placed in moist chambers after having been rinsed thoroughly under tap water for several minutes. Necrotic stem tissues were not surface sterilized. Chambers were incubated at about 22 degrees C under cool fluorescent light for 5-7 days. Fungi sporulating on tissues were transferred to potato dextrose agar for identification.



Figure 1. Tip blight of bareroot ponderosa pine seedling from the USDA, Forest Service Nursery, Bend, Oregon.



Figure 2. Tip blight of bareroot lodgepole pine seedling from the USDA, Forest Service Nursery, Bend, Oregon. Note the crook of the affected tip and the adjacent non-blighted tip (arrow).



Figure 3. Convoluted stem of a bareroot ponderosa pine seedling from the USDA, Forest Service Nursery, Bend, Oregon. Note pattern of necrosis and that the apical tip appears healthy.

Five genera of fungi were consistently found sporulating on necrotic stem tissues. These included *Phoma*, *Fusarium*, *Alternaria*, *Botrytis*, and *Epicoccum*. Although all these groups of fungi may be pathogenic under certain conditions, it was felt that the two groups of fungi most likely responsible for tip blight symptoms based on previous experience were *Phoma* and *Fusarium*. Therefore, isolates of these fungi obtained from symptomatic seedlings were identified to species using techniques previously described (James and Hamm 1985; Nelson et al. 1983).

Two species of *Phoma* were commonly found on tip blighted seedlings: *P. eupyrena* Sacc., which formed catenulate single-celled chamydopores in culture, and *P. pomorum* Thum., which formed both catenulate single-celled chamydopores and multi-celled dictyochlamydospores in culture. Although both species have previously been implicated in seedling diseases (James 1987b, James and Hamm 1985), isolates of *P. eupyrena* have been shown to be much more pathogenic in controlled greenhouse tests (P.B. Hamm, personal communication). Therefore, we believe that this species is likely more responsible for tissue necrosis than *P. pomorum*, although tests to substantiate this conclusion have not been made on the isolates obtained from the Bend Nursery.

Two species of *Fusarium* were likewise consistently obtained from blighted seedlings. These included *F. oxysporum* Schlect., a very common pathogen of conifer seedlings (Bloomberg 1976) which has previously been reported on tip blighted pine (James 1985b), and *F. acuminatum* Ell. & Ev., which has also been commonly associated with several diseases of seedlings (James 1985b; James 1987a). Both species have been shown to cause root diseases of seedlings in controlled pathogenicity tests (James and Gilligan 1984; James et al. 1986). However, their ability to elicit tip blight symptoms of pine seedlings has not been assessed.

Environmental conditions (primarily moisture and temperature) were conducive to spread and buildup of pathogens during 1987. Ponderosa pine was much more affected than nearby lodgepole pine and the differences may be due to host susceptibility or differences in inoculum concentrations. *Phoma* and *Fusarium* spp. were likely soil inhabitants which were present in sufficient numbers to cause disease when environmental conditions were conducive to infection. This problem has not previously occurred at such

high levels at the Nursery. Soil fumigation, which is commonly practiced at the Nursery, usually reduces or eliminates populations of both *Phoma* and *Fusarium* in the soil. Unless these pathogens are reintroduced on infested seed or from adjacent non-fumigated soil, their levels should not become high enough to be of concern to growers. Protective fungicides such as chlorothalonil and captan may be effective in reducing infection during the spring when seedlings are susceptible.

LITERATURE CITED

- Bloomberg, W. J. 1976. Distribution and pathogenicity of *Fusarium oxysporum* in a forest nursery soil. *Phytopathology* 66:1090-1092.
- James, R. L. 1983. Fungi associated with tip dieback of ponderosa pine seedlings at the Clifty View Nursery, Bonners Ferry, Idaho. USDA, Forest Service, Northern Region. 6p.
- James, R. L. 1984. Tip blight of ponderosa pine seedlings at the Fantasy Farms Nursery, Peck, Idaho. USDA, Forest Service, Northern Region. Rept. 84-3. 7p.
- James, R. L. 1985a. Diplodia tip blight of 1-0 ponderosa pine seedlings at the USDA, Forest Service Nursery, Coeur d'Alene, Idaho. USDA, Forest Service, Northern Region. 3p.
- James, R. L. 1985b. *Fusarium* associated with seedborne diseases of ponderosa pine seedlings at the Montana State Nursery, Missoula. USDA, Forest Service, Northern Region. 5p.
- James, R. L. 1985c. Tip blight of bareroot ponderosa and lodgepole pine seedlings at the USDA, Forest Service Nursery, Coeur d'Alene, Idaho. USDA, Forest Service, Northern Region. 3p.
- James, R. L. 1986. Sirococcus tip blight of bareroot pine seedlings at the Champion Timberlands Nursery, Plains, Montana. USDA, Forest Service, Northern Region. 3p.
- James, R. L. 1987a. Epidemiology of *Fusarium* on containerized Douglas-fir seedlings. 2. Occurrence, characteristics, and descriptions of *Fusarium* isolates obtained from seed and seedlings. USDA, Forest Service, Northern Region (In preparation).
- James, R. L. 1987b. Phoma tip blight of bareroot lodgepole pine seedlings, Champion Timberlands Nursery, Plains, Montana. USDA, Forest Service, Northern Region. 4p.
- James, R. L. 1987c. Tip blight of Scots pine seedlings - Montana State Nursery, Missoula. USDA, Forest Service, Northern Region. 3p.
- James, R. L. and C. J. Gilligan. 1984. Studies of *Fusarium* associated with containerized conifer seedling diseases: pathogenicity tests of isolates from the Alpine Nursery, Kalispell, Montana. USDA, Forest Service, Northern Region. Rept. 84-14. 29 p.
- James, R. L. and P. B. Hamm. 1985. Chlamydospore-producing species of *Phoma* from conifer seedlings in Pacific Northwest forest tree nurseries. *Proceedings of the Montana Academy of Sciences* (In press).
- James, R. L., E. P. Militante, J. Y. Woo, and C. G. Gilligan. 1986. Pathogenicity of *Fusarium* from forest seedling nurseries on Douglas-fir and ponderosa pine seedlings. USDA, Forest Service, Northern Region. Rept. 86-8. 12p.

- James, R. L., J. W. Schwandt, and J. Y. Woo. 1987. An evaluation of fungicides to control Diplodia tip blight at the Fantasy Farms Nursery, Peck, Idaho. USDA, Forest Service, Northern Region. Rept. 87-10. 4p.
- Nelson, P. E., T. A. Toussoun, and W. F. O. Marasas. 1983. *Fusarium* species: an illustrated manual for identification. The Pennsylvania State University Press, University Park. 193p.
- Schwandt, J. W. 1981. Sirococcus tip blight in north Idaho nurseries. Idaho Dept. of Lands. Rept. 81-7. 14p.