

6. Fusiform Rust

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Hosts

Fusiform rust, caused by the fungus *Cronartium quercuum* f. sp. *fusiforme*, requires both southern pine and oak trees to complete its life cycle.

Although 32 pine species have been shown to be susceptible to the fungus, the southern pine species most affected by the disease in nurseries are slash and loblolly pine, which are highly susceptible; longleaf and pond pines, which are less susceptible; and pitch and shortleaf pines, which are relatively resistant.

Members of the black oak group are the most common alternate hosts of the fungus, but 33 oak species are susceptible to the disease. Southern red oak and water oak are the most common alternate host for this fungus in the Southern United States.

Distribution

Fusiform rust is indigenous to the Southern United States and can be found from Maryland south to Florida and west to Arkansas and Texas. The disease incidence is highest in a zone approximately 150 miles wide, extending from the South Carolina coast to Texas where environmental conditions favorable for spore production and the susceptible (oak and pine) hosts occur together.

Damage

Fusiform rust is by far the most serious nursery disease of slash and loblolly pine; in contrast, the fungus does not cause any economic loss on oaks. Within the high disease incidence zone, nurseries

must take steps to control this disease on pine hosts. Although mortality may not occur in the nursery, infected seedlings rarely survive to age five or may result in poorly formed trees. To minimize losses in the field and disease introductions, infected seedlings must be culled at the nursery before outplanting.

Diagnosis

In the early spring, examine the underside of oak leaves in the vicinity of the nursery for orange urediniospores and brown, hair-like teliospores (fig. 6.1). The presence of urediniospores and telia on oak leaves indicates that if susceptible pine seedlings are in nearby nurseries, they will most likely become infected. Beginning in late summer, examine seedling stems for slight swellings or epidermal discolorations on the main stem above the root collar. On loblolly and slash pine, the typical spindle-shaped

stem gall becomes considerably larger and more obvious by the time the seedlings are lifted later in the season (fig. 6.2). On longleaf pine, however, the galls occur right at the groundline and tend to be more globose (fig. 6.3). During the fall, yellow-orange droplets of fluid may be observed on the galls. These droplets contain pycniospores, one of the five spore stages produced by the fungus (fig. 6.4).



Figure 6.1—*Uredinal pustules and hair-like telia of Cronartium quercuum* f. sp. *fusiforme* on the underside of an oak leaf. Photo by Robert L. Anderson, USDA Forest Service, at <http://www.bugwood.org>.



Figure 6.2—Typical spindle-shaped galls on loblolly pine seedlings infected with fusiform rust. Photo by Tom Starkey, Auburn University.

Conifer Diseases

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Figure 6.3—Typical gall (bottom seedling) formed on longleaf pine seedlings infected with fusiform rust. Photo by Tom Starkey, Auburn University.



Figure 6.4—Swelling on seedling stem and pycniospores produced by *Cronartium quercuum* f. sp. fusiforme. Photo by Scott A. Enebak, Auburn University.

Biology

This disease is caused by an obligate fungal parasite that requires living host tissue for survival. The orange aeciospores produced on pine galls in early spring only infect expanding oak leaves. A few weeks after oak infection, uredinial pustules develop on the underside of oak leaves; the uredinial pustules then produce urediniospores, which may reinfect other young oak leaves. As these infected oak leaves mature, telia will appear and they produce basidiospores. The basidiospores are produced from spring to early summer during periods of high humidity and moderate temperatures, and are the only spores of this fungus that can infect pine needles and shoots. It is at this time

of the growing season when seedlings in the nursery are germinating and emerging from the soil and are highly susceptible to basidiospore infection.

Control

Prevention

Use of conifer seed from genetically improved families or selected rust-resistant stock is the most effective and practical long-range approach to lessening the disease's effects on loblolly and slash pine.

Cultural

Only rust-free seedlings should be shipped from the nursery because infected seedlings rarely survive past age five and only serve to introduce or increase the disease in the field. Check seedlings for fusiform rust infection before lifting. If infection is present, then either cull seedlings or destroy infested beds.

Chemical

The use of fungicides provides the most effective control method in forest tree nurseries. Seedling infection can be prevented by applying a registered fungicide as a seed treatment before sowing and then followed with three to four foliar sprays every 2 to 3 weeks from seedling emergence through mid-June. A spreader-sticker can be added to improve coverage and reduce fungicide weathering. The frequency, timing, and coverage of fungicidal sprays are important for effective rust control.

Selected References

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