54. Dothistroma Blight of Pines

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Dothistroma blight is a devastating foliar disease of a wide range of pine species. The causal fungus, *Dothistroma pini,* infects and kills needles.

Hosts and Distribution

D. pini occurs in several plains States (fig. 54–1). Twenty pine species and hybrids are known hosts in the United States. In the central and eastern United States, the fungus is found most often in plantings of Austrian and ponderosa pines, which are highly susceptible. The fungus has not been reported in natural pine stands in the Eastern and Central States.

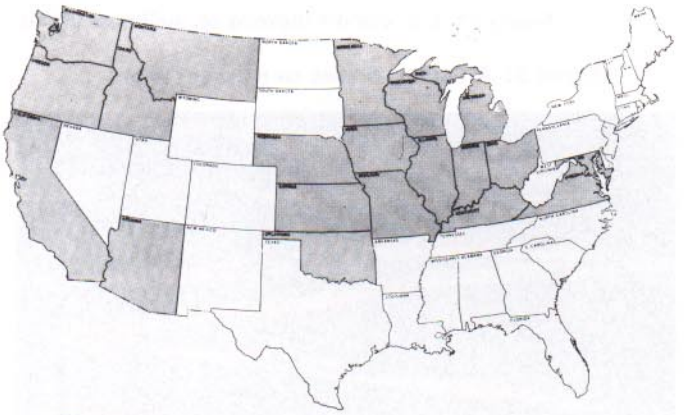

Figure 54–1. States in which *D. pini* is present (gray).

Symptoms and Signs

Early symptoms consist of deep-green bands and yellow and tan spots on needles. The deep green color of bands does not last, and can be detected only at the onset of symptom development. Later, the spots and bands turn brown to reddish brown (fig. 54–2). The bands are brighter red and more numerous on pines in California, Oregon, Washington, and Idaho, where this disease is often referred to as the "red band" disease.

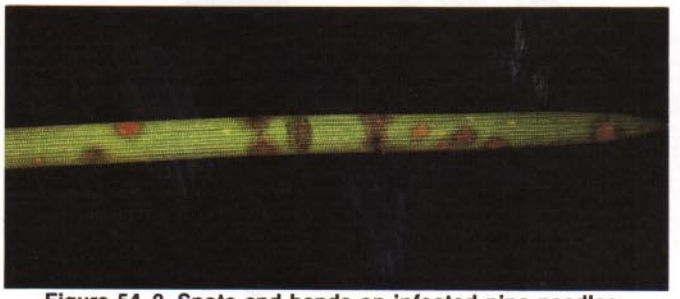

Figure 54–2. Spots and bands on infected pine needles.

The ends of infected needles progressively turn light green, tan, and brown, with the base of the needles remaining green (fig. 54–3). Needles may develop extensive necrosis (browning) 2 to 3 weeks after the first appearance of symptoms. Spores of the fungus are borne in fruiting bodies (acervuli) which develop below the epidermis of needles. As the acervuli enlarge, they split the epidermis longitudinally along two sides of the acervulus (fig. 54–4). Infection is typically most severe in the lower crown. Infected needles drop prematurely. Infected second-year needles are cast before infected current-year (first-year) needles. In some seasons, second-year needles are cast in the late fall of the year they became infected. In other seasons, loss of second-year needles is not extensive until late the following spring or early summer. Needles that become infected the year they emerge often are not shed until late summer the following year.

Disease Cycle

The fungus has both a sexual stage (*Scirrhia pini*) and

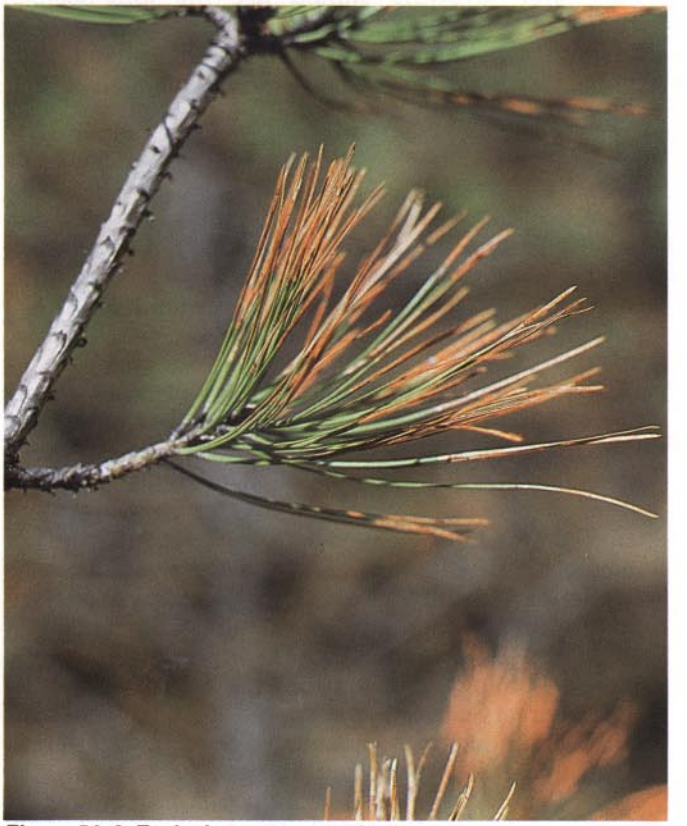

Figure 54–3. Typical appearance of infected needles: needle tips brown, needle bases green.

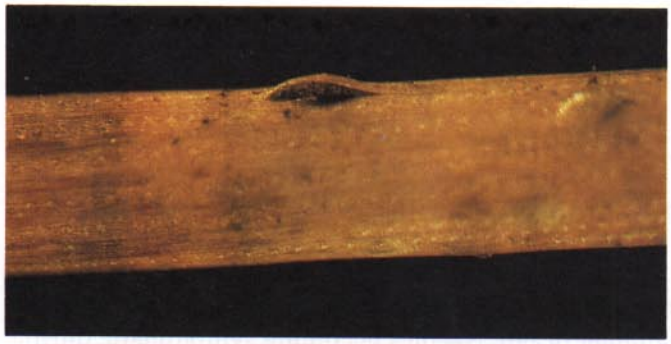

Figure 54-4. Fruiting bodies of *D. pini* raising the epidermis on a needle.

an asexual stage (*Dothistroma pini*). In the United States, the sexual stage has been found only in Alaska, California, and Oregon. The stromata of the sexual stage produce ascospores, whose role in the development of epidemics is not known, whereas much is known about the role of conidia (spores produced by the asexual stage) in disease development (fig. 54–5).

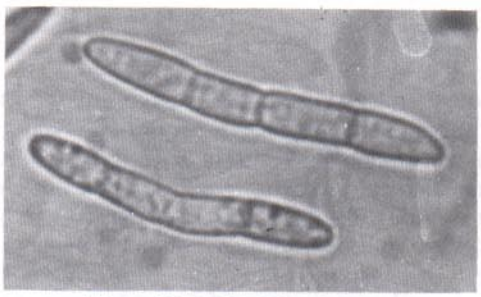

Figure 54-5. Conidia of *D. pini*.

The stromatic acervuli in which conidia are formed may develop sufficiently in the fall to raise and split the needle epidermis. They generally do not mature and produce conidia until the following spring. The conidia, which are exposed as the epidermis is raised, are released during wet weather and dispersed by rainsplash any time during the growing season. Thus, new infections can occur any time it rains from May to October. However, symptoms do not appear on newly infected needles until early fall in the Central United States.

Two growing seasons are required for completion of the life cycle in most areas of the United States (in California and Oregon, the cycle may be completed in 1 year).

Although the fungus has seldom been detected in young seedlings in nurseries, epidemics in isolated new plantings in the central Great Plains indicate that trees infected in the nursery must have been responsible. The fungus is common on older transplants in nurseries that produce pines for landscape plantings.

Damage

Successive years of severe infection result in decreased growth and, ultimately, death. The disease makes pines in landscapes unsightly and in Christmas tree plantings unmarketable. Premature defoliation caused by this fungus has resulted in complete failure of most ponderosa pine plantings in States east of the Great Plains. In the central and southern Great Plains, *D. pini* damages Austrian and ponderosa pines in Christmas tree, windbreak, and landscape plantings. In California, Oregon, and Washington, the fungus damages plantings of lodgepole and Monterey pines. Infection by *D. pini* occurs sporadically in natural stands of lodgepole and ponderosa pines in Idaho, Montana, and Washington.

Control

Copper fungicides effectively prevent infection by *D. pini*. Bordeaux mixture applied twice in the growing season has provided good protection of pines in the Central United States. Chlorothalonil also is registered for control of Dothistroma blight only in the North Central States.

The first application (mid-May) protects needles from previous seasons; the second application protects current-year needles. When control is intended for plantings of Austrian or ponderosa pines, the second application can be made after considerable new growth has occurred because current-year needles of these species initially resist infection and do not become susceptible until midsummer (July).

Effective control also has been obtained in plantings in the Central United States with a single application made after considerable growth has occurred (early June). There is some risk in this procedure, since infection could occur in previous years' needles before the early June application. A single application will control this disease on trees that do not have susceptible current-year needles. Many Christmas tree growers in the Central United States are effectively controlling Dothistroma with a single fungicide application.

Annual spraying may not be necessary in park, residential, and similar types of plantings. If infection occurs during a year in which fungicide has not been applied, fungicide can be applied the next year with confidence that good control will be obtained. If little or no infection occurs the year fungicide was not applied, spraying can be skipped for another year. Christmas tree growers should probably spray annually, however,.

The use of genetic resistance looks promising for preventing or reducing damage by this fungus. Seed from a Yugoslavian source, which has shown high resistance, is currently used to produce Austrian pines for Great Plains plantings. Recently, several geographic sources of ponderosa pine have been identified as having high resistance. Needles of all ages are highly resistant on some trees. On other trees, current-year needles are resistant, but older needles are susceptible.

Selected References

Peterson, Glenn W. Dothistroma needle blight of Austrian and ponderosa pines: epidemiology and control. Phytopathology. 57: 437–441; 1967.

Peterson, Glenn W. Resistance to *Dothistroma pini* within geographic seed sources of *Pinus ponderosa*. Phytopathology. 74: 956–960; 1984.