FOR269

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Annosum Root Rot of Southern Pines[1]

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Introduction

Annosum root rot (previously referred to as Annosus root rot) is widely regarded as the most economically damaging forest pathogen in temperate forests in the northern hemisphere (Asiegbu *et al*. 2005). Annosum root rot of southern pines is caused by the fungus *Heterobasidion annosum* (Sinclair and Lyon 2005), which can infect a wide range of host species, including southern pines (*Pinus* spp.) and redcedars (*Juniperus* spp.) (Barnard 1999). This disease can occur in both natural and planted forest stands but is most problematic following thinning in pine plantations. Annosum can cause tree mortality, reduced growth rates, increased susceptibility to attack by bark beetles, and regeneration failure, all of which have been documented in infected pine stands in Florida (Barnard 1999).

Pathogen Biology

Heterobasidion annosum is introduced into a previously uninfected stand by airborne spores. When spores land on fresh cut stumps, they germinate and the fungus grows through the root systems of the infected stumps and then infects roots of living trees adjacent to the infected stumps through root grafts. As it invades the host, the fungus decreases the capacity of the root system to supply water and nutrients. The fungus also compromises the structural integrity of the root system so that it cannot support the tree as well, and stands infected with the fungus will have more windthrown live trees compared to uninfected stands. Because the fungus reduces the number of roots and renders the remaining roots less efficient, it often leads to crown thinning (Figure 1). Other possible indicators of annosum root rot include clumps of soil bound to root surfaces by resin, resin soaking of root wood, fruiting bodies (Figure 2), and white stringy rot of the root wood that resembles shredded wheat[a] (Barnard 1999).

Figure 1. Healthy foliage (left), thinning foliage (right) caused by annosum root rot (Photo by Tyler Dreaden).

In the southeastern United States, soil characteristics can be used to determine the hazard

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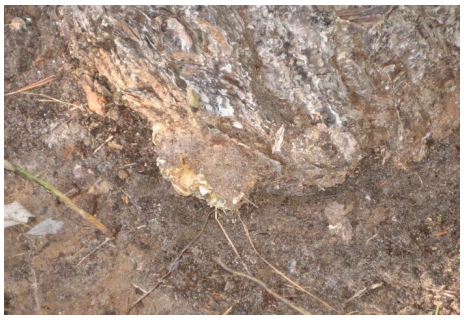

Figure 2. Fruiting body of *Heterobasidion annosum*, causal agent of annosum root rot on southern pines (Photo by Tyler Dreaden).

rating of a site for annosum root rot (Robbins 1998). For instance, sites on which the soils are sandy or sandy loam for at least 12 inches from the surface and that have good internal drainage and a low seasonal water table are considered high hazard sites. For more assistance, see The National Cooperative Soil Survey[b], which can be used to determine soil characteristics, a map showing general hazard ratings for annosum root rot[c], or your county forester[d].

In Florida the extent and impact of annosum root rot is unknown and difficult to assess (Barnard 1999). In a 1991 study of thinned slash pine plantations across northern Florida by Barnard *et al*. (1991), *Heterobasidion annosum* was found in 17 of 30 plantations. On only one of these *H. annosum* infected plantations was the infection considered problematic. Individual stands in Walton, Jackson, Leon, and Columbia counties have been observed with annosum root rot infections serious enough to require salvage harvests (Barnard 1999). However, the frequency and impact of annosum root rot in Florida is not known.

Prevention Strategies

Several things can be done on high hazard sites to help reduce the impact of annosum root rot. In the South, high temperatures from May through August on stump surfaces are often lethal to *H. annosum* spores. Also the fruiting bodies are produced during the winter, so that fewer spores remain in the air during the summer to infect stumps. Thus, to reduce the potential for new infections it is best to schedule thinning for warm months and avoid them during the cooler months, especially in the winter. If southern pine beetles are a threat, however, summer thinning may not be recommended. Consult your county forester[d] for further guidance.

In uninfected stands, dry, granular borax will prevent the fungus from infecting stump surfaces. Apply the borax to stump surfaces immediately after harvesting the trees using a salt shaker-type application. This treatment is not advised if annosum root rot is already present in the stand because the borax can prevent other natural competitors of the fungus from entering the stump. For more information on borax stump treatment, see the U.S. Forest Service Forest Insect & Disease Leaflet 76, "Annosus Root Rot in Eastern Conifers"[e] (Robbins 1998).

Producers in other parts of the world use the fungus *Phlebia gigantea* as a biological control strategy, and this method is currently under development for the southeastern United States. *Phlebia gigantea* will spread faster and overgrow the causal agent of annosum root rot, *H. annosum*. However, it is not commercially available in the United States at this time.

Clear cutting tends to interrupt annosum root rot disease progression, and severely infected stands usually can be safely replanted after clear cutting (Robbins 1998). The high temperatures and humidity in the Southeast allow the stumps to decompose rapidly, which limits the infection of planted seedlings. Normally a maximum of 5% of the seedlings will be killed by annosum root rot if the area is planted immediately after harvesting with no other control methods implemented (Robbins 1998).

For additional information on annusum root rot, refer to the links listed below.

[a] http://doacs.state.fl.us/pi/enpp/pathology/pathcirc/pp398.pdf

[b] http://websoilsurvey.nrcs.usda.gov/app/

[c] http://www.fs.fed.us/r8/foresthealth/atlas/annosus/annosus_intro.shtml

[d] http://www.fl-dof.com/

[e] http://nrs.fs.fed.us/pubs/857

Works Cited

Asiegbu, F. O., A. Adomas, and J. Stenlid. 2005. Conifer root and butt rot caused by *Heterobasidion annosum* (Fr.) Bref. *s.1*. Molecular Plant Pathology 6:395–409.

Barnard, E. L. 1999. Annosum Root Rot of Pines in Florida. Florida Department of Agriculture and Consumer Services, Division of Plant Industry, Gainesville. Plant Pathology Circular No. 398.

Barnard, E. L., S. P. Gilly, and W. N. Dixon. 1991. Incidence of *Heterobasidion annosum* and other root-infecting fungi in residual stumps and roots in thinned slash pine plantations in Florida. Plant Disease 75:823–828.

Robbins, K. 1998. Annosus Root Rot in Eastern Conifers. U.S. Department of Agriculture Forest Service. Forest Insect & Disease Leaflet 76.

Sinclair, W. A., and H. H. Lyon. *Diseases of trees and shrubs*. Root and Butt Rots caused by *Heterobasidion* Species. Second edition. Ithaca. Comstock publishing associates. 2005. 332–335.